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Assessment of ESG Efficiency of the Oil and Gas Sector in Kazakhstan

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ABSTRACT

The oil and gas industry plays a key role in the global and national economy, necessitating the need to develop sustainable development strategies to ensure long-term growth and resource security. The purpose of the study is to provide a comprehensive analysis of the ESG (environmental, social, and governance) efficiency of oil and gas companies in Kazakhstan based on the developed methodological approaches. The research employs a combined approach integrating quantitative and qualitative methods. Quantitative analysis includes statistical methods, econometric modeling, and index assessment, while qualitative evaluation is based on expert reviews, best practice analysis, and corporate reports. Correlation and cluster analyses are used to examine ESG performance and classify companies into different sustainability categories. The study is based on data from the RAEX analytical agency and the Bureau of National Statistics, covering the period from 2013 to 2023. The findings reveal significant disparities in ESG efficiency among Kazakhstan's oil and gas enterprises. While leading companies demonstrate strengths in environmental sustainability (E-Rank = 6), they require improvements in social responsibility (S-Rank = 18) and governance (G-Rank=7). Correlation analysis indicates a strong relationship between industry wages and pollution levels, highlighting potential economic-environmental trade-offs. Achieving sustainable growth in Kazakhstan's oil and gas sector requires technological modernization, and enhanced collaboration between regulatory bodies and private enterprises. Future research should explore the long-term financial and operational impacts of ESG policies on industry competitiveness.

KEYWORDS: Economy, Economic Stability, Sustainable Development, Corporate Governance, Oil Production, Resource Management, Strategic Development, Kazakhstan

SCSTI: 06.77.61

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1. INTRODUCTION

Kazakhstan's oil and gas industry plays a strategic role in the national economy, contributing significantly to GDP and being a significant source of export revenues. However, the industry faces new challenges in modern times, such as global trends towards decarbonization and increased demands for corporate social responsibility, as well as the need to adopt sustainable development principles. Environmental pollution remains one of the biggest problems in modern society, with air pollution significantly impacting climate, hydrology, human health, and agriculture. Therefore, assessing the ESG performance of the oil and gas sector becomes increasingly important as a key component of sustainable development.

Historically, the development of Kazakhstan's oil and gas industry has intensified since independence in 1991. The attraction of large international investors and the introduction of modern technologies have allowed the country to take significant positions in the global energy market. However, despite the successes achieved, the economy's dependence on hydrocarbon exports makes the industry vulnerable to changes in international climate and economic policies. In this context, adaptation to the new requirements of sustainable development, including ESG standards, is becoming essential for maintaining competitiveness and ensuring the long-term growth of Kazakhstan's oil and gas sector.

Scientific research confirms that effective ESG policies help reduce the environmental impact of businesses, increase social responsibility, and improve corporate governance (Fattouh et al., 2019; Giese et al., 2019; Bereznoi, 2021). International experience from developed countries shows that integrating ESG approaches leads to technological modernization, reduces production risks, and ensures long-term business sustainability (OECD, 2020). Companies focused on ESG principles also gain competitive advantages, access to cheaper financing, and strengthen their reputations.

However, in Kazakhstan, implementing ESG standards is accompanied by several difficulties, including underdeveloped institutional frameworks, dependence on traditional energy resources, and limited opportunities for introducing innovative technologies into industry. These factors lead to significant differences in ESG efficiency between companies in the oil and gas sector. This requires the development of objective tools for assessing sustainable development, such as ESG rankings, which allow quantifying companies' sustainable development based on environmental sustainability, social responsibility, and corporate governance parameters. The study of ESG rankings is necessary to identify trends in ESG practices and identify industry leaders and companies that need modernization. This, in turn, allows us to formulate targeted strategies to improve ESG indicators and contribute to the comparative analysis of Kazakhstan's oil and gas companies with their peers in other countries. This approach provides an opportunity to identify competitive advantages for the national industry and directions for necessary reforms to increase the sustainability of the oil and gas sector over the long term.

Thus, given the need to improve Kazakhstan's ESG efficiency for oil and gas enterprises and substantial differences in indicators of sustainable development among enterprises, a comprehensive review of existing methods for assessing ESG performance is required. This study aims to provide a comprehensive analysis of the ESG (environmental, social, and governance) efficiency of oil and gas companies in Kazakhstan based on the developed methodological approaches.

2. LITERATURE REVIEW

Many studies are devoted to the problems of ensuring sustainable growth of oil and gas industry enterprises due to their strategic importance for the economy and resource security (Gurvich, 2004; Perepelitsa &

Zhdanova, 2017). Sustainable growth refers to the ability of enterprises to maintain economic stability, adapt to changes in the external environment, and ensure long-term development while minimizing negative impacts (Pera, 2017). An analysis of the scientific literature shows that the steady growth of oil and gas enterprises is directly related to introducing innovations, increased operational efficiency, diversification of production processes, and resource management optimization (Kiseleva et al., 2020). The results of several empirical studies emphasize the importance of developing strategies aimed at reducing production risks and adapting to changes in global energy markets (Fattouh et al., 2019; Giese et al., 2019). This process is associated with economic benefits, such as job creation and industrial production growth and environmental challenges, including increased pollutant emissions and land-use changes.

Some scientists have extensively studied the process of achieving sustainable growth in the oil and gas sector by focusing on improved production performance and the optimization of industrial processes. Their research highlights the pivotal role of digitalization in transforming traditional operations (Ahmad et al., 2017; Lanshina et al., 2021; Akhunov et al., 2021). Companies can significantly reduce operational costs and enhance energy efficiency by leveraging advanced technologies such as automation, big data, and artificial intelligence. These advancements streamline production and support broader sustainability objectives by minimizing environmental impact. The results of these studies demonstrate that companies backed by regional governments and institutional frameworks tend to achieve more substantial progress in adopting digital and green technologies. This collaborative approach fosters the development of innovation-friendly ecosystems, accelerates the integration of cleaner technologies, and facilitates the shift toward a low-carbon economy (Noll et al., 2018; Deng, 2013). Moreover, such initiatives often lead to the establishment of industry benchmarks and regulatory frameworks that encourage broader participation in sustainability efforts (Okeke et al., 2022).

Several studies have highlighted how oil and gas companies adapt to new global challenges, such as transitioning to a low-carbon economy and strengthening environmental standards (Peng et al., 2019; Bereznoi, 2021). Thus, Peng et al. (2019) emphasized reallocating investments from traditional hydrocarbon extraction to renewable energy sources, such as solar and wind energy. In their study, Hastings and Smith (2020) assessed the role of the oil and gas sector in achieving net-zero greenhouse gas emissions. The authors concluded that the knowledge and expertise accumulated within the oil and gas industry are essential for developing and scaling carbon capture and storage (CCS) technologies. Bereznoi (2021) examined the adaptation of oil and gas companies to increasingly stringent environmental standards under the framework of EU climate initiatives. The study highlighted that successful adaptation requires significant investments in sustainable technologies and the integration of innovative approaches to meet evolving regulatory demands.

Several literary sources suggest that market sentiment plays a key role in ESG investing in oil markets (Dowling et al., 2016; Serafeim, 2020). For example, ESG studies claim that companies with strong and weak ESG indicators but with temporary social contradictions are perceived as weak and strong companies. In addition, in anticipation of low (high) incentives, investors ignore investing in companies that have strong (weak) ESG indicators but with a negative (positive) momentum of sentiment (Amel-Zadeh & Serafeim, 2018).

Other scientists have studied the role of attracting long-term investments, which have taken various forms, including those considering environmental and social aspects (Ferrat et al., 2022; Janicka & Sajnog, 2021). Studies have shown that ESG reversals, i.e., negative events related to companies'

activities, can weaken the positive impact of ESG factors on financial results (Aouadi & Marsat, 2018). Some scientists are studying the role of attracting long-term investments in infrastructure modernization and development, as well as the impact of ESG factors on the attractiveness of oil and gas companies to investors (Eccles et al., 2017; Brzeszczyński et al., 2019). This aspect is particularly relevant for industries such as the oil and gas industry, which is under intense public and investor scrutiny due to its high environmental impact (Brantley et al., 2014).

Current trends and practices of integrating ESG factors in the oil and gas industry are developing rapidly. Research shows that companies increasingly adopt ESG practices to reduce risks and improve overall operational efficiency (Aldowaish et al., 2022). The results of the Charfeddine et al. study (2020) showed that positive changes in oil prices are significant in all cases with an expected positive sign, which means that an increase in oil prices leads to an increase in real GDP.

Kazakhstani scientists have also investigated the issues of sustainable development of industrial enterprises. They claim that the oil and gas industry is essential for both global and national economic growth. It generates technological discoveries (Karabalin & Tukayev, 2019). Modern processes of geological exploration, production, transportation, and processing are all accompanied by extensive research using advanced methods from other sectors of the economy. Stable links between the oil and gas sector and other industries will enable the formation of industries that can develop early through service provision in the oil and gas field. In their work, Tleuzhanova and Dildebayeva (2024) showed that sustainable development requires environmentally friendly technology, strict environmental standards, and efficient resource management. Nevertheless, against the background of the practical results obtained due to the rational use of hydrocarbon resources by leading powers of the world, Kazakhstan, with such a powerful raw material base, still cannot declare itself a state whose oil and gas resources are used with high complexity. Therefore, the strategy for economic development of domestic oil and gas processing and petrochemical industries should be aimed at gaining the necessary momentum for progress shortly (Egorov et al., 2018).

Based on the literature review, it can be concluded that the strategic importance of sustainable development for enterprises in basic industries lies in their key role in economic stability. Many studies have highlighted the significance of innovation, improved operational efficiency, and digitalization in achieving sustainable growth. However, much of the current research focuses on international aspects of sustainability without considering the specifics of national contexts. The Kazakh scientific literature primarily focuses on oil and gas development from a national economic and technological perspective. Meanwhile, a combined approach considering environmental, social, and economic factors remains under-researched. Therefore, this study aims to address this gap in the literature. The study's results will contribute to the formulation of practical recommendations aimed at improving operational efficiency, minimising environmental risks, and achieving long-term sustainable growth.

3. RESEARCH METHODS

This paper attempts to evaluate the environmental, social, and governance (ESG) efficiency of oil and gas companies based on data from the analytical agency RAEX and the results of correlation analysis. The study seeks to identify key factors influencing sustainable development in the oil and gas sector, focusing on ESG aspects.

The primary data source is the official statistics of RAEX and Kazakhstan's Bureau of National Statistics, which provide quantitative assessments of parameters related to the development of oil and gas enterprises. The work follows five steps shown in Figure 1.

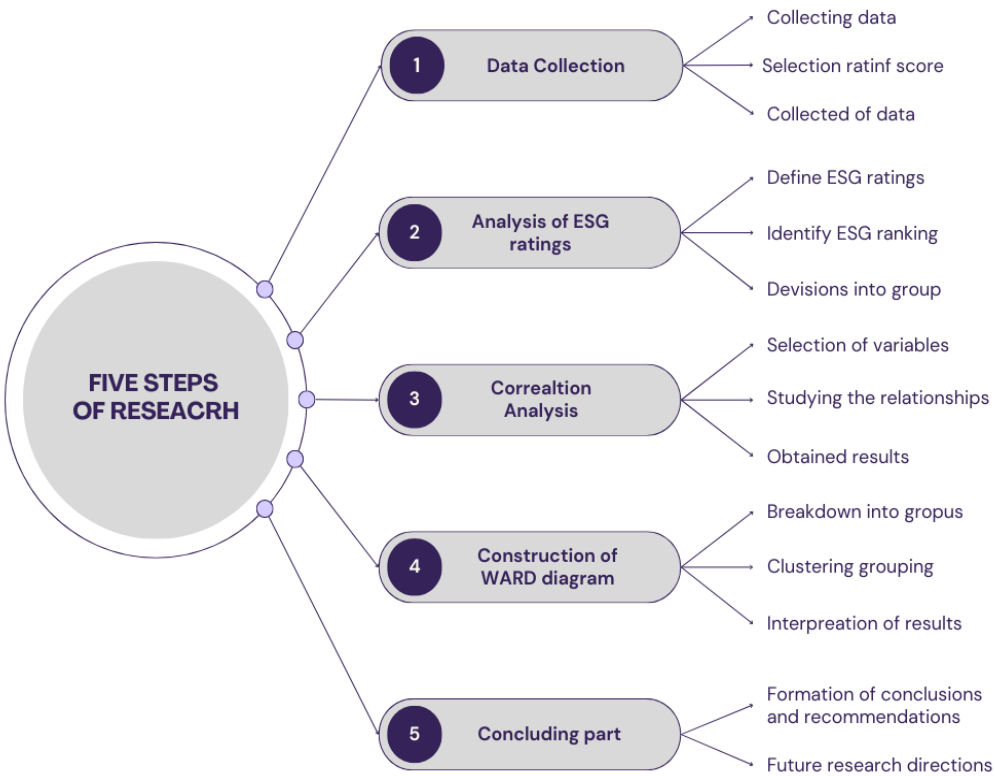

FIGURE 1. The scheme of the step-by-step stage of scientific research

According to the presented scheme, the research process was organised as a sequential execution of five key stages, each solving the tasks necessary for achieving a holistic result. At the initial stage, data was collected from official sources, emphasising its systematisation and the selection of indicators relevant to assessing companies' ESG ratings. Initial data was collected and used for further analysis, including information from annual collections of official statistics from the Bureau of National Statistics of Kazakhstan for the period 2013-2023.

The next step was to analyse ESG ratings, which allowed us to assess the competitive position of companies in the oil and gas industry and divide them into groups according to integral indicators. At this stage, the paper studied companies' operations' environmental, social, and managerial aspects. The companies' positions were evaluated based on ESG indicators, allowing us to group them according to integrated assessments (e.g., in categories with high, medium, and low scores).

Next, a correlation analysis was conducted in the third stage to study the relationships between selected variables. This stage allowed us to determine the level of linkages between various environmental, social, and managerial factors. Key variables for the analysis were selected (e.g., emissions, GDP, the oil and gas industry share, etc.), and a correlation matrix was constructed to identify the relationships among these indicators. In the fourth stage, cluster analysis was performed using the Ward method, which allowed us to form dendrograms to visualise the similarities among the study objects. Companies were divided into clusters that demonstrated their group characteristics, allowing them to be identified as homogeneous groups based on their key characteristics. The final stage included drawing conclusions, developing practical recommendations, and identifying

areas for further research. This step completed the combined assessment process.

The selection of variables for this analysis is critical to accurately assessing the effectiveness of ESG. Table 1 below provides a detailed explanation of the selected variables used in this study, which serve as the basis for the subsequent analytical processes. These variables cover a range of environmental, economic, and social indicators to provide a comprehensive view of the industry's sustainability dynamics.

TABLE 1. Explanation of the selected variables for the study

Code	Variable	Unit of measurement	Designation
Land_use_emissions	General emissions land use, land use change, and forestry	thousand tons	Y
Emissions_total	Per capita emissions of major pollutants	kg/person	X_1
Environmental_expenses	The volume of current expenditures on environmental protection	mln. tenge	X_2
Emissions_pol_per_capita	GDP per capita	mln. tenge	X_3
Oil_gas_gdp_share	Share of the oil and gas industry in GDP	%	X_4
Oil_profuction_dynamics	Dynamics of oil and gas condensate production,	mln. tons	X_5
Oil_gas_exports	Dynamics of oil and gas exports	billion dollars	X_6
Industry_avg_salary	Average wages in the industry	tenge	X_7

Note: compiled by authors

This dataset forms the basis for a structured analysis of ESG efficiency. It includes variables representing critical dimensions of sustainability, ranging from environmental impacts and economic contributions to social outcomes. By leveraging these indicators, the study aims to provide actionable insights into the ESG performance of Kazakhstan's oil and gas sector.

4. FINDINGS AND DISCUSSION

4.1 RESULTS OF ESG EFFICIENCY ASSESSMENT OF THE OIL AND GAS SECTOR

The international experience of structural and technological modernization shows that OECD countries with significant experience in ESG have achieved significant success in reducing their carbon footprint and minimizing environmental impact (OECD, 2021). In this context, the oil and gas sector play a key role in analyzing its approaches to structural reform and the implementation of ESG indicators. Additionally, the oil industry is a primary energy source and a significant contributor to economic growth in the region. Despite challenges like geopolitical instability and changes in global energy policies, the sector continues to grow. Cooperation between CIS countries in this field remains an essential factor for ensuring energy security, modernizing infrastructure, and developing new technologies.

Today, many rating agencies try to measure key criteria to help investors make appropriate decisions. At the same time, they use different approaches to assessing and defining criteria for each factor E, S, and G. Our paper attempts to compare the leading companies in Kazakhstan's and Russia's oil and gas sectors by their competitive positions in industry. The study uses data from RAEX, an analytical agency, which includes indicators such as E-rank, S-rank and G-rank (Table 2).

TABLE 2. ESG-ranking of companies in the oil and gas industry of Kazakhstan and Russia

Title of enterprise	Country	Industry	E-Rank	S-Rank	G-Rank
KazMunayGas	Kazakhstan	Oil and gas production	6	18	7
Tatneft Group	Russia	Integrated oil and gas companies	19	25	3
Rosneft	Russia	Integrated oil and gas companies	9	29	21
NOVATEK	Russia	Integrated oil and gas companies	16	8	48
LUKOIL	Russia	Integrated oil and gas companies	32	14	34
NC “QazaqGaz"	Kazakhstan	Oil and gas transportation	38	35	22
KazTransOil	Kazakhstan	Oil and gas transportation	55	23	20
Sakhalin Energy	Russia	Integrated oil and gas companies	26	34	79
Gazprom	Russia	Integrated oil and gas companies	36	50	52
Yakut Fuel and Energy Company (YATEK)	Russia	Integrated oil and gas companies	68	60	44

Note: compiled by authors based on RAEX (2024)

According to the data presented, companies in the oil and gas sector in Kazakhstan and Russia show significant differences in environmental, social, and managerial indicators, reflecting their current level of development and adaptation to the requirements for sustainable development. For example, Kazakh companies are distinguished by high environmental ratings, indicating active efforts to minimize environmental impact. However, they also need to develop corporate social responsibility further and improve management practices to increase efficiency and sustainability. By contrast, Russian companies have relatively high management performance, but their environmental and social aspects are less pronounced, underscoring the need to implement sustainable development principles.

In general, KazMunayGas has one of the best environmental indicators (E-Rank = 6), indicating a high environmental efficiency level. However, its social and managerial indicators are lower (S-Rank =18, G-Rank=7), which indicates the need to strengthen social responsibility and improve management processes. Russian companies, in turn, show more diverse results. For example, Tatneft has strong management indicators (G-Rank=3) but weaker environmental and social ratings (E-Rank =19, S-Rank =25), underscoring the need for improvement in these areas. Rosneft's environmental performance is balanced (E-Rank=9), while it's management and social performances remain average (G-Rank=21, S-Rank =29), reducing its competitiveness. The need for further integration of the principles of sustainable development remains relevant for Kazakhstan and Russia in order to increase the competitiveness and sustainability of their enterprises in the global market.

An important step in research is analyzing the Kazakh oil and gas industry in cooperation with Russian companies. Next, this paper focused on Kazakhstan's enterprises specializing in oil and gas upstream operations, such as exploration and production.

Table 3 ranks the oil and gas companies in Kazakhstan for 2022.

TABLE 3. ESG ranking of oil and gas enterprises in Kazakhstan

No.	Title of enterprise	Industry	E-Rank	S-Rank	G-Rank	Class
1	KazMunayGas	Integrated oil and gas companies	3	1	1	A
2	Karachaganak Petroleum Operating B.V.	Oil and gas exploration and production	2	2	5	B+
3	North Caspian Operating Company N.V. (NCOC)	Oil and gas exploration and production	1	3	7	B+
4	Nostrum (Zhaiykmunai LLP)	Oil and gas exploration and production	9	7	2	B+
5	Maten Petroleum	Oil and gas exploration and production	8	9	3	B+
6	Embamunaigas	Oil and gas exploration and production	4	4	6	B+
7	Mangistaumunaigas	Oil and gas exploration and production	5	6	4	B+
8	Kazakhoil Aktobe	Oil and gas exploration and production	6	5	7	B
9	Tengizchevroil	Oil and gas exploration and production	7	8	11	B
10	Kazakhturkmunai	Oil and gas exploration and production	10	10	12	B
11	Karazhanbasmunai	Oil and gas exploration and production	11	13	9	C
12	SNPS-Aktobemunaigas	Oil and gas exploration and production	12	11	14	C
13	KAZPETROLEUM GROUP	Oil and gas exploration and production	14	14	10	C

Note: compiled by authors based on RAEX (2024)

According to the data presented, Kazakh oil and gas companies demonstrate significant differences in environmental, social, and managerial aspects, reflecting their current level of development and willingness to implement the principles of sustainable development. According to the presented rating, the leader is KazMunayGas, which has received the highest integral rating of "A", indicating its strong position in all key ESG criteria. The second-ranking group, with a "B+" rating, includes such enterprises as Karachaganak Petroleum Operating BV, North Caspian Operating Company NV (NCOC), Nostrum (Zhaikmunai LLP), Maten Petroleum, and Embamunaigas. These industrial enterprises demonstrate stable results within the framework of individual ESG components, which reflects their importance for the oil and gas sector. However, their combined ratings indicate that there is room for improvement, especially in the areas of environmental responsibility and corporate governance.

The third group includes companies with a "B" rating, including Kazakhoil Aktobe, Tengizchevroil, and Kazakhturkmunai. These companies are located mainly in Kazakhstan's western and southern parts and have access to large hydrocarbon deposits. Despite the importance of their production activity, their compliance with ESG criteria remains limited, and their social activity remains relatively low.

Finally, a group of companies with a "C" rating shows the worst results according to the key ESG criteria. This group includes Karazhanbasmunai, SNPS-Aktobemunaigas, and KAZPETROLEUM GROUP. Low scores compared to the leaders in the ranking indicate the need for operations modernization and improvement of interaction with local

communities. The analysis reveals that these companies face problems, such as a low level of adoption of environmentally friendly technologies and a lack of attention to minimizing environmental harm. This is particularly noticeable against the backdrop of increasing demands for sustainable development and compliance with international environmental standards.

The global transition to sustainable development and the implementation of ESG principles brings the task of structural and technological modernization to the forefront for many states. For Kazakhstan, given its significant dependence on the raw materials sector and high carbon emissions, the problem of economic modernization is becoming extremely urgent. Increasing investment attractiveness, improving environmental sustainability, and growing companies' social responsibility require significant changes in resource management and use approaches.

4.2 RESULTS OF CORRELATION ANALYSIS

Kazakhstan's oil and gas industry plays a key role in shaping the national economy and influences various aspects of sustainable development. At the same time, the forms of sustainable growth have significantly transformed due to global challenges. In particular, the use of ESG approaches was driven by increased investor demand for more efficient use of information to make decisions about the profitability of enterprises.

Next, it is proposed to proceed to the results of correlation analysis, which allow us to study in detail the relationships between the studied variables (Figure 2).

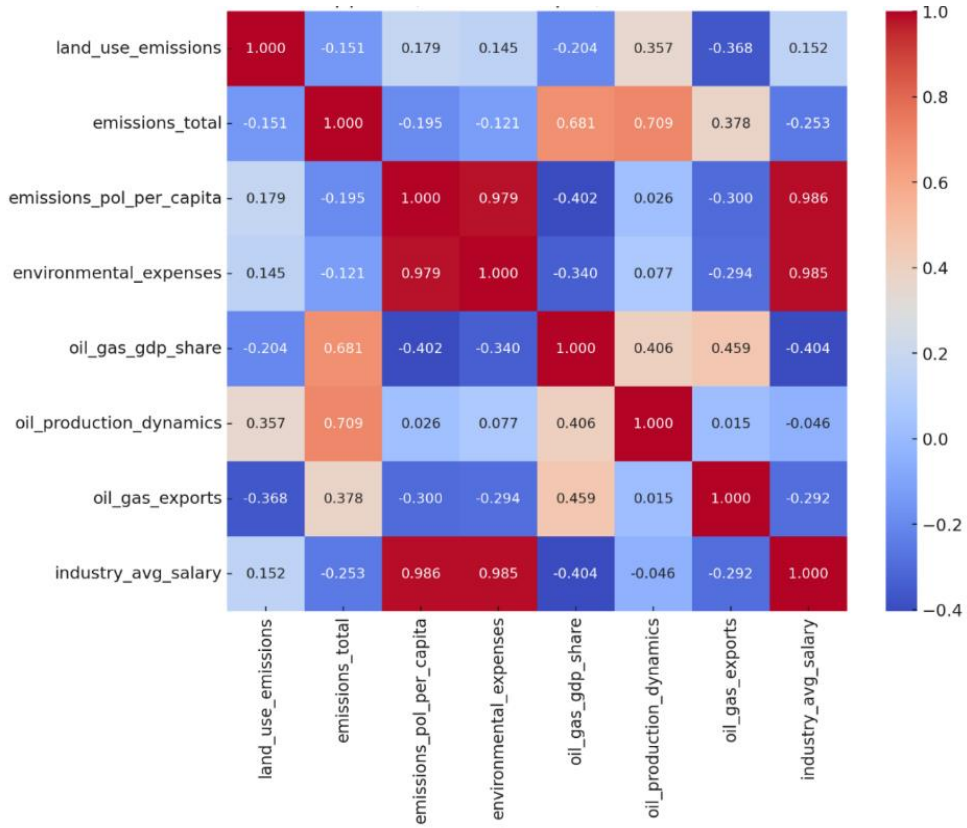

FIGURE 2. Matrix of correlation analysis

Note: compiled by authors based on Python

The oil and gas industry significantly impacts the environment: greenhouse gas emissions, water and soil pollution, and biodiversity loss. Moreover, the economy's reliance on fossil fuels may slow the transition to more sustainable and renewable energy sources. As a result, implementing ESG approaches is becoming a priority for most oil and gas companies. This trend is since the public, government, and investors demand specific actions in the field of ESG. Oil and gas companies that ignore the ESG agenda will be at a competitive disadvantage.

The results showed the presence of ambiguous relationships between the selected variables. The following results stand out in the group of the strongest positive correlations: the highest positive relationship was found between the emission of pollutants per capita and the average wage in the industry (0.986), which indicates a significant impact on income levels in the industrial sector on the environmental impact. A similar high positive relationship is observed between environmental costs and the average wage in the industry (0.985), which may indicate a redistribution of increasing incomes towards environmental programs. There is also a positive relationship between environmental costs and pollution emissions per capita (0.979), highlighting the growing costs of environmental measures with increasing pollution levels.

Next, we can identify a group of moderate positive correlations. Thus, there is a moderate correlation between the dynamics of oil production and the contribution of the oil and gas sector to GDP (0.406), which indicates a direct impact of production volumes on the economy's structure. Additionally, the positive relationship between oil production dynamics and pollution emissions (0.357) highlights the extractive sector's impact on the environment.

Finally, a group of strong negative correlations should be noted. Negative correlations have been found between the share of the oil and gas sector in GDP and the average wage in the industry (-0.404), which may indicate a redistribution of resources, in which a decrease in incomes in other industries accompanies an increase in the influence of the oil and gas sector. In addition, there is a negative relationship between the share of the oil and gas sector in GDP and pollution emissions per capita (-0.402), which may indicate a decrease in the economy's dependence on the oil and gas sector.

Hierarchical cluster analysis is used to visualize the identified relationships and their structure. This method allows for the grouping of variables based on their similarities and the identification of key patterns in the data.

Figure 3 is a dendrogram created from this analysis. It demonstrates which variables have the most substantial relationships and how they are grouped into clusters, reflecting the influence of economic, environmental, and social factors on the oil and gas sector.

The data shows a dendrogram obtained as a result of hierarchical cluster analysis using the Ward method, which reveals patterns in the dynamics of ESG efficiency in Kazakhstan's oil and gas sector for 2013-2023. Two main clusters were identified: 2014-2017 and 2021-2033. The first cluster includes 2009-12, which indicates relative stability in key ESG indicators. Corporate governance, environmental, and social sustainability showed minimal deviations, indicating the industry's stability, with minor regulatory and strategic management changes. The second cluster includes the period from 2018 to 2023, which is characterized by more pronounced fluctuations in ESG indicators. This consists of a subgroup from 2019 to 2102, where ESG efficiency is similar, which can be explained by stable industry trends such as strengthening environmental standards and a socially oriented transformation in corporate strategies. However, 2018 and 23 have separate development trajectories, likely due to institutional change, the influence of global economic factors, and the introduction of new ESG initiatives. A comparison of the distances between the clusters shows that 207 acts as a boundary between two stages in the evolution of ESG strategies for Kazakhstan's oil and gas sector.

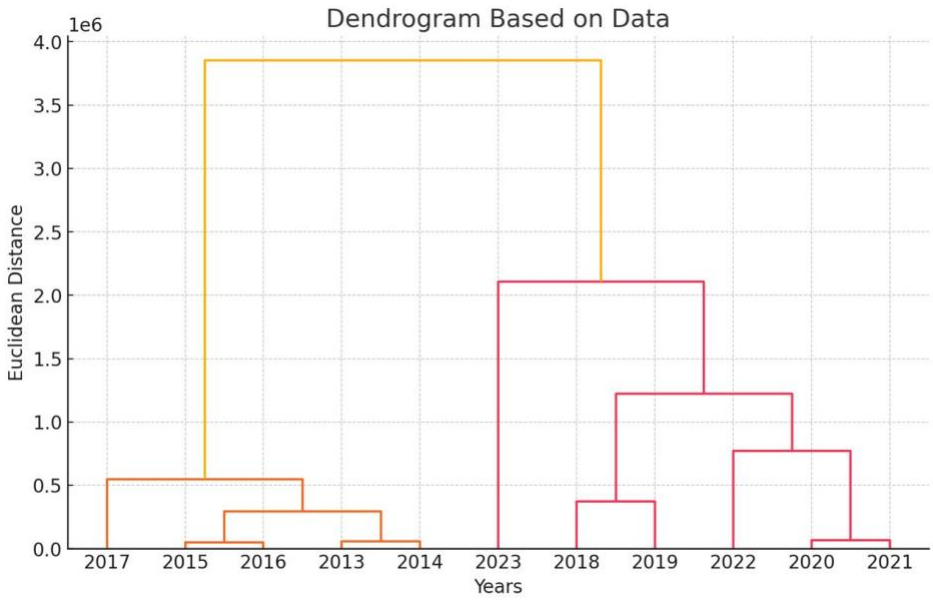

FIGURE 3. Dendrogram based on data

Note: compiled by authors based on Python

The significant difference in Euclidean distance between data groups before and after 27 indicates changes in corporate and regulatory practice that occurred during that period.

Thus, cluster analysis confirms that, since 2018, ESG-oriented initiatives have become more visible. At the same time, challenges remain related to the adaptation of companies to new standards for sustainable development. These findings emphasize the need for continued monitoring of the dynamics of ESG indicators and the development of strategies to enhance the effectiveness of the sustainable development of Kazakhstan's oil and gas industry.

5. CONCLUSIONS

The purpose of the study is to provide a comprehensive analysis of the ESG efficiency of oil and gas companies in Kazakhstan based on the developed methodological approaches. An analysis of existing research has shown that introducing ESG standards in the oil and gas sector is an important tool for increasing companies' competitiveness and sustainable development. Many scientific papers have shown the need to adapt the oil and gas industry to the global energy transition, strengthen environmental standards, and diversify activities through investments in renewable energy sources. However, in Kazakhstan, the process of implementing ESG approaches faces a number of barriers, including institutional and infrastructural constraints, dependence on traditional energy sources, and insufficient development of mechanisms.

Based on the conducted research, the following conclusions were obtained.

Firstly, the results of the ESG ranking of oil and gas companies in Kazakhstan demonstrated significant differences in the level of sustainable development between enterprises. Leading companies such as KazMunayGas have shown high environmental efficiency, which indicates implementing environmental protection measures and initiatives to reduce the carbon footprint. However, their positions in social

responsibility and corporate governance remain relatively low, indicating the need to improve domestic policy in these areas. Companies classified as having low ESG results, such as Kazakhoil Aktobe, Tengizchevroil, and Kazakhturkmunai, demonstrate an insufficient level of implementation of sustainable practices. A high environmental impact and a weak level of corporate governance characterize their activities.

Secondly, the study's results confirmed that the ESG efficiency of Kazakhstan's oil and gas companies varies significantly. The analysis showed that the leading enterprises demonstrate a high level of environmental sustainability, but their social responsibility and corporate governance remain relatively low. This indicates the need to find a balance between sustainable development and economic efficiency. Correlation analysis revealed a strong positive relationship between the industry's income level and the amount of environmental pollution, which indicates economic and environmental trade-offs. In addition, a link between environmental protection costs and emissions has been found, highlighting the need for more efficient use of environmental investments.

A comprehensive reform of policies and management approaches is required to increase the ESG efficiency of Kazakhstan's oil and gas sector. First, national ESG standards adapted to the specifics of the Kazakh economy must be developed and implemented. Second, the government should strengthen the regulation of environmental activities by providing incentives to reduce its carbon footprint, including tax incentives and subsidies for investments in green technologies.

Future research should focus on developing methods to assess the long-term impact of ESG policies on the operating results of oil and gas companies and explore the possibilities of integrating renewable energy sources into the oil and gas sector. In addition, it is necessary to conduct an in-depth analysis of international experience in the field of corporate governance and its adaptation to the conditions of Kazakhstan, which will increase the sustainability and competitiveness of the industry.

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REFERENCES

Ahmad, N., Ribarsky, J., & Reinsdorf, M. (2017). *Can potential mismeasurement of the digital economy explain the post-crisis slowdown in GDP and productivity growth?* OECD Statistics Working Papers, No. 2017/09. A Publishing. https://doi.org/10.1787/a8e751b7-en

Akhunov, R. R., Akhunova, L. R., Marichev, S. G., & Nizamutdinov, R. I. (2021). Russian oil and gas regions during the COVID-19 crisis and their digital transformation. *R-Economy*, *7*(3), 179-191. https://doi.org/10.15826/recon.2021.7.3.016

Aldowaish, A., Kokuryo, J., Almazyad, O., & Goi, H. C. (2022). Environmental, Social, and Governance Integration into the Business Model: Literature Review and Research Agenda. *Sustainability*, *14*(5), 2959. https://doi.org/10.3390/su14052959

Amel-Zadeh, A., & Serafeim, G. (2018). Why and how investors use ESG information: Evidence from a global survey. *Financial Analysts Journal, 74*(3), 87–103. https://doi.org/10.2469/faj.v74.n3.2

Aouadi, A., & Marsat, S. (2018). Do ESG Controversies Matter for Firm Value? Evidence from International Data. *Journal of Business Ethics, 151*, 1027-1047. https://doi.org/10.1007/S10551-016-3213-8

Bereznoi, A. (2021). Global oil & gas corporations in the race for technological superiority. *World Economy and International Relations, 65*(5), 59-67. https://doi.org/10.20542/0131-2227-2021-65-5-59-67

Brantley, S.T., Bissett, S., Young, D.O, Wolner, C.W., & Moore, L.G. (2014). Barrier Island Morphology and Sediment Characteristics Affect the Recovery of Dune Building Grasses following Storm-Induced Overwash, PLOS ONE, 9. http://dx.doi.org/10.1371/journal.pone.0104747

Brzeszczyński, J., Ghimire, B., Jamasb, T., & McIntoshd, G. (2019). Socially Responsible Investment and Market Performance: The Case of Energy and Resource Companies. *The Energy Journal, 40*, 17 - 72. https://doi.org/10.5547/01956574.40.5.jbrz

Charfeddine, L., Klein, T., & Walther, T. (2020). Reviewing the oil price–GDP growth relationship: A replication study. *Energy Economics, 88*, 104786. https://doi.org/10.1016/j.eneco.2020.104786

Deng, N. (2013). Study on the management innovation of enterprises in knowledge economy era. *Business and Management Research, 2*(4), 142-147. https://doi.org/10.5430/bmr.v2n4p142

Dowling, N.A., Youssef, G.J., Jackson, A.C., Pennay, D., Francis, K.L., Francis, K.L., Pennay, A., & Lubman, D.I. (2015). National estimates of Australian gambling prevalence: findings from a dual-frame omnibus survey. *Addiction (Abingdon, England), 111*, 420 - 435. https://doi.org/10.1111/add.13176

Eccles, R. G., Kastrapeli, M. D., & Potter, S. J. (2017). How to integrate ESG into investment decision-making: Results of a global survey of institutional investors. *Journal of Applied Corporate Finance, 29*(4), 125–133. https://doi.org/10.1111/jacf.12267

Egorov, O. I., Amaniyazova, G. D., & Saubetova, B. S. (2018). Oil refining and gas chemistry as priorities of innovative development of economy of oil and gas regions of Kazakhstan. *Economy: strategy and practice, 3*, 87-98. https://esp.ieconom.kz/jour/article/view/40/0?locale=en_US (In Russ.)

Ferrat, Y., Daty, F., & Burlacu, R. (2022). Short- and long-term effects of responsible investment growth on equity returns. *Journal of Risk Finance, 23*(1), 1-13. https://doi.org/10.1108/JRF-07-2021-0107

Fattouh, B., Poudineh, R., & West, R. (2019). The rise of renewables and energy transition: What adaptation strategy exists for oil companies and oil - exporting countries? *Energy Transitions, 3*, 45–58. https://doi.org/10.1007/s41825-019-00013-x

Giese, G., Lee, L.-E., Melas, D., Nagy, Z., & Nishikawa, L. (2019). Performance and risk analysis of index-based ESG portfolios. *The Journal of Index Investing, 9*(4), 46–57. https://doi.org/10.3905/jii.2019.9.4.046

Gurvich, E. (2004). Macroeconomic Role of Russia's Oil and Gas Sector. *Voprosy Ekonomiki, 10*, 4-31. https://doi.org/10.32609/0042-8736-2004-10-4-31 (In Russ)

Hastings, A., & Smith, P. (2020). Achieving net zero emissions requires the knowledge and skills of the oil and gas industry. *Frontiers in Climate, 2*, 601778. https://doi.org/10.3389/fclim.2020.601778

Janicka, M., & Sajnóg, A. (2021). The European Union's Environmental Policy and Long-Term Investments of Enterprises. *European Research Studies Journal, 4*, 335-355. https://doi.org/10.35808/ersj/2660

Karabalin, U. S., & Tukaev, A. K. (2016). New challenges and perspectives for the global oil market. *Neft i gaz, 4*(94), 11-21. http://neft-gas.kz/f/no4_neft_i_gaz_no4_2016.pdf (In Russ)

Kiseleva, O. N., Kulbyakina, A. V., & Ozerov, N. A. (2020). Innovative development technologies of oil and gas industries. *IOP Conference Series: Materials Science and Engineering, 862*, 062090. https://doi.org/10.1088/1757-899X/862/6/062090

Lanshina, T., Barinova, V., Kondratiev, A., & Romantsov, M. (2020). Sustainable development and digitalization: The unusual COVID-19 crisis requires original solutions. *International Organisations Research Journal, 15*(4), 91–114. https://doi.org/10.17323/1996-7845-2020-04-05

Noll, F., Lüke, W., Wappler, M., & Oles, M. (2018). Industrial companies in innovation ecosystems. *2018 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC),* 1-5. https://doi.org/10.1109/ice.2018.8436300

OECD. (2020) OECD Business and Finance Outlook 2020: Sustainable and Resilient Finance, OECD Publishing, Paris, https://doi.org/10.1787/eb61fd29-en

Okeke, I. C., Agu, E. E., Ejike, O. G., Ewim, C. P.-M., & Komolafe, M. O. (2022). Developing a regulatory model for product quality assurance in Nigeria's local industries. *International Journal of Frontline Research in Multidisciplinary Studies, 01*(02), 054–069. https://doi.org/10.56355/ijfrms.2022.1.2.0055

Pera, J. (2017). An enterprise's financial stability and its sustainable growth: A risk-based perspective. *International Entrepreneurship Review, 3*(2), 49-62. https://doi.org/10.15678/PM.2017.0302.04

Perepelitsa, D. G., & Zhdanova, O. A. (2017). Peculiarities of investment decision-making in the oil and gas industry aimed to ensure sustainable growth of the Russian economy. *International Journal of Energy Economics and Policy, 7*(1), 216-223. https://econjournals.com/index.php/ijeep/article/view/3859

Peng, Y., Li, J., & Yi, J. (2019). International oil companies' low-carbon strategies: Confronting the challenges and opportunities of global energy transition. *IOP Conference Series: Earth and Environmental Science, 237*(4), 042038. https://doi.org/10.1088/1755-1315/237/4/042038

RAEX. (2024). ESG ranking of oil and gas companies. Retrieved October 25, 2024 from https://raex-rr.com/

Tleuzhanova, M., & Dildebayeva, Zh. (2024). Role of oil production in the economic development of Kazakhstan. *Neft i gaz, 4*(142), 102-111. http://neft-gas.kz/f/nig_4_104-113.pdf (in Russ)

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