

UNECE

**Role of MSMEs in Securing Critical Raw
Materials Supply During COVID-19
Recovery In Kazakhstan**

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INTRODUCTION

The Republic of Kazakhstan is located in the center of Eurasia and ranks 9th in the world in terms of territory (2724.9 thousand km²) and 64th in terms of population (18984.8 thousand people), and, accordingly, is characterized by a very low population density (less than 7 people per 1 km²). Kazakhstan borders in the north and west with the Russian Federation, in the east with the People's Republic of China, and in the south with Kyrgyzstan, Uzbekistan and Turkmenistan. The country's territory is divided into 14 regions (Fig. 1).



Fig. 1 The administrative map of the Republic of Kazakhstan

The mineral resource complex forms the basis of the economy of Kazakhstan, being a state-forming one. In terms of reserves and production of many types of minerals (chromium, uranium, manganese, iron ores, copper, lead, zinc, phosphorites) Kazakhstan is among the top ten countries in the world (Table 1) [1].

In the depths of the country, 99 elements of the D. I. Mendeleev's table have been explored, of which 70 are mined at the deposits. In total, there were 493 deposits in the country in 2018 (Fig. 2), where more than 1200 varieties of mineral raw materials were mined.

Table 1. Place of the Republic of Kazakhstan in the world in terms of reserves and production of the main types of mineral raw materials

Mineral resource type	Reserves (tons)	Production volumes (tons / year)	Place in the world in terms of production	Place in the world in terms of proven reserves	Place in the world for ore quality
Iron ore	18 600 000 000	22 000 000	12	6	7
Manganese ore	635 200 000	2 361 000	6	4	10
Chrome ore	382 700 000	3 600 000	3	2	1
Bauxites	365 400 000	5 200 000	10	12	н/д
Lead	17 200 000	120 000	11	5	41
Zinc	39 800 000	377 000	10	5	40
Copper	39 300 000	440 000	11	12	63
Titanium	24 100 000	3700	16	10	15
Tungsten	2 100 000	2600	4	1	25
Aurum	2233	47,5	17	15	2
Argentum	53 204	77,39	10	4	31
Urenium	1 600 000	17 800	1	2	н/д
<u>Tin</u>	69 300	н/д	н/д	8	н/д
Coal	150 000 000 000	108 700 000	10	8	н/д
Oil	3 930 000 000	79 300 000	17	12	н/д

Over the years of independence, a favorable investment climate has been created in Kazakhstan, including due to political and macroeconomic stability, state support for entrepreneurship. In our country, the development of the geological and mining industries are important and priority.

The mining industry holds a leading position in the main types of minerals in the world, is represented on the world market for copper, uranium, titanium, ferroalloys and polymetals and has a significant impact on the regional markets for iron, coal and aluminum.

The ongoing reforms are aimed at increasing the competitiveness, technological and professional level of the subsoil use sector, creating comfortable conditions for investors, jobs and improving social welfare.

Micro, small and medium-sized enterprises (MSMEs), according to global statistics, are the backbone of developed economies. However, according to the OECD report (2018), the MSME sector in Kazakhstan is still underdeveloped. Privatization is only one aspect of the work to develop the private sector in Kazakhstan. Equally important, especially in terms of economic diversification, is policies that stimulate the emergence and growth of small and medium-sized enterprises. According to official data, currently MSMEs in Kazakhstan create only 26.8% of added value and 31% of employment, while in most OECD countries this is 57% and 60-70%, respectively. The majority (almost 60%) of MSMEs in Kazakhstan operate in low value added industries. Only 5.2% of Kazakhstani MSMEs are engaged in export activities, while this indicator for the countries of Eastern Europe and Central Asia is 22.8%, and for all countries with an upper middle income level - 19% [2].



Fig. 2 Main mineral deposits of the Republic of Kazakhstan, including CRM objects

Including, in the mining and geological industry of Kazakhstan, MSMEs occupy an insignificant share in the total production volume. One of the main reasons for this is the fact that traditionally, in Kazakhstan, the main attention was paid to maintaining at the achieved level of extraction and production of basic metals: Cu, Pb, Zn, Au, Ag, Fe, U, Cr, Mn, bauxite, phosphorites and, of course, hydrocarbons. At the same time, the main production facilities, which were built back in the Soviet period, are concentrated in large companies (Kazakhmys, Kazzinc, Kazatomprom, Kazphosphate, Altynalmas, Kazakhaltyn, Sokolovsko-Sarbaiskoe mining and production association, Kazchrome, Aluminum of Kazakhstan, etc.).

At the same time, in Kazakhstan, there are many dozens of deposits containing 29 CRM out of 30 (according to the list of 2020, excluding natural rubber), of which 17 are mined, and 21 CRMs are produced in the form of commercial products, including large volumes (mln t) - five CRM (Coking coal, Phosphate rock, Phosphorus, Bauxite, Titanium) (table 2).

Table 2. Critical Mineral Resources 2020

Antimony	Hafnium	Phosphorus
Baryte	HREE	Scandium
Beryllium	LREE	Silicon metal
Bismuth	Indium	Tantalum
Borate	Magnesium	Tungsten
Cobalt	Natural graphite	Vanadium
Coking coal	Natural rubber	Bauxite
Fluorspar	Niobium	Lithium

Gallium	Platinum Group Metals	Titanium
Germanium	Phosphate rock	Strontium

	Extraction and production from our own raw materials
	Production from imported raw materials
	There is no mining and production
Natural rubber	Absent

With the exception of the five above-mentioned CRMs, which are mined and processed in large volumes, the remaining 16 are mined and produced mainly along the way in the process of developing deposits of non-ferrous and ferrous metals, and are used in the industry of Kazakhstan in small quantities. The bulk of CRM products are exported. It should also be noted that in the process of processing non-ferrous and ferrous metal ores, a large proportion of the CRM contained in them goes to the tailings and slags of metallurgical production. Accordingly, additional extraction of CRM from secondary sources requires the introduction of advanced processing technologies into production and the development of new methods for obtaining CRM from secondary sources.

This should be facilitated by Kazakhstan's participation in the OECD Eurasian Competitiveness Program, which is designed to accelerate economic reforms and improve the business climate in order to ultimately ensure sustainable economic growth and employment in Central Asia (Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, Turkmenistan and Uzbekistan), as well as Eastern Europe and the Caucasus (Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova and Ukraine).

This program has a triple objective: (1) to transfer OECD best practices in attracting investment and improving competitiveness; (2) facilitating the discussion, exchange and consideration of the reform experience of the countries of the region; (3) assisting the countries of the region in developing government measures to support local enterprises and attract foreign investors.

In the process of implementing the OECD Project “Enhancing the Competitiveness of the Mining Industry in Kazakhstan”, the Government of the Republic of Kazakhstan has recognized economic diversification and increasing the competitiveness of mining enterprises as its top priorities. The country plans to increase the intensity of exploration, streamline procedural formalities and intensify activities to attract foreign direct investment (FDI). The state seeks to increase the share of products with high added value, as well as to modernize technologies, improve environmental protection and stimulate the search for new mineral resources. Within the framework of this project, Kazakhstan is being supported in solving the above tasks.

The main goal is to increase the investment attractiveness and competitiveness of the mining industry by identifying and analyzing conceptual barriers in certain areas, prioritizing policy recommendations and implementing them in practice, and developing the necessary skills and strengthening the capacities of the relevant parties. [3].

1. Preconditions: The general importance of MSMEs in the economy of Kazakhstan and in the mining and geological sector, in particular.

In accordance with paragraph 1 of Article 24 of the "Entrepreneurial Code of the Republic of Kazakhstan" [4], depending on the average annual number of employees and average annual income, business entities belong to the following categories (Table 3):

- small businesses, including micro-businesses;
- medium-sized businesses;
- subjects of large business.

Table 3. Criteria for business categories in Kazakhstan

Criteria	Unit of measurement	Business categories			
		Micro	Smaller	Middle	Big
Average annual income	\$mln.	<0,206	>0,206 <2,06	>2,06 <20,6	>20,6
Number of employees	people	15	100	250	>250

The share of MSMEs in the economy of Kazakhstan reaches 30.8% of GDP and provides employment for 3.3 million people, which is 37% of the total employed population. The largest share of production (88%) falls on small (15-100 people) and medium (101-250 people) enterprises, while they account for only 20% of operating SMEs. 25% of MSME entities and about half of the employed work in Almaty and Nur-Sultan. 2/3 of the subjects and half of those employed in MSMEs are represented in sectors with low labor productivity: trade, agriculture, services (Tables 4, 5).

Table 4. Distribution of registered MSME entities by type of economic activity as of January 1, 2021 [5]

Sectors of the economy	MSME - total	Including			MSMEs led by women	Including		
		LE *	IE **	F****		LE	IE	F
	1	2	3	4	5	6	7	8
The Republic of Kazakhstan, total	1610 496	401 512	983 549	225 435	680 897	107 773	515 794	57 330
Agriculture, forestry and fisheries	274 349	17 924	34 549	221 876	69 051	2 798	10 236	56 017
Industry	71 330	31 933	39 136	261	24 767	6 485	18 192	90
Mining industry	4 611	4 331	277	3	636	572	63	1
including the share (%) of the total number of MSMEs	0,29	1,08	0,03	0,001	0,09	0,53	0,01	0,002
including the share (%) of the total number of MSMEs in industry	6,46	13,56	0,71	1,15	2,57	8,82	0,35	1,11
Manufacturing industry	60 966	23 797	36 938	231	22 934	5 197	17 652	85
Electricity, gas supply	1 942	1 508	430	4	332	241	91	

Water supply; collection, treatment and disposal of waste	3 811	2 297	1 491	23	865	475	386	4
Building	95 944	61 631	34 144	169	18 777	10 479	8 269	29
Wholesale and retail trade	528 246	134 291	392 709	1 246	274 759	34 587	239 629	543
Transport and storage	93 463	17 336	75 755	372	17 648	4 220	13 362	66
Hotels and food	42 099	8 069	33 868	162	23 212	3 124	20 005	83
Information and communication	26 285	12 192	14 063	30	7 911	3 133	4 769	9
Financial and insurance activities	9 210	8 579	630	1	3 732	3 423	308	1
Real estate operations	91 128	12 779	78 076	273	54 041	4 244	49 676	121
Professional, scientific and technical activities	58 562	29 845	28 647	70	27 131	10 108	16 999	24
Administrative and support services	46 574	19 470	26 992	112	17 813	6 184	11 592	37
Public administration and defense; social Security	129	105	24		30	20	10	
Education	24 906	11 375	13 503	28	16 795	6 822	9 958	15

* - LE – legal entities, ** - IE – individual entrepreneurs, *** - F – farms

The tasks of restoring MSMEs and preventing the shutdown of enterprises during a pandemic, as well as an increase in unemployment, are becoming the highest priorities in the economic policy of the state. Today, the topic of state support for business has become the most discussed in the media and social networks.

Based on the specifics, scale and costs of mining, the number of MSME entities in the mining industry of Kazakhstan is generally small compared to their number, for example, in trade and the spheres of consumer services (Table 4).

Table 5. The number of employed in operating SMEs by type of economic activity as of January 1, 2021

Sectors of the economy	Number employed MSME - total	Including			MSMEs led by women	Including		
		LE	IE	F		LE	IE	F
	1	2	3	4	5	6	7	8
Total	3369 915	1715 634	1 353 776	300 505	1 050 889	448 932	540 645	61 312

Agriculture, forestry and fisheries	445 121	107 954	36 662	300 505	72 520	8 184	3 024	61 312
Industry	336 671	269 569	67 102		55 309	42 260	13 049	0
Mining industry	30 148	29 663	485	0	1 588	1 489	99	0
including the share (%) of the total number of MSMEs	0,89	1,73	0,04	0	0,15	0,33	0,02	0
including the share (%) of the total number of MSMEs in industry	8,95	11,00	0,72	0	2,87	3,52	0,76	0
Manufacturing industry	272 472	209 127	63 345		51 288	38 765	12 523	0
Electricity, gas supply	299 315	254 971	44 344		42 518	36 768	5 750	0
Water supply; collection, treatment and disposal of waste	949 058	376 247	572 811		430 740	153 457	277 283	0
Building	185 013	92 063	92 950		29 923	15 264	14 659	0
Wholesale and retail trade	120 623	45 536	75 087		46 375	19 246	27 129	0
Transport and storage	62 326	45 186	17 140		17 021	10 628	6 393	0
Hotels and food	21 132	20 471	661		9 266	9 266	0	0
Information and communication	162 589	63 213	99 376		64 836	17 385	47 451	0
Financial and insurance activities	140 752	106 986	33 766		44 784	25 835	18 949	0
Real estate operations	157 685	120 270	37 415		36 592	19 729	16 863	0
Professional, scientific and technical activities	108 125	86 816	21 309		43 107	32 899	10 208	0
Administrative and support services	74 364	63 116	11 248		45 075	40 513	4 562	0
Public administration and defense; social Security	28 295	14 992	13 303		4 183	695	3 488	0
Education	278 818	48 244	230 574		108 640	16 803	91 837	0

The importance of the mining industry of the Republic of Kazakhstan is recognized both domestically and internationally. Despite the fact that the number of people employed in the industry is only 2.25% of those employed in the economy of the Republic (Table 6, data for 2019), the share of the industry in GDP is about 20%, and in exports more than 80% [6].

Table 6. The number of workers in the mining industry and their share of the total number of employed [5]

№	Name	2018 г.	2019	2019 to 2018, %
1	Total employed in the economy, thousand people	8 695.0	8 780,8	1,0
2	Industry	641,7	649,6	1,2
3	In the mining industry, thousand people Total, including:	199,3	197,7	- 0,8
4	Mining of coal and lignite	28,2	28,0	- 0,5
5	Extraction of crude oil and natural gas	47,4	47,7	0,6
6	Mining of metal ores	82,9	82,1	- 1,0
7	Other mining industries	11,6	11,0	- 5,3
8	Mining technical services	29,2	28,9	-1,0
9	The share of workers in the mining industry in the total number of people employed in the economy, %	2.3	2,25	-2,2

It should be noted that due to the low criteria for income and the number of MSMEs, there are very few micro and small enterprises among mining enterprises, and, most often, they work on the extraction of raw materials for construction materials that do not belong to CRM. The overwhelming majority of mining enterprises are large business entities. For this reason, the share of those working in MSMEs in the mining sector of the economy is only 15.2%.

Service geological companies belong to MSMEs in the mining and geological industry, and only in some cases (large drilling and geophysical companies) belong to the category of large business. In connection with the enactment of the new Code on Subsoil and Subsoil Use (since July 2018), about 1,500 new licenses for the exploration of TPI have been issued, most of which are MSME companies.

1.1. COVID-19 and its impact on micro, small and medium-sized enterprises (MSMEs) in Kazakhstan

Crisis situations for MSMEs that have arisen in Kazakhstan, including in the mining and geological sector.

The COVID-2019 pandemic could not but affect the activities of MSMEs in Kazakhstan. The most significantly affected the general services sector for the population - trade, catering, hotel business and entertainment. In the mining industry, the coronavirus crisis affected, first of all, MSMEs that work in the extraction of construction materials, due to a decrease in activity in the construction industry, as well as among service geological companies, due to a slight decrease in the volume of work by subsoil users (Tables 7, 8). Nevertheless, in the last category of MSME, by the end of 2021, there is a tendency to overcome the crisis situation due to the activation of junior subsoil user companies that have received a large number of new licenses for the exploration of solid minerals.

Table 7. Dynamics of change in the number of MSME companies by sectors of the economy of Kazakhstan for 2017-2020

Sectors of the economy	2 017	2 018	2019	2020
	Number of MSMEs	Number of MSMEs	Number of MSMEs	Number of MSMEs

Total	1 145 994	1 241 328	1 330 244	1 357 311
Agriculture, forestry and fisheries	222 186	231 312	249 061	257 515
Industry, total	42 332	45 505	51 825	57 417
Mining industry	2 470	2 746	3 104	3 527
Building	52 011	58 139	64 912	72 155
Trade	408 198	434 770	443 478	437 328
Transport and storage	69 327	77 012	80 406	78 047
Hotels and food	26 884	29 924	34 435	35 801
Financial and insurance activities	5 915	6 190	6 622	5 759
Real estate operations	77 209	80 953	81 271	76 461
Professional, scientific and technical activities	31 807	34 361	39 309	46 449
Education	12 823	15 924	19 790	21 412
Other types of services	194 832	224 492	256 031	265 440

Table 8. Dynamics of change in the number of companies and the number of working MSMEs in Kazakhstan for 2017-2020

Indicators	2 017	2 018	2019	2020
Total in the economy of Kazakhstan, MSME	1 145 994	1 241 328	1 330 244	1 357 311
Total number of employees in MSME	3 190 133	3 312 457	3 398 786	3369 915
Including: Mining industry, number of MSMEs	2 470	2 746	3 104	3 527
Number of employees, people	29 768	33 891	32 334	30 148
Building	283 692	292 570	287 282	299 315

1.2. Current State of MSMEs in the Critical Raw Materials Value Chain (CRM) in Kazakhstan;

Examples on the position of SMEs in the PSC of critical raw materials in Kazakhstan.

For a more complete characterization of the general situation on CRM in Kazakhstan, it is advisable to divide them into five groups, according to the degree of development and use. At the same time, four groups represent the primary CRMs present in the subsoil (table 8), and the fifth group includes most of the known CRMs that are contained in secondary sources.

The first group includes 10 out of 29 CRMs present in Kazakhstan - Barite (Fig. 3), Boron (Fig. 4), Coking coal, Fluorite, Phosphate rocks, Phosphorites (Fig. 4), Metallic silicon, Vanadium, Bauxite, Titanium (Fig. 5), which are mined from their own fields. These CRMs constitute the core value of the ore.

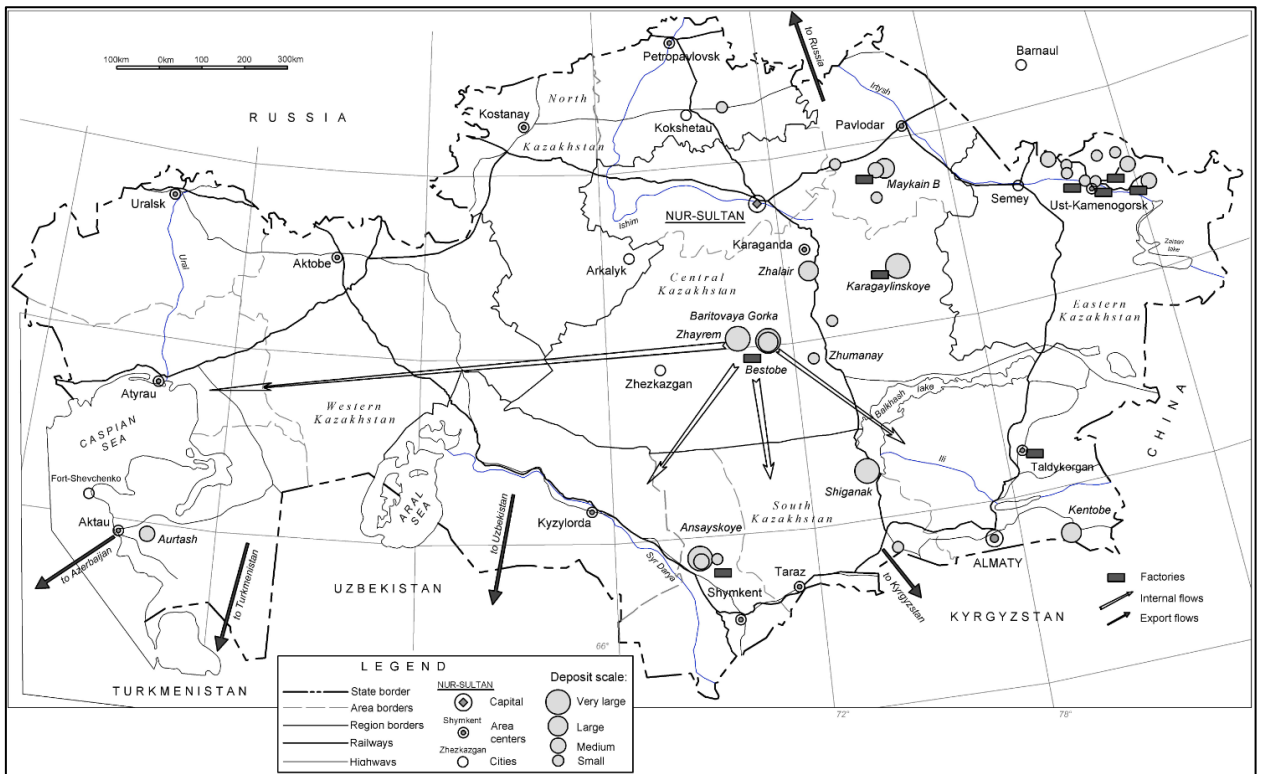


Fig. 3 Barite and barite-polymetallic deposits of Kazakhstan

The second group includes 7 CRMs, which are present in the form of impurity elements in complex deposits and are extracted during metallurgical processing of the main components of these deposits (copper, lead, zinc, iron, manganese, chromium, uranium, etc.), such elements include Antimony, Bismuth, Cobalt, Germanium, Indium, Platinum group, Scandium. These CRMs are most commonly available in pure metal form.

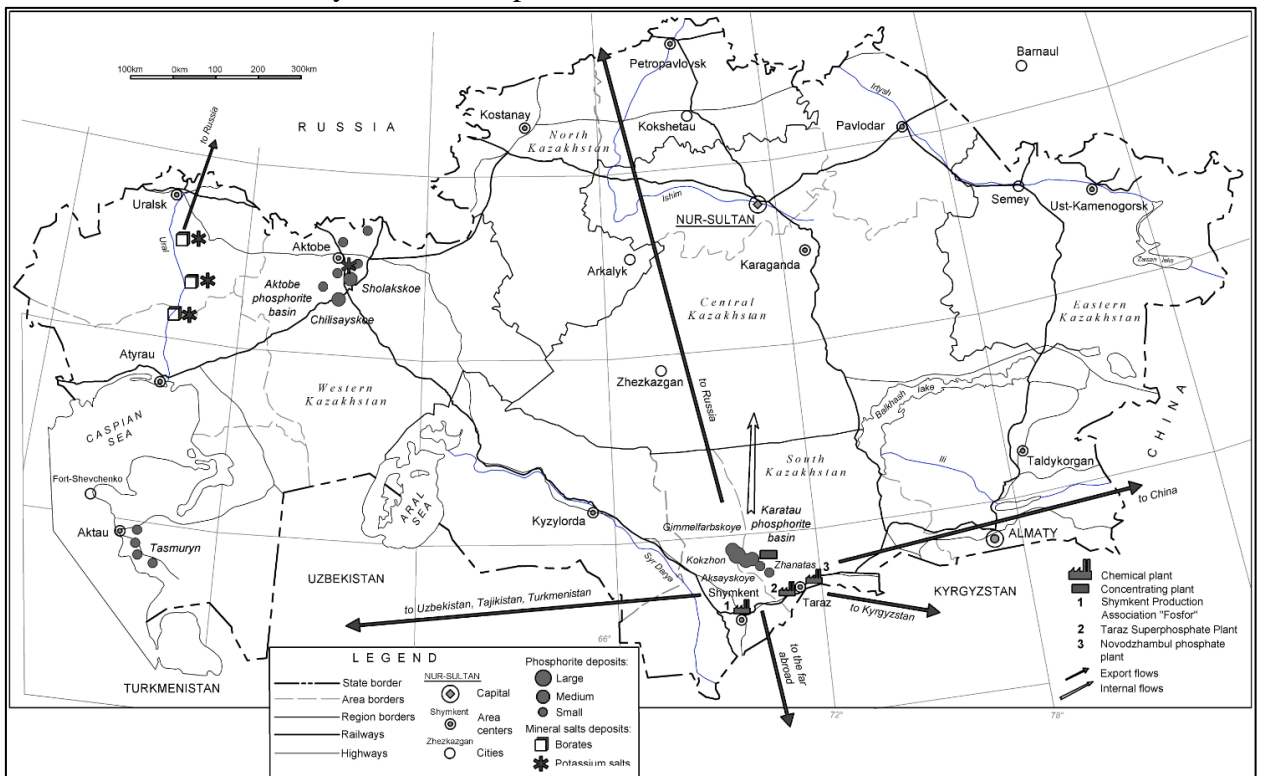


Fig. 4 Deposits of phosphorites, phosphorite rocks, boron and potassium salts in Kazakhstan

The third group is made up of 4 CRMs, which are available in the complex fields of Kazakhstan, but are not mined due to their low contents in the subsoil. However, these CRMs are produced in metallurgical plants from imported raw materials (corresponding concentrates). These are Beryllium, Niobium, Magnesium, Tantalum.

The fourth group includes 8 CRMs, which are present mainly in the form of impurity elements in complex deposits, and only in some cases in independent deposits (tin), but are not currently mined or produced as products. These include - Tungsten (Fig. 6), Gallium, Hafnium, Heavy REM, Light REM, Graphite, Lithium, Strontium.

As mentioned above, the bulk of the production and production of CRM falls on large businesses. Several medium-sized enterprises are also involved in the value chain of critical raw materials. For example, Stroyservice company (mining of barite ores of the Chiganak deposit in South Kazakhstan and production of gravity barite concentrate), Dostau-Litos company (mining of barite ores from the Ushtobe deposit in Central Kazakhstan and production of barite concentrate), Satpayevsky GOK (mining of ilmenite ores at the Satpayevsky deposit) East Kazakhstan and production of ilmenite concentrate), Tioline-Obukhov GOK (mining of ilmenite-rutile-zircon ores of the Obukhovskoye deposit in North Kazakhstan and production of ilmenite concentrate and rutile-zircon industrial product), Exoengineering company (mining of ilmenite-rutile-zircon deposits in Western Kazakhstan and the production of ilmenite concentrate and rutile-zircon middling).

The most stable situation of all the listed companies is observed at Satpayevsky GOK (Fig. 5). This is due to the fact that the entire volume of the ilmenite concentrate produced by this enterprise is bought by the Ust-Kamenogorsk titanium-magnesium combine. The other two mines supply their products (ilmenite and rutile-zircon concentrate) to various companies in Kazakhstan and the CIS, whose market is not sufficiently stable. Companies that produce barite concentrate mainly supply it under long-term contracts to oil and gas companies as a weighting

agent for drilling fluids.

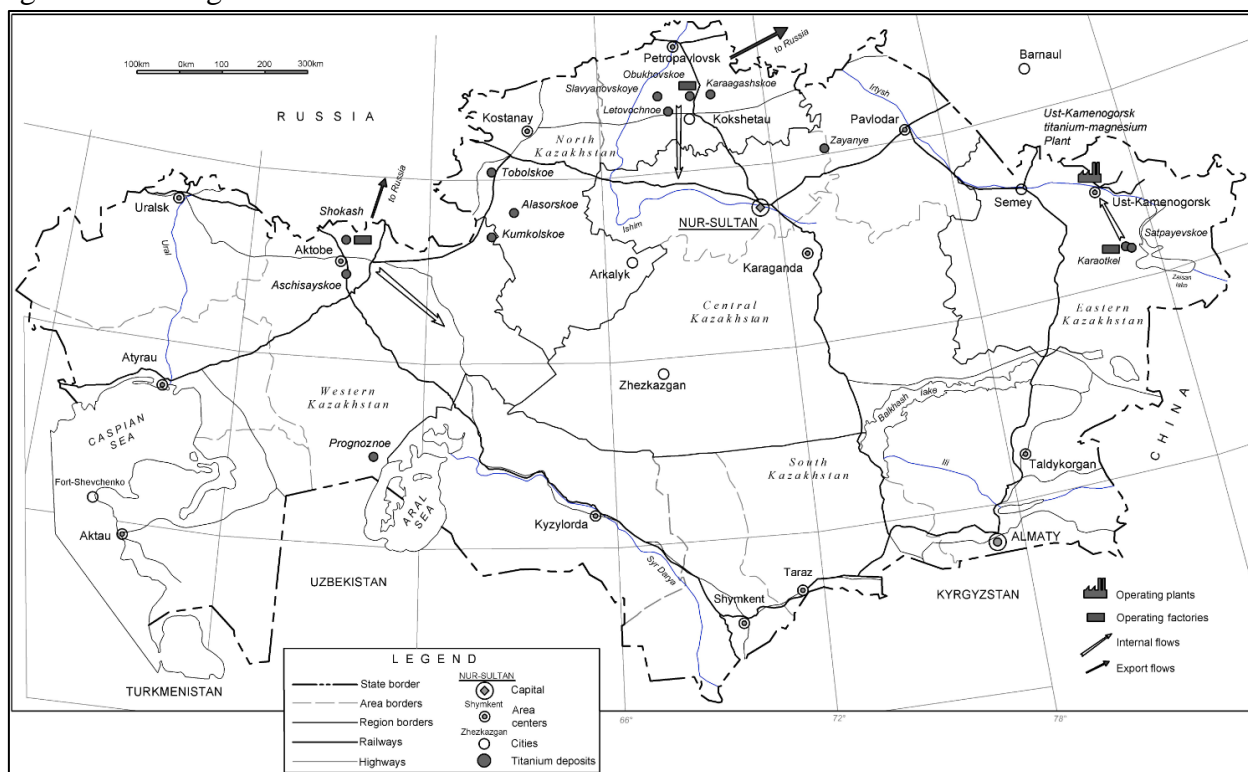


Fig. 5 Deposits of titanium-zirconium sands in Kazakhstan

Micro and small enterprises are not involved in the mining and production of CRM. However, as noted above, due to the increase in investment activity in the subsoil use of Kazakhstan, through the efforts of junior companies, exploration of some types of CRM is carried out, such as HREE and LREE (Kundybay company), Lithium.

Table 9 Extraction and production of CRM in Kazakhstan

CRM	Types of independent deposits	Associated component in different types of complex deposits	Manufacturer company	CRM products	Annual production of CRM, tons
1	2	3	4	5	6
1st Group					
Baryte	Baryte	Baryte-polymetallic	Stroyservice	Baryte concentrate	30000
Boron	Boron-potash		Inderbor	Boron concentrate	no data
Coking coal	Hard coal		Karagandaugol, Kazakhmys	Coking coal for metallurgy	8000000
Fluorite	Quartz-fluorite		Ulba Metallurgical Plant		no data
Phosphate rocks	Phosphorites		Kazphosphate		no data
Phosphorites	Phosphorites		Kazphosphate		3300000
Metallic silicon	Quartz		Tau Ken Samruk	Metallic silicon	23900,0
Vanadium	Vanadium	Iron ore deposits		Concentrate V ₂ O ₅	150,0

Bauxites	Bauxites		Aluminum of Kazakhstan		3300000
Titanium	Titanium-zirconium placers		Satpayevsky GOK, Obukhovsky GOK, Exoengineering Ust-Kamenogorsk Titanium-Magnesium Plant	Spongy titanium, metallic magnesium	no data
2nd Group					
Antimony	Not	Polymetallic	Kazzinc	Metallic antimony	650,0
Bismuth	Not	Polymetallic	Kazzinc	Metallic bismuth	270,0
Cobalt	Not	Nickel-cobalt ores, iron ores, copper ores	Sokolovsko-Sarbaykoe mining and production association	Metallic cobalt	no data
Germanium	Not	Bauxites, Polymetallic	Aluminum of Kazakhstan	Metallic germanium	no data
Indium	Not	Polymetallic	Kazzinc	Metallic indium	1,0
Platinum Group Metals	Not	Polymetallic	Kazzinc		no data
Scandium	Copper ores		Kazakhmys Zhezkazgantsvet-metallic Kazatomprom	Scandium Metallic	no data
3rd Group					
Beryllium	Not	Pegmatite tantalum-niobium-beryllium	Ulba Metallurgical Plant	Products from beryllium and alloys from imported raw materials	1747,0
Niobium	Tantalum-niobium-beryllium	Not		Metallic niobium, products and alloys from imported raw materials	47,0
Tantalum	Tantalum-niobium-beryllium	Not		Metallic tantalum, products and alloys	122,0
Magnesium	Magnesite	Not	Ust-Kamenogorsk Titanium-Magnesium Plant	Imported raw materials	no data
4th Group					
Tungsten	Tungsten-molibdenum	Tin-tungsten	Not mined	Not produced	
Gallium	Not	Polymetallic	Not mined	Not produced	
Hafnium	Not	Titanium-zirconium placers	Not mined	Not produced	

HREE	Weathering crust deposits	Titanium-zirconium placers			
LREE	Weathering crust deposits	Titanium-zirconium placers		Not produced	
Natural Graphite	Deposits of graphite	Not	Not mined	Not produced	
Lithium	Lithium	Tantalum-niobium-beryllium with lithium	Not mined	Not produced	
Strontium	Not	Baryte		Not produced	

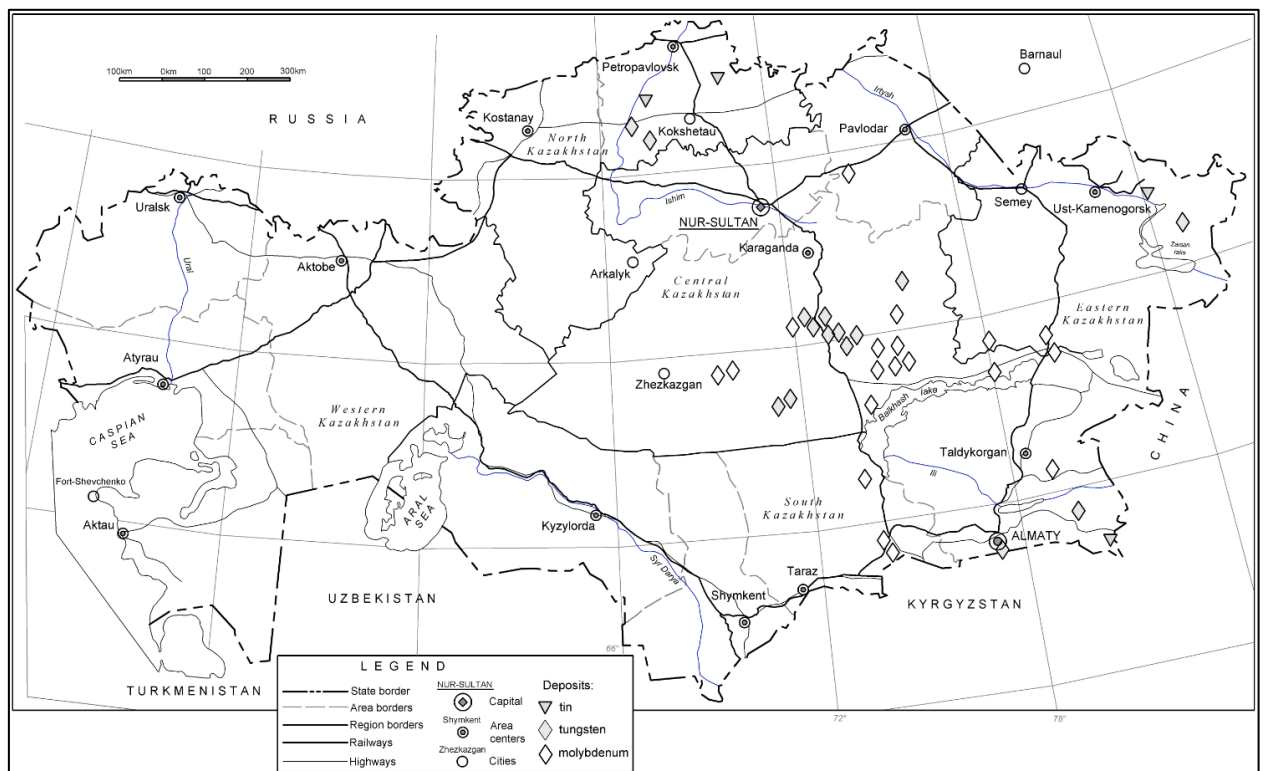


Fig. 6 Deposits of tin, tungsten and molybdenum in Kazakhstan

Elements of the fifth group, which includes all 29 CRMs, are not fully recovered in primary beneficiation and metallurgy. These CRMs are contained in the dumps of substandard ores that are mined and stored in special dumps during the development of open pits. During the beneficiation process, none of the CRMs is 100% recovered, to varying degrees a part of the CRM goes into concentrates, the other part remains in the tailings and accumulates in the tailings. During the metallurgical processing of concentrates, a certain proportion of CRM is extracted into separate products, the other part goes into the slags of the metallurgical production. For the secondary production of CRM from mining and metallurgical waste, it is necessary to conduct special scientific research in order to develop new technologies for extracting various types of CRM.

1.3. CRM Opportunities for MSMEs in the Period of Economic Recovery in Kazakhstan; New opportunities for MSMEs during the recovery period.

The potential of Kazakhstan for the development of the production of various types of CRM is very large. In total, for 29 types of CRM, in all regions of Kazakhstan there are hundreds of

deposits and ore occurrences that deserve exploration. The niche created thanks to the new Code "On Subsoil and Subsoil Use" is already beginning to be occupied by junior MSMEs for prospecting and exploration of CRM, receiving new licenses. There are already hundreds of such licensee companies. Accordingly, in the near future, a significant increase in demand (approximately 5-10 times) in the assessment of resources and reserves for new objects is expected. Geological consulting companies, which are also MSMEs, have seen an increase in demand for their services over the past year. In addition, service exploration companies note an increase in demand for exploration work from junior companies that have received new licenses.

Thus, the legislative improvements that have occurred in the past three years in the subsoil use of Kazakhstan provide a compensatory effect after a pandemic not only for recovery, but also for the development of MSME activity in the mining and geological industry.

Thanks to the OECD Program to Increase the Competitiveness of Eurasia Countries, there is a certain optimism regarding government support for business for the development of new technologies, which are especially needed by the organization of CRM production.

Benefits, special programs, increased accessibility to financial resources.

MSMEs have found themselves at the center of the Kazakh government's efforts to support the economy with both tax and fiscal stimulus. Support measures allowed Kazakhstani small and medium-sized businesses to maintain business activity, as well as significantly increase investment in fixed assets. For example, in the first quarter of 2021, small business increased the level of capital investments by 22.3% in annual terms, and medium - by 72.5%. [7].

The Kazakh authorities stepped up support for MSMEs even before the coronavirus crisis. In December 2019, the government of the Republic of Kazakhstan extended and expanded the Business Roadmap program, which was in effect from 2010 to 2020, for another five years, until 2024. In the first edition of the DKB-2020 for the period 2010-2015, the state allocated about \$ 1 billion to support SMEs, the expanded program for 2020-2024 provides for \$ 1.07 billion.

The increase in funding was caused not only by the inflation of the tenge. The list of support measures was expanded. To the traditional subsidizing of MSME loans, the direction of partial guarantee of loans was added and expanded.

Subsidized interest rates on loans remain the main support instruments: loans from MSME entities up to \$ 16.4 million for a period of up to five years fall under the terms of the program. The rate on them is subsidized up to 6%. An innovation of the DKB-2025 program was the participation in the scheme of subsidizing microfinance organizations along with second-tier banks.

Since the beginning of the coronavirus crisis, the government of the Republic of Kazakhstan has managed to implement several packages of business support measures. The first was proposed back in March 2020 after the introduction of the state of emergency. These were mainly tax incentives. The authorities suspended the deadlines for tax audits until June 1, postponed the deadlines for submitting tax reports for MSME entities and provided deferrals for the payment of all types of taxes and other mandatory payments to MSMEs without charging fines and penalties.

For the affected industries (catering and hospitality), zero property tax rates were applied until the end of 2020. For MSMEs in affected sectors, payroll tax rates - individual income tax, social tax, compulsory pension contributions and compulsory social health insurance payments - were zeroed from April to October 2020.

The subsidy programs have also been expanded. The Economy of Simple Things received an additional \$ 940 million. The total amount of fiscal stimuli in 2020 is estimated at about 9% of

GDP, most of which is aimed at compensating for the shortfall in revenues of the republican and local budgets.

The list of expected effects from MSME support includes a reduction in the tax burden (for firms from affected industries); exemption and deferral of payments were supposed to create conditions for the growth of the amount of funds that the company can leave in circulation. This should help, if not recovery, then support business activity in the affected industries.

The first response from businesses to incentives has been low-key. In a study evaluating government support for businesses conducted by KPMG in July 2020, it was found that 34% assess the relevance and feasibility of criteria in programs "below average", and 89% of companies do not believe that "tax holidays" are an effective measure to stabilize them. provisions.

Year-end statistics since the beginning of the coronavirus crisis indicate that the MSME crisis has been avoided. In some sectors, the situation is better than before March 2020.

The share of active MSME entities has also grown since the beginning of 2020. For example, the share of active small businesses increased from March 2020 to March 2021 from 68.1% to 71.2% and continues to grow. The share of operating individual enterprises in the same period practically did not change (increased from 86.2 to 86.6%) [8].

During the crisis year of 2020, the small business lending portfolio grew by 25% and reached 2.6 trillion tenge (\$ 6.1 billion), or 3.7% of GDP (2020). The most active growth in this period was the portfolio of loans to small and medium-sized companies operating in the sectors most resistant to the last crisis - communications (+ 45.7%) and industry (+ 28.2%).

Significant benefits for MSMEs are provided for in the activities of free economic zones, including in IT areas, where the efforts of small businesses create software for various sectors of the economy, including for the mining and geological industry.

A significant drawback in financing mining projects is the very weak use of the capabilities of Kazakhstani stock exchanges (KASE and AIX) by subsoil users.

1.4. Progress towards Sustainable Resource Management and Circular Economy: Application of UNFC and UNRMS in Kazakhstan.

Today, the government of Kazakhstan does not have an unambiguous understanding of the state of the country's mineral resource base, which forms the basis of its economy. This is due to the fact that many deposits, including very large ones, are still present in the state balance sheet based on estimates of the Soviet period, which have not been updated in the new economic conditions. This was, in particular, one of the reasons for the sharp lag in the growth of reserves from production for the main minerals, as well as the low rates of prospecting for new deposits (Fig. 7).

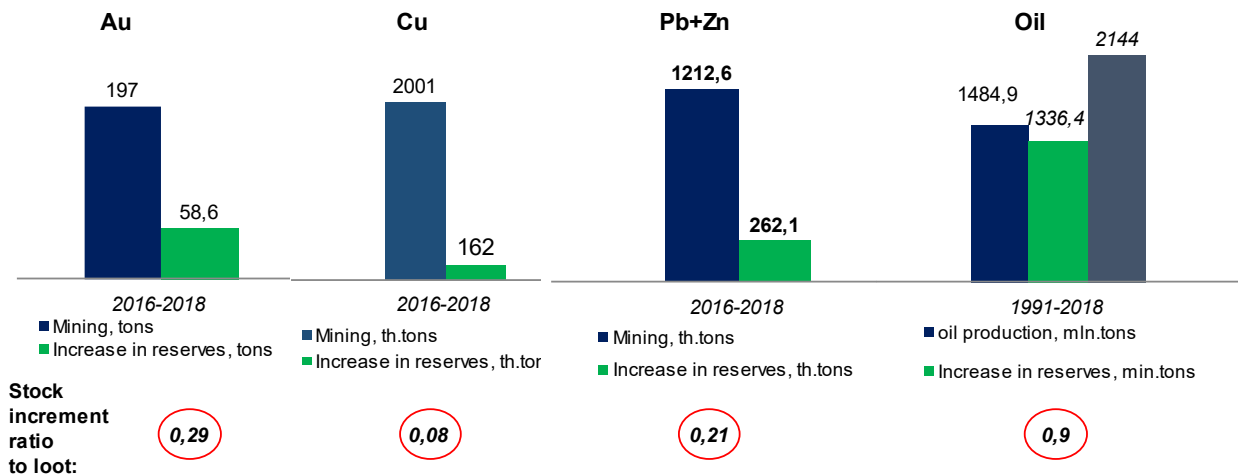


Fig. 7 Indicators of depletion of reserves and increase in reserves for the period 2016-2018

As follows from this illustration, in view of the multiple lag in the growth of reserves from the rate of production, very radical measures are required to correct the situation. One of these measures was the significant liberalization of the subsoil legislation, which includes the transition to international standards for geological reporting CRIRSCO. As part of the liberalization of legislation, issues of application of the UNFC and UNRMS are also being discussed with the leadership of the Committee of Geology and in the professional association PONEN. In the professional mining and geological environment, there is an understanding of the feasibility and effectiveness of the use of these tools, primarily at the level of government. To a certain extent, the limiting legal and technical factors are the transition period from the GKZ standard to the KAZRC * (CRIRSCO) standard [9] [10], in which the mining and geological industry of Kazakhstan is located today.

The transitional period should end by 01.01.2024. During the transitional period, exploration and geological reporting can be carried out both in accordance with the old GKZ standard and the new KAZRC standard. This process has been going on for the past three years. The dynamics of the increase in the number of reports by year, prepared in accordance with the KAZRC Code, demonstrates obvious progress (Fig. 8). In 2021, the number of reports prepared in accordance with the KAZRC Code already exceeds the number of reports prepared in

accordance with the GKZ standard.

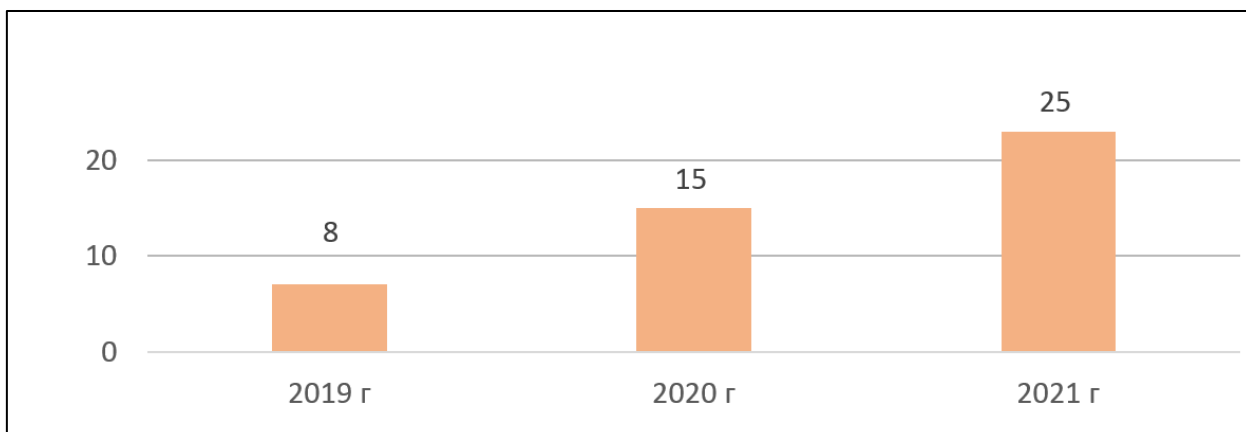


Fig. 8 Dynamics of submission of reports on the KAZRC Code to the Geology Committee

As noted above, MSMEs in the mining and geological sector of the economy of Kazakhstan occupy a large share among service geological companies, the demand for whose services has intensified today due to the increased need for certified exploration and preparation of reports under the KAZRC Code.

We regard the implementation of the KAZRC Code as a preparatory stage for the use of the UNFC and UNRMS, thanks to which the inertia (and the usual lack of alternatives) in the application of the morally and physically outdated Soviet GKZ standard is overcome. Since, to a large extent, both for specialists and officials, the process of changing the standard is a certain psychological problem and, accordingly, it takes a long time to get used to its application.

The transition period (from July 2018 to December 2023) is a fairly limited time, which, as the experience of the past three years shows, may not be enough for a new standard to take hold. Nevertheless, the PONEN Executive Committee intends to simultaneously continue information work with government bodies, as well as with the professional community, regarding the need to apply the UNFC and UNRMS.

Progress in this direction was noted during the development and discussion of proposals for the application of the UNFC in the new classification of resources and hydrocarbon reserves in Kazakhstan being developed, as part of the further implementation of the new Code on Subsoil and Subsoil Use.

Progress towards a circular economy in Kazakhstan is carried out gradually (albeit slowly), as part of the implementation of a whole series of government measures provided for by the Concept of Transition to a Green Economy, the Strategic Development Plan of the Republic of Kazakhstan until 2025, the new Environmental Code, Messages of the President of the Republic of Kazakhstan 2019, 2020, 2021.

For Kazakhstan, the issue of recycling waste, accumulated primarily as a result of the mining industry, becomes more and more acute every year. By 2010, more than 30 billion tons of mining waste had been accumulated in the Republic (tailings, slag and ash dumps, dumps of substandard ores and waste dumps), which, on the one hand, are objects of increased environmental hazard, and on the other, a potential source of huge quantities of minerals - rare, non-ferrous, ferrous metals, gold and CRM. Losses and incomplete use of mineral raw materials are observed at all stages of field development, processing and metallurgical processing. Most often, CRM extraction occurs during the metallurgical process. In a number of cases, the accumulated amounts of ore components in wastes of mining and metallurgical production are commensurate with their reserves in natural deposits.

The secondary processing of waste from mining and metallurgical industries with the extraction of additional volumes of metals requires the development of new technological methods, nevertheless, the cumulative result - the receipt of additional marketable products and a decrease in the environmental burden dictates that there is no alternative to carrying out such work and creating new industries in the framework of moving towards a green economy.

In accordance with the difference in the status of CRM for each group, primarily according to the degree of industrial development, they are quite contrastingly grouped by classes, subclasses and subcategories of the UNFC (Diagram 1, Table 10) [11]. For the fourth group of CRM (with the exception of tin, which is present in the complex Syrymbet deposit, which is being prepared for development), the main problem is the lack of technology for extracting these elements in Kazakhstan. However, in accordance with the Program of the Government of the Republic of Kazakhstan of 2014 on the rare metal industry [12], certain work is already underway to solve this problem in Kazakhstan, and therefore there are real prospects for the creation and implementation of new technologies for the extraction of some chemical elements of the 4th group.

Diagram 1. UNFC Classes and Sub-Classes Defined by Sub-Categories

<i>UNFC Classes Defined by Categories and Sub-categories</i>						
Total Products	Produced	Sold or used production				
		Production which is unused or consumed in operations				
	Class	Sub-Class	Categories			
			E	F	G	
Known Sources	Viable Projects	On Production	1	1.1	1, 2, (3) ^c	
		Approved for Development	1	1.2	1, 2, (3) ^c	
		Justified for Development	1	1.3	1, 2, (3) ^c	
	Potentially Viable Projects	Development Pending	2 ^b	2.1	1, 2, 3	
		Development On Hold	2	2.2	1, 2, 3	
	Non-Viable Projects	Development Unclassified	3.2	2.2	1, 2, 3	
		Development Not Viable	3.3	2.3	1, 2, 3	
	Remaining products not developed from identified projects		3.3	4	1, 2, 3	
	Potential Sources	Prospective Projects	[No Sub-classes defined]	3.2	3	4
		Remaining products not developed from prospective projects		3.3	4	4

Table 10. Application of the UNFC to assess various CRM groups in Kazakhstan

Группа CRM	Добываемые			Разведанные			Перспективные		
	E	F	G	E	F	G	E	F	G
I	1	1.1	1,2	1,2	2.1	1,2	3.2, 3.3	3, 4	3, 4
II	1	1.1	2,3	3.2	2.2	2,3	3.2, 3.3	3, 4	3, 4
III	-	-	-	3.2, 3.3	2.2, 2.3	1,2,3	3.2, 3.3	3, 4	3, 4
IV	-	-	-	2, 3.2	2.1, 2.2	1,2,3	3.2, 3.3	3, 4	3, 4
V	-	-	-	-	-	-	3.3	4	4

Possibilities of UNFC application for different CRM groups are illustrated below for four fields, one for each group (Table 10): Group I - Koku (phosphorites) in South Kazakhstan, the field is being mined (Table 11); Group II - Ridder-Sokolnoye (pyrite-polymetallic with impurity elements: antimony, bismuth, indium) in East Kazakhstan, the field is being mined (table 12); Group III - Akhmetkino (rare-metal pegmatites containing beryllium, lithium, tantalum, niobium, tin) in East Kazakhstan, mining is not carried out, exploration is completed (table 13); Group IV - Shokash (titanium-zirconium with a passing element hafnium) in Western Kazakhstan, the field is being mined (Table 14).

Table 11. Reserves and resources of the Koku phosphorite deposit according to the GKZ standard [13] and their possible classification according to the UNFC (I group CRM)

GKZ categories	Ore reserves, thousand tons	Content P ₂ O ₅ , %	UNFC Sub-Categories		
			E	F	G
A+B+C ₁	161090	24,7	1	1.1	1, 2
C ₂	167164	22,1	2	2.1	2, 3

Reserves classified by the sum of categories A + B + C₁ according to the GKZ standard are developed to obtain marketable products (yellow phosphorus and phosphate rock) [13]. In this regard, according to the UNFC, they belong to the class - "viable projects" and the subclass - "active". Reserves of category C₂ are explored at the preliminary stage, are not developed, and are characterized by uncertainty of their economic value, therefore, according to the UNFC, these reserves correspond to the class - "potentially viable projects" and the subclass - "pending development".

Table 12. CRM reserves and resources at the Ridder-Sokolnoye pyrite-polymetallic deposit according to the GKZ standard [14] and their possible classification according to the UNFC (II group CRM)

GKZ categories	Ore reserves, thousand tons	Content	UNFC Sub-Categories		
			E	F	G
For the main components (copper, lead, zinc - the average content of conditional zinc in%)					
A+B+C ₁	22111	3,58	1	1.1	1, 2
C ₂	35044	4,0	3.2	2.2	2, 3
For CRM (antimony, bismuth, indium - the average content of elements in ppm)					
C ₂ =(A+B+C ₁ +C ₂)	57155	Antimony – 143 Bismuth – 9,0 Indium – 1,0	1	1.2	2, 3

The classification of reserves according to the GKZ standard for the main components (copper, lead, zinc) by a set of characteristics (geological knowledge and technical and economic

feasibility) has been studied in different detail - reserves by the sum of B + C1 categories are mined, ores are processed to obtain copper, lead and zinc concentrates. Reserves of category C2, as less reliable, require additional exploration to transfer them to higher categories. For associated components (antimony, bismuth, indium), the degree of all characteristics does not correspond to the degree of study of the main components, therefore, they can be classified according to the GKZ standard, only as corresponding to category C2. But since these CRMs, during metallurgical processing, are simultaneously extracted from concentrates, they can be obtained in the form of commercial products - the metals antimony, bismuth and indium. Therefore, according to the UNFC, reserves of antimony, bismuth, indium are classified as "viable projects" and a subclass — "active".

Table 12. CRM reserves and resources in the Akhmetkino complex pegmatite deposit according to the GKZ standard [15] and their possible classification according to the UNFC (third group of CRM)

GKZ categories	Ore reserves, thousand tons	Content g/t	UNFC Sub-Categories		
			E	F	G
A+B+C ₁ +C ₂	3591,8	T ₂ O ₅ – 147 Nb ₂ O ₅ – 150 BeO – 460	3.3	2.3	1, 2, 3

Despite the fact that, according to the GKZ classification, the reserves of the Akhmetkino deposit belong to high categories, due to the low contents of useful components, the development of the deposit is unprofitable, and therefore according to the UNFC it corresponds to the class - "non-viable projects", the subclass - "development is inexpedient".

Table 14. CRM reserves and resources in the Shokash titanium-zirconium deposit according to the GKZ standard [16] and their possible classification according to the UNFC (fourth group of CRM)

GKZ categories	Ore reserves, thousand tons	Content	UNFC Sub-Categories		
			E	F	G
For the main components (ilmenite, rutile, zircon - conditional ilmenite content in%)					
A+B+C ₁	161090	6,7	1	1.1	1, 2
C ₂	167164	5,4	3.2	2.2	2, 3
For CRM (average hafnium content, ppm)					
C ₂ =(A+B+C ₁ +C ₂)		Hafnium - 65	3.2	2.2	2, 3

According to the UNFC, due to the lack of a developed technology for extracting hafnium from zircon concentrate, its reserves can be classified as "non-viable projects", subclass - "the issue of development is not clarified."

It should be emphasized that it is CRM, in connection with the special status and significance of these types of mineral raw materials, the ever-increasing market demand for these elements, that can become the objects of application of the UNFC and UNRMS in Kazakhstan, to provide special approaches to their study and socio-economic significance with taking into account their distribution by regions of the country.

2. A Brief Overview of Opportunities for MSMEs in the Supply of Critical Raw Materials in Kazakhstan

2.1. Primary and secondary CRM resources in Kazakhstan

As noted above, out of 30 types of CRM in Kazakhstan, 29 are present in the form of primary resources, and all 30 are in the form of secondary resources. Most of the CRMs, which are present in the form of impurities in the ores of non-ferrous, ferrous, rare metals and gold deposits, are found in the deposits of different regions of Kazakhstan.

A significant part of Kazakhstani deposits containing CRM are being exploited. The received products in the predominant quantity are sent for export. The main issue of the development of the potential of CRM, concluded in the form of impurity elements in ores of deposits of various types of minerals, was and remains the question of the technology of extracting these elements from ore, as well as from the waste of concentration and metallurgical industries.

Prospects for increasing production in Kazakhstan for those types of CRM that have been mined in large volumes from their own deposits for a long time (in which these CRMs are not impurity, but the main minerals) - Coking coal, Phosphate rock, Phosphorus, Bauxite, Titanium, Baryte are quite significant.

More than 300 deposits of fossil coal with geological reserves of 170.2 billion tons are known in Kazakhstan [17]. More than 9/10 of all coal reserves are concentrated in the central and northern parts of the country. The largest basins are Ekibastuz (12.5 billion tons), Karaganda (9.3 billion tons) and Turgai (5.8 billion tons). The largest reserves and the largest coal basins and deposits belong to the Carboniferous (Karaganda and Ekibastuz coal basins) and Jurassic deposits.

Various deposits have reserves of brown, bituminous and coking coal. The total volume of reserves is sufficient to maintain the current production rates for a very long period (over 200 years). All known reserves of coking coal are concentrated in the Karaganda coal basin.

Kazakhstan ranks eighth in the world in terms of proven coal reserves (25.6 billion tons, or 2.2% of world reserves, according to BP Statistical Review of World Energy, June 2017) and tenth in the world in terms of production (102.4 million tons, or 1.4% of world production) [18].

In the total annual volume of coal production, coking coal accounts for about 8-10% (about 8-10 million tons).

Like the resources and reserves of coal, phosphorites are also significant in scale, their total resources in Kazakhstan amount to $n * 10$ billion tons, the main volumes of which are located in South Kazakhstan. Large industrial complexes have been operating on the basis of these resources and reserves for decades. First of all, this is the Kazphosphate company. The main types of end products of Kazphosphate enterprises are yellow phosphorus and phosphate rock. The volume of phosphorite mining in recent years has been about 3.0-3.5 million tons per year. The products of the phosphorus industry enterprises are mainly exported.

Bauxite deposits are located mainly in Northern Kazakhstan, many of them have already been worked out. The largest of them (for example, Belinskoe, Krasnooktyabrskoe) have been in operation for decades. Bauxites are mined from the Krasnooktyabrskoye and Torgayskoye bauxite ore occurrences of JSC Aluminum of Kazakhstan, which supply them to the Pavlodar alumina refinery. Then, alumina is processed at the Pavlodar electrolysis plant to primary aluminum. The volume of bauxite production is 3.0-3.5 million tons per year, the volume of alumina production is about 1.4 million tons [19] and primary aluminum is about 1.0 million tons. The predicted potential of the mineral resource base of bauxite is very significant (over 100 million tons), however, many undiscovered occurrences lie at a considerable depth (150-200 m), which reduces

the prospects for their quarry production. The products of the Pavlodar Aluminum Plant are mainly exported.

Deposits of titanium raw materials (ilmenite and rutile) are mainly represented by buried placers, which are known in Western, Northern and Eastern Kazakhstan. The total number of known deposits is more than 20, and, in addition, more than 100 occurrences of this type of minerals are known, some of which, as a result of exploration, can be transferred to the category of deposits. There are three fields in operation that produce ilmenite concentrate and rutile-zircon middlings. Most of the ilmenite concentrate is supplied to the Ust-Kamenogorsk titanium-magnesium plant, which produces spongy titanium and metallic magnesium. The company's products are mainly exported [20].

The main reserves of barite are found in complex barite-polymetallic deposits, which are widely known in Eastern and Central Kazakhstan. Barite from these deposits, as a rule, is present in intergrowths with lead and zinc sulfides, and therefore it can be extracted only by flotation. The barite content in complex ores of such deposits ranges from 3 to 20% (Table 10). However, such barite is not in demand by consumers who prefer to use gravity barite concentrate in their production. In South and Central Kazakhstan, quartz-barite deposits with a higher barite content are also known, which is extracted by the gravity method, which is in wide demand among consumers.

CRM supply from secondary sources

Receiving CRM from secondary sources involves the following types of them: batteries, car tires, glass processing, disposal of photovoltaic cells, radio-electronic waste processing, recycling of poor ore dumps, tailing dumps and ash and slag dumps of energy and metallurgical industries. In terms of scale, the last three categories of secondary CRM sources are several orders of magnitude superior to all the others, and therefore these objects deserve a primary and more detailed discussion.

Tailings dumps of concentration plants, slag dumps of metallurgical plants and ash dumps of power plants contain very significant amounts of useful components and are the most large-scale and promising secondary sources for obtaining a large number of useful components. Tailings of concentration plants of copper, zinc, lead, iron ore mining enterprises contain, first of all, minerals of basic metals, due to their incomplete extraction from ore during concentration (70-90%). In addition to the minerals of the main components, from 30 to 80% of individual CRMs (for example, Antimony, Bismuth, Indium, Barite, Cobalt and others) are present in the wastes of the processing industry. There are possibilities for additional extraction of the main useful components, as well as CRM from the tailings of concentration plants and slag dumps, subject to the development of new technological solutions (various types of pyro- and hydrometallurgical methods).

So, for example, the Belogorsk mining and processing plant (East Kazakhstan region), for more than 40 years, processed complex rare-metal pegmatite ores to obtain tantalum-niobium, tin, spodumene, quartz, feldspar concentrates, which were sent for metallurgical processing to plants in Kazakhstan and Russia. In the early 90s, the plant stopped mining and processing ores due to the low content of useful components.

During the period of the enterprise's activity, the stocks of the tailings of the Belogorsk GOK accumulated in the amount of 14.9 million tons, while the content of useful components (tantalum, tin, beryllium and lithium) in them quite allows organizing their recycling (Table 16) [21].

Table 15. An example of the contents of impurity elements in polymetallic deposits in Kazakhstan unit of measurement

CRM	Unit of meas.	Ore	Pyrite	Chalcopyrite	Sphalerite	Galena
1	2	3	4	5	6	7
Antimony	g/t	0-2700	0-850	0-1340	0-850	40-3000
Baryte	%	3,0-20,0				
Bismuth	g/t	0-170	0-120	0-280	0-310	0-3500
Cobalt	g/t	0-550	0-1400	0-220	0-300	0-180
Gallium	g/t	0-50	0-9	0-58	0-800	0-20
Germanium	g/t	0-3	0-4	0-7	0-15	0-4
Indium	g/t	0-8	0-5	0-16	0-41	0-3
Platinum Group Metals	g/t	0-0,3				

Considering the specificity of secondary resources - tailing dumps of concentrating factories and slag dumps of metallurgical plants (on the one hand, there is no need to create mining production, and, on the other hand, as a rule, it is necessary to carry out research and development work with experimental processing of this secondary raw material), their development can become an area of activity for MSMEs.

Some examples of CRM grades in ore minerals of polymetallic ore deposits that are present in tailings are shown in Table 15.

Table 16. CRM stocks in tailings of the Belogorsk mining and processing plant in East Kazakhstan

CRM	Unit of meas.	Contents	CRM reserves, Tons
1	2	3	4
Tantalum	g/t	31,8	472,6
Tin	g/t	95,5	1421,0
Beryllium	g/t	456,4	6789,5
Lithium	g/t	175,3	2606,9

The Caspian Chemical and Metallurgical Plant (Aktau), over a long period of processing uranium-phosphorus ores, has accumulated 108.9 thousand tons of enrichment tailings containing HREE and LREE. The amount of REE is 4.37%, including HREE 2.44% (2662.7 tons), LREE 1.93% (2101.3 tons) [21].

One more example. The reserves of the tailing dump of the Karagailinskaya concentration plant, which processed the lead-zinc ores of the deposit of the same name, amount to 16.6 million tons, which contain 49.7 thousand tons of lead, 87.8 thousand tons of zinc and 4134.5 thousand tons of barite, with average grades lead 0.29%, zinc 0.84% and barite 25.2%, some of which can be recovered during recycling, primarily barite.

This also applies to substandard polymetallic ores stored at the industrial site of the Karagailinsky GOK in the amount of 461 thousand tons, which contain 2.07 thousand tons of lead, 3.8 thousand tons of zinc and 69.2 thousand tons of barite, with average content of lead 0.45%, zinc 0.83%, barite 15.0% [21].

The above examples are just a small fraction of the tailings dams that can be involved in recycling, as a result of which there is the possibility of cost-effective recovery of certain types of CRM.

On slag dumps of metallurgical plants, in contrast to tailing dumps, information on the content of elements is extremely limited, since analyzes of the slag material were carried out for the main components (for example, copper, lead, zinc, gold, silver) and slag-forming (various oxides). Analyzes for incidental components (including CRM) contained in processed concentrates, as a rule, were not performed. Therefore, to obtain such information, an additional study of the material of the slag dumps is required for the content of CRM in them.

2.2. Applications in key sectors

CRM in Kazakhstan in the form of commercial products is produced only by large vertically integrated companies - Kazzinc, Kazakhmys, Ust-Kamenogorsk titanium and magnesium combine, Kazatomprom, Ulba metallurgical plant, Kazphosphate.

Kazzinc has five mines that extract polymetallic ores, as well as three concentration plants for processing these ores to obtain copper, zinc, lead and gold-bearing concentrates. The company has four metallurgical plants that produce copper, lead and zinc as their main products. In addition, during the metallurgical processing of concentrates, separate CRMs are additionally extracted, such as Antimony, Bismuth, Indium, and Platinum group metals. The bulk of CRM products are exported.

Kazakhmys has 15 copper mines, four concentrators that produce copper concentrate, and two metallurgical plants that produce cathode copper. In addition, the Company has a Zhezkazganredmet enterprise that produces scandium.

The products of the Ust-Kamenogorsk Titanium-Magnesium Combine are certified by all world aerospace enterprises. Kazakhstani titanium occupies 11% of the world market, 18% of the titanium market in the aerospace industry, is used in shipbuilding, medicine, oil and chemical industries. The partners of UKTMK JSC are such companies as Boeing, Airbus, Nippon Steel, SNECMA, General Electric and many others [20].

Kazphosphate LLP sells more than 22 types of products, of which the main product is yellow phosphorus. With the support of Development Bank of Kazakhstan JSC (DBK, a subsidiary of Baiterek Holding), Kazphosphate LLP is successfully increasing its export potential, selling products to the countries of near and far abroad [22].

2.3. Supply and demand

Information on supply and demand for CRM, in the public domain, across Kazakhstan, is not available, these data are not published. Proposals for the supply of certain types of CRMs are published on the Internet by various dealers who offer them to potential consumers in Kazakhstan, while the origin of these CRMs (from Kazakhstani manufacturers, or imports), as a rule, is not disclosed. As mentioned above, certain information on the total volume of CRM production of the first and second groups, but the division into domestic consumption and export, is not published.

In the annual reports "On the implementation of the Extractive Industries Transparency Initiative in the Republic of Kazakhstan", information on reserves, production and export products is published for the main minerals of Kazakhstan: iron, chrome, manganese ores, copper, lead, zinc, gold, silver, uranium, oil and gas. From the general list of CRM, this report contains data only on bauxite, which are mined annually in an amount of 3.5 to 5.7 million tons and are fully processed at the Pavlodar Aluminum Plant to obtain alumina, from which primary aluminum is then produced. most of which is exported [6].

2.4. COVID-19 forecast in Kazakhstan

In Kazakhstan, the fourth wave of coronavirus is currently declining. As of mid-October 2021, over 8 million people were vaccinated, which is 42% of the total population of the Republic. Over the past two months, mortality and overall morbidity have been significantly reduced in most regions of the country.

Restrictive measures are updated by the sanitary supervision bodies of the Ministry of Health of Kazakhstan 2-3 times a month, depending on the situation in different regions. The most stringent measures were taken at the end of September, when full-time work of unvaccinated employees was prohibited for all categories of enterprises. Unvaccinated employees may have a permit for full-time work, subject to weekly PCR tests. All vaccinated employees can work without restrictions. Also, from November 1, the need for revaccination was announced. First of all, revaccination is prescribed for employees of critical organizations: employees of medical institutions, education, internal affairs bodies, trade, public catering and other organizations, the functioning of which is associated with constant contacts with the population. In addition, it has also already been determined that vaccination against coronavirus acquires an annual status.

3. Guidelines and Problem-Solving Best Practices for MSMEs in the Supply of Raw Materials. business environment in Kazakhstan

As demonstrated in the first section, MSMEs play a significant role in the economy in Kazakhstan. The country has created a favorable business environment for doing business. In the mining and geological sector, in the supply of raw materials, as noted above, MSMEs are present in the segment of development and supply to the domestic market of raw materials for the production of building materials (for example: building sand, brick clays, gypsum, sand and gravel mixtures). The activities of such companies directly depend on the situation in the construction industry and, in a pandemic, a decrease or increase in the activity of such MSMEs occurs synchronously with a decrease and increase in the activity of construction companies (Table 8).

In a single case, the Stroyservice company (which is a medium-sized enterprise) mines quartz-barite ores from the Shiganak deposit in South Kazakhstan, obtaining a gravity barite concentrate and supplying it to oil companies for use as a weighting agent for drilling fluids. Production volumes in recent years have been about 30 thousand tons of barite concentrate. The company sets the task, in view of stable demand, to increase the annual production of barite concentrate to 50 thousand tons.

Several hundred junior companies have been granted subsoil use rights for exploration of solid minerals over the past three years. The vast majority of these new subsoil user companies are MSMEs. At the same time, many of them, due to the lack of sufficient financial resources of their own, are in search of investors. A significant improvement in the financial security of these companies can be achieved if lending is applied secured by the right to subsurface use with low interest rates. However, second-tier banks do not yet agree to such conditions, since they are not legally prescribed.

The introduction of such an option into the lending rules could significantly increase the activity in the market of junior subsoil users to promote exploration projects, which would help to reduce the exploration time and achieve the final results of licensees. The activity of juniors of subsoil users is hindered by the practical absence of attractive conditions for the placement of such projects (companies) on Kazakhstani stock exchanges. Although, in general, the limited placement of such companies on two Kazakhstani stock exchanges is associated, first of all, with the general traditional underdevelopment of this version of financing in the mining and geological business of Kazakhstan. The overwhelming majority of shares of the largest mining companies in Kazakhstan are listed on the Kazakhstan stock exchanges.

3.1. Business promotion and business registration

The creation and activities of MSMEs are regulated by the Entrepreneurial Code of the Republic of Kazakhstan (with amendments and additions as of 06/07/2021) and the Law of the Republic of Kazakhstan dated April 22, 1998 No. 220-I "On limited and additional liability partnerships" (with amendments and additions to as of 01.07.2021) [23] [24].

MSMEs in Kazakhstan can be registered online within 15 minutes. Opening a bank account for MSMEs also occurs online.

In the period from 2017 to 2020 (table 7), the number of registered MSME enterprises has constantly increased annually, even despite the pandemic, respectively, by 8.3, 7.2 and 2.0%, with an increase in the number of employees in 2018 to 2017 and in 2019 to 2018 (table 7), respectively by 3.8 and 2.6% and a decrease in the number in 2020 against 2019 by 0.85%.

3.2. Policy, regulations and rules

The formation of legal norms and rules for the development of MSMEs took place in three stages. At the moment, the policy, norms and rules of Kazakhstani business are at the third stage, which originates from the enactment of the Law of the Republic of Kazakhstan "On Private Entrepreneurship" dated January 31, 2006, which systematized the norms governing entrepreneurial activity, and united them into a single legislative act. To replace numerous acts regulating entrepreneurial relations, one legislative act was adopted, which established the general beginnings of private entrepreneurship in the Republic of Kazakhstan.

As a result, a monistic system of private law has developed in our country - there is the Civil Code, which is the main legislative act regulating market relations, and special legislation on entrepreneurship. Based on the principle of priority of the norms of special legislation over the norms of general legislation, the significance of the Civil Code in the context of the dualistic system of private law is significantly reduced, which is hardly justified. At this stage in the development of market relations, it is not so important that the process of developing legislation on entrepreneurship necessarily ends with its codification; it is more important to bring it into line with international standards and the realities of today.

State support for MSMEs

State support for small business in the Republic of Kazakhstan is implemented in such areas as: 1) creation of conditions for the use by small business entities of state financial, statistical, material and technical and information resources, as well as scientific and technical developments and technologies; 2) development of state, sectoral (sectoral) and regional programs for the development of small business; 3) establishment of a simplified procedure for state registration and liquidation of small businesses; 4) establishment of an optimal tax regime; 5) adoption of programs for lending to small businesses; 6) creation of a system for attracting and using investments, including foreign ones, to support and develop small businesses; 7) ensuring the guaranteed volume of procurement of goods (works, services) for state needs; 8) organization of training, retraining and advanced training of personnel through the development of existing and creation of new educational and research centers, consulting organizations and information systems for support and development of small business; 9) creation of national development institutions.

State support and development of small business is carried out by: 1) providing financial support; 2) organizing a network of small business support centers; 3) organizing the activities of business incubators; 4) transfer to the subjects of small business in trust management or lease of objects of state property that have not been used for more than one year; 5) gratuitous transfer to

small businesses in the ownership of objects leased or entrusted to organize industrial production and the development of the services sector to the population after a year from the date of the conclusion of the contract if the conditions stipulated by it are fulfilled in the manner established by the Government of the Republic of Kazakhstan [7].

3.3. Access to data, information and knowledge, and development of entrepreneurial skills

To ensure accessibility to data, information and knowledge, the "Damu" Entrepreneurship Development Fund has developed and implemented the "Business Advisor" program, which ensures the solution of the following tasks: 1) conducts accessible and unified express courses of an applied nature on creating your own business and its effective conduct ; 2) in all regions of Kazakhstan, groups of professional lecturers-trainers have been formed, who on a systematic basis conduct training courses on creating their own business and its effective conduct for the population with entrepreneurial initiative and acting entrepreneurs in all regions of Kazakhstan's regions; 3) provides active information support on all instruments of state support for entrepreneurship to a large number of the population; 5) the collection of the necessary information is carried out on the basis of studying the real needs of the population with entrepreneurial initiative and operating entrepreneurs in all regions of Kazakhstan for the further creation of Centers for non-financial support of entrepreneurship [7].

Committee of Geology, in 2022 it is planned to complete the project of creating the National Geological Data Bank with filling it at the first stage with scanned copies of all geological reports (over 150 thousand) available in the republican geological funds, and completing the Interactive online map of subsoil use, which will greatly facilitate understanding of the licensed and free part of the country's territory, and will make available for general use all the historical geological information.

3.4. Development of entrepreneurial skills

The development of entrepreneurial skills is provided by government programs that regularly provide free training for entrepreneurs in the regions, primarily in the basics of entrepreneurial activity. Such courses are conducted systematically and cover all the main areas of MSME activities (agriculture, construction, manufacturing, trade, tourism services).

In addition, both in the regions and in the capital and megalopolises, commercial training centers have been operating for many years, which offer highly specialized courses on a paid basis for MSMEs in any areas of scientific, industrial, commercial activity, the widest range of sectors of the economy.

3.5. Market access

The market of services for MSMEs in the mining and geological industry of Kazakhstan does not have any restrictions. Over the years of independence (since 1991), some areas of small business have gradually formed, which have occupied certain sectors. In the field of mining, these are raw materials for the production of building materials, and for the construction of roads (many hundreds of MSMEs), as well as several medium-sized enterprises for the extraction and production of CRM (less than 10 MSMEs). In this part of the country's extractive sector, large companies have no interest of their own, due to the limited volumes of production and sales of products, due to the fact that these products, as a rule, of low cost, must be sold near the places of their production. If interested, large companies create MSMEs that occupy the appropriate niche.

The situation in the geological services sector (exploration and consulting) is very similar. In the early 1990s, state-owned exploration enterprises were privatized. However, out of 50 large geological exploration enterprises of the Soviet era that were privatized, only a few remained that have retained part of their potential to a sufficient extent to the present day. Most of these Soviet

enterprises went bankrupt, sold off equipment, laid off staff and were liquidated due to a sharp decline in exploration demand in the last decade of the last century. Nevertheless, during the same period, the most proactive industry specialists, independently or with the support of successful businessmen, began to create new exploration enterprises and consulting geological companies, many of which are still present in the industry market and are successfully developing.

The third group of MSMEs (quantitatively there are many hundreds) are junior subsoil companies that are beginning to develop exploration activities, and those that have issued exploration licenses in the hope of finding partners (investors) for exploration. In any case, both the one and the second, on the one hand, intensify geological exploration in new promising areas, and on the other hand, they contribute to attracting additional investments in the mining and geological sector of the economy of Kazakhstan.

3.6. Access to finance

Traditionally, the main problems of MSME development in the mining and geological sector of the economy of Kazakhstan (as well as in other industries) are associated with the financial support of work. For example, the following can be attributed to them: 1) lack of working capital; 2) lack of access to banking credit services, both for solving the problem with working capital, and for the implementation of initiated or planned investment projects; 3) lack of free access to loans from state and municipal funds to support small businesses due to the small size of their financial assets and limited budgetary funding of these funds; 4) a decrease in demand for products, with a constant level of costs, threatens a deterioration in capital turnover indicators, a decrease in the rate of profit and business profitability; 5) the risk of non-payments from counterparties - refusal to work with some counterparties, decrease in profits, increase in the risk of overstocking [7].

Access to MSME finance is provided through targeted MSME financing programs, which include a system of grants for priority areas of business (creation of small industries), concessional lending through second-tier banks, debt restructuring with lower interest rates, and the establishment of tax incentives for certain categories of MSMEs. In the long term, from 2023 it is planned to reduce the total tax burden on MSMEs by 1.5 times.

In my opinion, one of the most significant drawbacks of wide access to finance for MSMEs in the mining sector of the economy of Kazakhstan is the underdevelopment of the domestic securities market for junior companies of subsoil users. In turn, the limitation of this market is due to the fact that the population of our country is very little involved in this market.

3.7. Access to technology

As mentioned above, the actual MSMEs in the mining and geological sector, many exploration and consulting companies use in their activities most of the available technologies for remote sensing of the earth (ERS), modern geophysical technologies, digital topographic survey technologies, including using drones, specialized software for 3D modeling of the geological environment and ore mineralization, database management software, etc.

The competitiveness of MSMEs is determined precisely by the level of use by these companies of modern technologies for collecting and processing geological data, interpreting and modeling mineralization for the purpose of its reliable assessment.

Access to all the aforementioned modern technologies for MSMEs is not limited and is determined only by the financial and personnel capabilities of a particular enterprise.

Another part of technological issues is enrichment and metallurgical processing technologies, which are characterized by limited access either as “know how”, which are actually classified, or patented, and patents are expensive, and therefore MSMEs cannot afford to purchase them for use. Nevertheless, in these cases, there is an option for the participation of technology

rightholders as part of joint ventures with Kazakh MSME entities, whose contribution to the joint business may be a new technology.

3.8. Logistics and supply chains

Available information on CRM manufacturers in Kazakhstan is available only for the largest companies. For example, the leader of the Kazakh chemical industry, Kazphosphate LLP, is strengthening its position in the world market for phosphorus-containing products, despite the challenges associated with the pandemic and high competition. The enterprise continues to export finished products to 26 countries of the world. The geography of importing countries of Kazakhstani phosphorus-containing products includes: Azerbaijan, Afghanistan, Belarus, Dominican Republic, Hungary, Germany, Denmark, India, Spain, Cyprus, China, Kyrgyzstan, Lithuania, Netherlands, Poland, Russia, USA, Tajikistan, Turkmenistan, Turkey, Uzbekistan, Ukraine, France, Czech Republic, Switzerland, Japan.

The company produces 22 types of various phosphorus-containing products, including phosphorites for its own processing, yellow phosphorus, phosphate, sodium tripolyphosphate, phosphorus-potassium fertilizers, ammophos and tricalcium phosphate feed.

The company largely managed to maintain the pace of work and export volumes during the crisis thanks to government support measures. The company, as an exporter of finished products, receives support from the state through the provision of loans in national currency and subsidies of interest. For example, the Development Bank of Kazakhstan JSC, within the framework of the exporters support program, in 2015 opened a credit line for the purchase of raw materials, materials and services for pre-export operations. This line expired in August 2020. To date, an agreement has been signed to open a credit line for a new period until 2023.

The company plans to increase the production of fertilizers in two stages and launch capacities up to 1.5 million tons of fertilizers per year. Also, work is constantly underway to improve the quality of already manufactured products, which will ensure a stable presence in the world market. The construction of the second stage of the production of mineral fertilizers for 500 thousand tons per year has already begun.

4. A summary of guidelines and best practices for the supply of critical raw materials for MSMEs

Critically important raw materials in the field of activity of sectoral MSMEs occupy a very small share of their market, these are only a few medium-sized enterprises, in particular: LLP "Stroyservice" and LLP "Dostau Litos" (production and supply of barite concentrate), LLP "Tioline" (Obukhovskiy GOK), Satpayevskiy GOK, Expoengineering LLP (extraction of titanium-zirconium sands and production of ilmenite concentrate and rutile-zirconium middling product. Guaranteed sales are provided for barite concentrate (the first two of the above-mentioned enterprises) by regular consumers by Kazakhstani oil and gas companies, the main consumer of South and Western Kazakhstan. ilmenite concentrate is the Ust-Kamenogorsk titanium-magnesium plant, rutile-zirconium middling is exported to enterprises that can separate it into rutile and zircon concentrate with high added value. significantly lower than the corresponding concentrates, and capital investments for the organization of production for the separation of middlings into two conditioned concentrates are too significant.

Thus, the main constituent elements of best practice for MSMEs in Kazakhstan are sustainable demand for the products of these enterprises, primarily in the domestic market. This is especially important in the current epidemiological situation, when manufacturers have large losses of time due to idle time of goods at the borders.

Conclusions:

Market mechanisms operating in Kazakhstan are generally favorable for the development of MSMEs. Despite the pandemic, the number of MSMEs in the mining and geological sector of the economy increased in 2020-2021, thanks to the liberalization of legislation on subsoil and subsoil use, as well as the ease of registering MSMEs. However, during this period, the number of workers in the MSME industry declined.

Due to the low criteria for attribution to MSMEs, the participation of these enterprises in the CRM supply chains is minimal. To expand the participation of MSMEs in working with CRM, the state needs to create special programs for organizing technological research on the extraction of CRM contained in secondary sources (tailings, ash and slag dumps). This type of subsoil use, with favorable financial conditions and increased accessibility to advanced technologies, can attract MSMEs to participate in the development of additional CRM sources. This option is able to solve, in addition to the production of products, also the tasks of disposal of a certain part of the hazardous waste of mining and processing and metallurgical industries.

4.1. Recommendations for MSMEs in Kazakhstan

A wide range of CRM resources, which Kazakhstan has at its disposal, allows, in the future, to significantly increase the importance of MSMEs in the mining and geological sector of the country's economy. The growing global demand for many types of CRM products as part of the move towards a "green economy" should have a positive effect on the prospects for increasing prices for CRM, which, in turn, will cause the need to develop new fields and create new industries. Taking into account the regional dispersal of deposits across the territory of Kazakhstan, in different regions of the country there are specific prospects for the development of such new industries.

So, for example, in East Kazakhstan, where there are complex pegmatite deposits containing tantalum, niobium, tin, lithium, on the basis of which, until 1993, the Belogorsk mining and processing plant operated, with an increase in demand for these CRMs, several (3 -4) new mines, as well as built new processing plants.

In Eastern and Central Kazakhstan, on the basis of numerous tailings and slag dumps of metallurgical production, with a favorable development of the market for a number of CRMs (antimony, bismuth, cobalt, germanium, scandium and some others), conditions can be created for organizing MSMEs to create new industries from secondary sources, subject to the development of new technologies.

In addition, the development of the "green economy" will definitely contribute to the increase in the existing production volumes, which today extract some types of CRM (barite, phosphorites, bauxite, silicon, vanadium, titanium, etc.).

4.2. Application of Policy Recommendations for Kazakhstan.

First of all, the efforts of the state should be focused on the implementation of the recently adopted State Program for Support and Development of Business "Business Road Map 2020" [25], which is designed to ensure sustainable and balanced growth of regional entrepreneurship, as well as maintaining existing and creating new permanent jobs. In particular, this program should be implemented by 2025:

- 1) Bringing the share of MSMEs in GDP to at least 33.8%.
- 2) Increase in tax revenues from Program participants 2 times from the level of 2017.
- 3) Creation of new 30 thousand jobs by the Program participants.

4) Bringing the share of manufacturing in the structure of GDP to at least 13.4%.

5) Bringing the share of medium-sized businesses in the economy to at least 13.7%.

In addition to the implementation of this State Program, it is also necessary to carry out the following actions at the state level:

- to carry out a centralized certification of waste - dumps of substandard ores, tailings, ash and waste disposal sites;

- provide MSMEs with access to advanced technologies for recycling waste from mining and processing and metallurgical industries;

- adopt a targeted Program for the development of new technologies for recycling waste with the aim of additional extraction of CRM;

- allocate targeted grants for the introduction of advanced technologies and the development of new technologies;

- develop and implement a system of non-bank financing for MSME;

- ensure the availability of refresher courses for permanent development and improvement of MSME employees; including providing organization of needs-based financial education MSME entrepreneurs;

- form an accessible program for the provision of state grants in areas of concern for MSME;

- on a regular basis to assess and forecast financial and operational risks for MSMEs.

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