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THE STRATEGY OF TECHNOLOGICAL DEVELOPMENT OF THE MINING AND METALLURGICAL COMPLEX

Strategia rozwoju technologicznego kompleksu górniczo-hutniczego

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Abstract

The article discusses the stages of implementation of the strategy for the technological development of the mining and metallurgical complex of the Republic of Kazakhstan. The implementation of each stage is represented by a sequence of activities aimed at the formation and development of the main components of the technological development strategy. It also discloses the tools to ensure a balance of external and internal factors in the implementation of the strategy of technological development.

Adnotacja

W artykule omówiono etapy realizacji strategii rozwoju technologicznego kompleksu górniczo-hutniczego Republiki Kazachstanu. Realizacja każdego etapu jest reprezentowana przez sekwencję działań mających na celu ukształtowanie i rozwój głównych elementów strategii rozwoju technologicznego. Ujawnia również narzędzia zapewniające równowagę czynników zewnętrznych i wewnętrznych w realizacji strategii rozwoju technologicznego.

Key words: *mining and metallurgical complex, strategy of technological development, innovative development of metallurgy, industry 4.0, state regulation of metallurgical production*

Słowa kluczowe: *kompleks górniczo-hutniczy, strategia rozwoju technologicznego, innowacyjny rozwój hutnictwa, przemysł 4.0, państwowa regulacja produkcji hutniczej*

The implementation of the Strategy "Kazakhstan-2050" in the field of the formation of the economic policy of the new course, in particular in the field of metallurgy, requires a radical change, first of all, the state organizational and economic mechanism of regulation, the main purpose of which is to increase the competitiveness of the industry[1].

It should be noted that in modern technological processes implemented at metallurgical plants, multiple transformations of material and energy flows are carried out in order to obtain the required products. Hence, it is obvious that efficiency in this case is determined by the possibilities of joint management of the transformation of all three listed components - materials, energy and information, i.e. the volume of metal products of a given quality with minimal cost and resource intensity. In addition, the efficiency of a modern metallurgical enterprise is characterized not only by current technical and economic indicators, but also by the speed of adaptation to changing market needs, innovative potential, and susceptibility to advanced technologies.

The modern development of the world metallurgy is characterized by radical changes associated with a sharp acceleration of scientific and technological progress in the field of production technologies and the quality of manufactured products. The driving force of this process is the innovative nature of capital reproduction, based on scientific achievements, rapid development of new technologies for the production of modern competitive metal products. Kazakhstan needs to develop high technologies in the domestic manufacturing industry, the main share of which is occupied by the export-oriented metallurgical complex.

The choice of priority areas of research and development plays an important role in the corporate innovation strategy. Taking into account the complexity of the problems being solved in the metallurgical industry, their wide range, close connection with the globalization of the economy, the stimulation of new metallurgical industries should be based primarily on economic management methods, provide conditions for the economic interest of metallurgical enterprises for the development of 4-5 repartitions.

The practical implementation of the strategy of technological development of the mining and metallurgical complex is based on the creation of all appropriate conditions. In this regard, we assume three main stages of the implementation of the strategy of technological development of the mining and metallurgical complex:

[1] *Real sector of Kazakhstan's Economy: Industrial and Technological Transformations*, ed. A A. Satybaldina, Almaty , 2016, p. 254.

- Stage 1 of institutional improvement - 2022-2024 - (improvement of the regulatory framework, formation of economic conditions aimed at structural transformation of metallurgy, foresight positioning of MMC in domestic and foreign markets);
- Stage 2 of modernization of existing metallurgical enterprises and development of new mini (micro) metallurgical plants - 2025-2035 - (renewal of the production apparatus of metallurgical companies, full use of production capacities, diversification of metallurgical production taking into account the needs of the domestic and foreign market, import substitution and increase in the export potential of the country);
- Stage 3 of the innovative development of metallurgy - 2035-2050 - (the formation of new high-grade industries that ensure the growth of output of high commodity readiness in the metallurgical complex, the introduction of effective environmental, resource- and energy-saving technologies of the 4th and 5th grades).

Already in the medium term, Kazakhstan's metallurgy will face both restrictions on efficient production assets and energy restrictions on significant economic growth.

At the 1st stage of 2022-2024, it is necessary to start implementing an economic policy based on new principles. In the metallurgy of Kazakhstan, it is necessary to form a regulatory and legal space to determine the specific responsibilities of government departments in this area. Deregulation of the economy, guarantees of property rights and equal conditions of competition should become the main motives of economic policy. It is necessary to take measures to overcome the fundamental problems of the regulatory framework, which, first of all, include:

- fragmentary legislation;
- the contradiction between the existing tasks of state regulation and the powers of the state to implement them;
- inconsistency of norms contained in various areas of legislation (labor, budget, tax);
- ineffective practice of implementing existing legislation.

The main principles of the development of the regulatory legal framework for strengthening institutions that provide conditions for normal economic activity and protection of property rights should be:

- continuity in the development of the regulatory legal framework;
- the complexity of the development of legislation, taking into account the peculiarities of each sphere of regulation;

- informing about planned changes in legal regulation;
- establishment and strengthening of measures of economic and administrative responsibility.

In general, in modern conditions, the improvement of the regulatory framework for the development of metallurgy of the Republic of Kazakhstan should be implemented on the basis of the application of the following basic principles:

- competitive market as the main regulator of economic development;
- minimization and optimization of state intervention in the economy;
- openness of the economy;
- liberalization of economic activity at the micro level.

In this regard, in the future, the main tasks of the state's structural policy are:

- increasing innovation activity and advancing the development of the high-tech sector of the economy;
- promote the development of higher and secondary specialized education that meets the needs of modernizing traditional and developing "new" sectors of the economy;
- reduction of transaction costs of enterprises ' activities due to the development of institutions for the markets of goods, services, labor and capital, the formation of an infrastructure for supporting entrepreneurial activity;
- stimulating the processes of clustering enterprises, improving their efficiency, facilitating the integration and formation of large efficient and competitive companies with full support for the development of small and medium-sized businesses.

The next stage (2025-2035) should be a period of large-scale structural adjustment of the economy, which will be stimulated by a whole range of socio – economic factors-the accumulation of new investments, growing external competition, the creation of more efficient mechanisms for the flow of capital and labor, which should lead to an increase in the efficiency of production factors. During this period, it is important to focus the state's investment activity on updating the entire range of industrial and financial infrastructure. The state's financial policy should be aimed at ensuring financial stability and reducing the debt burden on the economy. The main driver of economic growth at this stage will be the development of a "new sector" based on the release of entrepreneurial initiative.

- decommissioning of inefficient and maximum utilization of the most efficient metallurgical enterprises,

– implementation of industry-specific programs and comprehensive regional programs aimed at improving the efficiency of resource use, taking into account import substitution and the needs of the domestic and foreign markets.

In addition, Kazakhstan needs to pay great attention to the development of mini-factories. In recent years, the metallurgical industry has widely used low-capacity plants for the production of carbon and alloy steels: 200-400 thousand tons per year using electric furnaces with a capacity of 10-50 tons[2]. Due to the development of mini-plants, the share of electric steel increases: for example, in the United States, out of 130 continuous steel casting plants, 97, i.e. 75%, work in small electric steelmaking shops. Many mini-factories with electric furnaces have been built in India, China (Taiwan). In some cases, even small plants with a capacity of 2-10 thousand tons of steel per year provide significant benefits and are cost-effective, they allow you to produce high-quality steel at a lower price than steel obtained at conventional metallurgical plants.

Achieving these goals requires efforts to ensure the inflow of investments aimed at modernizing and replacing the production apparatus, strengthening the innovative nature of development, as well as measures to maintain and create the general economic infrastructure (transport, production, vocational education system, etc.) necessary to reduce transaction costs in metallurgy and increase its efficiency.

At the third, innovative stage of development (2035-2050), while maintaining and consolidating positive trends in industry, it is necessary to create scientific, technical and production prerequisites for a radical technological re-equipment of the main economically significant production sectors and an increase in the share of modern, globally competitive products. It should be taken into account that the efficiency of a modern metallurgical enterprise is characterized not only by current technical and economic indicators, but also by the speed of adaptation to changing market needs, innovative potential, and receptivity to advanced technologies.

Thus, the main content of the strategy for the development of metallurgy until 2050 is the creation of production facilities that implement the latest technological mode, and access to domestic and foreign markets with world-class high-tech products. The implementation of this stage should result in ensuring competitive positions in promising market sectors where domestic

[2] B. R. Rakishev *Mining and metallurgical complex in the industrial and post-industrial development of society* „Reports of the National Academy of Sciences of the Republic of Kazakhstan" 2019, no1. p. 15.

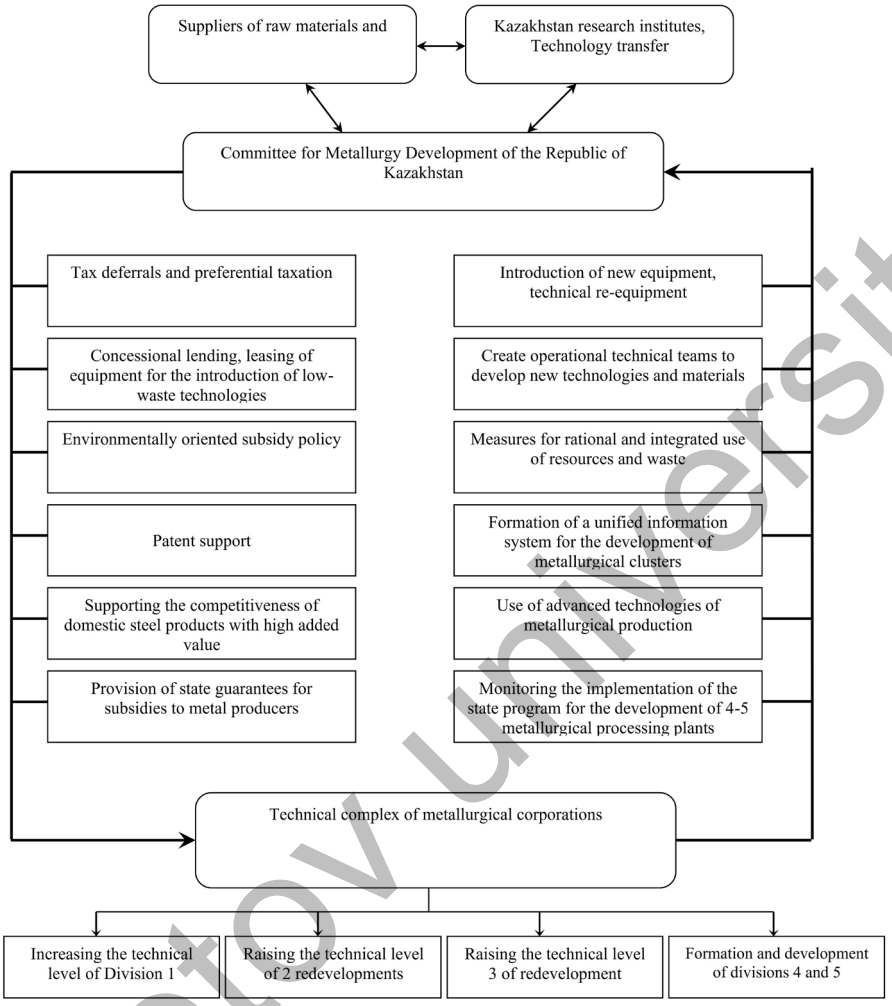
products were not previously represented, and in some cases, the formation of new areas of demand, in which domestic high – tech products would play a dominant role[3].

In our opinion, one of the most effective areas of reforming the metallurgical industry is the development of a system of state incentives and support for new production facilities of 4-5 stages. This mainly concerns the organizational transformation of state regulation of metallurgy. The fundamental conclusion of this is the foreign experience in the development of metallurgy. The organizational structure of management of the problems of development of the metallurgical industry as a whole, including the formation of production of new metal materials and 4-5 processing stages, should include a system of interrelated bodies, in which the priority role should be played by the Committee for the Development of Metallurgy of the Republic of Kazakhstan (Figure 1).

To achieve this goal, the Committee for the Development of Metallurgy of the Republic of Kazakhstan develops incentive measures that allow implementing the principles of innovativeand technological development of the metallurgical industry and contribute to the formation of 4-5 processing divisions in the republic:

- tax deferrals and preferential taxation of steel plants;
- concessional lending, leasing of equipment for the introduction of low-waste technologies of metallurgical production;
- provision of state guarantees for subsidies and incentives for metalproducers;
- environmentally oriented subsidy policy;
- technology transfer and patent support for the introduction of new equipment and technologies;
- through customs regulation, support the competitiveness of domestic steel products with high added value in foreign markets.

[3] A.A. Romanova, A.I. Tatarkin *Structural policy and Development strategy (on the use of Yu. V. Yaremenko's developments in practical research of the Ural region economy)* «Problems of forecasting", 2003, no.4.p. 38



Source: own elaboration

Figure 1 Improvement of state regulation of metallurgical production

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A In the interests of the state on The Committee for the Development of Metallurgy of the Republic of Kazakhstan should be assigned the following tasks:

- organization of development and monitoring of the implementation of the state program for the development of 4-5 metallurgical processing plants;
- study of current and prospective demand for domestic steel products in domestic and foreign markets;
- creation of operational technical teams to develop new technologies and materials;
- formation and maintenance of a unified information system for the development of metallurgical clusters;
- provision of state interests in international organizations within the scope of their competence, participation in the preparation of draft international treaties and agreements.

Based on the tasks set by the Committee for the Development of Metallurgy of the Republic of Kazakhstan, it is possible to identify priority tasks, the need to solve which is required at the present stage.

It is known that the economic state of the state is determined by the technological potential and the degree of its use in production. At the same time, the level of technology must be supported by the country's scientific and technical potential, and therefore a progressive industrial policy that meets the realities of our time is impossible without science and its achievements. First of all, the main task of further reforming and restructuring of Kazakhstan's metallurgy is to bridge the technological gap between the world and its own level of development and ensure the creation of modern metal products based on the full interaction of production and science.

The United Nations Mission for the Commercialization of Science, in its 1995 report "Kazakhstan: Advancing Science to International Markets,"assessed: "Science and technology represent perhaps the most valuable asset that the country has in terms of perspective; it is something that can potentially drive economic growth for decades to come."[4]

[4] An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy. Copenhagen: DASTI, 2016. https://www.researchgate.net/publication/301363577 [date of access 15.04.2020]

Thus, Kazakhstan, which has a huge natural resource and scientific potential, is able to reach the frontiers of technological security. The basis of such innovative development is, as UN experts note, " ... the scientific infrastructure, which is very peculiar, advanced and far superior to most countries of the world." At the same time, the impact of domestic science on the development of the country's economy is almost imperceptible due to the lack of favorable conditions for the development of new high-tech technologies. In this regard, a rational combination of state regulation and market mechanisms, measures of direct and indirect stimulation of scientific, scientific-technical and innovative activities is possible with effective public administration.

In other words, it is necessary to integrate fundamental and applied research, since the knowledge obtained during the first one should mostly flow into the second one for the development of new technologies, justification of their rational parameters, creation of new materials with specified properties, and so on. If, for example, you take a purely fundamental science – mathematics, then you can create new and improve well-known research methods for technical and other branches of science. New techniques, algorithms, programs, etc. created on the basis of these methods are subject to commercialization. Consequently, with the integration of fundamental and applied research, almost any fundamental knowledge can be commercialized in the future.

The main factor in increasing the demand for scientific and technological innovations is the provision of tax incentives for enterprises that master advanced domestic technologies, for example, the exclusion of value-added tax and social tax for a period of at least payback periods or (and) loan repayment periods. For enterprises that develop high-tech industries through technology transfer, it is proposed to exclude value-added tax for a period of at least three years, but not less than the terms of technology development or (and) loan repayment terms. For all enterprises that adopt new technologies, exclude payment of customs duties on imported technological and auxiliary equipment. This will make it possible to attract private, including foreign, funds and carry out accelerated industrial development and use of highly efficient developments, develop high-tech industries based on them in accordance with the state program of industrial and innovative development of the Republic of Kazakhstan. New jobs will be created, and the tax base will expand.

To encourage the creation of industries where the contribution of science is new technologies, the contribution of investors is financial and material resources, it is proposed to adopt a government decree that would implement the principle of paying interest on loans from second-tier banks by the inno-

vation fund for existing new enterprises implementing an innovative project. This will create interest in the need for innovative development and will attract second-tier banks to participate in innovation activities[5].

Thus, the organizational and economic mechanism of state regulation allows solving many problems associated with the introduction of new equipment, the use of advanced technologies in metallurgical production. Thus, in the current economic and political situation in Kazakhstan, which is more stable than before, the process of developing 4-5 redevelopments can be intensified. The above measures should form the basis of the policy of both the state, that is, at the macro level, and the enterprise, that is, at the micro level.

There should be an increase in the production of products with the highest added value, stimulating the export of final processed products, financing advanced training programs and retraining of personnel, creating diversified and effectively competing integrated companies in the world markets that can resist protectionist methods of struggle. Without the implementation of these measures, the task of significantly increasing the GDP growth rate is not solved, since there will be no increase in the growth rate of industrial production.

Stimulating the development of the domestic market by establishing closer cooperation with metal-consuming industries, such as agricultural machinery, automotive, railway and power engineering, etc. We are talking about the joint development of technical regulations focused on the production of end-stage products in metallurgy with strict quality characteristics, which will be in demand in the implementation of innovative projects.

As you know, the successful formation of mechanisms for innovative and scientific and technological development is primarily a consequence of the political and social conditions prevailing in society.

The complexity of transformational shifts in the economy is manifested not only in the fact that restructuring and streamlining the structure requires reforming the management system or creating a new one, with the subsequent integration of business entities both in the new management system and in new tasks facing the governing bodies. The main difficulty is in adapting production facilities to market requirements and conditions of independent management in the mode of expanded reproduction and technological renewal. This is what the scientific and industrial policy should ensure. To achieve this goal, it is necessary both to form a model for the development of the scientific and innovative sphere itself, which provides for strengthening innovation activity, concentrating resources on key areas of scientific and technological

[5] H.S. Park *Technology convergence, open innovation, and dynamic economy.* «J. Open Innov. Technol. Mark. Complex» 2017, no.3, p.24.

progress, forming research and production structures that can compete in domestic and foreign markets, and motivationally operating organizational and economic mechanisms for creating and distributing innovations.

Problems of economic development of Kazakhstan's metallurgy industry in the near future will be determined by its ability to attract resources for accelerated growth. The exhaustion of market factors (such as free capacities, "soft" resource constraints, and favorable global conditions) highlights the task of quantitative and qualitative growth of production capital focused on the production of steel products provided with domestic and foreign market demand. Therefore, attracting investment in domestic metallurgy is considered as the most important source for creating a competitive domestic technical base for metallurgical production.

First of all, it is necessary to eliminate the fundamental reasons for the weakness of Kazakhstan's metallurgy, which is expressed primarily in the structural deformation of metallurgy, where dozens of large and unique deposits of metal ores account for several plants.

The solution of these problems requires the development of new principles for the formation of financial and economic mechanisms for stimulating new metallurgical industries.

The priorities of financial and economic mechanisms for stimulating new metallurgical industries in these conditions will be to promote radical modernization of production and its structural adjustment, increase the competitiveness of production of metallurgical products with high added value, accelerate investment development of high-tech, innovative projects, and form a new technological order in metallurgy.

Achieving these goals of the state policy for the development of metallurgy requires the implementation of a set of measures to create a favorable investment climate in the country, support investment initiatives in the market sector of the economy, and create legislative and institutional conditions for the economic activity of private investors that are adequate to modern market requirements.

In connection with the above, the main principles of state policy will be::
– in the field of creating a favorable investment climate in metallurgy:
  - strengthening the role of the state as a guarantor of maintaining a favorable and predictable regulatory regime for the economic activities of domestic and foreign investors; publicizing the state investment policy;
  - creation of equal competitive business conditions for all investors, regardless of the form of ownership, contributing to efficient allocation of capital and sustainable economic development;

- introduction of effective legislative and practical mechanisms to protect the interests and rights of investors in the implementation of investment projects;
- liberalizing the market for investment projects by simplifying the procedures for approval and obtaining permits for their development and implementation;
- ensuring that investors can obtain reliable information about organizations in order to analyze and select investment objects (regulation of the composition and structure of financial and non-financial information disclosed, methods of its disclosure; accounting reform, development of standards that meet international accounting standards);
- promoting the development of a modern institutional infrastructure of the investment market that ensures effective transformation of the national economy's savings into investments in metallurgical production.

– in the field of public investment:
  - strengthening the social orientation of investment activity in the country, the absolute priority of investment in solving problems of fundamental and applied science in the field of metallurgy;
  - openness and predictability of the state investment policy, stimulating the attraction of non-state sector capital to solve priority tasks of metallurgy development;
  - priority of state support for infrastructure facilities that are strategically important for the country and contribute to innovative and technological breakthroughs in metallurgy.
– in the field of supporting investment activities in the private sector of the economy:
  - creating conditions for increasing the investment potential of Kazakhstan's metallurgical enterprises by reducing the tax burden and improving the depreciation policy;
  - liberalization of the foreign trade and tax regime for the import of modern technological equipment required for the modernization of existing metallurgical enterprises to Kazakhstan.

In order to effectively finance modernization processes in the metallurgical industry aimed at developing the 4th-5th division, it is necessary to consider mechanisms that facilitate the transfer of financial capital from the main sources of investment in this sector of the economy.

Thus, for the purpose of sustainable and dynamic development of metallurgy, it is necessary to increase the efficiency of the financial intermediation system, designed to ensure the accumulation of temporarily available

funds of individuals and legal entities and the transformation of savings into investments.

A necessary condition for the development of financial intermediation is to expand the circle of investors focused on long-term investments and increase the reliability of non-financial sector enterprises as borrowers (issuers). Important tasks in this context are to improve the quality of accounting and transparency of financial statements of potential borrowers and the security of organized savings.

The medium - and long-term funds accumulated by financial intermediaries through the banking system and the stock market will be redistributed as investment resources. Development and financial intermediation institutions need to increase the level of capitalization, reduce the risks of long-term operations, and expand the range of instruments they use.

The main problem of forming an effective financial and economic mechanism in metallurgy is the search and effective placement of financial resources (financial resources, securities, technologies, equipment, patents and licenses, etc.).

Based on this, the financial condition of metallurgical enterprises is expressed in the formation, placement and use of financial resources and is characterized by the availability of financial resources necessary for normal production, commercial and other activities of the enterprise, the expediency and efficiency of their placement and use, financial relationships with other business entities, solvency and financial stability.

At the present stage, foreign managers of metallurgical enterprises use only 3 possible types of external financing:

- preferential budget financing;
- leasing;
- direct investment or long-term loans.

It should be noted that the republic has already formed the financial basis for these listed instruments.

In general, the metallurgical and metalworking industries will develop in 4 directions in the next few years:

- Production of new types of products using new technologies;
- Increasing the complexity of the use of raw materials and processing of industrial waste;
- Informatization of production processes;
- Greening of production processes.

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