

# Creation of the Coal Technological Cluster as a Factor of Strategic Competitiveness of the Russian Coal Industry

## Creación del clúster tecnológico del carbón como factor de competitividad estratégica de la industria hullera rusa

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#### ABSTRACT:

The purpose of the work is to determine the perspectives of increase of competitiveness of the Russian coal industry within the cluster model of development. The core of the methodology of this research consists of the method of determined factor analysis, within which the proprietary multi-factor multiplicative model of strategic competitiveness of the coal industry is used. The authors also use the method of problem and strategic analysis. The authors perform the factor analysis of strategic competitiveness of the Russian coal industry with emphasis on accounting of the clustering factor and determine the problems and perspectives of realization of the cluster model of development of the Russian coal industry. The performed factor analysis showed that clustering is a dominating factor of providing the strategic competitiveness of the Russian coal industry and influences its growth. This determines the expedience of expansion of cluster processes in this sphere. For this,

#### RESUMEN:

El objetivo del trabajo es determinar las perspectivas de aumento de la competitividad de la industria hullera rusa dentro del modelo de desarrollo del cluster. El núcleo de la metodología de esta investigación consiste en el método de análisis factorial determinado, en el que se utiliza el modelo multifactorial patentado de competitividad estratégica de la industria hullera. Los autores también utilizan el método de problema y análisis estratégico. Los autores realizan el análisis factorial de la competitividad estratégica de la industria del carbón ruso con énfasis en la contabilidad del factor de agrupamiento y determinan los problemas y perspectivas de realización del modelo de Cluster de desarrollo del Ruso industria del carbón. El análisis factorial realizado mostró que la agrupación es un factor dominante para proporcionar la competitividad estratégica de la industria del carbón ruso e influye en su crecimiento. Esto determina la conveniencia de la expansión de los procesos de Cluster en esta esfera.

the authors offer the strategy of increase of the Russian coal industry's competitiveness within the cluster model of development. As a result of the research, it is empirically proved – with the help of the factor analysis – that creation of the coal technological cluster is a significant factor of strategic competitiveness of the Russian coal industry. The perspectives of increase of the Russian coal industry's competitiveness within the cluster model of development are predetermined by the state activation of support for private cluster initiatives among the coal and technological enterprises and R&D institutes.

**Keywords:** coal industry, strategy of development, competitiveness, coal & energy and coal & technology cluster, cluster model of development.

Para ello, los autores ofrecen la estrategia de aumento de la competitividad de la industria hullera rusa dentro del modelo de desarrollo del cluster. Como resultado de la investigación, se demuestra empíricamente – con la ayuda del análisis factorial – que la creación del clúster tecnológico del carbón es un factor importante de competitividad estratégica de la industria del carbón ruso. Las perspectivas de aumento de la competitividad de la industria hullera rusa dentro del modelo de desarrollo del cluster están determinadas por la activación del estado de apoyo a iniciativas de Cluster privado entre las empresas de carbón y tecnología e i+d. institutos.

**Palabras clave:** cluster de desarrollo, industria del carbón, estrategia de desarrollo, competitividad, carbón y energía y carbón y tecnología.

## 1. Introduction

The coal industry is very important in the modern Russian economy. As of 2015, its share in the Russian GDP constitutes 3.1%, and more than 17% of the Russian export revenues are provided by the coal industry. In the conditions of realization of the resource model of the Russian economy development, the coal industry forms the foreign economic image of the country and its position in the global economic system. Due to this, development and support for the long-term global competitiveness of the coal industry is one of the strategic priorities of the Russian economy.

Due to this, the problem of provision of strategic competitiveness of the Russian coal industry is very topical. This article offers a hypothesis that creation of the coal technological cluster is a significant factor of strategic competitiveness of the Russian coal industry. The purpose of the work is to verify this hypothesis and to determine the perspectives of increase of competitiveness of the Russian coal industry within the cluster model of development.

The set goal is achieved through three consecutive stages. At the first stage, the factor analysis of strategic competitiveness of the Russian coal industry is made with the emphasis on the factor of clustering. At the second stage, the problems and perspectives of realization of the cluster model of development the Russian coal industry are determined. The third stage is related to development of the strategy of increase of competitiveness of the Russian coal industry within the cluster model of development.

## 2. Materials and method

The classic approach to determining the competitiveness of a separate company or the whole sphere is based on its comparison to the competitiveness of the performed products and supposes the comparison of technical characteristics that reflect the quality of products, pricing and marketing characteristics of the object of the research with the selected model. The theoretical and methodological foundations of analysis of competitiveness are given in the works (Rudychev et al., 2013), (Hečková and Chapčáková, 2011), (Nazemi and Mashayekhi, 2015), (Lisin et al., 2015), et al.

Fundamental and applies issues, related to creation and functioning of economic clusters, are studied in the works (Zorin et al., 2016), (Popkova et al., 2013a), (Popkova et al., 2013b), et al. Specifics of the work of the coal technological enterprises and functioning of the coal technological sphere in various countries of the world are given in the works of such researchers as (Tkacheva et al., 2015a), (Tkacheva et al., 2015b), (Afanasiev et al., 2015a), Afanasiev et al., 2015b), et al.

We think than unlike the tactical (static, which works in the short-term perspective), the strategic (long-term perspective) competitiveness of economy is determined by innovative activity of entrepreneurial structures that are part of it and their number.

It is supposed that clustering stimulates the increase of the number of enterprises in the sphere, as its increases their market positions with preservation of intra-cluster competition and stimulates the innovative activity due to expansion of the access to financial resources and increase of connection between R&D institutes and enterprises in a cluster.

The core of the methodology of this research consists of the method of the determined factor analysis within which the following multi-factor multiplicative model of strategic competitiveness of the coal industry is used:

$$SCCI=(CIci*IIci*NEci)*NCci \quad (1)$$

where

SCCI – strategic competitiveness of the coal industry;

CIci – number of created innovations in the sphere of the coal industry;

IIci –number of implemented innovations by enterprises of the coal industry;

NEci –number of enterprises of the coal industry;

NCci –number of clusters in the sphere of the coal industry.

In order to determine the character and the level of influence of each factor on the level of strategic competitiveness of the coal industry, the algorithm of the method of chain replacements for the multi-factor multiplicative model is used, which includes six main stages. At the first stage, the information on the values of indicators CIci, IIci, NEci, and NCci is gathered in the previous (zero) period with the index "0" (2014) and the current period with the index "1" (2015).

At the second stage, the strategic competitiveness of the coal industry in the previous period is determined:  $SCCI0=(CIci0*IIci0*NEci0)*NCci0$ . At the third stage, the conventional indicators are calculated:

- $SCCI(1)=(CIci1*IIci0*NEci0)*NCci0$ ;
- $SCCI(2)=(CIci1*IIci1*NEci0)*NCci0$ ;
- $SCCI(3)=(CIci1*IIci1*NEci1)*NCci0$ .

At the fourth stage, the strategic competitiveness of the coal industry is determined in the current period:  $SCCI1=(CIci1*IIci1*NEci1)*NCci1$ . At the fifth state, the change of the resulting indicator under the influence of each separate factor is determined by deducting the calculated indicators:

- $\Delta SCCI(CIci)=SCCI(1)- SCCI0$
- $\Delta SCCI(IIci)=SCCI(2)- SCCI(1)$
- $\Delta SCCI(NEci)=SCCI(3)- SCCI(2)$
- $\Delta SCCI(NCci)=SCCI1- SCCI(3)$

At the sixth stage, the correctness of calculations is verified with the help of determining the general deviation of the level of strategic competitiveness of the coal industry in the previous period from its level in the current period, which should equal the sum of its deviations under the influence of the determined factors:

- $\Delta SCCI=SCCI1-SCCI0=\Delta SCCI(CIci)+ \Delta SCCI(IIci)+ \Delta SCCI(NEci)+ \Delta SCCI(NCci)$

The authors also use the method of problem and strategic analysis.

### 3. Results

Let us perform the factor analysis of strategic competitiveness of the Russian coal industry. In 2014, there were only two coal technological clusters in Russia – the territorial innovational cluster "Complex processing of coal and anthropogenic waste" in Kemerovo Oblast and "Karakansk coal & energy cluster" in Kemerovo Oblast (Krasnyansky, 2015), (Ten reasons for

coal chemistry for Russia, 2015).

In 2015, three new coal chemistry clusters in the regions of coal production appeared – the Elginsky site (the Republic of Sakha (Yakutia)), the Ulugkhem basin (The Republic of Tyva) and Kuzbass (Krasnyansky, 2011) – i.e., there are five of them in Russian. The information necessary for the factor analysis is given in Table 1.

**Table 1**  
Dynamics of indicators for the factor analysis in 2014-2015

<b>Indicators</b>	<b>2014 (0)</b>	<b>2015 (1)</b>
CIci	43	45
IIci	6,009	6,341
NEci	186	195
NCci	2	5

Source: (The Federal State Statistics Service, 2015).

Let us determine the strategic competitiveness of the coal industry in 2014:  $SCCI_0 = (43 * 6009 * 186) * 2 = 96119964$ . Let us calculate the conventional indicators:

- $SCCI(1) = (45 * 6009 * 186) * 2 = 100590660$ ;
- $SCCI(2) = (45 * 6341 * 186) * 2 = 106148340$ ;
- $SCCI(3) = (45 * 6341 * 195) * 2 = 111284550$ .

Let us determine the strategic competitiveness of the coal industry in 2015:  $SCCI_1 = (45 * 6341 * 195) * 5 = 278211375$ . Let us determine the change of the resulting indicator under the influence of each separate factor:

- $\Delta SCCI(CIci) = 100590660 - 96119964 = 4470696$ ;
- $\Delta SCCI(IIci) = 106148340 - 100590660 = 5557680$ ;
- $\Delta SCCI(NEci) = 111284550 - 106148340 = 5136210$ ;
- $\Delta SCCI(NCci) = 278211375 - 111284550 = 166926825$ .

Let us perform the verification of the calculations' correctness:

$$\Delta SCCI = 278211375 - 96119964 = 4470696 + 5557680 + 5136210 + 166926825 = 182091411 - \text{calculations are correct.}$$

The performed factor analysis showed that due to increase of the number of created innovations in the sphere of the coal industry, its strategic competitiveness in 2015 grew by 4470696 (2%), as compared to 2014, due to increase of the number of implemented innovations – by 5557680 (3%), due to increase of the number of enterprises of the coal industry – by 5136210 (3%), and due to increase of the number of clusters in the sphere of the coal industry – by 166926825 (92%).

This shows that clustering is a dominating factor of provision of strategic competitiveness of the Russian coal industry and influences its growth. This determines the expedience of expansion of cluster processes in this sphere. We determined the following key problems of clustering in the Russian coal industry.

The first problem is the lack with the modern Russian coal technological enterprises of stimuli for unification into clusters. Low level of competition, caused by high barriers for entering in the sphere of the Russian coal industry, creates a favorable environment for independent functioning of separate coal technological enterprises. That is, they are not interested in

creation of clusters, which will require from them the exchange of financial and human resources, as well as technologies that constitute their competitive advantages.

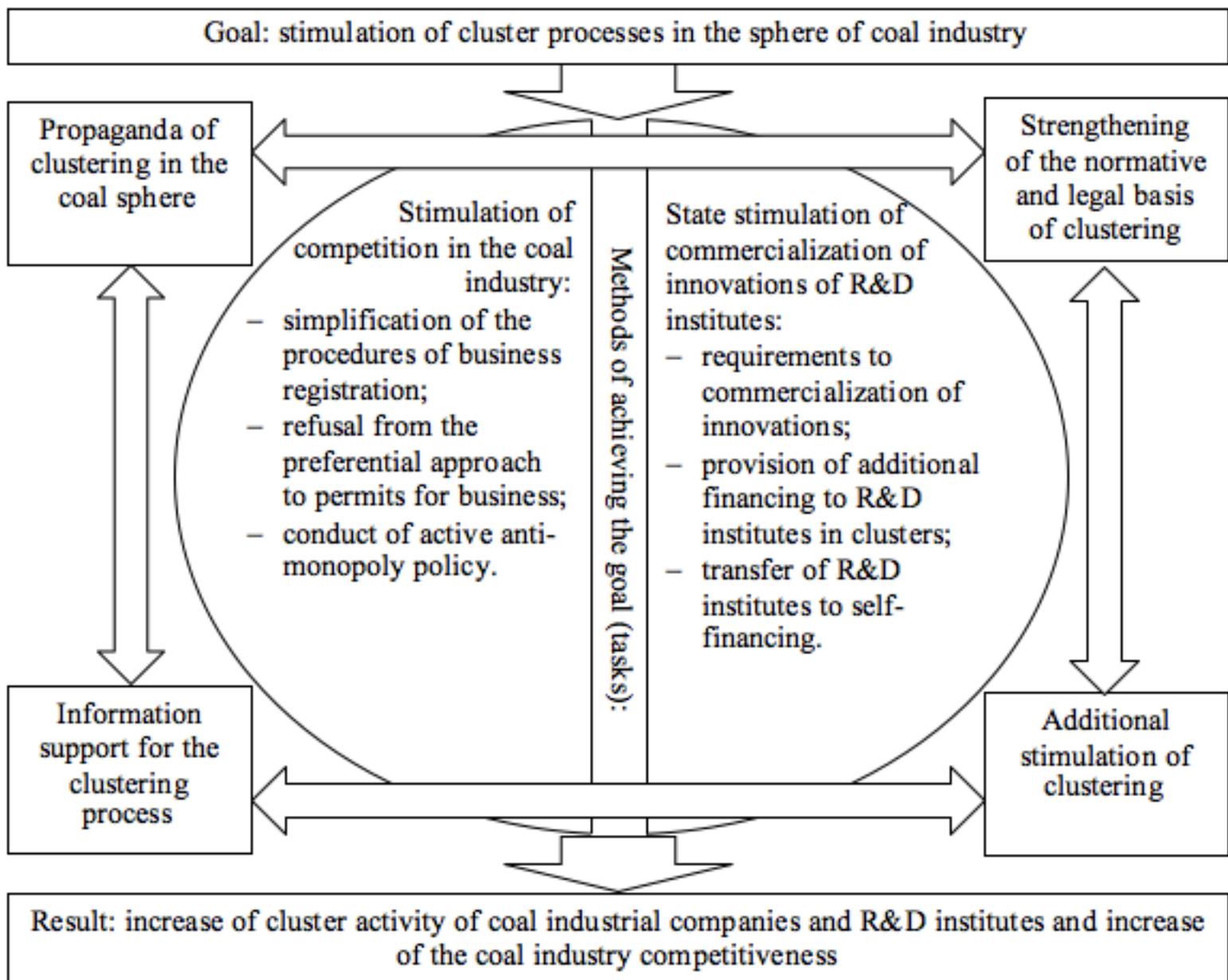
The second problem is absence of connection between the Russian coal technological enterprises and R&D institutes and the latter lacking stimuli for cooperation. R&D institutes in Russia receive state financing, so they are more interested in creation of innovations for justifying the received financial resources and attraction of the new ones. In such conditions of functioning, they are not interested in cooperation with real business, including the coal technological enterprises and in entering the clusters.

Perspectives of realization of the cluster model of the Russian coal industry development are related to solving these problems, i.e., realization of the two main strategic directions. Firstly, it is necessary to stimulate competition in the coal industry for creation of the highly-competitive environment, survival in which will require from the coal technological companies to unite into clusters. Firstly, it is expedient to change the approach to financing the activity of R&D in favor of increase of requirements to commercialization of innovations.

For realization of these perspectives, this work offers the strategy of increase of competitiveness of the Russian coal industry within the cluster model of development, which is shown in Figure 1.

**Figure 1**

Strategy of increase of the Russian coal industry competitiveness within the cluster model of development



As is seen from Figure 1, within the offered strategy the main goal is stimulating the cluster processes in the sphere of the coal industry. This goal is achieved by two indirect methods (it supposes solving two main tasks). The first task: stimulating competition in the coal industry. This requires simplification of the procedures of business registration, refusal from the preferential approach to the issue of permits for doing business, and active anti-monopoly

policy.

The second task: state stimulation of commercialization of innovations of R&D institutes is achieved by means of setting requirements to commercialization of innovations, provision of additional financing of R&D institutes in clusters, and by transferring R&D institutes to self-financing, which will make them commercialize innovations as a source of revenues.

Also, the offered strategy supposes realization of the means of direct support for realization of cluster initiatives in the sphere of the coal industry: propaganda of clustering in the coal sphere, information support for the process of clustering, strengthening of the normative & legal basis of clustering, and additional stimulation of clustering (e.g., tax). As a result of realization of this strategy, increase of cluster activity of coal industrial enterprises and R&D institutes is expected, which, in its turn, will lead to increase of competitiveness of the coal industry.

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## 4. Discussion

Thus, the offered hypothesis is proved – it is empirically shown that creation of the coal technological cluster is a significant factor of strategic competitiveness of the Russian coal industry. Perspectives of increase of competitiveness of the Russian coal industry within the cluster model of development are largely predetermined by state activation of private cluster initiatives among the coal technological companies and R&D institutes.

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## 5. Conclusion

The obtained authors' conclusions contribute into development of the modern economic science, which predetermines high theoretical significance of the performed research. In particular, the notion, sense, and methodology of determining the strategic competitiveness of an economic sphere are specified, which stimulates the development of the concept of marketing, and the role of clusters in provision of strategic competitiveness of the coal industry is determined, which stimulates the development of the concept of clustering.

The developed authors' recommendations for realization of the cluster model of the Russian coal industry development determine the practical significance of the results of this work. The largest scientific value in the article belongs to the strategy of increase of the Russian coal industry competitiveness within the cluster model of development. However, orientation only at the modern Russian economy is its limitation, as it does not allow using it in other countries.

We think that further perspectives of complex development of the concept of marketing and the concept of clustering in the context of studying the possibilities and perspectives of provision of strategic competitiveness of the coal industry are related to collection and analysis of international empirical data for establishing more precise dependence between creation of the coal technological clusters and increase of strategic competitiveness of the Russian coal industry for the purpose of determining the perspectives of maximization of the positive effect that emerges in this process.

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