

Sustainability of the Energy Complex of the Regions Development

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Abstract: The scale of the sphere of economic, social development dictates the need to consider the issues caused by the condition, problems, and prospects of the coal mining industry, which is the foundation of the regions' energy complex. The capacity of the raw material base of the coal mining industry is determined by the presence and localization of coal basins, rich in mineral resources, located in the eastern, European part of Russia, where there are coal reserves of all types, grades, with high-quality characteristics and technological properties. Consideration of the economic status, issues, and potential development of the coal industry will be given by the Rostov region example, which is a vivid example of coal mining territory, which clearly shows the prospects of development and problems of functioning of economic entities of the coal industry. The choice of this area is conditioned by the fact that this sphere is an urban-forming branch of the coal-mining industry for this region. The possibility of optimizing the coal-mining sphere as energy basis in conditions of economic, social instability, and tension is revealed, which is characterized by the closing of mines, decrease in volume of coal mining, availability of huge debts. Negative impacts, risk factors in the coal-mining territories include the manifestations caused by external economic instability, low investment attractiveness, and innovation activity. The abovementioned requires unceasing attention to today's realities, displaying of which will activate actions aimed at revival and upliftment of coal sector enterprises, the tendency of which will be an opportunity to improve the social environment, economic climate, assist prospective development of regions.

1 INTRODUCTION

The vector of economic development is the coal mining industry, the development of which forms the stable functioning of all spheres of economic management, predetermining the introduction of new technologies, the maintenance of environmental and economic efficiency of territories (Islamov, 2017), the optimization of economic scenarios (Plakitkina and Plakitkin, 2019).

The article aims to study the coal mining industry, considering the issues of negative impact and prospects for the development of this sphere of management. The solution of the target orientation is

conditioned by representing the functioning and assessment of the coal mining industry, overcoming risk situations with possible transformations in this sphere of activity.

The issues conditioned by the functioning of the coal mining industry are reflected in the works of the following authors:

- status, coal basin assessments, and export potential analysis: articles by Linnik Y.N. (Linnik et al., 2019), Galiyev J.K. (Galiyev and Galiyeva, 2019), Yutyayev et al. (2019), Gorbunova M.L. (Gorbunova et al., 2020), Medvedev A.V. (Medvedev et al., 2019);
- problems of product realization: article by Bazhin V.Yu. (Bazhin et al., 2019);

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- development, competitiveness: an article by Boyko N.A. (Boyko et al., 2019).

The magnitude of consideration of the state issues, assessment, problems, prospects of the coal mining industry in Russia requires consideration of the regional positioning of the coal sector, detailing the existing negative and optimizing factors of the above-mentioned industry.

2 METHODOLOGICAL APPROACHES DETERMINING THE STATE, PROBLEMS OF THE COAL MINING INDUSTRY IN THE REGIONS

Situational definition of the state, problems, prospects of development of the coal mining industry should be based on a comprehensive assessment that predetermines the construction of a system of priority areas, highlighting the trends of negative factors, positioning the possibility of a promising approach aimed at minimizing the risk situations in the coal mining industry. This trend predetermines the following directions:

1. Analysis of the coal mining industry's state. In assessing the coal mining industry's state, we note that there are 129 coal deposits and 22 coal basins in Russia. The coal mining sector is an urban-forming sector in 15 Russian regions (Tarazanov and Gubanov, 2020). Highlighting the volume of coal production, we note the following trend: in 2016 the value of the extracted raw material resource was 417.514 million tons, 2017. - 442.189 mln t, 2018. - 468.945 million tons, 2019 - 470.938 million tons, 2020. - 435.913 million tonnes. The data presented speak of the alarming aspect caused by the decline in production of the coal mining industry. The leaders in the coal mining industry are the Kemerovo Region, Krasnoyarsk Territory, Trans-Baikal Territory, and the Republics of Buryatia and Khakassia. In

presenting the assessment of the state of the coal mining industry in the Rostov region, we note that the link coal base of Russia is the Rostov region, in which 43% of the area is coal-bearing. The value of coal resources is indicated as 24.5 billion tons, reserves as of the beginning of January 2019 - 13.5 billion tons. The structure of reserves and grade composition of coal is shown in Figure 1,2.

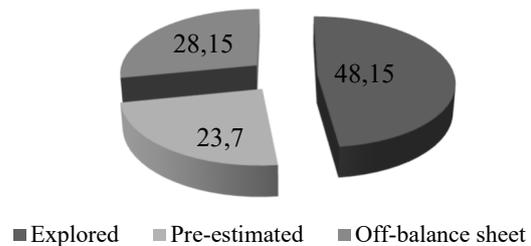


Figure 1: Structure of coal reserves, %.

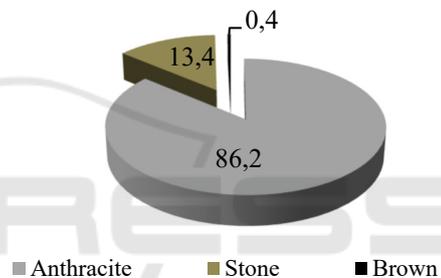


Figure 2: Coal grade composition, %.

For the period 2018-2020, anthracite production was 16.48 million tonnes, and enriched anthracite production was 11.85 million tonnes.

Let us highlight and evaluate the performance of the coal industry in the Rostov region. The data of the turnover value, production index, and volume of shipped products in the Rostov Oblast coal mining industry are presented in Table 1.

Table 1: Analysis of coal mining companies in Rostov region.

Name of indicators	Time period		
	2018	2019	2020
Turnover, million	22,658.4	21,670.1	19,277.2
Volume of products shipped, RUR mln.	22,138.7	21,700.5	34,742.4
Share of the volume of shipped products in the turnover, %	97.71	100.14	180.23

The data presented shows that coal mining companies' turnover value has decreased in 2019-2020 compared to the same period in 2018. The

volume of shipped products undergoes positive dynamics. The highest share of the volume of shipped products is seen in 2020, which amounted to more

than 180% of the turnover of enterprises of the coal mining industry of the Rostov Region.

The lowest volume of coal produced is indicated in 2019 for the period 2018-2020. The volume of coal mined in 2020 is similar to that in 2018.

The value of monthly coal production for the period 2018-2020 is shown in Figure 3.

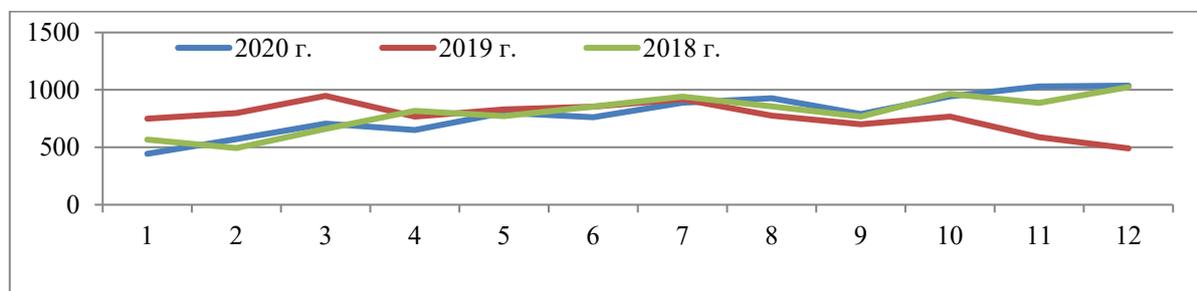


Figure 3: Coal production 2018-2020, thousand tonnes.

The data presented in Figure 3 shows an increase in coal production in 2018, 2020. The highest peak of coal production in 2018 is in the month of October, December. The year 2019 is characterized by a decline in coal production at mines in the Rostov Region. Beginning in March 2019, there has been a decline in coal production. The critical volume of coal production at mines in the Rostov region is defined by the value of 490.3 thousand tons, which was recorded in December 2019.

Potential increase of coal mining volumes is seen in 2020, which is determined by the growth of demand for this type of natural resource.

2. Problems of the coal industry in the regions. The reflection of this aspect is determined by the presence of the reduction of the coal industry risk resilience index in 2020 by 0.2 units.

A variety of factors of instability in the coal mining sector of the regions can be grouped into groups, defined by problems of external and internal nature. Despite their multiplicity, let us single out the most capacious of them, which include:

- uncertainties in the economic environment caused by Covid-19 in the first quarter of 2020. (Dagilis,2020);
- high level of taxation and low level of available credit resources, presence of financial difficulties. The average tax rate in 2019 for coal mining industry is 52.5%. The amount of credit resources provided can be judged from the information provided by the Bank of Russia. In 2019, the share of lending to industries engaged in the extraction of fuel and energy minerals in the total volume of lending to the industrial production sector was 1.11%. In 2020, this indicator is undergoing a positive

trend, increasing by 0.24%. Financial difficulties in the coal mining industry are determined by the growing financial burden and limited attraction of borrowed, credit resources. The financial instability of enterprises, low liquidity ratios make it difficult to obtain loans and generate low investment activity. Thus, in the first 9 months of 2020 compared to the same period of 2019, the level of investment decreased by 7.13%;

- wear and tear on equipment. Let us note the following data: the share of fully worn-out fixed assets in 2019 was 25.2%, which is higher than the same period in 2018 by 1.3%, the level of depreciation is more than 54%, the renewal rate in 2019 was 8.1%, the reduction of activities aimed at modernization, reconstruction works (Zhukova and Lobunets, 2014);
- high level of logistics costs and import dependence. When highlighting the logistics costs in the coal mining industry, it can be noted that barriers constitute a constraint on the industry's infrastructure. The presence of underdeveloped logistics of railroad transportation, restrictions in the acceptance of goods by sea ports predetermine the presence of arrhythmic work of the industry, untimely delivery of products. High costs of coal transportation to the destination impact the price of products, increasing it, which negatively affects the competitiveness of coal mining enterprises. Import dependence is determined by the underdevelopment of the Russian machine-building industry. The high level of import dependence of domestic

machine-building enterprises has caused investment tensions in the machine-building industry, which has affected all economic sectors' functioning problems, including the coal mining industry (Parakhina et al., 2017).

Purchasing special coal-mining equipment, spare parts from foreign companies, coal-mining enterprises incurs additional costs. Rising costs are driven by large project capacity and high capital expenditures.

- changing demand for the products of coal mining enterprises. Global coal demand is undergoing a decline of 8% in early 2020 compared to 2019. 8% compared to 2019, driven by pandemic processes in China, lower gas prices, increased use of renewable energy sources, and transition to low-carbon strategies by foreign territorial units;

- low innovative motivation manifested in the following aspects. First, innovation processes carried out in terms of updating the active part of the main production assets. The slowdown of innovation processes in this area is determined by the low level of adaptation of foreign equipment to Russian deposits' geological conditions; lack of consistency in the reconstruction work; low qualification level of employees of coal mining enterprises, which affects the development of new technologies, equipment. Second, weak innovation processes in terms of product innovation.

Impacting negative factors affecting regional coal mining operations include (Dulin et al., 2019):

1. Management of business processes determined by the presence of not fully developed and approved plans; low efficiency of conducted operational processes; actions of inconsistency in the procurement field; occurrence of emergency processes.

2. Weak innovation project management processes, caused by: lack a central apparatus whose functional feature is strategic and tactical decision-making; fuzzy prioritization in design processes; low cross-functional interaction; lack of unified standards.

3. Ongoing personnel management processes including: presence of factors of information tension, low level of personnel activity, level of corporate culture and ethics, professionalism; lack of motivational processes.

4. General industry problems, which include: mining of favorable high-quality reserves, deep mining, availability of multistage transport supplies, which increase the cost of production, raising the price, the end result of which is a decrease in the

competitiveness of products of the coal mining industry of the Rostov region.

The coal mining industry's considered negative factors are typical in most cases for all territorial units and coal basins. The general nature of the highlighted problems requires consideration of the potential of coal mining areas, an example of which will be the Rostov region's territory.

3 RESULTS OF RESEARCH

Representation of the coal mining industry, significant in the sphere of energy supply, despite the appearance of new resources, innovative technologies for energy conversion, suggests that a more thorough development of issues, limiting the destruction of this industry, is required, as the scale of application of this raw material resource accompanies the sectoral development of various spheres of economic management. The current situation in the coal mining industry, which is characterized by a decrease in production and sales volumes, is caused by a decrease in export supplies, a high level of taxation, low innovation activity, a high degree of physically and morally obsolete equipment used. The presence of low qualification of employees in the coal mining industry, lack of motivation reduces the activity of staff in the process of technology innovation.

4 RESULTS AND DISCUSSION

Based on the results of the assessment, highlighting the problematic situations in the coal mining industry, the potential of the coal mining industries is:

- possibility of wider application of coal mining products, allowing the functioning of all spheres of economic activity, reducing unemployment, supporting various industries;
- study and management strategy aimed at the possibility of the proximity of coal mining areas to the points of implementation, availability of transport infrastructure, network of roads, railways, sea, airports;
- development of the transport sector's throughput capacity during export operations of coal mining companies' products. The likelihood of a decline in demand for coal mining products from the European continent is quite high, increasing demand from China requires the availability of modern sea routes. The creation of specialized coal terminals using

modern technologies will ensure the growth of export operations, which will help the coal industry enterprises to get out of the crisis. The groundwork for modern terminal construction is being designed and implemented on the territory bordering the Rostov Region - Krasnodar Territory. Commissioning of the bulk terminal will make it possible to export coal to the Middle East, Africa, Asia, America, and South Europe, which will predetermine increasing external supplies and avoid risk situations caused by a domestic decline in demand for the products of coal mining companies. The functioning of the terminals will not only occupy an additional market niche, but will also provide revenues to the budgets and extra-budgetary funds of Russia and the region, there will be approaches aimed at reducing logistics costs, through the unity, the interconnection of industrial policy of the enterprise and the sphere of coal mining products sales (Nifontov et al., 2019).

- activation of strategic planning processes and elaboration of scenarios of development of this sphere of management. The coal mining industry's strategic directions should be implemented with the coordination of actions of governing bodies, representatives of all spheres of economic management. Implementation of coal mining industry scenarios should be built, positioning the relationship with the indicators of the value of domestic and external demand, price categories.
- development of processing industries, since in most cases coal mining enterprises act as a supplier of raw materials to the coal industry, buying then the products of coal industry processing. An example of sectoral development of the sphere of business interested in purchasing coal industry products is the sphere of sorbent production. The volume of foreign purchases of sorbents is evidenced by their value, which amounts to more than 75%. Extensive use of coal in chemical, construction, fuel and energy, food industry, agriculture, construction industry make coal products in demand. To maintain the potential of the coal industry, it is necessary to revive the extensive spheres of economic management, which will allow to increase and provide the interesting spheres of activity with products, reducing the unemployment rate, activating the impact on raising the economic, social sphere

of the territories of the whole state. The increase in export operations to African and Latin American countries, which currently have no oil, gas processing plants, nuclear power plants, deserves special attention.

- activation of processes of renewal of the active part of fixed assets, taking into account such indicators as: volume of demand for products of coal mining enterprises, level of use of equipment of main and auxiliary production, which will allow rationalizing investments of funds in reconstruction processes of the coal mining industry. For flexibility, the optimal rate of replacement of obsolete and obsolete equipment at coal mining enterprises, we propose to use a formula based on economic and mathematical modeling, the use of reporting data of business entities in the industry, reflected in the thesis research of one of the authors of the article (Kabachevskaya, 2007). The validity of the application of the derived formula is the possibility to avoid risk factors due to insufficient demand and take into account the factors limiting the volume of production (Parakhina et al., 2019).

$$S_o = 6,80 + 0,04D - 0,06V_1 - 0,01V_2 \quad (1)$$

where S_o - equipment update rate;
 D - value of demand for the subject's products;
 V_1 - the amount of unused equipment, machinery of the main production;
 V_2 - value of unused equipment, auxiliary production machines.

Noting the diversity of approaches to support, development of this sector, it is necessary to note the presence of interacting factors, which have a comprehensive nature of development, allowing a positive impact on the economy and social transformation.

5 CONCLUSIONS

Singling out the territories of energy resources, availability of coal mining, we conclude the necessity of revival and development of this sector of the economy, which is explained not only by the availability of qualitative coal reserves but also by the possibility of development and support of the economic and social balance of this territorial unit.

Representation of the negative factors identified by the uncertainty of the external environment, instability, loss of markets, the presence of physically and morally obsolete equipment, facilities, high logistics costs, low professionalism of employees in the field of coal mining demonstrate the need to highlight the potential opportunities, carrying the positive revival of interest in the industry, its support and development. The vast potential defined by the issues of taxation optimization, crediting, reducing depreciation of fixed assets, intensification of motivation, reconstruction activities aimed at opening transport corridors, reduction of logistics costs will combine the efforts of comprehensive approaches to optimize the functioning of the coal mining sector. New prospects for revival, support, development of the coal mining industry increase the likelihood of development of numerous spheres of economic activity, which is a major vector factor in the environment of the economy and society of the region, the state as a whole.

REFERENCES

- Bazhin, V.Yu., Kuskov, V.B., Kuskova, Y.A.V. (2019). Problemy ispol'zovaniya nevestrebovannykh ugol'nykh i otikh uglesoderzhashchikh materialov v kachestve energeticheskikh briketov. *Ugol'*, 4:50-55.
- Boyko, N.A., Chvileva, T.A., Romasheva, N.V. (2019). Razvitiye ugledobyvayushchey otrasli regiona: modelirovaniye i predvaritel'nyy analiz. *Ugol'*, 11:43-48.
- Dagilis, Ye.V. (2020). Vliyaniye pandemii koronavirusa na rossiyskiy eksport energeticheskogo uglya. *Rossiyskiy vneshneekonomicheskii vestnik*, 9:106-114.
- Dannyye Ministerstva energetiki RF. <https://minenergo.gov.ru/opendata>
- Dannyye territorial'nogo organa Federal'noy sluzhby statistiki po Rostovskoy oblasti. Sotsial'no-ekonomicheskoye polozheniye Rostovskoy oblasti za 2018-2020 gg. <https://rostov.gks.ru/>.
- Dannyye Federal'noy sluzhby gosudarstvennoy statistiki. Osnovnyye fondy. http://old.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/enterprise/fund/
- Dannyye Tsentra kon'yunkturnykh issledovaniy Instituta statisticheskikh issledovaniy i ekonomiki znaniy Natsional'nogo issledovatel'skogo universiteta «Vysshaya shkola ekonomiki». Delovoy klimat v promyshlennosti v avguste 2020 g. https://issek.hse.ru/data/2020/09/19/1581422995/DK_industry_august2020.pdf
- Dulin, A.N., Dulin, R.A., Gabitov, R. M. (2019). Vozmozhnosti strategicheskogo razvitiya ugledobyvayushchikh kompaniy na regional'nom urovne, *Gumanitarniy Yuga Rossii*, №4, 8(38):146-256.
- Galiyev, Zh.K., Galiyeva, N.V. (2019). Effektivnost' funktsionirovaniya krupnykh ugledobyvayushchikh predpriyatiy. *Ugol'*, 6:59-64.
- Gorbunova, M.L., Livanova, Ye.Yu., Morozova, T.S., Kuassi, D.YA. (2020). Analiz eksportnoy deyatel'nosti liderov rossiyskoy ugol'noy promyshlennosti. *Ugol'*, 2: 55-62.
- Islamov, S. R. (2017). Ugol' kak nizkouglerodnoye toplivo. *Ugol'*, 4: 50-54.
- Kabachevskaya, Ye.A. (2007). Avtoreferat dissertatsii na soiskaniye uchenoy stepeni kandidata ekonomicheskikh nauk «Vliyaniye urovnya ispol'zovaniya i obnovleniya oborudovaniya na protsess stabilizatsii funktsionirovaniya mashinostroitel'nykh predpriyatiy».
- Linnik, Yu.N., Linnik, V.Yu., Zhabin, A.B., Polyakov, A.V. (2019). Analiz mineral'no-syr'yevoy bazy perspektivnykh ugol'nykh basseynov i mestorozhdeniy Rossii. *Ugol'*, 4: 26-30.
- Medvedev, A.V., Nikitenko, S.M., Mesyats, M.A. (2019). Analiz rezul'tativnosti ugledobyvayushchikh kompaniy. *Ugol'*, 11:36-43.
- Mirovyye zapasy uglya. <http://global-finances.ru/mirovye-zapasy-uglya/>.
- Nalogovaya nagruzka po vidam ekonomicheskoy deyatel'nosti: tablitsa v 2019 godu ot FNS RF. <https://www.26-2.ru/files/nal-n-19.pdf>
- Nifontov, A.I., Chernikova, O.P., Kushnerov, YU.P. (2019). Metody ekonomicheskoy effektivnosti logisticheskoy sistemy i upravleniya urovnem logisticheskikh zatrat, *Vestnik KemGU*, 4(2):239-245.
- Parakhina, V. N., Boris, O. A., Timoshenko, P.N. (2017). Innovative development of Russian industry: regional problems and opportunities for their solution. *Trends of Technologies and Innovations in Economic and Social Studies (TTIESS 2017)*, 38:506-511.
- Parakhina, V.N., Timoshenko P.N., Simonov A.A., Chernyshov M.A. (2019). Spline models in forecasting the balance of development of the industrial complex. *The European Proceedings of Social & Behavioural Sciences EpSBS*. LIX:657-667. <https://dx.doi.org/10.15405/epsbs.2019.04.70>.
- Plakitkina, L.S., Plakitkin, YU.A. (2019). Novyye stsennyye razvitiya ekonomiki Rossii: otsenka tsen i finansovo-ekonomicheskikh pokazateley razvitiya ugol'noy promyshlennosti do 2025 g. *Ugol'*, 2:40-46.
- Programma razvitiya ugol'noy promyshlennosti Rossii na period do 2035 goda. <http://static.government.ru/media/files/OoKX6PriWgDz4CnNAxwIYZEE6zm6I52S.pdf>
- Svedeniya o razmeshchennykh i privilechennykh sredstvakh. https://cbr.ru/statistics/bank_sector/sors/
- Tarazanov, I.G., Gubanov, D.A. (2020). Itogi raboty ugol'noy promyshlennosti Rossii za yanvar'-dekabr' 2020 goda. *Ugol'*, 3:54-69.
- Yutyayev, A.Ye., Yakunchikov, Ye.N., Oganeyan, A.S., Agafonov, V.V. (2019). Otsenka proyektnykh resheniy tekhnologicheskikh sistem ugol'nykh shakht s uchetoм riska. *Ugol'*, 7:52-58.
- Zhukova, I.A., Lobunets, V.S. (2014). Sostoyaniye ugol'noy promyshlennosti Rostovskoy oblasti: problemy i perspektivy yeye razvitiya, *Problemy regional'noy ekonomiki*, 2, 12(3):174-177.