# Analysis of Factors Affecting to the Development of Sub-Production Industry of the Republic of Kazakhstan

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## ARTICLE INFO

## ABSTRACT

*The entry of non-mining companies into the world market raises the problems of strategic planning and company management especially significant in a market economy. The considered model of strategic planning and management is versatile and suitable to the development strategy of companies taking into account regional and national interests. The aim of the study is to develop recommendations for the application of modern methods of strategic management in the non-mining companies to determine the main routes for the development of this industry in a pandemic. The information base of current investigation includes legislative and other normative acts of the Republic of Kazakhstan, statistical data of the Agency of the Republic of Kazakhstan on Statistics, analytical materials, materials of scientific economic literature and periodicals, materials of scientific and practical conferences, data of electronic resources, as well as financial statements of Top 40 foreign companies. Research methods. In this work, the following methods such as abstract-logical, economic-statistical, monographic, as well as methods of system analysis, economic comparison, expert assessments, economic and mathematical modeling were used. Conclusions: The main provisions and conclusions given in this work can be used in the development and implementation of strategic management policy and further planning of non-mining companies. In the process of analyzing the non-mining industry, a forecast was identified for the development of strategic planning for their further activities, since oil companies-subsoil users are basically important and active agents of economic and social development, receiving income as a result of the development and use of oil fields in Kazakhstan. Research out-comes: Using the provided statistical data on the indicators of non-mining companies, we analyzed the influence of some*

*factors affecting the final results of companies' activities by creating a re-gression model, and also analyzed the impact of investments in fixed capital in the non-mining industry of the Republic of Kazakhstan on the pro-duction volume (goods and services) achieved by this industry.*

## INTRODUCTION

The relevance and efficiency of strategic management of enterprises and numerous industries in modern economic conditions has been proven by varied previous scientific works. The key mechanisms of strategic management of enterprises in various sectors of the economy should take into account the main trends and specifics of the industry development; it is also necessary to adapt them to modern economic conditions. These circumstances confirm the feasibility of improving the processes and mechanisms of strategic management of enterprises, industrial complexes, as well as further investigations in this area. The developed non-mining industry traditionally demonstrates the technological power of the state. Nowadays, this sector is no longer a source of large-scale growth in employment and jobs in developed countries. However, it still remains as one of the key development tools in developing countries. To bring new industries into the zone of industrial activity, since 2010 the Republic of Kazakhstan has been implementing an industrial policy that aimed at creating a highly productive and export-oriented manufacturing industry including the non-mining industry.

The strategic importance of the country's non-mining industry predetermines the need of creation more flexible management structures and effective integration mechanisms to ensure the development of enterprises and industries that are part of it. The production efficiency and development of modern non-mining companies is largely determined by the degree of their adaptation to ongoing changes in the environment of functioning and development. The processes that characterize the domestic economic situation often do not suit into the framework of the generally accepted theory. Therefore, in order to solve the problems arising in these conditions, the enterprise is required to search for new and non-standard solutions and approaches.

The post-COVID reality is changing the economy, and the mining industry is no exception. The market is demanding that mining become more dynamic and flexible. Now there is a need to create the production that would work autonomously and be distinguished by an unprecedented level of efficiency and productivity. Such a "model company" invests in innovation and employees who clearly see their goals and realize the value of the result, and their workplace is as safe as possible not only for them, but also for the environment. Companies that can build fully interconnected supply chains will not only eliminate the silos of operational processes, but also ensure their transparency and reduce costs.

## 1. LITERATURE REVIEW

The problems of understanding the strategic future of an enterprise is always attracted interest in multiple scientific fields. A review of modern sources made it possible to highlight some definitions of strategic planning. I.A. Lieberman (2016) noted that *"the strategy is presented as a master plan of action, which determines the priorities of strategic objectives, resources and a certain algorithm of action in order to achieve strategic goals"*. A group of economists T.N. Litvinova, I.A. Morozova and E.G. Popkova concluded that strategic planning is aimed at the management aspect of changes in the enterprise. The outcome of strategic planning is a strategic outline that determines the stages and resources that are needed to achieve strategic goals (Ivanova, 2016).

Yu.N. Ivanov emphasizes that modern competition has promoted the development of adequate models of firms' behavior, which led to start and continue intensive work on research in the field of strategic planning (Litvinova et al., 2016). I. Ansoff (1989) defines strategy as a complex and potentially powerful tool with which a modern firm can withstand changing environmental conditions. Financial planning undoubtedly influences to the financial strength of companies. In this case, it seems relevant to analyze available strategic tools that aimed at improving the efficiency of the enterprise and searching

for new methodological techniques to managing the development strategy of economic entities, taking into account the state of the external and internal environment, the current conjuncture of the Kazakhstan and world markets based on the materials of the oil and gas industry. According to the author, changes in any economic system are caused by the influence of the external environment, and also affect it. To avoid chaos, uncertainty and possible errors in system management, the international management practice actively employs the category and process of strategic management. Including the analysis of the environment, the definition of the mission and goals of the system, the choice of strategy, its implementation and evaluation make it possible to streamline and systematize all elements of the system and ensure its controllability. According to L.G. Zaitsev and M.I. Sokolova, "strategic management" is concluded as:

- type, scope of management activities consisting in the implementation of the selected long-term goals throughout making changes in the organization;
- the process by which the organization interacts with its environment;
- the area of scientific knowledge that studies techniques and tools, the methodology for making strategic decisions and ways in practical implementation of this knowledge (Zaitsev, Sokolova, 2015).

The non-mining industry is the most significant branch of the primary sector, that includes extraction, processing and enrichment of raw materials - energy, ore, mining chemical construction materials. Its fraction in the total industrial production of developed countries and countries with transitional economy is around 8-10% (in Australia, Norway and Canada - 15-20%, in most developing countries - 30-50%, in some of those - over 80%, for example, Persian Gulf countries, Zambia). The export quota of mining products in developed countries usually does not exceed 5% (exceptions are the above developed countries and South Africa). This number fluctuates from 15-20 to 80% (or above) in developing countries. As the most important field, high-quality and efficient development of mining resources requires broad cooperation with the world's largest oil companies, which have a great experience in geological exploration, production, and processing of hydrocarbons, as well as their transportation. According to V.A. Kulakovskaya (2016), the positioning of the non-mining industry as an income-generating sector of the economy is due to several factors such as the presence of massive reserves of minerals, existing structure of the domestic economy and system of the industry taxation. A.I. Dmitrieva (2017) stated that the key task of the firm's strategy should be develop a model for searching, adapting and introducing innovations that create a steady stream of investments and innovations that provide competitive advantages and achieve the strategic goals.

By forming the priority directions of the region's industrial policy, it is essential to take into account that the resulting indicators should be achieved at the level of key industrial companies in the region. This makes it necessary to increase their profitability and innovativeness in a strategic perspective (Zhogova et al., 2017). Consequently, the efficiency of production and development of modern non-mining companies is largely defined by the degree of their adaptation to the ongoing changes in the environment of functioning and development (Krasnikova, 2019). Innovative and investment indicators of the development of the world economy were analyzed by many scientists over the past ten years. These display in search of competitive advantages and effective technological solutions, the world's largest corporations have begun to increase investments in R&D (Ivanova and Mamedyarov, 2019). G. Zervas et al. (2017) reported that the development of the phenomenon of the shared economy, the intensification of a use of outsourcing, the changing role of small and medium-sized enterprises in a number of industrial and high-tech sectors of the economy where the non-mining industry occupies an important position.

## 2. METHODOLOGY

Kazakhstan's economic and investment policy was created from scratch as a bold market and supporting a wide layer of local and foreign subsoil users. Within the framework of the adopted legislation, individual contracts are concluded with them, where the task of increasing production and export of hydrocarbons is solved by creating an investment climate suitable for investors. That will subsequently ensure the emergence of over 200 contracts for oil and gas subsoil use.

Kazakhstan's investment policy is aimed at ensuring that the volume of capital investments attracted to the country grows not only because of super-projects, but also as a result of an increase in the total number of subsoil users and contractors, as evidenced by the following data (Figure 1) (Data of the Committee on Statistics of the Republic of Kazakhstan for 2010-2019).
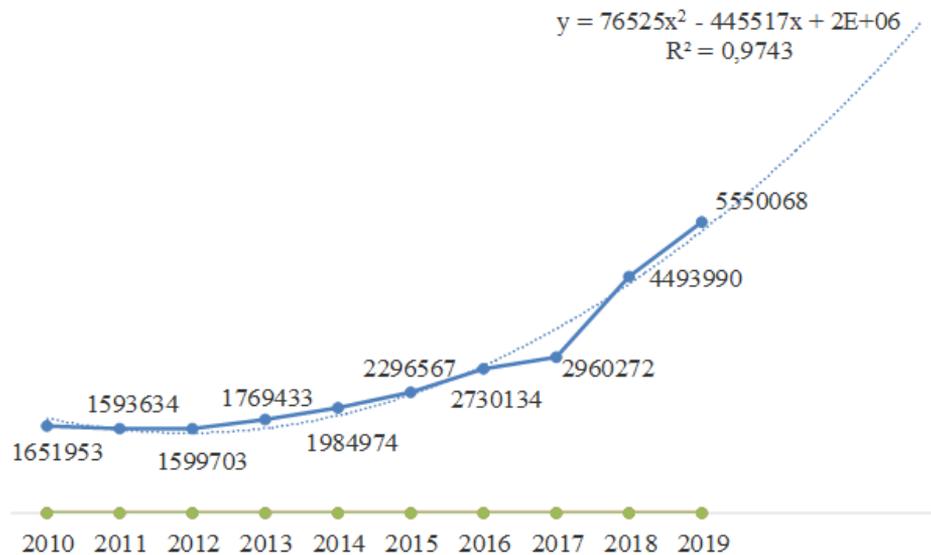
$$y = 76525x^2 - 445517x + 2E+06$$
$$R^2 = 0{,}9743$$

5550068

4493990

2296567  2960272

1769433  2730134

1593634

1984974

1651953  1599703

2010  2011  2012  2013  2014  2015  2016  2017  2018  2019

**Figure 1.** Fixed capital investments in the non-mining industry of the Republic of Kazakhstan for the period of 2010 to 2019, million KZ tenge.

Source: Compiled by authors based on the source: Electronic resource: Data of the Committee on Statistics of the Republic of Kazakhstan for 2010-2019 (2019)

There is of great interest to determine the influence of investments in fixed capital in the non-mining industry on the production volume (goods and services) achieved by this industry. It is natural to assume that the benefit on investment does not occur immediately, but after a certain period of time there is likely to attain a profit. Thereby, it is advisable to use a dynamic model with a distributed lag (assuming a lag value of three) for the analysis (Sedelev, 2009):

$$y_t = \alpha + \beta_0 x_t + \beta_1 x_{t-1} + \beta_2 x_{t-2} + \beta_3 x_{t-3} , \qquad (1)$$

Where:

- the volume of services rendered by the placements (mln. KZ tenge);
- investments in fixed capital (mln. KZ tenge).

Graphical analysis (Figure 1, Figure 2) suggests that the lag structure has a polynomial form, as a result of this, the Almon method (Data of the Committee on Statistics of the Republic of Kazakhstan for 2010-2019) can be used to estimate the model parameters.
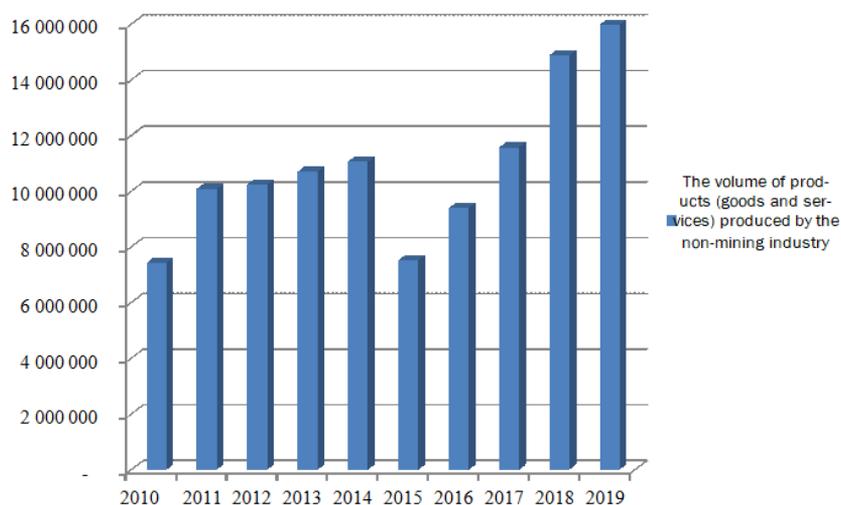
44

**Figure 2.** Dynamics of the production volume (goods and services) in the non-mining industry of the Republic of Kazakhstan for 2010-2019.

Source: Compiled by authors based on the source: Electronic resource: Data of the Committee on Statistics of the Republic of Kazakhstan for 2010-2019 (2019)

The statistical data presented in Table 1 were used to build this model.

**Table 1.** Dynamics of the investments in fixed capital and production volume of the non-mining industry for the period of 2010-2019

| Year | The production volume (goods and services) in the non-mining industry | Fixed capital investments in the non-mining industry |
|---|---|---|
| 2010 | 7 419 550 330 | 1 651 953 |
| 2011 | 10 081 254 022 | 1 593 634 |
| 2012 | 10 242 052 603 | 1 599 703 |
| 2013 | 10 696 926 187 | 1 769 433 |
| 2014 | 11 060 179 488 | 1 984 974 |
| 2015 | 7 521 179 590 | 2 296 567 |
| 2016 | 9 397 618 601 | 2 730 134 |
| 2017 | 11 568 784 610 | 2 960 272 |
| 2018 | 14 877 068 476 | 4 493 990 |
| 2019 | 15 978 061 372 | 5 550 068 |

Source: compiled by authors

The implementation of the Almon method made it possible to obtain the results depicted in Table 2. A model with a distributed lag was built, the relative coefficients and the average lag were determined.

**Table 2.** Results of constructing a dynamic model with a distributed lag

| Distributed lag model: | $y_t = -9121201,051 - 0,511x_t - 4,131x_{t-1} + 1,216x_{t-2} + 15,528x_{t-3} + \varepsilon_t$ | |
|---|---|---|
| Relative ratios, % | current time | -0,042 |
| | within a year | -0,341 |
| | after two years | 0,100 |
| | after three years | 1,283 |
| Average model lag | | 3,709 |

Source: compiled by authors

Analysis of the resulting dynamic model allows us to conclude that investments in fixed capital of the non-mining industry lead to a rise in the production volume of this industry within a three-year period. Thus, for the non-extractive industry, one of the most important aspects is the need to optimize approaches to pricing and implement regulatory reforms which can attract new investment in an extremely competitive environment in the global market, and in order to pave the way to successful integration within the EAEU. Oil companies-subsoil users are important and active agents of economic and social development, as they receive income as a result of the development and use of oil fields in Kazakhstan. According to the contracts concluded with subsoil users, they are obliged not only to use in their activities the goods and services produced by domestic producers, but also to train Kazakhstani specialists at the expense of income from subsoil use.

The economy of Kazakhstan today has a "raw materials orientation" and, in the near future, the situation will not change significantly. Harmless production allows focusing not on maximum production volumes, but also a use of energy and water resources with minimal harm to the environment. This policy is followed by the transition from manual control to automated processes with their self-organization and self-control. Under these conditions, employees are shifting to remote control, and production to flexible management with a focus on demand and sales. According to the National Bank of the Republic of Kazakhstan, at the end of 2019, the net inflow of direct investments in the oil and gas industry of the Republic of Kazakhstan preliminary amounted to USD 5,664.6 million of the total volume of direct investments in Kazakhstan. In the period of 2016–2018, the inflow of investments in the oil and gas industry of the Republic of Kazakhstan increased by 95.9% (by USD 2,012.2 million) (Figure 3) (Data of the National Bank of the Republic of Kazakhstan for 2016-2019, 2019).



**Figure 3**. Net inflow of direct investments in the oil and gas industry of Kazakhstan, million US dollars

Source: Created from source: Electronic resource: Data of the National Bank of the Republic of Kazakhstan for 2016-2019, (2019)

According to the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan as of 2019, 315 companies engaged in the production of crude oil and natural gas were registered in Kazakhstan, of which 187 are operating. Of the total number of companies involved in the production of crude oil and natural gas, they are divided into:
− large enterprises (more than 250 employees) - 22 (including 22 operating);
− medium-sized enterprises (from 101 to 250 employees) - 23 (including 20 operating);
− small businesses (from 5 to 100 employees) - 270 (including 145 operating).

In terms of the geography of the location of companies in the countryas follows:
− Almaty - 89 (of which 52 are operating);
− Mangistau region - 30 (17);
−
− Aktobe region - 27 (9);
− Kyzylorda region - 14 (8);
− Zhambyl region - 13 (9).

At the beginning of 2019, the actual headcount at the enterprises for the production of coke and petroleum products amounted to 8.1 thousand people. Regionally, the largest number (67.9%) is concentrated in Atyrau, Pavlodar regions and Shymkent. This is due to the fact that in these regions there are 3 large domestic oil refineries - «Atyrau refinery» LLP (Atyrau), «Pavlodar oil chemistry refinery» LLP (Pavlodar) and PetroKazakhstan Oil Products LLP (Shymkent). Considering the foreign experience in the development of the non-mining industry, we would like to note that 40 of the largest mining companies are quite successfully overcoming the difficulties that have befallen them due to the COVID-19 pandemic - they certainly coped with the situation better than many other sectors of the economy, as evidenced by the following data (Figure 4) (Mining industry, 2020).
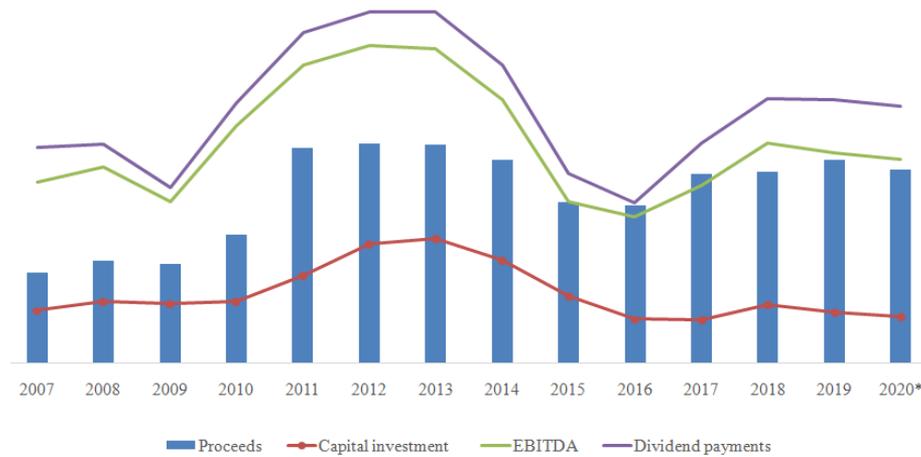


**Figure 4**. Dynamics of indicators of 40 largest mining companies, billion US dollars

Source: Compiled by authors based on the source: Electronic resource: Mining, (2020)

Top 40 companies generated revenues of USD 692 billion in 2019, i.e. increased by 4% compared to last year - mainly as a result of rising commodity prices (Figure 5) (Mining industry, 2020).
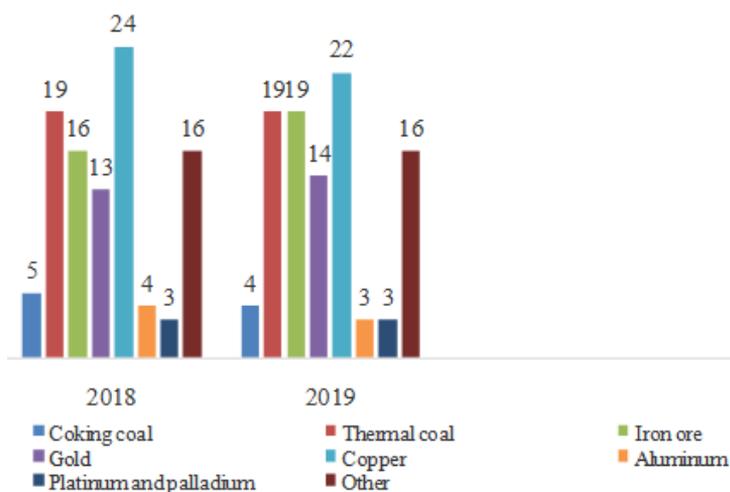


**Figure 5.** Maintaining the revenue structure of Top 40 companies by commodities for 2018-2019, in %.
Source: Compiled by authors based on the source: Electronic resource: Mining, (2020)

The pandemic revealed that the resilience of the industry and the role that mining companies play in supporting local communities and the economy as a whole. Although there is still a long way out of the crisis. Mining companies are already analyzing the lessons they have experienced from the current situa-

tion. The coal sector's contribution to total revenues remained at the level of the previous year, while the share of the iron ore sector increased, mainly due to the price. It reached the peak over the past five years and amounted to almost $ 130 per tonne.

The price of iron ore, which dramatically decreased in production due to the tragic events in Brazil, further reduced due to falling demand and a trade war between the United States and China. As for Kazakhstan, the situation with the volume of production in current prices in the context of the regions of the non-mining industry indicates that among the regions by:

− Karaganda region is the leader in coal and lignite mining;
− Atyrau and Mangystau regions are leading in the production of crude oil and natural gas;
− mining of metal ores - Aktobe, Kostanay, Pavlodar regions;
− mining of iron ore - Kostanay region;
− mining of non-ferrous metal ores - Aktobe, East Kazakhstan regions;
− other branches of the mining industry - Atyrau, Zhambyl, Kostanay regions (Table 3) (Data of the Committee on Statistics of the Republic of Kazakhstan for 2010-2019).

The pandemic has affected the prices of various commodities in different ways: for some it fell, for others it increased. However, some prices remain relatively stable. Non-ferrous metal prices have declined significantly since January 2020 due to weakening demand and uncertainty over the dynamics of economic development. The decline in prices for copper, nickel and zinc since December 2019 has been expressed as a percentage in double digits. Large mining companies expect the demand for non-ferrous metals to weaken in the remainder of the year, and some of them have moderately cut their production forecasts in response to this. Thus, some of Top 40 companies have lowered their forecasts for copper, nickel and zinc mining by an average of 6-7%. Some commodity prices may decline further after COVID-19 restrictions are lifted that affect production. Since the price of gold rises during the crisis, gold mining companies are in an advantageous position - in recent months there has been a recovery in stock prices.

**Table 3**. Global production and the impact of COVID-19 on the activities of mining companies

| A country | Copper | Gold | Iron ore | Coal | Nickel |
|---|---|---|---|---|---|
| USA | 7 | 6 | | 9 | |
| Canada | 7 | 5 | | | |
| Brazil | | | 19 | | |
| Peru | 12 | | | | |
| Argentina | 28 | | | | |
| Congo | 7 | | | | |
| South Africa | | | | 3 | |
| Russia | | 9 | 4 | 4 | 10 |
| China | 13 | 8 | 14 | 46 | |
| India | | | 8 | 10 | |
| Philippines | | | | | 16 |
| Indonesia | | | | 7 | 30 |
| Australia | | 10 | 37 | 6 | 7 |
| New Caledonia | | | | | 8 |

Source: Compiled by authors based on the source: Electronic resource: Mining, (2020)

The price of iron ore has remained above $ 80 per tonne throughout the entire coronavirus outbreak. Some huge iron ore mines reached record production levels in the 1st quarter of 2020 as China began to recover from the crisis and recover business activity. China is expected to increase its budget for infrastructure projects to support a weakened economy. Undoubtedly, mining companies operating in the same geographic region, in the same market and offering a single product are more likely to be affected by an event such as the COVID-19 pandemic than diversified businesses. While some mining companies have simplified their asset portfolios to focus on efficiency gains, it is important to ensure the right balance of unified and diversified operations (Appendix A). In the context of large markets such as

China and India that are driving global economic growth, mining companies should ask themselves how they can diversify their customer base and strengthen demand (Table 3) (Mining industry, 2020).

**Table 4**. The largest organizations engaged in the extraction of non-fuel minerals in Kazakhstan

| Organization | Main product type | Own |
| --- | --- | --- |
| «NMC Tau-Ken Samruk» JSC | Copper, gold, iron ore and so on | State owned |
| NAC «Kazatomprom» JSC | Uranium, rare metals | State owned |
| EurasianResourcesGroup (headquarters in Luxembourg) | Ferroalloys, iron ore, aluminum, copper, cobalt, coal | With state participation (40% of shares belong to the Committee for State Property and Privatization of the Ministry of Finance of the Republic of Kazakhstan, 60% are divided between the three founders and members of the board) |
| ArcelorMittal (headquarters in Luxembourg) | Iron ore, coal | Private enterprise (37.38% of shares are held by HSBC Trustee (C.I) Limited, 62.44% - to other public shareholders) |
| «Corporation Kazakhmys» LLC (headquarters in Kazakhstan) | Coal | Private enterprise |
| KAZ Minerals (headquarters in Kazakhstan) | Copper | Private enterprise |
| LLC «Kazzinc» (headquarters in Kazakhstan) | Zinc and lead | Privately Held (69.61% owned by Glencore International AG headquartered in Switzerland) |

Source: Compiled by authors based on the source: Electronic resource: Reforming the mining industry in Kazakhstan: investments, sustainable development, competitiveness, (2019)

The mining industry in Kazakhstan is largely represented by a number of large foreign and state-owned enterprises involved in the extraction of non-fuel minerals, and in some cases by their subsidiaries. The dominant position in the industry is occupied by the Samruk Kazyna National Welfare Fund, whose portfolio companies are NAC KazAtomProm JSC and Tau-Ken Samruk NGK JSC - one of the greatest state-owned enterprises. Apart from, the state owns Kazgeology JSC, which is engaged in mineral exploration, and the Ministry of Finance of Kazakhstan owns 40% of Eurasian Resources Group shares. Table 4 represents some of the key enterprises engaged in the extraction of non-fuel minerals in Kazakhstan (Reforming the mining industry in Kazakhstan: investment, sustainable development, competitiveness, 2019).

Currently, Kazakhstan is an attractive country for attracting foreign investment in the oil and gas sector, since the country's position in the overall ratings of the business environment is generally favorable and growing in comparison with other countries. Taking this into account, the use of strategic planning for oil and gas companies will be able to successfully resist new global challenges and threats (National Energy Report Kazenergy, 2019). Kazakhstan is rich in hydrocarbon raw materials, has always strived to develop the deep processing sector in order to reorient its raw material potential towards the production of products with high added value. Over the years, in a country that annually increases oil and gas production, special programs have been developed and adopted to develop the hydrocarbon processing sector and obtain products with high added value.

Kazakhstan has developed a Concept for the Development of the Fuel and Energy Complex (FEC) until 2030, developed in June 2014, which is a key document that defines the strategic goals of the exploration and production sector. According to this concept, in the future until 2030 in the oil industry will be:

- economic incentives have been created to attract investments in geological exploration and effective technological development of oil production;
- the personnel potential of the oil and gas industry is ensured;
- technology transfer in the oil production segment was provided;
- the domestic market of petroleum products was ensured, the capacities for oil refining were expanded;
- developed a competitive market for oil products and oil refining.

The most important factor in the development of the mining industry is the use of innovative technologies to transform core business models and key production processes. Innovations will provide an opportunity to attain a completely new level of efficiency and safety, which are achieved through the integration of processes and the use of artificial intelligence. Another development factor is a new approach to working with staff and partners. This contributes to the formation of new values, more flexible conditions for interaction and personalization of processes. Finally, such changes will make it possible to modernize the business processes of mining companies by switching to remote control (Industry analysis report 2019).

More than 12 key stages of production (from exploration to shipping) can become autonomous from direct human involvement. The correct choice of such stages in each company is based on three criteria including the importance of the business process, its complexity, and the time required for its implementation. Based on the study of the activities of non-mining companies, certain conclusions were drawn:

− An important element of the company's strategic planning is an increase in the volume of capital investments and investments aimed at increasing the level of production, and proven reserves of the company by investing additional funds in the development of new technologies and geological exploration, as well as in improving the financial performance of the company.
− The direction of the energy policy of companies is obvious to stimulate investments in the development of alternative energy.
− Development of international cooperation is one of the priority areas of the oil and gas industry.

In general, the results of the study were achieved, as follows:

− the general trend of development of the modern non-mining industry, both in the Republic of Kazakhstan and taking into account foreign experience;
− provided its characteristics as one of the main sectors of the economy of Kazakhstan;
− it has been proven that the non-mining industry is the driving force behind the ongoing socio-economic reforms in Kazakhstan, and the conductor of modern innovative and management decisions;
− using the construction of a regression model, we analyzed the impact of investments in fixed capital of the sub-mining industry on the production volume (goods and services), its transportation.

## CONCLUSION

According to experts, the non-mining industry occupies a strong position in the context of COVID-19 on the global economy and production. Mining companies are financially strong and most of them continue to operate, albeit with increased levels of precaution and preventive control. However, the long-term consequences of the pandemic are still unknown. Top 40 mining companies need to take advantage of current financial stability to rethink their strategy, which will increase business resilience in the future.

In this regard, the non-mining complex of Kazakhstan requires the implementation of the following measures:

− further attraction of investments for the reproduction and development of the mineral resource base;
− renewal of fixed capital in the mineral resources sector using the latest advances in equipment and technology;
− use of the depreciation fund exclusively for the intended purpose;
− increasing the economic efficiency of production and sales activities of non-mining companies, reducing costs in the production, distribution and marketing of hydrocarbons;
− improving the financial condition of the mineral resource complex;
− ensuring full financial transparency of the activities of non-mining enterprises to identify (Sikhimbaeva, 2011).

Considering the risks of COVID-19 in enterprises, companies may outsource some functions. For instance, replace IT functions to the cloud or outsource non-core operational functions to contractors. Such changes can reduce operating costs and eliminate maintenance costs. The main directions of development for industrial companies will be:

– automatic movement of materials (unmanned loaders and cranes);
– automation of repetitive tasks, including assembly (for example, industrial robotics);
– predictive service (using the Web and artificial intelligence).

Most industrial companies are going to strengthen their digital presence in response to the increased demand on the Internet, which will continue after the crisis, so the main challenge for industrial enterprises is structural adaptation to the new market realities, which implies:

– building new supply chains with a greater focus on national contractors (which will minimize problems in the event of quarantine measures and border closures);
– changing working conditions for employees with an emphasis on the transition of some employees (where possible) to the format of remote work;
– a serious revision of the product line and, where it seems appropriate, the reorientation of production to the healthcare and smart industries;
– the widespread introduction of robotics and artificial intelligence in production and management to reduce dependence on quarantine measures and the ability to quickly and painlessly scale production of products depending on the demand situation;
– changing models and channels for selling and promoting products with a shift to the online environment, where an increase in the range of solutions is expected, taking into account the specifics of the sectors;
– continuous monitoring of macroeconomic conditions and demand, changes in consumer behavior using artificial intelligence technologies;
– creating long-term relationships with suppliers of sanitary protection solutions (personal protective equipment, cleaning) (Digest. Impact of the COVID-19 pandemic on industry and the environment, 2020).

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**Appendix A.** Volume of production (goods and services) in current prices in the context of regions of the non-mining industry

(in thousand tenge)

| Region | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|
| The Republic of Kazakhstan | 7 419 550 330 | 10 081 254022 | 10 242 052603 | 10 696 926187 | 11 060 179488 | 7 521 179 590 | 9 397 618 601 | 11 568 784610 | 14 877 068476 | 15 978 061 372 |
| Akmola region | 22 146 270 | 29 567 091 | 45 973 602 | 44 333 335 | 47 677 700 | 53 470 523 | 69 221 995 | 54 957 966 | 59 372 762 | 75 897 044 |
| Aktobe region | 739 735 712 | 981 644 944 | 1 024 466 748 | 984 788 175 | 896 515 882 | 658 564 807 | 822 406 237 | 954 056 761 | 1 149 744 235 | 1 142 089 899 |
| Almaty region | 6 613 429 | 7 673 712 | 7 699 183 | 9 342 098 | 11 645 147 | 14 994 903 | 13 882 861 | 12 143 386 | 11 555 000 | 14 577 293 |
| Atyrau region | 2 832 566 513 | 3 988 163 946 | 3 852 908 343 | 4 245 164 480 | 4 502 527 807 | 3 052 481 615 | 3 948 896 927 | 4 931 030 025 | 6 411 495 450 | 7 268 682 061 |
| West-Kazakhstan region | 881 695 048 | 1 344 777 763 | 1 498 907 720 | 1 482 062 197 | 1 657 346 095 | 1 146 628 333 | 1 388 588 609 | 1 690 284 309 | 2 213 469 221 | 2 114 621 342 |
| Jambyl region | 8 651 131 | 12 967 286 | 17 141 431 | 18 766 577 | 21 818 878 | 23 288 140 | 35 970 914 | 43 586 663 | 49 334 091 | 57 777 122 |
| Karaganda region | 88 461 119 | 134 426 171 | 134 653 117 | 193 647 709 | 281 371 474 | 159 861 739 | 209 385 885 | 287 805 257 | 355 034 682 | 400 265 192 |
| Kostanay region | 279 935 973 | 368 070 252 | 269 745 444 | 279 580 176 | 240 313 714 | 161 269 735 | 236 453 124 | 296 037 471 | 366 149 722 | 501 961 043 |
| Kyzylorda region | 756 951 759 | 1 000 462 903 | 1 032 466 324 | 1 066 725 741 | 880 763 024 | 475 356 805 | 515 061 166 | 583 804 839 | 778 607 510 | 669 337 455 |
| Mangistau region | 1 538 594 091 | 1 927 283 584 | 2 037 069 437 | 2 023 476 213 | 2 150 787 444 | 1 358 046 905 | 1 613 869 200 | 2 037 105 064 | 2 594 926 768 | 2 600 970 545 |
| South-Kazakhstan region | 72 776 169 | 81 339 594 | 140 238 114 | 146 024 760 | 149 421 529 | 193 505 205 | 216 924 144 | 152 742 977 | : | : |
| Pavlodar region | 75 089 345 | 89 534 007 | 100 470 907 | 104 755 951 | 113 235 467 | 119 247 709 | 202 725 501 | 340 443 104 | 376 231 718 | 420 910 959 |
| North-Kazakhstan region | 387 788 | 799 342 | 1 540 354 | 1 785 886 | 2 001 116 | 1 558 116 | 3 170 806 | 2 063 802 | 2 760 006 | 4 594 005 |
| Turkestan region | : | : | : | : | : | : | : | : | 188 989 763 | 224 503 886 |
| East-Kazakhstan region | 115 945 983 | 114 542 579 | 78 675 657 | 96 471 817 | 104 533 875 | 102 905 055 | 121 061 232 | 182 722 986 | 318 865 490 | 481 202 689 |
| Nur-Sultan city | - | 848 | 11 217 | 1 072 | - | - | - | - | - | - |
| Almaty city | - | - | 85 005 | - | 220 336 | - | - | - | - | - |
| Shymkent city | : | : | : | : | : | : | : | : | 532 058 | 670 837 |
| Mining of coal and lignite | | | | | | | | | | |
| The Republic of Kazakhstan | 130 585 989 | 182 656 456 | 195 036 869 | 207 005 546 | 219 282 250 | 213 521 406 | 232 703 098 | 292 079 360 | 342 996 228 | 357 768 139 |
| Akmola region | 1 702 456 | 2 941 713 | 5 819 492 | 5 090 849 | 2 903 137 | 966 110 | 448 480 | 871 228 | - | - |
| Aktobe region | 6 830 | 10 860 | 10 622 | - | - | - | - | - | - | - |
| Almaty region | 39 246 | 46 345 | 62 763 | 75 854 | 91 037 | 112 719 | 127 110 | 159 264 | x | x |
| Jambyl region | 807 889 | 858 813 | 222 160 | 166 240 | 153 572 | 45 482 | 49 365 | 51 795 | x | 724 303 |

| Karaganda region | 47 869 703 | 85 659 440 | 82 269 773 | 92 156 918 | 100 891 266 | 97 796 936 | 110 556 691 | 144 981 011 | 178 305 040 | 192 442 968 |
|---|---|---|---|---|---|---|---|---|---|---|
| Kostanay region | 118 476 | 74 005 | 60 236 | 6 312 | - | - | - | 34 701 | x | - |
| Mangistau region | - | - | - | - | - | - | - | - | - | - |
| South-Kazakhstan region | - | - | - | - | - | - | - | - | : | : |
| Pavlodar region | 71 059 425 | 83 571 776 | 95 291 976 | 96 575 375 | 101 668 173 | 98 424 906 | 103 719 540 | 123 633 583 | 136 996 313 | 133 820 361 |
| North-Kazakhstan region | : | : | : | : | : | : | : | : | - | - |
| East-Kazakhstan region | 8 981 964 | 9 493 504 | 11 299 847 | 12 933 998 | 13 575 065 | 16 175 253 | 17 801 912 | 22 347 778 | x | 30 561 948 |
| Shymkent city | : | : | : | : | : | : | : | - | - | - |
| Extraction of crude oil and natural gas | | | | | | | | | | |
| The Republic of Kazakhstan | 6 195 386 180 | 8 572 794 725 | 8 720 733 578 | 9 036 471 043 | 9 164 094 733 | 5 880 227 129 | 7 409 929 215 | 9 202 732 776 | 12 060 235116 | 12 653 589 432 |
| Aktobe region | 520 172 503 | 703 033 529 | 727 819 069 | 701 454 417 | 576 948 877 | 372 506 011 | 541 607 513 | 596 087 223 | 743 264 885 | 692 367 888 |
| Atyrau region | 2 744 667 107 | 3 857 404 578 | 3 744 047 179 | 4 152 270 397 | 4 369 105 095 | 2 921 390 144 | 3 763 126 907 | 4 716 819 043 | 6 140 391 378 | 7 019 078 796 |
| West-Kazakhstan region | 859 317 201 | 1 326 435 984 | 1 472 388 876 | 1 435 908 484 | 1 605 757 424 | 1 069 772 118 | 1 276 176 932 | 1 614 829 855 | 2 154 013 998 | 2 044 536 605 |
| Jambyl region | 1 672 720 | 2 256 289 | 4 697 304 | 4 684 419 | 4 726 032 | 4 994 985 | 7 266 339 | 13 207 931 | x | 13 090 301 |
| Kyzylorda region | 711 330 342 | 938 557 053 | 954 870 964 | 971 722 984 | 763 244 830 | 379 165 651 | 415 600 476 | 476 431 932 | 674 522 510 | 583 241 929 |
| Mangistau region | 1 358 226 307 | 1 745 097 444 | 1 816 896 606 | 1 768 177 473 | 1 839 928 675 | 1 128 120 255 | 1 398 580 100 | 1 776 375 214 | 2 316 306 859 | 2 290 522 881 |
| East-Kazakhstan region | - | 9 848 | 13 580 | 2 252 869 | 4 383 800 | 4 277 965 | 7 570 948 | 8 981 578 | x | 10 751 032 |
| Extraction of crude oil | | | | | | | | | | |
| The Republic of Kazakhstan | 6 154 112 810 | 8 519 705 866 | 8 639 057 158 | 8 955 085 020 | 9 078 512 779 | 5 757 048 120 | 7 293 084 725 | 8 994 914 135 | 11 819 914670 | 12 256 876 373 |
| Aktobe region | 519 607 254 | 701 997 219 | 726 943 528 | 700 776 267 | 575 489 139 | 369 095 348 | 538 497 171 | 543 433 221 | 681 994 984 | 630 727 896 |
| Atyrau region | 2 744 667 107 | 3 857 404 578 | 3 744 047 179 | 4 152 270 397 | 4 369 105 095 | 2 921 037 851 | 3 759 443 391 | 4 686 866 597 | x | 6 846 804 320 |
| West-Kazakhstan region | 838 737 153 | 1 296 159 635 | 1 411 287 948 | 1 377 618 292 | 1 541 106 904 | 974 192 663 | 1 205 585 527 | 1 542 977 724 | 2 071 905 608 | 1 945 564 999 |
| Jambyl region | 132 862 | 173 413 | 606 408 | 622 659 | 588 540 | 758 530 | 1 050 179 | 1 177 114 | x | 964 147 |
| Kyzylorda region | 708 586 941 | 936 099 992 | 952 585 014 | 966 054 520 | 759 968 797 | 378 806 222 | 415 029 052 | 475 915 749 | 674 072 800 | 582 356 051 |
| Mangistau region | 1 342 381 493 | 1 727 861 181 | 1 803 573 501 | 1 757 576 388 | 1 831 896 328 | 1 113 040 120 | 1 373 417 691 | 1 744 499 017 | 2 278 158 148 | 2 250 378 256 |
| East-Kazakhstan region | - | 9 848 | 13 580 | 166 497 | 357 976 | 117 386 | 61 714 | 44 713 | x | x |

| Region | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| The Republic of Kazakhstan | 41 273 370 | 53 088 859 | 81 676 420 | 81 386 023 | 85 581 954 | 123 179 009 | 116 844 490 | 207 818 641 | 240 320 446 | 396 713 059 |
| Aktobe region | 565 249 | 1 036 310 | 875 541 | 678 150 | 1 459 738 | 3 410 663 | 3 110 342 | 52 654 002 | 61 269 901 | 61 639 992 |
| Atyrau region | - | - | - | - | - | 352 293 | 3 683 516 | 29 952 446 | x | 172 274 476 |
| West-Kazakhstan region | 20 580 048 | 30 276 349 | 61 100 928 | 58 290 192 | 64650520 | 95579455 | 70591405 | 71 852 131 | 82 108 390 | 98 971 606 |
| Jambyl region | 1 539 858 | 2 082 876 | 4 090 886 | 4 061 760 | 4 137 492 | 4 236 455 | 6 216 160 | 12 030 817 | x | 12 126 154 |
| Kyzylorda region | 2 743 401 | 2 457 061 | 2 285 950 | 5 668 464 | 3 276 033 | 359 429 | 571 424 | 516 183 | 449 710 | 885 878 |
| Mangistau region | 15 844 814 | 17 236 263 | 13 323 105 | 10 601 085 | 8 032 347 | 15 080 135 | 25 162 409 | 31 876 197 | 38 148 711 | 40 144 625 |
| East-Kazakhstan region | - | - | - | 2 086 372 | 4 025 824 | 4 160 579 | 7 509 234 | 8 936 865 | x | x |

**Mining of metal ores**

| Region | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| The Republic of Kazakhstan | 652 602 840 | 794 453 856 | 722 893 143 | 789 832 524 | 863 139 286 | 740 258 462 | 989 193 040 | 1 188 391 467 | 1 474 218 362 | 1 908 282 087 |
| Akmola region | 15 372 625 | 20 896 486 | 31 604 858 | 29 633 124 | 32 428 175 | 35 628 367 | 47 166 600 | 37 210 799 | 40 584 628 | 55 130 852 |
| Aktobe region | 141 978 850 | 180 937 534 | 178 437 612 | 180 200 372 | 193 676 382 | 204 194 438 | 217 698 581 | 247 770 151 | 285 218 274 | 306 013 492 |
| Almaty region | 606 592 | 190 789 | 100 842 | 235 395 | 509 682 | 528 253 | 131 429 | 103 606 | - | - |
| Jambyl region | 107 842 | 534 308 | 1 158 986 | 4 050 066 | 7 771 559 | 6 576 636 | 4 415 876 | 3 332 874 | 1 735 942 | 3 933 627 |
| Karaganda region | 35 323 685 | 40 567 768 | 40 202 146 | 84 728 330 | 160 267 653 | 42 009 665 | 78 908 327 | 111 836 518 | 129 293 468 | 157 859 183 |
| Kostanay region | 270 180 794 | 355 854 981 | 254 820 621 | 263 450 195 | 220 475 434 | 143 241 794 | 210 224 310 | 264 697 955 | 323 116 647 | 452 540 033 |
| Kyzylorda region | 16 215 493 | 18 307 909 | 28 310 530 | 31 290 290 | 32 786 342 | 39 065 066 | 50 950 111 | 40 079 447 | x | 35 994 932 |
| South-Kazakhstan region | 69 636 605 | 78 695 280 | 129 657 384 | 135 581 543 | 141 455 925 | 180 972 042 | 204 810 745 | 138 512 755 | : | : |
| Pavlodar region | 2 035 096 | 3 443 231 | 1 435 473 | 3 037 647 | 5 035 437 | 14 754 645 | 90 591 230 | 206 039 153 | 225 778 616 | 271 653 273 |
| North-Kazakhstan region | 53 264 | 358 016 | 794 849 | 543 481 | 435 546 | 187 419 | 56 735 | 152 975 | x | 1 743 771 |
| Turkestan region | : | : | : | : | : | : | : | : | x | 212 938 144 |
| East-Kazakhstan region | 101 091 994 | 94 667 554 | 56 369 842 | 57 082 081 | 68 297 151 | 73 100 137 | 84 239 096 | 138 655 234 | 253 435 133 | 410 474 780 |

**Iron ore mining**

| Region | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| The Republic of Kazakhstan | 257 726 583 | 338 431 665 | 235 763 247 | 254 451 742 | 223 536 863 | 136 571 839 | 194 827 776 | 244 023 794 | 291 173 061 | 415 898 376 |
| Akmola region | 2 001 369 | 3 442 139 | 2 723 599 | 2 234 172 | 2 320 192 | 1 697 685 | 2 423 567 | 3 014 097 | x | 4 734 187 |
| Aktobe region | 164 997 | 269 555 | 782 658 | 1 232 604 | 1 529 591 | 102 243 | 1 195 490 | 1 420 000 | x | x |
| Almaty region | - | 190 789 | 58 742 | 235 395 | - | - | 104 069 | - | - | - |

| Region | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Karaganda region | 30 723 615 | 29 998 241 | 24 761 893 | 16 649 923 | 12 312 956 | 21 384 644 | 18 734 295 | 14 023 150 | 11 402 699 | 7 266 035 |
| Kostanay region | 373 441 658 | 253 835 825 | 214 353 567 | 173 682 496 | 122 316 571 | 198 128 350 | 232 015 276 | 218 175 098 | 323 126 483 | 248 294 182 |
| South-Kazakhstan region | | :: | 44 611 | - | - | - | - | - | - | - |
| Turkestan region | 47 296 | x | :: | - | - | - | - | - | - | - |
| East-Kazakhstan region | - | - | 429 626 | 772 231 | 142 384 | 174 086 | - | - | - | - |
| **Extraction of non-ferrous metal ores** | | | | | | | | | | |
| The Republic of Kazakhstan | 1 492 383 711 | 1 183 045 301 | 944 367 673 | 794 365 264 | 603 686 623 | 639 602 423 | 535 380 782 | 487 129 896 | 456 022 191 | 394 876 257 |
| Akmola region | 50 396 665 | x | 34 196 702 | 44 743 033 | 33 930 682 | 30 107 983 | 27 398 952 | 28 881 259 | 17 454 347 | 13 371 256 |
| Aktobe region | 299 061 872 | x | 246 350 151 | 216 503 091 | 204 092 195 | 192 146 791 | 178 967 768 | 177 654 954 | 180 667 979 | 141 813 853 |
| Almaty region | 3 933 627 | - | 103 606 | 27 360 | 528 253 | 509 682 | - | 42 100 | - | 606 592 |
| Jambyl region | 127 135 568 | 1 735 942 | 3 332 874 | 4 415 876 | 6 576 636 | 7 771 559 | 4 050 066 | 1 158 986 | 534 308 | 107 842 |
| Karaganda region | 79 098 375 | 99 295 227 | 87 074 625 | 62 258 404 | 29 696 709 | 138 883 009 | 65 994 035 | 26 178 996 | 29 165 069 | 28 057 650 |
| Kostanay region | 35 994 932 | 69 280 822 | 50 344 388 | 36 541 814 | 20 925 223 | 22 347 084 | 31 434 919 | 36 645 523 | 32 728 498 | 21 886 612 |
| Kyzylorda region | :: | x | 40 079 447 | 50 950 111 | 39 065 066 | 32 786 342 | 31 290 290 | 28 310 530 | 18 307 909 | 16 215 493 |
| South-Kazakhstan region | 271 653 273 | :: | 138 468 144 | 204 810 745 | 180 972 042 | 141 455 925 | 135 581 543 | 129 657 384 | 78 695 280 | 69 636 605 |
| Pavlodar region | 1 743 771 | 225 778 616 | 206 039 153 | 90 591 230 | 14 754 645 | 5 035 437 | 3 037 647 | 1 435 473 | 3 443 231 | 2 035 096 |
| North-Kazakhstan region | 212 890 848 | x | 152 975 | 56 735 | 187 419 | 435 546 | 543 481 | 794 849 | 358 016 | 53 264 |
| Turkestan region | :: | x | :: | :: | - | - | - | :: | :: | :: |
| East-Kazakhstan region | 410 474 780 | 253 435 133 | 138 225 608 | 83 466 865 | 72 957 753 | 68 123 065 | 57 082 081 | 56 369 842 | 94 667 554 | 101 091 994 |
| **Other sectors of the mining industry** | | | | | | | | | | |
| The Republic of Kazakhstan | 248 734 573 | 265 709 458 | 191 988 321 | 175 693 575 | 154 573 107 | 136 670 954 | 111 466 217 | 122 873 130 | 121 994 308 | 76 853 226 |
| Akmola region | 10 448 926 | 11 319 682 | 11 539 918 | 16 280 562 | 14 934 386 | 11 364 739 | 8 548 700 | 7 374 617 | 5 559 466 | 5 045 705 |
| Aktobe region | 28 047 677 | 25 538 066 | 24 138 250 | 15 584 417 | 13 685 304 | 16 137 892 | 11 889 989 | 10 909 440 | 9 169 093 | 7 948 392 |
| Almaty region | 12 213 599 | 9 969 205 | 10 069 754 | 12 242 086 | 12 972 229 | 9 975 360 | 8 574 125 | 7 390 269 | 7 436 578 | 5 967 591 |
| Atyrau region | 88 015 596 | 122 229 535 | 58 865 686 | 54 438 095 | 53 475 288 | 42 650 772 | 26 791 062 | 40 468 208 | 47 534 351 | 21 374 700 |
| West-Kazakhstan region | 1 118 366 | 732 754 | 913 439 | 921 788 | 825 416 | 794 322 | 567 478 | 333 989 | 406 200 | 189 575 |
| Jambyl region | 30 750 862 | 28 407 947 | 25 605 097 | 21 860 305 | 9 968 127 | 7 731 835 | 8 095 632 | 9 967 333 | 8 161 219 | 5 165 630 |
| Karaganda region | 14 091 666 | 12 780 139 | 11 002 914 | 9 021 135 | 11 725 051 | 13 065 267 | 9 243 936 | 7 823 567 | 7 253 423 | 4 874 009 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Kostanay region | 9 636 703 | 11 122 512 | 13 734 652 | 13 369 202 | 14 225 433 | 14 951 907 | 20 674 600 | 22 521 051 | x | 28 326 816 |
| Kyzylorda region | 2 763 638 | 3 183 656 | 3 119 773 | 2 984 050 | 2 081 623 | 1 467 861 | 1 926 593 | 2 291 490 | x | 3 208 922 |
| Mangistau region | 4 233 189 | 10 563 862 | 7 486 036 | 5 546 089 | 4 474 856 | 4 514 320 | 4 520 622 | 4 527 218 | 4 425 790 | 5 132 723 |
| South-Kazakhstan region | 2 343 231 | 2 644 314 | 4 249 816 | 4 870 192 | 3 423 293 | 5 047 149 | 5 221 568 | 5 288 030 | .. | .. |
| Pavlodar region | 1 994 824 | 2 492 496 | 3 480 960 | 4 360 465 | 4 727 116 | 5 274 390 | 5 758 986 | 7 977 744 | 9 537 590 | 10 650 030 |
| North-Kazakhstan region | 334 524 | 441 326 | 731 398 | 1 222 495 | 1 061 053 | 969 796 | 1 108 214 | 1 414 236 | x | 2 269 181 |
| Turkestan region | .. | .. | .. | .. | .. | .. | .. | .. | 4 484 816 | 5 635 895 |
| East-Kazakhstan region | 4 981 515 | 6 024 964 | 5 791 137 | 5 401 730 | 4 737 057 | 4 761 883 | 6 134 604 | 5 833 494 | 6 696 806 | 8 153 477 |
| Nur-Sultan city | - | 848 | 11 217 | 1 072 | - | - | - | - | - | - |
| Almaty city | - | - | 718 | - | 220 336 | - | - | - | - | - |
| Shymkent city | .. | .. | .. | .. | .. | .. | .. | .. | 532 058 | 670 837 |