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Strategic Development of World Nickel Producers: Impact of Global Economic Trends

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Abstract

The relevance of the research. The mining and metallurgical industry is one of the strategically important industries. Today, the role of companies operating in this sector is transforming. Growing demand for metals of critical and strategic importance for the global economy on the one hand, and the actualization of sustainable development trends and the climate agenda on the other hand, predetermine the need to revise approaches to strategic management of companies in the medium and long term. Adaptation to emerging challenges is becoming an integral part of the economic growth of companies in the metallurgical sector. Therefore, the identification and substantiation of trends in the economic development of the mining and metallurgical sector is becoming relevant.

The purpose of the research is to summarize the directions of strategic development of the leading nickel producing companies under the conditions of the energy transition and the need for a more complete consideration of socio-environmental factors.

Research methods. The research is based on general scientific methods of analysis, synthesis and decomposition of factors. The work involves methods of strategic analysis and planning, as well as tools of statistical analysis.

Results. The paper reviews the current trends in the global mining and metals sector, including ESG agenda, digitalization, transformation of business models, geopolitical and macroeconomic trends. The peculiarities of mining and metallurgical companies' functioning are identified, and contradictions between potential contribution to sustainable development and emerging environmental risks are revealed. The key areas of industry digitalization are systematized. The peculiarities of the nickel industry development are defined, the existing threats and opportunities are substantiated. The strategic directions of development of the world's largest nickel producers (PAO MMC "Norilsk Nickel", Valo, Glencore, BHP Billiton, Anglo American) were identified.

Conclusion. The development of the mining and metals sector is currently associated with a high degree of uncertainty, which requires adaptation to new challenges. The key trends today are actualization of the ESG agenda and the concept of sustainable development, increased requirements to project financing – responsible investment, increased importance of resource and energy efficiency, accelerated scientific and technological progress, digital transformation, and increased influence of geopolitical factors. Today, nickel producing companies are at a transitional stage – in search of their own niche in the context of their changing role in the economy built on new principles. The companies' economic growth in the long term will be determined by their ability to adapt to new challenges.

***Keywords*:** nickel, industry, economic development, trends, sustainable development, strategic management and planning.

Introduction

Currently, the global mining and metallurgical sector is at the stage of strategic transformation [1, 2]. Under the influence of emerging trends related to the actualization of the ESG agenda and the global energy transition, the establishment of a new technological structure, increasing innovative potential, etc., fundamentally new guidelines for industrial development are being formed, the structure of demand is changing, and areas of metal consumption are expanding and diversifying.

The nickel industry plays a significant role in the development of Russian metallurgy. Along with molybdenum,

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tungsten, cobalt, gold, rare and rare-earth metals, nickel is classified as a group of strategically important types of mineral raw materials [3]. The areas of its consumption cover not only traditional industries, such as petrochemicals, aircraft and mechanical engineering, chemical and food industries, medicine, but also progressive areas – hydrogen and nuclear energy, production of electric vehicles, wind energy. In a number of countries (including the EU – European Union), nickel is classified as a critical mineral, which confirms the thesis about the growing importance of this metal for the global economy [4].

Russia has the largest metal reserves concentrated in the Norilsk industrial region. Today, the national company PAO MMC "Norilsk Nickel" is the largest metal producer, ranking first in the world in terms of production of high-grade nickel and fourth in the primary nickel sector, meeting not only domestic but also global needs.

The functioning of the global nickel market is associated with a high degree of uncertainty caused by the current instability of macroeconomic parameters, as well as a change in the vector of priorities of the metallurgical industry as a whole. Nickel producing companies occupy high positions in ESG ratings, form long-term plans and strategies in the field of sustainable development (SD), and focus on innovation. For sustainable development in the long term, companies need to adapt to emerging trends, look for new opportunities for positioning in the market, while minimizing potential risks and threats. This fact updates the topic of this research, the purpose of which is to summarize the directions of strategic development of leading nickel producing companies in the context of the energy transition and the need for a more complete account of socio-ecological factors.

To achieve this goal, the work consistently solves the following tasks: (1) review of development trends in the global

Table 1. The degree of depreciation of fixed assets in the mining industry for 2023, % [9]
Таблица 1. Степень износа основных фондов в отраслях горной промышленности за 2023 г., % [9]

Directions	Objects				
	Building	Residential buildings	Facilities	Cars and equipment	Vehicles
Mining in general	30,0	25,8	49,8	57,2	37,5
Coal mining	35,2	46,2	53,5	59,2	52,4
Crude oil and natural gas production	29,3	11,6	33,0	56,1	51,0
Mining of metal ores	*42,7*	*50,3*	*57,7*	*61,4*	*49,0*
Averaged over all types of economic activity	30,4	36,0	34,7	54,5	56,8

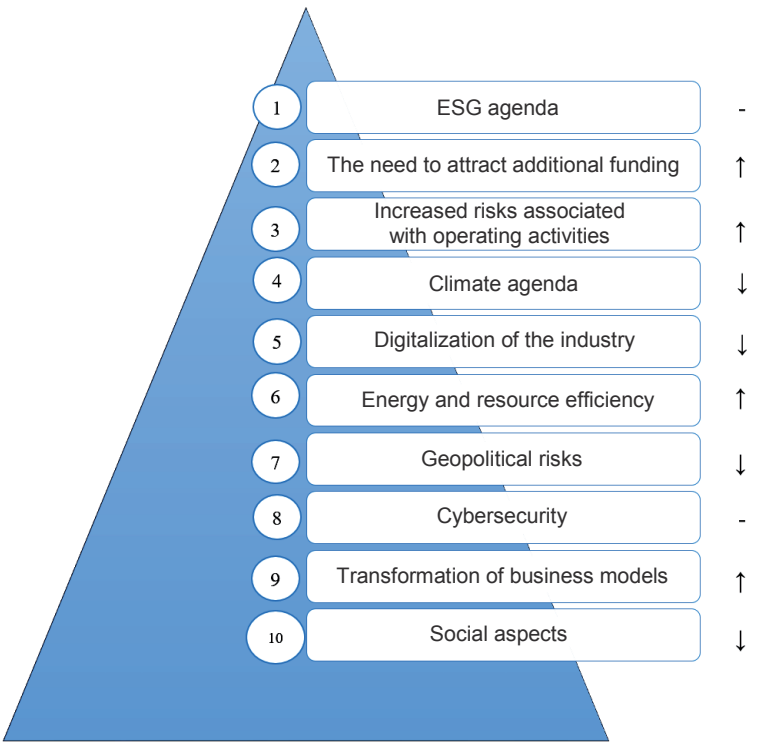

Figure 1. Prioritization of development trends in the global mining and metallurgical sector in 2024. Compiled by the authors based on [1]: "-" – the relevance of the factor has not changed compared to 2023; ↑ – increase in trend relevance, ↓ – decrease in trend relevance
Рисунок 1. Приоритизация трендов развития мирового горно-металлургического сектора в 2024 г. Составлено авторами на основе [1]: «-» – актуальность фактора не изменилась по сравнению с 2023 г.; ↑ – рост актуальности тренда, ↓ – снижение актуальности тренда

mining and metallurgical sector, (2) research into problems and prospects in the nickel industry, (3) justification of directions for strategic development of the nickel industry in the long term based on consideration of the strategic priorities of Russian and foreign companies that are the largest manufacturers in the global market.

Review of trends in the mining and metallurgical sector. Today, the development of the mining and metallurgical industry is influenced by multidirectional trends. The recovery of Russian companies after the COVID-19 pandemic today is fraught with new challenges determined by geopolitical factors and macroeconomic instability. For example, in 2022, restrictions were introduced on the import of national products in the countries of the European Union and the United States, including manufactured goods and steel, which make up a significant share in the structure of Russian exports. Changes in trade flows have led to supply chain disruptions and restructuring. Moreover, the mining and metallurgical sector is influenced by modern trends in the field of green economy.

Trends in the global energy transition are influencing the development of the metals sector. However, this impact is assessed not only from a negative, but also from a positive side. This approach is explained by the fact that new green technologies require increased use of metals, which will systematically lead to an increase in production volumes [5, 6].

At the same time, a contradiction arises: on the one hand, metallurgy contributes to the achievement of global sustainable development goals, ensuring an economy based on the principles of low-carbon development, on the other hand, extensive mining and processing of metals can have a significant negative impact on the environment and cause serious environmental consequences, including pollution of water bodies and atmospheric air, land degradation, and an increase in the level of morbidity among the population in the regions of presence [7, 8]. Often the reasons for this are the use of outdated production technologies (high level of wear and tear, reaching 60% for machinery and equipment, 57% for structures – table 1), lack of waste management systems (man-made objects), low efficiency of the gas and dust treatment plants used [9]. It is important to understand that the metallurgical industry is not only capital-intensive, but also energy- and resource-intensive.

It should be concluded that the development of the metallurgical industry is contradictory in nature, which is why the most important task facing companies today is solving the problem of balancing the contribution to achieving global sustainable development goals with the existing social and environmental risks.

The EY study prioritized trends that are relevant for the development of the mining sector at the present stage – fig. 1 [1]. The position of the key trend is maintained by the ESG agenda, based on the need to maintain three components: 1) ecology, 2) society, 3) corporate governance [10].

It is interesting that metallurgical companies are leaders in several ESG areas. According to a study by the National Rating Agency (NRA), they demonstrate the highest level of disclosure of information on sustainable development, show the greatest degree of integration of environmental practices into activities (implementation of progressive environmental management systems, imposition of high demands on partners and suppliers in the field of compliance with OS standards, etc.), are leaders in the field of social responsibility (charity, creation of social infrastructure, human resources development programs, etc.). According to the RAEX rating, the top 10 companies for integrating the ESG concept into their activities include AO "Polyus", AO "Polymetal", Evraz Group, PAO MMC "Norilsk Nickel" [11].

The role of the climate agenda should also be noted. The total volume of CO_2 emissions from the mining and metallurgical sector reaches 5 billion tons of CO_2 equivalent, which is why the search for new opportunities to minimize the car-

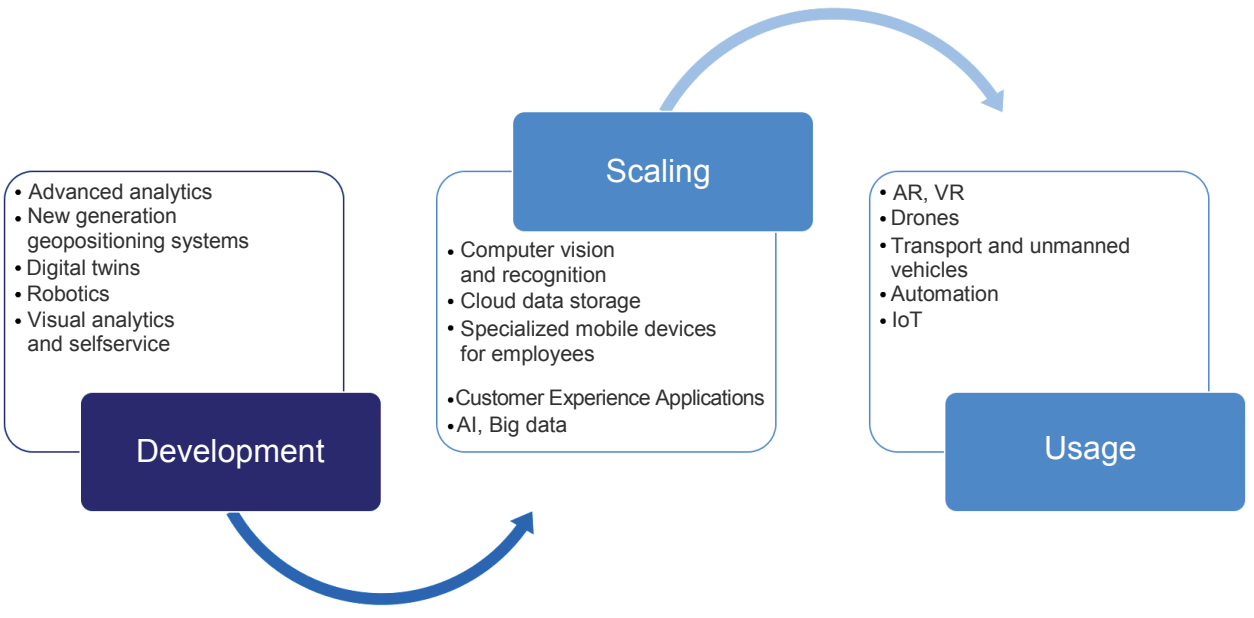

Figure 2. Digital technologies in the mining and metallurgical sector. Compiled by the authors based on [12]
Рисунок 2. Цифровые технологии в горно-металлургическом секторе. Составлено авторами на основе [12]

Table 1. Information on nickel reserves and production volumes by country, thousand tons. Compiled by the authors based on [14]
Таблица 1. Сведения о запасах и объемах добычи никеля по странам, тыс. т. Составлено авторами на основе [14]

A country	Inventory volumes	Share in total volume reserves, %	Production volumes	
			2022	2023
USA	340	0,3	17,5	17
Australia	24 000	18,3	155,0	160
Brazil	16 000	12,2	88,5	89
Canada	2200	1,7	143,0	180
China	4200	3,2	114,0	110
Russia	8300	6,3	222,0	200
Indonesia	55 000	42,0	1580,0	1800
New Caledonia	7100	5,4	200,0	230
Philippines	4800	3,7	345,0	400
Other countries	9100	6,9	404,0	380

bon footprint is one of the most important areas within the metallurgical industry.

One of the trends that will increase its impact in 2024 is the increased need for financing. EY justifies this fact by expanding the resource base and introducing new production capacities due to the growing global demand for metals [1]. At the same time, the importance of energy and resource efficiency is growing, which creates incentives to move away from the extensive type of reserve development to the intensive one.

Another important trend is the digital transformation of the mining and metallurgical industry, recognized as a strategic business priority [12]. The effects of this process are associated with cost optimization, reduction of losses and downtime in production, improved quality of data processing, and increased labor productivity [13]. Fig. 2 shows digital technologies, the use of which is relevant for the mining and metallurgical sector.

It should be noted that, along with digital transformation, cybersecurity issues are also becoming relevant (the trend ranks 8th according to EY) [1]. Mitigating threats in this direction is considered one of the priority tasks, without which the sustainable development of companies in the long term seems impossible.

Important trends include the transformation of companies' business models. In the new conditions, a fundamentally new approach to managing organizations is being formed, focused on creating value for stakeholders and achieving generally accepted goals of sustainable development.

Nickel industry: features of development at the present stage. It is obvious that the role of metals for the national and global economy is becoming increasingly important. Accelerated innovative development and the transition to a new technological structure determine the growth in demand for a number of metals, including nickel.

Russia ranks fourth in the world in terms of nickel reserves, only surpassed by Australia, Brazil and Indonesia in this indicator – table 2. The total volumes of metal production in recent years have remained at the level of 400 thousand tons per year.

At the same time, market conditions remain volatile. Fig. 3 shows the dynamics of average annual prices for nickel in 2014–2022. Among the main factors influencing the price of the metal are the slowdown in economic growth in China (the main consumer, more than 60% in the structure of primary nickel consumption), geopolitical tension in producing countries, and imbalance in the world market. Today, there is a surplus in the low-grade nickel segment, while in the high-quality nickel segment the opposite situation is observed – a deficit [15].

Low-grade nickel is represented by nickel oxide and ferronickel, produced from laterite raw materials. Its main suppliers to the world market are Tsingshan Group, Delong Group, Anglo American. High-grade nickel is produced in the form of briquettes, cathodes, rondels, as well as chemical compounds. The leaders in this segment are PAO MMC "Norilsk Nickel", Vale, Glencore, BHP, Sumitomo Metal Mining (SMM).

At the moment, the main area of metal consumption is the production of stainless steel, which occupies more than 65% of the total demand structure. This is followed by batteries (15%), alloys (8%), electroplating and special steels (about 10%) [15].

At the same time, the structure of global demand for nickel is changing under the influence of new trends. According to Goldman Sachs estimates, in the next decade the main driver of growth in demand for metal will be the "green" economy. This thesis is confirmed. After all, nickel is one of the key components in the production of stainless steel and electric car batteries. Nickel consumption per battery is approximately 65 kg. By 2040, according to BloombergNEF, the production of electric vehicles will exceed 67 million vehicles. Also, according to PAO MMC "Norilsk Nickel" estimates, future demand for metal will be positively influenced by the growth in low-carbon fuel production and the expected development of energy storage infrastructure [16].

According to IEA forecasts, achieving the goal of limiting global warming to 2 °C will require an increase in nickel consumption – an increase of more than 20 times compared to current consumption levels. At the same time, the carbon intensity of nickel products is estimated at 10 t of CO_2 per 1 ton. According to this indicator, the metal is second only to aluminum (smelting) [17]. This fact significantly limits the possibilities for future development of the industry and determines the need to adapt to the target priorities of the climate agenda.

Development of nickel producing companies: strategic directions. Development trends in the mining and metallurgical sector and the specifics of the nickel market are reflected in the development trajectory of metal producing companies. Despite the fact that PAO MMC "Norilsk Nickel" occupies a monopoly position in Russia, there are a significant number

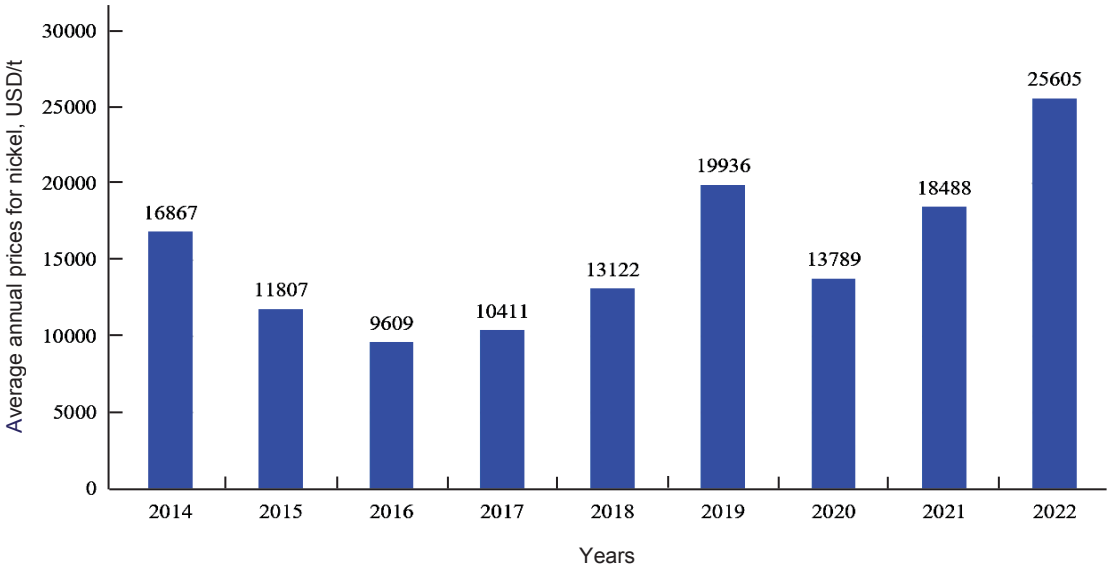

Figure 3. Average annual prices for nickel in 2014–2022, USD/t. Compiled by the authors based on [15]
Рисунок 3. Среднегодовые цены на никель в 2014–2022 гг., долл. США/т. Составлено авторами на основе [15]

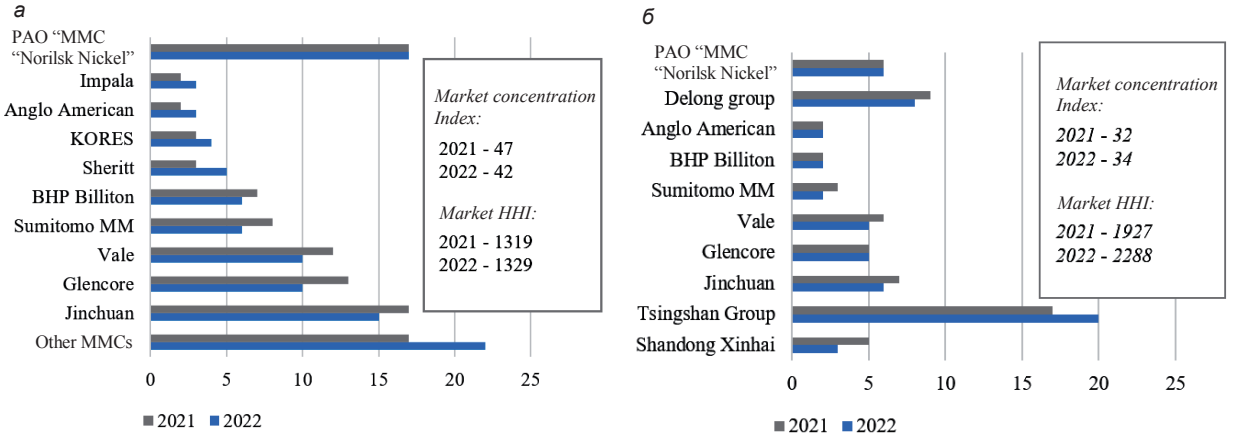

Figure 4. Share of producers in the global nickel market in 2021–2022, %: *а* – high-grade nickel segment; *б* – primary nickel segement [15]
Рисунок 4. Доля производителей на мировом рынке никеля в 2021–2022 гг., %: *а* – сегмент высокосортного никеля; *б* – сегмент первичного никеля [15]

of competitors in the global nickel market. The assessments indicate that the global market is moderately concentrated (Fig. 4). The largest companies are developing long-term strategies to maintain and strengthen their own positions, focusing not only on the economic component, but also on environmental and social goals. Such a policy, as stated, corresponds to modern priorities of sustainable development and current principles of the ESG agenda [17, 18].

Using the example of the world's largest nickel producers, table 2 presents a summary of strategic goals, missions, priorities, areas of diversification and companies' contributions to the ESG agenda and sustainable development.

Based on the analysis and generalization of the main goals and directions of strategic development, it should be concluded that the world's largest nickel producing companies are trying to follow the trends of sustainable development and low-carbon economy. Environmental and social aspects are coming to the fore, forming the basis of the ESG agenda. The theme of contribution to global SDGs is clearly visible [23].

The directions of business diversification are also largely determined by modern trends. A number of companies are focusing on the development of the renewable energy sector, as well as the search for new opportunities in the processing segment, which corresponds to the principles of the circular economy.

The largest nickel producers also emphasize their undoubted contribution to ensuring a new technological structure, as well as the global energy transition in the necessary types of mineral resources. The strategic visions of the organizations reviewed are based on long-term scenarios and plans for the climate agenda. Thus, the strategy of PAO MMC "Norilsk Nickel" is based on three scenarios for economic development and climate change:

1) the "Rapid transition" scenario assumes achieving target temperature change values by 2050 and fulfilling the conditions of the Paris Agreement. The main focus is on preserving the environment and ensuring the well-being of society. The resource and energy intensity of industry under these conditions is reduced to the minimum possible values;

Table 2. Summary of strategic development goals, priorities and directions for diversification of the world's largest nickel producers. Compiled by the authors based on [15, 19–22]
Таблица 2. Обобщение стратегических целей развития, приоритетов и направлений диверсификации крупнейших мировых производителей никеля. Составлено авторами на основе [15, 19–22]

Company	Target	Mission	Strategic priorities	Areas of business diversification	Modern business concepts	
					Integration of the ESG concept	Contribution to SD
PAO MMC "Norilsk Nickel" (Russia)	Ensuring sustainable green growth over the long term	Provide the world with non-ferrous metals, efficiently and safely using natural resources and capital to realize people's plans for development and technological progress	Increasing ore production volumes, Increased metal production, increasing competitiveness in the global market Reducing negative impact on the environment Ensuring high efficiency of the occupational safety system	Launch of new projects in South America, Africa, Indonesia and Southeast Asia Research on the possibilities of using metals in "green" areas and hydrogen energy	✓	✓
Vale (Brazil)	Improving the quality of life of society and transforming the future.	Ensure sustainable development by transforming natural resources.	Following the principles of sustainable development at all stages of the production chain Making a significant contribution to a low-carbon future Respect for the interests of stakeholders at all levels of management	Diversification of sales markets Expansion of the production of non-ferrous metals, coal, phosphates	✓	✓
Glencore (Switzerland)	Ensuring the responsible supply of goods that improve everyday life		Implementation of a responsible approach to production Contributing to the goals of the global energy transition (Priority is given to the production of critical minerals, low-carbon development) Continuous improvement of technologies and introduction of innovations into production	Circular economy – recycling waste to produce new types of finished products "Green" energy – searching for new opportunities for using metals	✓	✓
BHP Billiton (Australia)	Ensuring high added value throughout the entire economic cycle, with special attention to sustainable business practices and responsible consumption of natural resources	Bring together people and resources to create a better world.	Sustainable growth of the company in the long term Contributing to accelerating decarbonization through the production of critical minerals Increasing production potential Balanced growth in company value	Mineral fertilizer sector, Production of aluminum, ferrochrome and coal	✓	✓
Anglo American (England)	Rethinking approaches to mining to improve society	Creating long-term value for stakeholders while maintaining high ethical standards and minimizing environmental impact	Reducing CO_2 emissions, minimizing carbon footprint Increasing energy efficiency, reducing resource intensity of production Ensuring a significant social contribution to the development of the regions of presence	Transition to 100% renewable electricity supply by 2025 Production of nickel and platinum group metals (PGMs): increased production volumes and expanded product range Diamond and steel mining: developing these areas to ensure sustainable growth and reduce dependence on copper price fluctuations	✓	✓

2) the "Sustainable Palladium" scenario assumes moderate climate regulation. The key emphasis in this case is on maintaining existing socio-economic and technological trends;

3) the "Global Growth" scenario assumes accelerated economic growth and significant technological progress. With this development option, environmental aspects are relegated to the background.

According to company estimates, the probability of the first scenario is 25%, the second – 70%, and the third – only 5%. This fact indicates that in the medium term, the previously identified trends of the ESG agenda, sustainable development, reducing energy intensity and increasing energy efficiency, leveling out the carbon footprint, as well as the growing importance of approaches to social responsibility will remain relevant.

It is obvious that the world's nickel producing companies today are in a transitional stage – in search of their own niche in the context of a change in their role in an economy built on new principles (the market for renewable energy sources, electric vehicles, green technologies), which is why the trends in the areas of innovative development and digitalization remain decisive, which is also reflected in the considered strategic priorities of organizations.

Conclusion

Thus, the development of the mining and metallurgical sector at the present stage is associated with a high degree of uncertainty. Emerging trends are transforming approaches to company management. Today, the long-term development of companies in the metallurgy sector is impossible without finding a balance between the contribution to sustainable development and the need to minimize the risks associated with the functioning of the industry – from the stage of metal extraction to processing and high processing.

Nickel is classified as a critical mineral. The main driver of increased demand for the metal in the medium term will be the electric vehicle market, growth in low-carbon fuel production and the expected development of energy storage infrastructure. At the same time, the nickel market remains unbalanced and is characterized by a high degree of volatility. In a highly competitive global metal market, companies should focus on long-term sustainable growth through diversification of activities.

As part of the study, it was determined that the world's key nickel producers (PAO MMC "Norilsk Nickel", Valo, Glencore, BHP Billiton, Anglo American) in the global market are gradually changing strategic priorities in accordance with new challenges and processes that are aimed at the gradual formation of a "green economy", building development plans in accordance with sustainable development goals, the requirements established in the Paris Agreement, and the climate agenda. The economic growth of companies in the long term will be determined by their ability to adapt to new conditions and emerging challenges.

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Стратегическое развитие мировых производителей никеля: влияние трендов глобальной экономики

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Аннотация

Актуальность темы исследования. Металлургическая промышленность является одной из стратегически значимых отраслей. Сегодня роль компаний, функционирующих в данном секторе, трансформируется. Рост спроса на металлы, представляющие критическую и стратегическую значимость для мировой экономики, с одной стороны, и актуализация тенденций устойчивого развития и климатической повестки, с другой, предопределяет необходимость пересмотра подходов к стратегическому управлению и планированию компаниями в средне- и долгосрочной перспективе. Адаптация к возникающим вызовам становится неотъемлемой частью экономического роста компаний, ввиду чего актуализируется тематика выявления и обоснования трендов развития горно-металлургического сектора.

Цель исследования – обобщение направлений стратегического развития ведущих компаний-производителей никеля в условиях энергетического перехода и необходимости более полного учета социально-экологических факторов.

Методы исследования. Исследование опирается на общенаучные методы анализа, синтеза и декомпозиции факторов. В работе задействованы методы стратегического анализа и планирования, а также инструменты статистического анализа.

Результаты. Проведен обзор современных трендов мирового горно-металлургического сектора, среди которых ESG-повестка (учет экологических, социальных факторов, ценностей корпоративного управления), цифровизация, трансформация бизнес-моделей, геополитические и макроэкономические тенденции. Определены особенности функционирования горно-металлургических компаний, выявлены противоречия между потенциальным вкладом в устойчивое развитие и возникающими экологическими рисками. Систематизированы ключевые направления цифровизации промышленности. Определены особенности развития никелевой промышленности, обоснованы существующие угрозы и возможности. Выявлены стратегические направления развития компаний, являющихся крупнейшими производителями никеля в мире (ПАО «ГМК "Норильский никель"», Valo, Glencore, BHP Billiton, Anglo American).

Вывод. Развитие горно-металлургического сектора в настоящее время связано с высокой степенью неопределенности, что требует адаптации к новым вызовам. Ключевыми трендами сегодня являются актуализация ESG-повестки и концепции устойчивого развития, повышение требований к финансированию проектов – ответственное инвестирование, повышение значимости ресурсо- и энергоэффективности, ускоренный научно-технологический прогресс, цифровая трансформация, усиление влияния геополитических факторов. Компании-производители никеля сегодня находятся на переходном этапе – в поисках собственной ниши в условиях изменения их роли в экономике, построенной на новых принципах, в том числе связанных с формированием «зеленой экономики» и с низкоуглеродным развитием. Экономический рост компаний в долгосрочной перспективе будет определяться возможностями их адаптации к новым вызовам.

***Ключевые слова*:** никель, промышленность, экономическое развитие, тренды, устойчивое развитие, стратегическое управление и планирование.

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