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CLUSTER MODEL OF DEVELOPMENT AS A FACTOR OF INCREASE OF COMPETITIVENESS AND INNOVATIONAL POTENTIAL OF COAL INDUSTRY

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ABSTRACT

The authors analyze the role of coal industry in modern Russia and determine problems and perspectives of its development with the help of clustering. The authors perform evaluation of current competitiveness of Russian coal industry, conduct SWOT-analysis of development of Russian coal industry, and determine probable consequences of advantages of clustering for development of coal industry of Russia. The authors' recommendations are presented in the form of cluster model of development of Russian coal industry.

Keywords: coal industry, competitiveness, innovational potential, coal, energy, technological cluster, cluster model of development.

INTRODUCTION

Coal industry plays an important role in economy of modern Russia. Firstly, coal is widely used in production of energy at thermal power plants and is an indispensable condition for effective functioning of fuel and energy complex, which creates infrastructure of industrial spheres of economy, stipulating their successful functioning and development.

While at present coal industry constitutes a quarter of fuel and energy complex, according to plans of strategic development of Russia, by 2020, its share will grow by more than 1.5 times. This shows that coal industry is irreplaceable, and its role in Russian economy grows with time. At that, despite large stock of coal, demand exceeds offer, and this imbalance also has a tendency for increase.

Secondly, coal is actively used in industry, being important raw material for its many spheres. Coal is actively used in housing and road construction, creation of various synthetic materials, etc. Therefore, coal industry is not only a supplier of energy but a supplier of raw materials for other spheres of industry.

Thirdly, Russia possesses a third part of the global deposits of coal, which is an important sphere of export. Taking into account raw material direction of Russian economy, coal export is an important component of formation of GDP and an important factor of national economic growth. That's why development of coal industry is of top-priority for contemporary Russia.

Nevertheless, due to low level of internal competition, coal industry is not developed in Russia. Technology of extraction and processing of coal is not improved, equipment is not modernized, and other innovations are not implemented. State stimulation of innovational activities in coal industry showed its ineffectiveness, which causes necessity for search for means of development of coal industry in Russia.

This article offers a hypothesis that clustering is a perspective direction of development and a factor of increase of competitiveness and innovational potential of coal industry of Russia. The purpose of the research is verification of the offered hypothesis and determination of perspectives of clustering of coal industry and development of cluster model of development of coal industry in Russia.

MATERIALS AND METHOD

For study of peculiarities of functioning of coal industry in Russia and other countries of the world, the work uses materials of the research of such authors as (Betz *et al*., 2015), (Chen *et al*., 2015), (Lakhno, 2015), (Steckel *et al*., 2015), and (Tkacheva *et al*., 2015), in which the sense of coal industry and its role in economic development are viewed.

For determination of perspectives of clustering of coal industry, the work uses materials of such scientists as (Aragón *et al*., 2014), (Emmoth *et al*., 2015), (Nica, 2010), (Popkova *et al*., 2015), (Reveiu and Dârdală, 2015), Vanka *et al*., 2012) (Xavier Molina-Morales *et al*., 2015), (Gallié *et al*., 2013), in which existing experience in the sphere of clustering of various sectors if industry is systematized, and advantages and threats of clustering are determined.

Despite a large number of studies by contemporary authors, devoted to search for tools and ways of development of coal industry, and works in the sphere of cluster study, there is no theoretical and methodological basis of the use of cluster model of development in coal industry, which causes necessity for conduct of further research in this sphere.

This research is devoted to filling this gap in scientific research and determination of expedience of clustering of coal industry of Russia. Methodological basis of this research consists of methods of modeling, forecasting, SWOT-analysis, as well as classical methods of scientific research: induction, deduction, analysis, synthesis, and graphical presentation of information.

In order to determine current level of competitiveness of Russian coal industry, its strong and weak sides, as well as perspectives of its growth, the work uses the methodology of evaluation of competitiveness (Table-1).

As is seen from Table-1, methodology of evaluation of competitiveness supposes comparison of indicators of competitiveness in Russia with the market leader. There are three groups of indicators of competitiveness: quality indicators, pricing indicators, and marketing indicators. Indicators could be direct and reverse. Direct indicators are the ones which value is optimal. Reverse indicators are indicators the smallest value of which is optimal.

Quality indicators include a direct indicator: calorific capacity and reverse indicators: total humidity and impurity content - ash and scrape. Based on these indicators, quality index is calculated - as direct average of ratio of Russian indicators to model ones. Pricing indicators include a direct indicator - labor efficiency, and reverse indicators - transport charge and coal price. Based on these indicators, price index is calculated, as direct average of ratio of Russian indicators to model ones.

Marketing indicator is a direct indicator - brand strength. Based on this indicator, marketing index is determined. As a result, indicator of competitiveness, as direct average of quality index, pricing index, and marketing index, is calculated. The close the indicator of competitiveness is to 1, the higher is the level of competitiveness of Russian coal industry in the world coal market.

RESULTS

Let us conduct evaluation of the current level of competitiveness of coal industry of Russia in the world coal market (Table-2). The model would be coal industry of the USA, which is the leader in the world coal market.

As is seen from Table-2, as to indicators of quality, Russian coal is not worse, and in some cases even better, which is clearly shown by quality index of Russian coal which is equal to 1. However, as to pricing indicators, Russian coal industry yields to the American due to high transport charges, low labor efficiency, and, accordingly, high coal price - so pricing index of Russian coal constitutes 0.67.

Strength of American brands in coal industry is higher that of Russian ones. That's why marketing index of Russian coal industry constitutes 0.75. Competitiveness of Russian coal industry constitutes 0.8 of the American. It is a high level of competitiveness - but there are perspectives of its growth by means of improvement of pricing and marketing indicators of competitiveness.

Drawbacks of coal industry of Russia could be eliminated with the help of clustering. Creation of a coal cluster will allow eliminating most of intermediaries and reducing transport charges, strengthening Russian coal brands and increasing labor efficiency by means of implementation of innovations into production. Taking into account close connection of coal industry with other spheres and fuel and energy complex, clustering can strengthen this connection and increase effectiveness of its members' cooperation through translation of knowledge and information.

Clustering can be also useful for establishing strong horizontal connections between competing enterprises of coal industry of Russia. Creation of coal cluster will stipulate simplification of information exchange while joining of capitals will create possibilities for development of technologies of extraction and processing of coal and implementation of innovations into coal industry. In order to show advantages of clustering, let us conduct SWOT-analysis of development of coal industry of Russia (Table-3).

As is seen from Table-3, strengths of coal industry of Russia include large stock of coal, experience of coal extraction, and flexibility and adaptability of production. Weak sides of Russian coal industry are high accidence rate and low level of autoimmunization of production, large damage to environment, and high coal price due to long chain of value added.

Creation of coal cluster will create conditions for development of technologies of manufacture and implementation of innovations, which will ensure automatization of production, increase coal quality, reduce accidence risk, and increase environmental compatability of production. Joining of enterprises of coal industry in to cluster will allow reducing the chain of value added and price for Russian coal.

Without the use of cluster model, development of coal industry of Russia is threatened with increase of global competition and consumers' power, new wave of technological changes, necessity for modernization, and depletion of the potential of raw materials export model of Russia. Thus, results of SWOT-analysis confirm expedience of clustering of coal industry of Russia. This research offers the following cluster model of development of coal industry of Russia (Figure-1).

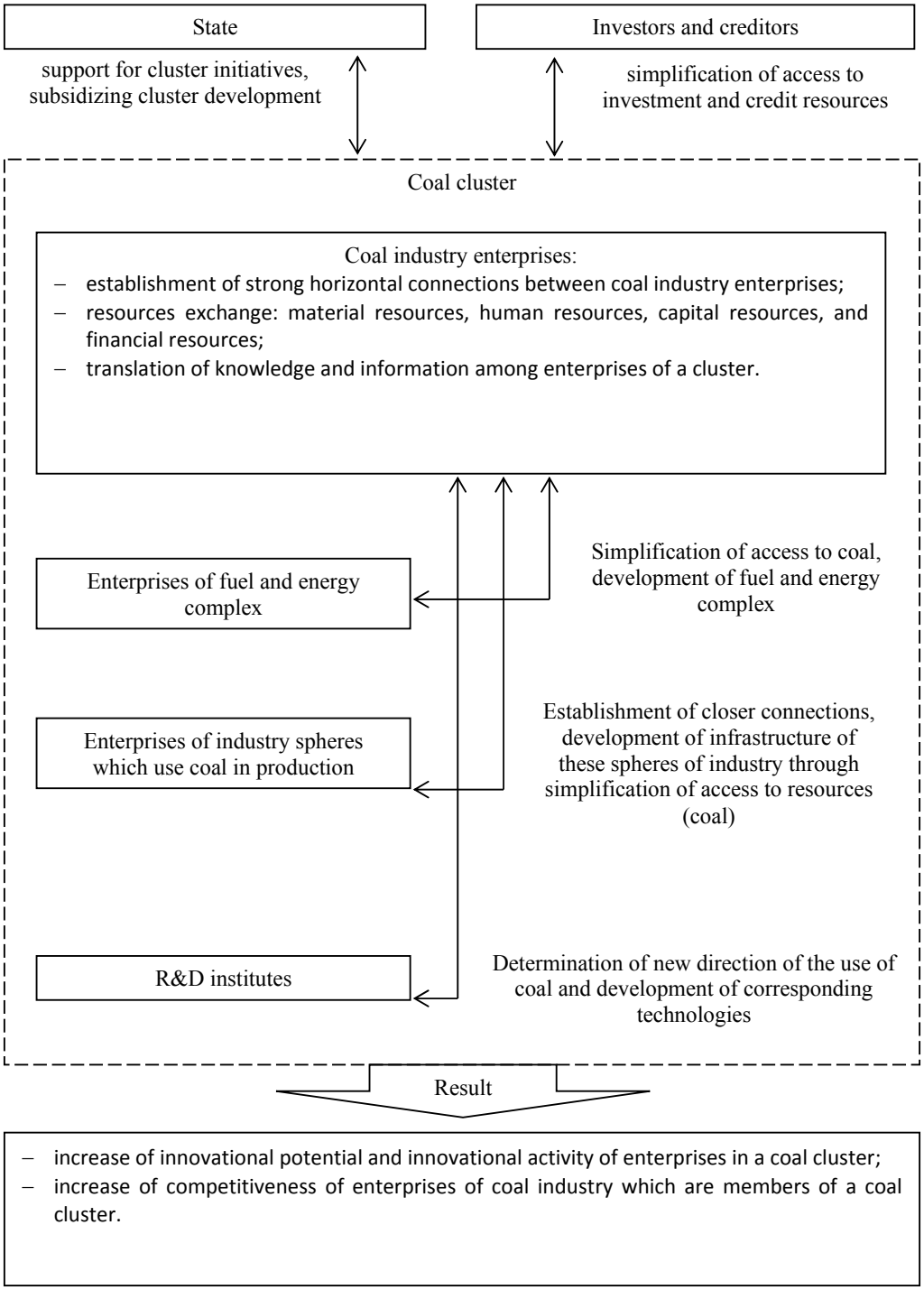

Figure-1. Cluster model of development of coal industry of Russia.

As is seen from Figure-1, cluster model of development of coal industry of Russia supposes joining into coal cluster of enterprise of coal industry, enterprises of fuel and energy complex, and enterprises of the spheres of industry, which use coal in production, and R&D institutes.

Clustering of enterprises of coal industry will lead to establishment of strong horizontal connections and resources exchange: material resources, capital resources, and financial resources, as well as translation of knowledge and information among enterprises in cluster.

Joining of enterprises of coal industry and enterprises of fuel and energy complex into a coal cluster will lead to simplification of access to coal and development of fuel and energy complex. Enterprises of coal industry and enterprises of the spheres of industry

which use coal in production will see establishment of closer connections and development of infrastructure of these spheres of industry through simplification of access to resources (coal).

Integration of enterprises of coal industry and R&D institutes will allow determining new perspective directions for use of coal and develop technologies necessary for that. This will be an additional vector of development of coal industry. As a result; there will be growth of innovational potential and innovational activity of enterprises in coal cluster and increase of competitiveness of enterprises of coal industry which are a part of coal cluster.

CONCLUSIONS

Thus, as a result of the research, the offered hypothesis is proved, and it is determined that clustering is a perspective direction of development and factor of increase of competitiveness and innovational potential of Russian coal industry - as it ensures attraction of investments, implementation of innovations into production, reduction of cost, increase of coal quality, and growth of strength of Russian brands of coal industry.

There are large perspectives of clustering of coal industry of Russia, related to integration of coal production, processing industry, and R&D institutes. The developed cluster model of development of coal industry of Russia allows realizing these perspectives and stipulates increase of effectiveness and innovational activity of coal industry enterprises.

Despite consideration of national peculiarities and practical orientation of the conducted research, it is limited by theoretical nature, generalization of modeling results, and weak detalization. That's why a perspective direction of further research in this sphere is practical application of the developed cluster model of development of Russia coal industry for determination of its possible drawbacks and directions of improvement.

Table-1. Combined table for evaluation of competitiveness of Russian coal industry.

Indicators ofcompetitiveness	Market leader	Coal industryof Russia
Quality indicator		
Total humidity, %	TH_{leader}	TH_{Russia}
Ash content, %	AC_{leader}	AC_{Russia}
Sulfur content, %	SC_{leader}	SC_{Russia}
Calorific capacity, kcal	CC_{leader}	CC_{Russia}
Quality index (QI)	1.00	$(TH_{leader}/TH_{Russia}+AC_{leader}/AC_{Russia}+SC_{leader}/SC_{Russia}+CC_{Russia}/CC_{leader})/4$
Pricing indicators		
Transport charges, %	TC_{leader}	TC_{Russia}
Labor efficiency per year per 1 employee, thousand tons	LE_{leader}	LE_{Russia}
Price for 1 ton of coal, $	PC_{leader}	PC_{Russia}
Price index (PI)	1.00	$(TC_{Russia}/TC_{leader}+LE_{leader}/LE_{Russia}+PC_{leader}/PC_{Russia})/3$
Marketing indicators		
Brand strength	BS_{leader}	BS_{Russia}
Marketing index (MI)	1.00	BS_{Russia}
Indicator ofcompetitiveness	1.00	$(IC_{Russia}+PI_{Russia}+MI_{Russia})/3$

Table-2. Results of evaluation of competitiveness of Russian coal industry in world coal market.

Indicators of ccompetitiveness	Coal industryof USA	Coal industryof Russia
Quality indicators		
Total humidity, %	10	12
Ash content, %	11	9
Sulfur content, %	0.75	0.3
Calorific capacity, kcal	4	7
Quality index	1.00	1.00
Pricing indicators		
Transport charges, %	10	25
Labor efficiency per year per 1 employee, thousand tons	11	9
Price of 1 ton of coal, $	80	100
Price index	1.00	0.67
Marketing indicators		
Brand strength	1.00	0.75
Marketing index	1.00	0.75
Indicator of competitiveness	1.00	0.80

Table-3. SWOT-analysis of development of Russian coal industry.

Strong sides of Russian coal industry	Weak sides of Russian coal industry
large coal deposits, perspectives for extraction intensification	accidence risk and low level of production autoimmunization
experience of coal extraction, availability of know-how	damage to environment
flexibility and adaptability of coal production	high coal price due to long chain of value added
Perspectives of development of Russian coal industry within a cluster model	Threats to development of Russian coal industry without use of cluster model
automatization of production and processing of coal, reduction of accidence rate	increase of global competition and consumers' power
reduction of damage to environment due to implementation of new technologies	new wave of technological changes and necessity for modernization
increase of quality and reduction of coal price	depletion of potential of raw materials export model of Russia

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