

# Specific features of the competitiveness of mining enterprises

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## Abstract

**Relevance.** Mining enterprises are the basis for all industries that determine the competitiveness of the country's economy and its development on the world stage. In modern conditions, the problem of improving the quality of products and reducing the costs of enterprises is becoming particularly relevant. In the context of a sharp change in the environment of the world commodity markets, an important task remains to ensure the competitiveness of the products of the mineral resource complex industries of Russia.

**Research Methodology.** The comparison method.

**Results.** The features of the competitiveness of the mining industry were considered, taking into account the influence of external and internal factors. The factors determining the development of the mining sector were presented. The unique features of mining enterprises that determine the relevance of increasing their competitiveness were revealed. Favorable and unfavorable economic and market factors were listed. The specific features that can be attributed to the internal factors of the competitiveness of mining enterprises were highlighted, as well as the impact of internal and external factors on the competitiveness of mining enterprises and the need for state support for small and medium-sized non-high-tech enterprises to stimulate the extraction of associated minerals. The main directions of increasing the competitiveness of the mining industry were determined.

**Conclusions.** In order to increase the competitiveness of mining enterprises, the following areas of necessary measures to improve public administration of the industry have been identified, such as managing the renewal of the material and technical base, developing permissible economic mechanisms for stimulating and supporting economic entities, bringing legislation into line with the WTO requirements and reducing administrative barriers in the industry.

**Keywords:** competitiveness, features of the mining industry, factors of competitiveness, internal and external factors, features of the competitiveness of mining enterprises.

## Introduction

Since 2008, the mining sector has come under pressure from external factors in terms of determining the level of penetration of digital technologies into production processes, the choice of energy supply sources, and at the same time has begun to play a large role in the value chain of vertically integrated companies. These tendencies have determined serious organizational and managerial changes, resulted in the change of generations in the top management of companies and fundamental changes in strategies. However, the fundamentally important issues of ensuring competitiveness remained mainly in the field of development technologies and methods of solving environmental issues.

In modern conditions of intensification of integration and globalization processes, the main indicator of assessing the economic positions of a country, regions, enterprises and organizations is their competitiveness, since it is this criterion that makes it possible to assess the leading positions in the market, identify the strengths and weaknesses of the organization, opportunities and threats, and forms strategic directions of economic development [1]. Competitiveness is certainly a difficult economic category. Each enterprise needs to analyze its position in the market and determine how to achieve an increase in advantages over competitors. The term "compet-

itiveness" is used in relation to various phenomena and processes: in the national and world economies, at the level of regions and enterprises, when creating products, quality management, marketing, personnel, etc. [2]. A demanded direction in the field of development and increasing the efficiency of the mining industry is the formation and strengthening of the competitive advantages of mining enterprises in the national and international markets.

At present, the following factors can be identified as determining the development of the mining sector: 1. Strengthening the role of mining assets in the value added chains of vertically integrated companies. 2. Global tightening of the environmental agenda with the growing material consumption of the new technological paradigm and energy transition. 3. Urbanization and the increasing density of infrastructure determine the economic efficiency of recycling technologies and the growing amount of secondary resources coming into circulation. 4. Moving centers for the extraction of mineral raw materials to regions with high socio-economic and institutional risks. 5. New opportunities opening up thanks to digitalization and, above all, big data. 6. The growing territorial-demographic imbalance, which determines the types of consumption: 6.1)

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the substantially growing Southeast Asia, including India, Pakistan. 6.2) the countries of the golden billion on the other side, pursuing a policy of a tough ecological restart.

Mining enterprises have a number of unique features that determine the relevance of increasing their competitiveness. Probably, each of these features individually did not critically influence the formation of the problem, but in conjunction their role and systematic impact turn out to be decisive. Undoubtedly, the key element in the system of specific features is the underlying asset, represented by the right to use a geometrized subsoil plot. The economic development strategy of a mining enterprise is determined by the technological solutions incorporated in the project. Mining enterprises have a predetermined life span, which depends on the volume of minerals in the depths, therefore, it is convenient to describe their activity with the help of a project-based approach.

### Results

The main features of mining enterprises that distinguish them from other sectors of the national economy are:

- 1) dependence on natural and climatic conditions;
- 2) susceptibility to technogenic and natural-technogenic geological processes and phenomena;
- 3) significant environmental impacts, both during the extraction of a mineral resource, and after the shutdown of the enterprise;
- 4) the impact of the method of development and production on the cost of mining operations;
- 5) limited lifespan of a mining enterprise;
- 6) the need for the reproduction of the raw material base and technological reproduction processes;
- 7) unfavorable social conditions for workers:

– the mining industry, unlike other sectors of the national economic system, is extremely influenced by natural and climatic factors. All large fields (especially oil and gas) are located in remote regions of the country (north, northeast, east) with harsh climatic conditions. In these geocryological conditions, the temperature factor has a significant effect on the course of thermomechanical processes in the permafrost rock mass around the mine workings. Under these conditions, various mining and technological complications arise both during open and underground mining of minerals, consisting in the destruction of host rocks and ore bodies and associated mining and technogenic accidents and emergencies. The costs associated with the listed unfavorable climatic conditions increase the cost of mining and processing of minerals. In some cases, mineral deposits in the northern regions are not developed at all, although there is a need for them [3];

– mining operations are accompanied by various technogenic changes in the environment – the collapse of mountain ranges, landslides, karst-suffusion and erosion processes, the formation of sinkholes associated with a change in the stress condition of massifs and rock properties; flooding, waterlogging associated with violation of the regime of ground and surface waters; changes in landscapes and geochemistry of the area of work and other hazardous processes. A large number of objects that have a negative impact on the environment of the first and second categories, in areas with a large population, increases the danger and unpredictable consequences of major technogenic disasters. Many private enterprises cannot afford to compensate, by their own means, for the damage to human health and the

environment caused by such disasters, but they are obliged to be accountable for the consequences at the legislative level [4];

– the mining industry is characterized by an intense impact on the natural environment. Mining operations introduce irreparable damage to the natural environment and change the existing ecological situation in the territories where enterprises are located. These changes are manifested in various combinations of negative phenomena: emissions and discharges of harmful substances and chemical elements into the atmospheric air, depletion and pollution of ground and surface waters, alienation of territories for mining, pollution, dehydration and salinization of soils, flooding and waterlogging of underworked territories, hydrogeological and geochemical changes in the area of work, etc. [5]. The impact of a particular mining enterprise on the environment depends on the production capacity, the applied equipment and development technology, the geochemical characteristics of the type of mineral, the method of development. The most significant violations of the natural environment occur during open mining. For example, the cause of soil and land contamination during open mining is the formation of dumps and the storage of overburden rocks directly on the soils, dusting of waste dumps of tailing dumps, sludge dumps and the spread of harmful elements from their surface over a considerable distance, discharge of contaminated process water onto the ground, etc.

Sustainable economic development with an increasing pressure on the environment is impossible without the introduction of measures aimed at protecting the environment. Such measures provide for the implementation of environmental measures, the introduction of resource-saving and innovative technologies, recycling and use of industrial waste, cost reduction, etc. Environmental measures are measures to improve the state of the environment. They require significant injections of financial resources. But since these investments do not go to the reproduction of fixed capital or its increase, that is, they do not bring additional financial results, these costs are interpreted as a factor holding back the economic development of the enterprise. Business owners try to reduce such costs in pursuit of their own private gains. Therefore, they try not to spend money on environmental protection in full. The realities of today are that investments in environmental protection, which are necessary for the implementation and execution of environmental standards (norms and regulations) of product safety are mandatory;

– the simplest and cheapest way to develop minerals is open mining. With this method, powerful production equipment can be used, which makes it possible to extract a large amount of rock mass per unit of time at a low cost of its extraction. The technology and processes of preparatory and excavation works with this method are simple, the costs of mining are relatively low, the working conditions are safer than with the underground method. Opportunities for open mining are limited by the maximum depth of the field being developed and the presence of minerals at these depths. The underground method is used to develop mineral deposits of various forms, thickness, dip angle and occurring at depths from 20 m to 5 km. Due to the variety of forms of ore bodies of various types of minerals, dozens of methods of underground mining are used. The most common are caving, used in the development of massive ore bodies, a system of ore shrinkage when mining narrow veins, a board-and-pillar system, a system of an open face with pillars, systems with filling the worked-out space with empty rocks after

ore breaking and extraction, etc. In the case of underground development of a deposit, the adopted method, technology and mechanization of work, affect the technical and economic indicators of mining enterprises. For example, goaf stowing (it is used not only to ensure an appropriate development system, the safety of chambers and workings from destruction, but also as a prophylaxis against failures and collapses at mining sites) or enrichment at other enterprises can increase the cost of mining operations by tens of percent. In addition to open and underground mining methods, there is a combined one, used mainly in the cleaning-up of deposits, and some other special methods. These include hydraulic, dredging (during the development of placer gold deposits), leaching (at deposits of copper, uranium, mineral salts, etc.) and underwater mining;

– the lifespan of a mining enterprise depends on the amount of mineral reserves and ranges from 3 (placer gold mining enterprises) to 50 years or more (enterprises developing the largest and unique deposits). Large, unique and rich in the content of useful components deposits are currently depleted or worked out and deposits with a relatively short lifespan, or with a low content of useful components are being put into operation. After the closure of a mining enterprise, many social problems arise – the employment of released workers, the creation of new jobs, etc. If a mining enterprise was a city-forming enterprise, then when it is closed, the city begins to die out. As a result, additional investments are needed to maintain the ecological situation and social sphere for many years to come;

– with the aim of increasing the explored raw material base of mining enterprises, transferring reserves to the highest categories, geological exploration is being carried out at the operating mines. To control the completeness and quality of the development of reserves, to obtain reliable data that ensure annual and operational planning, operational exploration is carried out, which is carried out throughout the entire period of mining. Based on its results, the reserves, quality and spatial distribution of the mineral are determined or specified. Mining enterprises are constantly in need of reproduction of the front of excavation (in case of underground mining – cleaning) operations. To put new production horizons into operation, entrance trenches are permanently dug inside the quarry, various mine workings (galleries, cross drifts, entries, etc.) and structures to protect mine workings from water inflows. These structures require large capital investments, and not to increase the volume of production, but only to maintain them. Not a single branch of the national economy bears such costs. With any type of mining, the depth of the mining horizons increases over time, and, accordingly, the costs of mining – for transportation, drainage, maintaining the lining, etc.;

– long-term studies at mining enterprises have shown that modern working conditions of workers are characterized by high dustiness, intense noise and vibration, unfavorable microclimate, the levels of which often exceed hygienic standards. At the same time, even very effective complexes of engineering means of combating harmful factors do not always ensure a decrease in their levels to permissible values. When performing underground work, dust concentrations are observed to be 2–10 times higher than the hygienic standards. Mining conditions are also characterized by high humidity, variable temperature, increased density and pressure of mine air, cramped conditions in mine workings, a high degree of danger, etc.

Fulfillment of safety conditions and compliance with hygienic standards, as well as recovery of workers after illnesses with temporary disability entail high costs. These costs also increase the cost of mining.

The unfavorable economic and market factors include a large amount of capital investments in projects for exploration, production and processing of minerals, high volatility of prices for mineral raw materials and processed products, limited access to international financial markets, higher operating costs compared to similar foreign enterprises, especially in small and medium-sized enterprises. The technical and economic indicators of such enterprises are usually lower than those of large ones.

All of these features are common to all enterprises in the industry and directly affect the formation of the competitiveness of mining enterprises. In this regard, it becomes necessary to highlight specific features that can be attributed to the internal factors of the competitiveness of mining enterprises. These include:

– obligatory feasibility study of conditions (limit values of natural indicators used for outlining, calculating and evaluating mineral reserves);

– natural conditions and natural capital of a particular mining enterprise (reserves, off-balance reserves, resources, mining and processing waste as part of natural capital);

– natural quality of raw materials and technological features of its extraction and processing;

– probabilistic approach to assessing reserves and resources;

– often low geological knowledge of the field being developed by the enterprise;

– lack of prospects for replenishment of reserves (reproduction of the mineral resource base);

– high costs for the reproduction of the mineral resource base;

– lack of economic, tax and other incentives for the development of geological prospecting works;

– the value of the content of useful components per unit of volume or weight of the rock mass;

– mountain (technogenic), including environmental, risks;

– price risks (for mining enterprises, whose products depend on prices in world markets);

– high business risks, which, apart from the usual risks, include geological, social and environmental risks.

In addition to the listed internal factors, competitiveness is significantly influenced by external factors – climatic, economic-geographical, country, regional, district, etc. conditions. So, in the northern and most of the eastern territories, mining and geological exploration in a harsh climate, undeveloped transport and energy infrastructure, a shortage of qualified specialists are economically ineffective. As a rule, there are no manufacturing activities in such areas; raw materials are exported outside the mining region. The territorial gap between the areas of extraction and consumption of extracted resources leads to inefficient use of raw materials, primarily due to the transport component of the cost of production and processing. Country factors depend on the optimal balance of political and economic components of the investment climate – the situation in the business and investment climate of the

country (the level of bureaucracy, taxation system, control of business by legislation and authorities, etc.). To assess the ease of doing business and the general level of the business climate in the countries of the world, the World Bank has created a special rating – Doing Business – an indicator of the ease of doing business. This rating is used by scientists, economists and politicians. Russia is ranked 31st in 2019, 28th in 2020 (in 2012, President of the Russian Federation V. V. Putin set a goal in the “May Decrees”, by 2018 to enter the top 20 countries of this rating) [6].

Various factors, both internal and external, can affect the competitiveness of enterprises in different ways, and they are specific and characteristic for each. The study of various factors involves the identification of strong and weak opportunities and threats to development, by means of which factors influence the activities of the enterprise [7]. Having considered the factors of the external and internal environment, it can be assumed that the competitiveness of an enterprise is a combination, on the one hand, of the characteristics of the enterprise itself, and on the other hand, the characteristics of external factors influencing it [8].

In the current socio-economic conditions, in order to win in competition (especially with foreign competitors), mining enterprises need innovative business models to manage technological solutions, costs, capital, risk management, operational efficiency, and human resources. Within the framework of the sixth technological paradigm, an innovative mineral and raw material digital technological system will be developed, which radically changes the existing approaches to prospecting, exploration, development and enrichment of mineral raw materials [9]. Foreign mining enterprises use various software products aimed at managing technological indicators and other data in real time, for example, such as the approach in the standard of geometallurgy [10], planning, management and optimization of mining operations Open Pit Planning [11], etc.

It should be noted that it is difficult to obtain state support for small and medium-sized non-high-tech enterprises (competitive selection, competent preparation of documents,

a well-formed, sound business plan, investment program, etc. in the absence of appropriate specialists). There are practically great risks of claims by state bodies for the return of received state support measures, the risks of applying penalties in amounts equivalent to the amounts provided. State support is necessary for mining enterprises to stimulate the extraction of associated minerals (in most cases they are not of commercial interest), the purchase of mining and processing technologies that minimize the impact on the environment [12], and stimulate the introduction of the most accessible technologies (mainly foreign), etc. e. As noted in [13], “it must be stated that with the transition of the extractive industries to market conditions of management in the geological industry (as well as in the mining industry. *Our amendment*) there were no necessary conditions for a really effective partnership”.

### Conclusions

In conclusion, the following conclusions can be drawn:

1. The relationship between the development of the mining industry and competitiveness is determined by the interaction of regional ecological, economic and social systems.

2. The competitiveness of mining enterprises is determined by the availability of technical, economic and organizational conditions for the creation of production and marketing of high quality products that meet the requirements of specific groups of consumers.

3. The mining industry is one of the main sectors of the national economy. The indicators that reduce the competitiveness of the industry in this region are a high rate of return on assets, a low renewal rate and a high degree of wear and tear of fixed production assets.

4. In order to increase the competitiveness of mining enterprises, such courses of necessary measures to improve the state management of the industry have been identified, as the management of updating the material and technical base, the development of permissible economic mechanisms for stimulating and supporting economic entities, bringing legislation into line with the requirements of the WTO and reducing administrative barriers in the industry.

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# Специфические особенности конкурентоспособности горнодобывающих предприятий

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## Аннотация

**Актуальность.** Горнодобывающие предприятия являются основой для всех отраслей промышленности, определяют конкурентоспособность экономики страны и её развитие на мировой арене. В современных условиях особую актуальность приобретает способность предприятия работать в динамичной конкурентной среде при удержании или повышении имеющихся конкурентных преимуществ. В условиях резкого изменения конъюнктуры мировых сырьевых рынков важной задачей остается обеспечение конкурентоспособности предприятий и продукции отраслей минерально-сырьевого комплекса России. Для оценки конкурентоспособности горнодобывающих предприятий необходим учет их специфических особенностей, на основе которых могут быть определены направления формирования их конкурентных преимуществ. В работе приведена совокупность таких особенностей.

**Метод исследования:** метод сопоставлений и сравнений.

**Результаты работы.** Рассмотрены особенности конкурентоспособности горнодобывающей промышленности с учетом влияния внешних и внутренних факторов. Представлены факторы, определяющие развитие горнодобывающего сектора. Раскрыты уникальные черты горнодобывающих предприятий, определяющих актуальность повышения их конкурентоспособности. Перечислены благоприятные и неблагоприятные экономические и рыночные факторы. Выделены специфические особенности, которые можно отнести к внутренним факторам конкурентоспособности горнодобывающих предприятий. Это воздействие внутренних и внешних факторов на конкурентоспособность горнодобывающих предприятий и необходимость государственной поддержки для малых и средних невысокотехнологичных предприятий для стимулирования извлечения попутных полезных ископаемых. Определены основные направления повышения конкурентоспособности горнодобывающей отрасли.

**Выводы.** В целях повышения конкурентоспособности горнодобывающих предприятий выделены такие направления необходимых мер для совершенствования государственного управления отраслью, как управление обновлением материально-технической базы, разработка допустимых экономических механизмов стимулирования и поддержки хозяйствующих субъектов, приведение законодательства в соответствие с требованиями ВТО и снижение административных барьеров в отрасли.

**Ключевые слова:** конкурентоспособность, особенности горнодобывающей промышленности, факторы конкурентоспособности, внутренние и внешние факторы, особенности конкурентоспособности горнодобывающих предприятий.

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