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Assessment of metallurgical enterprises' activities in Kazakhstan in the context of international trends

Abstract. The geological industry of Kazakhstan is transiting to CRIRSCO, the international system of reporting standards for mineral reserves. In view of the set tasks, the problem of adjusting the geological and economic assessment of deposits is being updated in order to adapt it to the international requirements and to increase accessibility and transparency for a potential external investor. This research has been carried out on the basis of the Kazakhmys Corporation LLC, the largest international company engaged in exploring, mining and processing of various minerals. The authors of this paper have made an attempt to expand the geological and economic assessment of the enterprise by digitizing the key business processes. On the basis of the formed factual database of the geological and economic indicators and characteristics of the stratiform pyrite-copper-lead-zinc deposit Kuzmuryr, which is part of the Kazakhmys Corporation LLC, the economic indicators of extracting associated components have been calculated.

Digital transformation is a key area of technological development of the mining industry in Kazakhstan for the coming years. In this regard, automation of calculating the geological and economic assessment of the investigated field will allow the company not only to reduce investment and operating costs, but also to deepen the internal analytical work to monitor the effectiveness of the applied digital solutions. Transformation of the economy of Kazakhstan presupposes state support for promising regions. The article shows that transition of the Kuzmuryr deposit to underground mining in the medium term will accelerate the solution of pressing regional problems and remove social tension in the monotowns adjacent to the deposit. In order to strengthen its position in the global economy, Kazakhstan strives to achieve socio-economic goals in the field of sustainable development. It has been established that changing the method of production and automation of business processes of the Kazakhmys Corporation LLC will have a positive effect on the energy efficiency due to more rational use of available technologies. The research will improve the validity of predictive management decisions to strengthen the financial and economic situation and the international positions of the mining and smelting enterprise.

Keywords: Kazakhstan; CRIRSCO Codes; Digitizing; Deposit; Geological Economic Assessment

JEL Classifications: L53; O14; O25

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Оцінка діяльності металургійних підприємств у Казахстані в контексті міжнародних тенденцій

Анотація. Геологічна промисловість Казахстану переходить на CRIRSCO, міжнародну систему звітності про запаси корисних копалин. У контексті поставлених завдань актуалізується проблема коригування геолого-економічної оцінки родовищ з метою її адаптації до міжнародних вимог, підвищення доступності та прозорості для потенційного зовнішнього інвестора. Це дослідження було проведено на базі ТОВ «Корпорація Казахмис», найбільшої міжнародної компанії, що займається дослідженням, видобутком та переробкою різних корисних копалин. Автори зробили спробу розширити геолого-економічну оцінку підприємства через цифровізацію ключових бізнес-процесів. На основі сформованої фактичної бази даних геолого-економічних показників та характеристик шаруватого пірито-мідно-свинцево-цинкового родовища Кусмурын, що входить до складу ТОВ «Корпорація Казахмис», розраховано економічні показники видобування супутніх компонентів. Цифрова трансформація є ключовим напрямком технологічного розвитку гірничодобувної промисловості Казахстану на найближчі роки. У зв'язку з цим автоматизація розрахунків геолого-економічної оцінки досліджуваного родовища, дозволить підприємству поряд зі зменшенням інвестиційних і експлуатаційних витрат, поглибити внутрішню аналітичну роботу з моніторингу результативності застосовуваних цифрових рішень. Трансформація економіки Казахстану передбачає державну підтримку перспективних регіонів. У статті показано, що перехід на підземний видобуток корисних копалин родовища Кусмурын у середньостроковому періоді прискорить вирішення назрілих регіональних проблем, зніме соціальну напруженість у наближених до родовища моно містах. З огляду на зміцнення своїх позицій у світовій економіці, Казахстан прагне досягнення соціально-економічних цілей для забезпечення сталого розвитку. Встановлено, що зміна способу видобутку й автоматизація бізнес-процесів «Корпорації Казахмис» позитивно відобразяться на енергоефективності за рахунок більш раціонального використання наявних технологій. Проведене дослідження покращить обґрунтованість управлінських рішень для зміцнення фінансово-економічної ситуації та міжнародних позицій гірничо-металургійного підприємства.

Ключові слова: Казахстан; коди CRIRSCO; оцифровка; депозит; геолого-економічна оцінка.

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Оценка деятельности металлургических предприятий Казахстана в контексте международных трендов

Аннотация. Геологическая отрасль Казахстана переходит на международную систему стандартов отчетности по запасам полезных ископаемых CRIRSCO. В свете поставленных задач актуализируется проблема корректировки геолого-экономической оценки месторождений с целью адаптации ее к международным требованиям, повышения доступности и прозрачности для потенциального внешнего инвестора. Настоящие исследования проведены на базе ТОО «Корпорация Казахмыс» – крупнейшей международной компании, осуществляющей поисково-разведочные, добычные и перерабатывающие процессы разнообразных полезных ископаемых. Авторы статьи предприняли попытку расширить геолого-экономическую оценку предприятия за счет цифровизации ключевых бизнес-процессов. На основе сформированной фактографической базы данных по геолого-экономическим показателям и характеристикам стратиформного колчеданно-медно-свинцево-цинкового месторождения Кусмурын, входящего в состав ТОО «Корпорация Казахмыс», рассчитаны экономические показатели извлечения попутных компонентов. Цифровая трансформация является ключевым направлением технологического развития горнодобывающей промышленности Казахстана на ближайшие годы. В этой связи автоматизация расчетов геолого-экономической оценки исследуемого месторождения, позволит предприятию наряду с уменьшением инвестиционных и эксплуатационных затрат, углубить внутреннюю аналитическую

работу по мониторингу результативности применяемых цифровых решений. Трансформация экономики Казахстана предполагает государственную поддержку перспективных регионов. В статье показано, что переход на подземную добычу полезных ископаемых месторождения Кусмурын в среднесрочном периоде ускорит решение назревших региональных проблем, снимет социальную напряженность в близлежащих к месторождению моногородах. Для укрепления позиций в мировой экономике, Казахстан стремится к достижению социально-экономических целей в области устойчивого развития. Установлено, что изменение способа добычи и автоматизация бизнес-процессов ТОО «Корпорация «Казахмыс» положительно отразятся на энергоэффективности за счет более рационального использования имеющихся технологий. Проведенные исследования позволят повысить обоснованность управленческих решений по укреплению финансово-экономического состояния и укреплению международных позиций горно-металлургического предприятия.

Ключевые слова: Казахстан; коды CRIRSCO; цифровизация; месторождение; геолого-экономическая оценка.

1. Introduction

In the period of complication of geological exploration, when it is required to identify the objective laws of the development of geological exploration as a specific area of the economic activity, an objective geological and economic assessment of deposits is of particular importance. Moreover, such an assessment brings it as close as possible to the actually formed market with representation of the real state of the subject and the expected prospects for its advancement in the competitive environment. In addition to the above, there is a need for a reliable geological and economic assessment of deposits that have predictable mineral resources but are characterized by a low degree of exploration and do not have the necessary infrastructure, relocation of geological exploration to hard-to-reach areas, deterioration of mining and geological parameters of the development, which inevitably requires innovations in the process of production (State Program «Digital Kazakhstan», 2017; A set of measures for the technological re-equipment of basic industries until 2025 including elements of the Fourth Industrial Revolution, 2017).

2. Brief Literature Review

A review of foreign sources indicates the continuing interest in the growth of objectivity, transparency and correctness of geological and economic assessment of enterprises (Milkov, 2015; Yemez et al., 2016; Luo & Tung, 2017; Maghfouri et al., 2014; Sherin et al., 2020; Singh et al., 2016; Singh et al., 2017).

Kazakhstan is a member of the CRIRSCO International Committee and was the first post-Soviet country to reform the subsoil use sector by means of bringing it closer to the international requirements by transitioning to the international system of CRIRSCO mineral reserves reporting standards (Code of the Republic of Kazakhstan, 2021; Minister for Investment and Development of the Republic of Kazakhstan, 2019). The implementation of this system began in 2019, and until 2024 the transition period is envisaged for the successive replacement by enterprises of the previously adopted Soviet system of reserves classification. The country has developed the «Code of the Kazakhstan Association for Public Reporting on the Results of Exploration, Mineral Resources and Mineral Reserves (KAZRC), 2016», which corresponds to the CRIRSCO reporting template, and at the moment subsoil users are mastering this system (Qazgeology, 2019). There is no information in the open press on how enterprises are adapting to the new requirements, what difficulties they face and how they overcome them.

Kazakhstan is implementing the low-carbon development strategy striving to achieve the targets of the Paris Agreement (Official Information Source of the Prime Minister of the Republic of Kazakhstan, 2021; Andresen et al., 2021). The country is actively moving towards sustainability in its development, both at the current moment and in the foreseeable future by means of introducing progressive international experience (Rogge & Reichardt, 2016; Bloomberg, 2020; Sabuj et al., 2021).

Kazakhstan assesses realistically the risks to the economy in the event of failure to fulfill its international obligations, and takes into account the risk factors affecting foreign direct investment in the mining sector, which developing countries have already faced (Yang et al., 2020). In light of the above, the accumulated world experience is especially useful for the country demonstrating the need to take into account various environmental, social and national factors when assessing mineral reserves (Rupprecht, 2020).

To form the transparent environment in the interests of investors and in accordance with the recommendations of the OECD representatives regarding the establishment of an adequate

threshold for mineral reserves, it is envisaged to determine clear grounds for the prospects of each deposit. For Kazakhstan, a reliable and correct assessment of the resource potential of system-forming mineral raw materials will accelerate the formation of mining and smelting clusters, which will increase self-sufficiency of the regions.

Kazakhstan is reforming regional policy by supporting economic activities in the regions that contribute to the national growth while improving the living standards of the local population. This takes into account specifics of the region, its contribution to the country's economy (Ziganshina & Janusz-Pawletta, 2020).

Within the framework of the article, the authors summarize the results of studies aimed at bringing the geological and economic assessment of the field to the world standards. An attempt has been made to deepen the previous authors' research focusing on new aspects of the geological and economic assessment of enterprises in Kazakhstan from the standpoint of increasing requirements for digitalization of the key business processes (Issatayeva, 2020; Aubakirova, 2019).

The demand for this study is supported by an attempt to assess the impact of the information and communication technologies on the generalized performance indicators of mining enterprises, their positioning in the market and the opening prospects for their socio-economic advancement (Prodani et al., 2019).

The world experience demonstrates ever new opportunities for commercialization of metallurgical enterprises technologies (Van Rooyen et al., 2020). This is especially true in terms of developing new technologies, exchanging the experience at the international level in the use of advanced technologies and new knowledge for developing countries (Van der Heiden et al., 2016). The foregoing once again confirms the relevance of the issues under consideration for Kazakhstan, which in the past two decades has mainly adapted foreign experience but in recent years has demonstrated success in creating its own technical solutions.

The practical significance of our research consists in the fact that inclusion of the components calculated by the authors into the system of indicators of the Kazakhmys Corporation LLC activities will allow deepening for the first time in domestic practice the assessment of the international competitiveness of the enterprise. Automation of calculations of the considered components and their subsequent integration with the intelligent SAP ERP platform used by the Kazakhmys Corporation LLC, will provide an effective tool for planning and accounting for corporate resources. The unified system for collecting, storing, processing and presenting information will be improved for making operational management decisions supported by up-to-date digitized data of geological and economic assessment of deposits.

The theoretical and methodological basis of research is based on the methods of system and structural analysis, economic and mathematical modeling, the process approach, methods of mathematical statistics and forecasting. The systematic approach allowed studying the Kazakhmys Corporation LLC as a set of heterogeneous and dynamic economic subsystems. Using the process approach, the integration processes and business processes required for the geological and economic assessment of the field have been analyzed.

When solving the set tasks, the following software products were used: 1C: Enterprise 8. Management of our company for Kazakhstan. Basic version; Statistica, CASE-technologies, Excel, Expost forecasting.

The following data were used as the information base: legislative and regulatory acts of the Republic of Kazakhstan, long-term strategies and programs for the development of the geological industry of Kazakhstan, statistical data of the work of the Kazakhmys LLC and the Kusmurn deposit, information resources of the GEO-KZ LLC geological company of the Kazakhmys LLC deposits, scientific research by foreign scientists, materials posted in the Internet, statistical and research information accumulated by the authors.

3. Results

Economic indicators of extracting associated components

When performing a geological and economic assessment of the stratiform pyrite-copper-lead-zinc deposit Kusmurn and the study of permanent exploration conditions for the main mineral raw materials, it is necessary to substantiate the feasibility and procedure of calculating reserves of associated useful components. The key criteria for the industrial value of associated components

are as follows: the market demand, availability of the developed technological scheme of their extraction from the products of processing mineral raw materials and the degree of concentration in these products, which ensures extraction on the acceptable economic basis. In addition to the above-mentioned, there is taken into account the possibility of selective mining ore dressed with associated components.

Thus, the concept of an associated component is rather arbitrary and depends on the dynamically changing market conditions of various minerals. Associated components that are on the state balance sheet for a deposit but cannot be economically efficiently used («economically inactive») must be written off the balance sheet, or transferred to the category of off-balance minerals. Associated useful components are minerals contained in minerals, chemical elements and their compounds that are not of decisive importance for the industrial evaluation of a deposit, but during the processing of basic minerals they can be economically extracted and used, since for all the balance associated components subsoil users are required to pay tax for the extraction of minerals, regardless of whether they are used or not (Code of the Republic of Kazakhstan, 2021).

The studies have established that most of the associated components of the Kusmury deposit belong to the group of rare and trace elements (selenium, tellurium, cadmium) and are present in the form of impurities (isomorphic, mechanical, microinclusions) in the main ore-forming minerals of the deposits and do not form accumulations of their own minerals. When dressing, associated components are accumulated in concentrates, and during processing they are concentrated in commercial products or in mining waste.

Associated components in the ores of the Kusmury deposit of the Kazakhmys Corporation LLC were studied by us at the stage of geological exploration. During the operation period of the field, no studying of associated components was carried out.

The income obtained by a mining and processing enterprise is in general defined as the cost of the commercial product, R или NSR (net smelter return), paid by the buyer, minus the costs incurred by the manufacturer for the sale of these products including transportation to the consumer, insurance, marketing, etc.

For the Kazakhmys Corporation LLC, as well as for other mining and processing enterprises of Kazakhstan, it is important to determine the level of prices for metals in the resulting commercial concentrates and semi-finished products. The methodology of calculating the cost of marketable products and the income of an enterprise for different types of minerals has its own characteristics. However, the general principles are the same for most metallurgical companies in the world (Yin & Tang, 2020; Blocher et al., 2005).

The cost of marketable products (concentrate and semi-finished products) is determined in world practice on the basis of the sales prices of products by metallurgical plants minus the costs and profits of metallurgical processing. It is more convenient to express the NSR value as a percentage of the value of the commercial metal produced from the concentrate (semi-finished product).

In selective concentrates, the base metal is subject to evaluation. In concentrates containing precious metals, gold and silver are also subject to evaluation.

The Kazakhmys Corporation LLC, like many other metallurgical enterprises of the country, does not pay for all 100% of the metal contained in the concentrate. Table 1 provides the information of the payable metal grades in copper and zinc concentrates.

Table 1:
Payable metal contents in concentrates

Metal	Payable metal content
<i>Copper concentrates</i>	
Copper	Paid for 96.5 % metal in concentrate, but the minimum retention should be 1.10%
Gold	The cost of 1-1.5 g of gold in each ton of concentrate is not paid (depending on the agreement)
Silver	90 % of the metal contained in the concentrate is paid, but the minimum retention should be 30 g/t
<i>Zinc concentrates</i>	
Zinc	Paid for 85 % zinc in concentrate but 8 % minimum retention (industry standard)
Silver	Paid for 70 % silver after 3 ounce deduction. Payment can fluctuate by 60-80 % after holding 3-5 ounces
Cadmium	Paid for up to 70 % of cadmium in concentrate (by agreement, given a favorable situation on the metal market, currently not paid)

Source: Compiled by the authors based on the statistical data by the GEO-KZ LLP geological company

Payment for metallurgical processing of concentrates and metal refining is weakly related to the price of the metal, since it is also affected by the degree of utilization of metallurgical facilities, exchange rates and unusual situations (for example, closure of a large mine or force majeure events).

The presence of harmful impurities in the concentrate leads to an increase in costs of metallurgical enterprises for the production of pure metal. If the content of such impurities exceeds a certain specified level, consumers impose fines on the suppliers of such concentrates.

In a number of publications, when discussing the complexity of the processing of raw materials, an opinion is expressed that the cost of associated components significantly affects the cost of commercial products, and in some cases exceeds the cost of the main components (Söderholm et al., 2015; Birol & Keppler, 2000; Pomykalski et al., 2014; Piesse & Thirtle, 2000). The authors proceed from the assumption that precious metals are considered as associated components, the cost of which in concentrates is in some cases very significant. The content of rare components practically does not and cannot significantly affect the cost of flotation concentrates of non-ferrous metal ores.

Table 2 shows the calculation of the cost of all valuable components in copper concentrate, taking into account their possible extraction in metallurgical production (the cost of components in concentrate in % of the cost of metal has been calculated based on the actually accepted reduction with the reduction factor of ~0.9) according to the data on the Kusmury deposit:

- the cost of reducible selenium, tellurium and sulfur in 1 tonne of copper concentrate does not exceed USD 14.1 (of which USD 12.2 is the cost of sulfur), which makes 1.41% of the main components cost;
- the potential cost of non-reducible zinc, lead, cadmium in 1 tonne of copper concentrate is USD 35.1 (of which USD 32.4 is the cost of zinc), which makes 3.51% of the main components cost (Rudko et al., 2019; Issatayeva & Yefimenko, 2019).

In 2010-2014, the actual production of crude selenium at the Balkhash copper smelting plant, which is also a structural subdivision of the Kazakhmys Corporation LLC, varied from 37.139 to 52.165 tonnes, the selling price was in the range of USD 10-20 per 1 kg, which was significantly lower than the price of metallic selenium (USD 40.5 per 1 kg). For this reason, selenium production was discontinued in the following years.

The copper telluride production decreased from 4,066 tons in 2010 to 1,079 tons in 2012; copper telluride was not produced in 2013-2018. In 2010-2012, it was sold at a fixed price of USD 20 per 1 kg, which is also significantly lower than the price of metal tellurium (USD 40 per 1 kg).

The sulfuric acid production of the Kazakhmys Corporation LLC is represented by sulfuric acid shops of the Zhezkazgan and Balkhash copper smelting plants. In 2010-2018, the sulfuric acid

Table 2:
Calculating the cost of the main and associated components in the copper concentrate of flotation ore dressing of the Kusmury deposit

Component	Content, %	Amount of metal in the concentrate, kg/t	Possible reduction at the stage of metallurgical processing, %	Metal cost, USD /kg	Metal cost in 1 ton of the concentrate		
					% of the metal cost *	In USD	
Payable part							
Cu	23	230	95	4.5	85.5	884.9	
Au	0.00028	0.0028	90	38580	81	87.5	
Ag	0.0065	0.065	90	482	81	25.4	
Total							997.8
Theoretically reduced but not payable associated components							
Se	0.0203	0.203	45	20	40.5	1.64	
Te	0.019	0.186	3	40	2.7	0.20	
S	81.77	817.65	83	0.02	74.7	12.2	
Total							14.1
Non-reducible non-payable main and associated components							
Zn	4.2300	42.3	50	1.7	45	32.4	
Pb	0.3000	3.0	50	1.7	45	2.3	
Cd	0.0525	0.525	60	1.4	54	0.40	
Total							35.1

Note: * - the metal cost in the concentrate in % of the metal cost was calculated proceeding from the actually accepted reduction with the decreasing coefficient ~0.9.

Source: Compiled by the authors based on statistical data on the Kusmutyn deposit

production turned out to be unprofitable, which forced the produced sulfuric acid to be sold at its own expense. The cost of production of 1 tonne of sulfuric acid was USD 20.6.

The analysis made it possible to draw a conclusion. Considering low reserves of associated components, their low content, the absence of independent deposits of associated components, the absence of technologies of dressing and processing associated components, as well as the limited possibilities of extracting associated components at existing production facilities, it is recommended for the Kazakhmys Corporation LLC to carry out the procedure for transferring economically inactive balance reserves of associated components (selenium, cadmium, tellurium, sulfur) accounted for in categories C_1 и C_2 , in off-balance sheet reserves.

Based on the economic assessment of the efficiency of processing associated components for the Kazakhmys Corporation LLC, recommendations were developed on selecting the method of further development of the Kusmuryyn deposit with decreasing open pit mining and gradual transition to underground mining, as economically more effective in the medium term (Aubakirova, 2020).

The analysis of the results of technical and economic indicators of all the three options (Table 3) shows that the underground mining method is effective, since the main reserves of polymetallic ores are concentrated below the 600m horizon. Therefore, with the open mining method, a significant amount of stripping work will be required. The stripping ratio is 14.8-22.0 m³/t, and with the annual ore productivity of 1.0 million tonnes, the open pit mine output will be from 13.0 to 22.2 million m³ per year. Finally, as the open pit deepens, the length of the rock mass transportation increases, which will increase the cost of ore mining.

In order to reduce the cost of transporting of ore, several types of transport were considered within the open pit: trailer trucks, inclined skips and conveyors. However, due to the transportation of significant volumes of rock mass, no positive efficiency has been achieved. Thus, open pit mining of reserves (excluding additional exploration) is ineffective (Rudko et al., 2019).

The rest of the ore bodies can be mined by the underground method. The tendency of solid ores to spontaneous combustion obliges them to be mined with preventive measures for occurrence of underground fires. For this purpose, it is recommended to work out the development system with horizontal layers with filling. Disseminated ores can be mined in the usual way with overburden caving.

It should be stated that the results obtained on the remaining balance reserves (excluding additional exploration in 2012-2016) do not allow considering the Kusmuryyn field as an economically efficient field.

The above calculations correspond to the KAZRC system, according to which the Kazakhmys Corporation LLC reports of the results of exploration work, mineral resources, mineral reserves, the feasibility study for selecting the method of the further development of the deposit (Isataeva & Yefimenko, 2019; Aubakirova, 2020; Aubakirova, 2014).

Despite the main obstacles to digitalization of enterprises in Kazakhstan associated with the initially low level of automation, absence of financial resources, the digital infrastructure lagging from consumer demands and absence of competencies among personnel, the Kazakhmys Corporation LLC has set ambitious programs for implementing the program Industry 4.0 in all the business processes until 2025. If in 2017-2019 the emphasis was on the use of big data technologies, then from 2020 the foundations for building a digital model of the enterprise, mastering technologies that contribute to the growth of labor safety, reduce costs, and form effective cooperation with contractors are being laid (State Program «Digital Kazakhstan», 2017). In this aspect,

Table 3:
Technical and economic indicators of the options compared

Indicator	Unit	Option 1 (underground mining)		Option 2 (open pit mining)	Option 3 (open pit and underground mining)
		With driving the Ventilation shaft	With driving the transport incline and the lifting upraise		
Cost of cathode copper	USD /t	5,391	5,352	10,543	6,677
Capital expenditures	USD/million	250.6	226.8	40.9	223.6
Net present value	USD/million	46.0	67.9	-497.6	-65.6
Internal rate of return	%	14	17	-	-
Payback period	Years	7	6	-	-

Source: Compiled by the authors based on statistical data on the Kusmuryyn deposit

Kazakhstan has to carry out great work, because assessing the development sustainability and communication processes of mining enterprises are still new, and the related procedures are insufficiently studied. A variety of approaches to assessing the socio-economic and environmental challenges faced by the mining industry will need to be adapted to local conditions (Marimuthu et al., 2021). For Kazakhstan, as well as for other countries, various aspects of cybercrime management and the achievement of security in relation to the key energy infrastructures are becoming increasingly important (Pléta et al., 2020). All the calculations for the geological and economic assessment have been performed using software products and integrated with the intelligent SAP ERP platform of the Kazakhmys Corporation LLC. Reliability of the economic calculations carried out is largely determined by the value of the applied initial information at the investigated field (Häggquist & Söderholm, 2015).

In general, studies confirm that digitalization of the economic assessment of mineral deposits (Janocko et al., 2019) deepens not only the financial and economic component of the assessing the enterprise activities but also significantly affects technical prospects of the mining sector (Litvinenko, 2020).

Digitalization of geological operations at the Kusmurn deposit contributes to the growth of the effective planning its development validity in order to ensure the current and future growth in reserves, efficient extraction of ore mass and minimizing losses.

4. Conclusions

The above calculations of the geological and economic assessment of the Kusmurn deposit comply with the requirements of the international system of reporting standards for mineral reserves in the aspect of the obligations assumed by the Government of Kazakhstan in order to implement the Extractive Industries Transparency Initiative.

One more important point should be noted. Improving the geological and economic assessment of enterprises contributes not only to the approximation to the international system of reporting standards for mineral reserves CRIRSCO but also opens up new opportunities for assessing the sustainable development of the Kazakhmys Corporation LLC in accordance with the international code of GRI standards (Global Reporting Initiative) (Global Reporting Initiative) (Morhardt et al., 2002; Adams, 2017; Maas et al., 2016), solving regional socio-economic problems (UNIDO, 2020). Implementation of sustainable development by Kazakhstan enterprises is an important stage for the development of Kazakhstan on the way to entering the thirty leading countries of the world. In addition to the above and taking into account the increasing competition between regions in the country, including the one for obtaining government orders and additional investments (Tsaurkubule et al., 2020), the Government seeks to form the most favourable conditions for each region taking into account its specifics and expected contribution to the national economy (Meyer & Neethling, 2017).

In Kazakhstan, not all of the largest companies annually publish sustainable development reports in the format of the international set of the GRI standards, explaining this by the difficulties of adequately measuring the intellectual capital and systematizing the results of such measurements (GRI, 2021). The Kazakhmys Corporation LLC, as a mining company, whose activities have a significant impact on the living conditions of the population in the territories where it is located, also carries reputational risks by submitting such reports (EY's Global Mining & Metals Center, 2020). In light of the above, the opportunities that are opening up for the Kazakhmys Corporation LLC to replenish the indicators of the GRI standards with a reliable calculation of intellectual capital taking into account its invaluable contribution to the national economy (Radjenovic & Krstic, 2017) will strengthen its position in international markets and once again declare its involvement in sustainable development.

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