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Integrated Policy Strategies and Regional Policy Coordination for Resilient, Green and Transformative Development: Supporting Selected Asian BRI Partner Countries to Achieve 2030 Sustainable Development Agenda

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Oil and gas sector of Kazakhstan: its challenges and opportunities for decarbonizing the economy

Abstract

The research conducted within the framework of this paper focuses on the analysis of the decarbonization potential of the oil and gas industry in Kazakhstan. The study is structured in four main sections. Chapter 1 provides an overview of the oil and gas sector of Kazakhstan including description of the key industry players, highlighting the role of the sector for the economy, and reviewing of GHG emissions and key trends. Chapter 2 analyzes the regulatory framework, providing an overview of national regulations to address GHG emissions and the greening of the economy, and an assessment of the performance of existing and planned policies, their gaps, and opportunities. An analysis of the key challenges and opportunities for decarbonizing the sector is presented in Chapter 3, which looks at the key challenges facing oil and gas companies in Kazakhstan, as well as best practices and methods for decarbonization. The final Chapter presents key policy recommendations for public authorities and the business sector to promote decarbonization.

Contents

KEYWORDS: Oil and Gas Sector, Greenhouse Gas Emissions, Emissions Trading System, Renewable Energy Sources, Energy Efficiency, Energy Transition

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Executive Summary

Kazakhstan, country rich in natural resources, has long depended on its oil and gas sector as a cornerstone of its economy. Over the last 10 years, however, Kazakhstan's growth has slowed from 10% over 2000-2007 to below 4% [1], highlighting the vulnerabilities of an economy still dependent on hydrocarbons. With the growing global emphasis on combating climate change and reducing carbon emissions, Kazakhstan faces significant pressure to decarbonize its energy sector.

Recognising these challenges, the Government of Kazakhstan is paying special attention to the transformation of the national economy towards its decarbonisation. Over the past 10 years, a number of strategic documents on sustainable development, transition to a green economy and carbon neutrality have been adopted, outlining practical steps to move the country towards a low-carbon development path.

In order to fulfil international obligations in the field of GHG emission reduction, Kazakhstan has been implementing a GHG emissions trading system (KazETS) since 2013.

GHG emissions from the oil and gas sector are still smaller than those from power or mining sectors, accounting for no more than 6% of the country's emissions. Meanwhile, the free allocation of greenhouse gas emission allowances increased from 19,055,377 units in 2013[2] to 22,379,767 units in 2025[3].

At the same time, the ETS is not the only factor influencing the success of the decarbonisation of Kazakhstan's oil and gas sector. Changes in energy prices will also be important in the energy transition, which will involve not only the purchase of carbon credits but also the construction of new power plants. For example, according to EY's estimates based on the approaches proposed by the Kazakhstan Electricity Association, in order to meet Kazakhstan's 2030 NDC target, the price of electricity to end users may increase by 24.12 KZT/kWh. This figure consists of 17.55 KZT/kWh due to a capital cost allowance and 6.57 KZT/kWh due to the cost of purchasing carbon units[4].

Kazakhstan has created rather mature legislation to support the development of renewable energy sources (RES), which are considered as one of the vectors of development of the energy complex of Kazakhstan in recent years. At the end of 2023, the volume of electricity generated by renewable energy facilities amounted to 6.67 billion kWh (wind – 3824.99 million kWh; solar – 1853.95 million kWh; hydro – 993.87 million kWh; Bioenergy – 2.71 million kWh) or 5.92% of the total volume of electricity generation.

A great potential for decarbonization of Kazakhstan's economy lies in the industrial energy efficiency sector. In order to accelerate further reduction of energy intensity of the economy, in 2023, the Concept for the Development of Energy Saving and Energy Efficiency in the Republic of Kazakhstan for 2023-2029 was adopted, covering the industrial sector, energy, transportation, buildings sector and population.

[1] https://www.worldbank.org/en/country/kazakhstan/overview#1
[2] Resolution of the Government of the Republic of Kazakhstan dated 13 December 2012 No. 1588 "On Approval of the National Plan of Allocation of Quotas for Greenhouse Gas Emissions for 2013" // https://adilet.zan.kz/rus/docs/P1200001588
[3] Order of the Minister of Ecology, Geology and Natural Resources of the Republic of Kazakhstan dated 11 July 2022 No. 525 "On Approval of the National Carbon Plan" // https://adilet.zan.kz/rus/docs/V2200028798
[4] Victor Kovalenko, EY, Is your business ready for the expected strengthening of carbon regulation? // https://www.ey.com/ru_kz/climate-change-sustainability-services/is-your-business-ready-for-expected-increase-in-carbon-regulation

In this paper, we highlight that, decarbonizing Kazakhstan's oil and gas sector presents numerous challenges, including economic, technological, regulatory, and social dimensions.

In addition to the high cost of Kazakh oil, issues of imperfect regulation of the domestic market, local oil and gas companies face a lack of incentive mechanisms for the implementation of decarbonization projects and imperfect climate change legislation.

The current system of carbon regulation in the Republic of Kazakhstan requires significant reform. Reduction of greenhouse gas emissions only through the current ETS system has a number of limitations and is insufficient to fulfill the international obligations of the country.

Under these conditions, the paper recommends that the most promising areas for decarbonization of the oil and gas industry at the moment appear to be improving operational efficiency and energy efficiency, as well as increasing the share of RES of sufficient ambition to achieve the goals of decarbonization of companies.

We further recommend that, to effectively promote decarbonization in its oil and gas sector, Kazakhstan needs a multifaceted strategy encompassing regulatory reforms, financial incentives, technological advancements, and stakeholder engagement. This document outlines key policy recommendations designed to facilitate this transition, ensuring that the nation can continue to harness its energy resources while minimizing its environmental impact.

Having a sound, fair and predictable legislative framework that provides clear target indicators and a set of different tools to achieve them encourages businesses to more actively develop and invest in their corporate climate strategies based on their operational goals and taking into account global best practices.

Introduction

This work is undertaken within the framework of the UNCTAD project “Integrated Policy Strategies and Regional Policy Coordination for Resilient, Green and Transformative Development: Supporting Selected Asian BRI Partner Countries to Achieve 2030 Sustainable Development Agenda”.

The project aims to assist four major developing countries in Asia – Kazakhstan, Malaysia, Pakistan, and Turkiye – in their efforts to achieve the Sustainable Development Goals (SDGs) and green industrialization. The main objective of the project is to support: 1) effective integrated policy strategies and improved capacity at the national level, including South-South peer learning; and 2) economic cooperation and policy coordination at the regional level.

The research conducted within the framework of this paper focuses on the analysis of the decarbonization potential of the oil and gas industry in Kazakhstan. Despite the fact that the total volume of direct carbon emissions from the oil and gas industry is not the most significant part of total country emissions (only about 6%), the integration of oil and gas sector companies into the overall process of decarbonization of the country's economy is important for a number of reasons. First, they have strong scientific, engineering, financial and managerial competencies. Secondly, due to the wide presence of major international oil and gas companies as investors in Kazakhstan’s market, there is an opportunity to access best practices, technologies and share experience through joint partnerships. And, of course, ensuring sustainable development of the oil and gas sector, as well as improving its competitiveness, is in the direct interests of the country, taking into account the crucial role of the oil and gas industry in the country's economy.

It is important to understand that the concept of low-carbon development is not so much about reducing greenhouse gas emissions as it is about focusing on the introduction of new technologies, developing scientific potential, increasing the operational efficiency of production and consumption, and modernizing infrastructure, which should lead to an improved quality of life for the population, healthier ecosystems and a more competitive economy. Climate transition goes beyond individual sectors, it concerns all sectors of the economy, which can be integrated into the implementation of new political transformations and structural economic reforms.

Thus, this study consists of four main sections describing the following areas:

I. Analysis of the Oil and Gas Sector of Kazakhstan:
   - Country Profile (including oil and gas sector organization in the country).
   - Oil and gas sector industrial profile, key industry players, the role of the sector for the economy.
   - Review of GHG emissions in the oil and gas sector and evaluation of key trends.

II. Legal framework analysis:
   - Review of national regulations to address GHG emissions and greening the economy.
   - Evaluation of the performance of existing and planned strategies, its gaps and opportunities.

III. Analysis of the key challenges and opportunities to decarbonize the sector:

- Review of key challenges that oil and gas companies meet while decarbonizing its operational assets in Kazakhstan.
- Best decarbonization practices and methods, and evaluation of key opportunities it could imply.

IV. Key policy recommendations to foster decarbonization:

- Recommendations for public authorities.
- Recommendations for corporate sector.

1. Analysis of the Oil and Gas Sector of Kazakhstan

1.1 Country Profile.

Kazakhstan is located in the heart of the Eurasian continent. Its territory is 2,724,900 square kilometres. It is the second largest country in the Commonwealth of Independent States (CIS) and the ninth largest in the world.

Kazakhstan's vast territory is rich in mineral resources. Companies engaged in the extraction and processing of coal, oil, gas, non-ferrous and ferrous metals play a leading role in the national economy. The most important minerals are ores of non-ferrous and ferrous metals, uranium. The world's largest reserves of chromium, vanadium, bismuth, fluorine, iron, zinc, tungsten, molybdenum, phosphorite, copper, potassium, cobalt, kaolin and cadmium have been discovered in Kazakhstan. There are about 250 oil and gas fields in the country, including the largest – Tengiz. The recoverable reserves of the Tengiz and Korolev fields are estimated at 750 million to 1.1 billion tonnes of oil. Kazakhstan has 160 million tonnes of coal reserves in 155 locations, including 10 deposits of coal, bitumen and lignite. Kazakhstan's iron ore resources are among the cleanest in the world. Kazakhstan ranks second in the world in phosphorite reserves (after Russia), thanks to the Zhanatas and Karatau deposits. Kazakhstan is the world's leading producer of aluminium. Huge reserves of copper ore are found in Zhezkazgan, the second largest deposit in the world. Kazakhstan has significant resources of salt and timber.

Since the early 2000s, Kazakhstan has experienced impressive economic growth, driven by the first generation of market reforms, rich mineral production and significant foreign direct investment (FDI). Sustained economic growth has transformed the country into an upper-middle-income country, contributing to higher living standards and poverty reduction.

Over the last 10 years, however, Kazakhstan's growth has slowed from 10% over 2000-2007 to below 4%[5], highlighting the vulnerabilities of an economy still dependent on hydrocarbons and with stagnant productivity growth.

Looking ahead, adjusting to the global green transition presents significant challenges for Kazakhstan.

Reviving economic growth and increasing productivity will require bolder steps to enable private sector development, modernize outdated infrastructure, including through public investment, and stimulate economic diversification by reducing national carbon emissions and increasing competition throughout the economy, complemented by human capital strengthening and policies to support decarbonization.

In 2023, real GDP grew by 5.1% largely due to a boost in oil production, fiscal stimulus, and strong consumption. Oil production's 6% increase significantly contributed to this growth. Consumer confidence remained high despite stagnant incomes and tight monetary policy, as evidenced by retail (7%, real terms), car sales (8%), and new business registration (10%). Capital investment also rose, predominantly in non-resource sectors (80%)[6].

Unemployment slightly decreased to 4.7%, and a substantial minimum wage increase helped reduce poverty to 8.8% (at USD 6.85/day). Inflation, which peaked at 21.3%,

[5] https://www.worldbank.org/en/country/kazakhstan/overview#1
[6] https://www.worldbank.org/en/country/kazakhstan/overview#3

slowed to 9.3% by February 2024, leading to a central bank rate cut. The current account shifted from a surplus to a deficit, with a drop in exports and a surge in imports, though FDI inflows helped finance this deficit. However, momentum has weakened as major investment projects in the oil sector, financed through FDI, near completion[7].

The budget deficit widened to 1.6% of GDP due to higher social spending and reduced oil tax revenue (1.2% of GDP). The banking sector remained strong, with low non-performing loans (3%), but rising household debt and interest rates warrant attention[8].

1.2 Oil and gas sector industrial profile, key industry players, the role of the sector for the economy.

The oil sector is one of the main pillars of Kazakhstan's economy, playing a key role in the formation of exports, the state budget and GDP, as well as long-term economic development. According to the statistical review of the world energy industry prepared by BP in 2021, the country possesses substantial oil reserves, ranking 12th globally with more than 30 billion barrels (3.9 billion tonnes)[9]. Approximately 80% of the oil extracted is directed towards export, primarily through Russian territory. Kazakhstan's gas resources are also among the top 20 in the world, with total reserves of 2.3 trillion cubic meters, accounting for about 1.2% of global reserves[10].

The country is the 10th major producer of oil in the world market[11] due to the availability of a wide range of raw materials. Kazakhstan has over 250 oil and gas fields registered[12]. Most of them are located in the west of Kazakhstan.

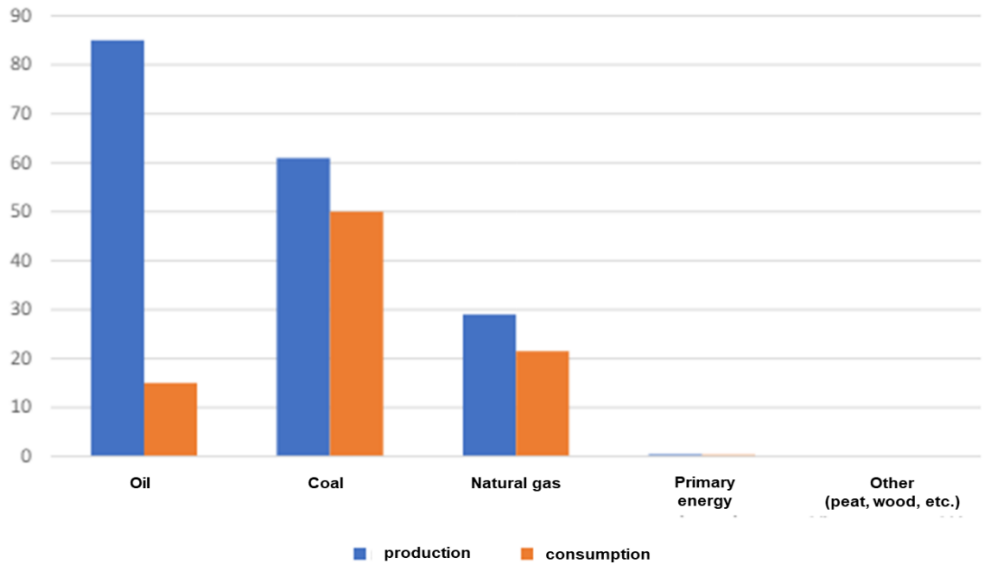
An analysis of oil and gas production data in recent years identified ten major oil-producing operators. Major oil companies include Tengizchevroil (TCO), Karachaganak Petroleum Operating (KPO), North Caspian Operating Company (NCOC N.V.), JSC "CNPC-Aktobemunaigaz", JSC "Mangistaumunaigaz", JSC "Ozenmunaigaz", JSC "Embamunaigaz", JSC "Karazhanbasmunai", Kazgermunai LLP, and Buzachi LTD[13]. Together, these companies accounted for 62% of the total oil production in the country in 2021. They represent consortia of large international oil and gas companies, joint ventures of Kazakhstani and international companies, as well as the national oil and gas operator.

According to the Eighth National Communication of the Republic of Kazakhstan and the Fifth Biennial Report to the UN Framework Convention on Climate Change, Kazakhstan remains a net exporter of primary energy resources (mainly crude oil). However, Kazakhstan's net primary energy exports fell more sharply than domestic consumption during the pandemic, so the share of total primary energy output supplied to the domestic market increased from 49.3% in 2019 to 50.1% in 2020. Looking ahead, the share of

[7] Ibid.
[8] Ibid.
[9] BP Statistical Review of World Energy, 2021. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf
[10] Ibid.
[11] https://oec.world/en/profile/hs/crude-petroleum
[12] KIOGE, Kazakhstan posts historic high in development of its oil and gas industry, (2020). https://kioge.kz/en/press-center/news/news-blog/1357-kazakhstan-posts-historic-high-in-development-of-its-oil-and-gas-industry
[13] TCO is a consortium of Kazakhstan's state-owned KazMunaiGas (20%), the US companies Chevron (50%) and ExxonMobil (25%), and Russia's Lukoil (5%). The Karachaganak Venture brings expertise and knowledge from five oil & gas companies — ENI SpA (29.25%), Shell plc (29.25%), Chevron (18%), Lukoil (13.5%) and KazMunaiGas (10%). NCOC is the consortium includes seven of the world's largest and most experienced energy companies: KazMunayGas (16,88%), Eni (16,81%), Shell (16,81 %), ExxonMobil (16,81 %), TotalEnergies (16.81 %), CNPC (8,33%) and Inpex (7,56%). Aktobemunaigaz and Buzachi are owned by Chinese state companies CNPC and Sinopec respectively. These companies, together with the Kazakh state-owned company KazMunaiGas, also have 50 per cent stakes in Mangistaumunaigas, Karazhanbasmunai and Kazgermunai. Ozenmunaigas and Embamunaigas are wholly owned by the state company KazMunaiGas.

production consumed domestically is expected to average 52% over the forecast period (reaching 61% in 2050)[14].

Figure 1. *Balance of primary energy resources in Kazakhstan by fuel type in 2020, in mln. tons of oil equivalent*



Source: The Eighth National Communication of the Republic of Kazakhstan and the Fifth Biennial Report to the UN Framework Convention on Climate Change

Visible primary energy consumption in Kazakhstan in 2020 decreased by 2.7% to 89.5 million tonnes of oil equivalent (Mtoe), reflecting a particularly sharp decline in oil demand (-12.3% to 15.8 Mtoe) and coal consumption (-0.9% to 49.8 Mtoe), while natural gas consumption increased (+0.2% to 21.3 Mtoe) and primary electricity consumption increased (+7.5% to 2.6 Mtoe).

Kazakhstan's net primary energy exports, about 80% of which have recently been oil, declined by 5.6% to 89.2 Mtoe in 2020 due to shocks to global oil markets as a result of the COVID-19 pandemic[15].

In general, Kazakhstan's oil sector continues to expand in physical terms. In 2023, oil production amounted to around 90 million tonnes, of which 70.5 million tonnes were exported[16].

These figures are the highest in recent years, but still below pre-recession levels. Such high production volumes are due to record oil production results at Kashagan, while the

[14]Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan, United Nations Development Program in Kazakhstan, Global Environment Facility. Eighth National Communication and Fifth Biennial Report of the Republic of Kazakhstan to the UN Framework Convention on Climate Change. Astana, 2022 // https://unfccc.int/sites/default/files/resource/684371_Kazakhstan-NC8-BR5-2-8NC_final_ru.pdf
[15]Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan, United Nations Development Program in Kazakhstan, Global Environment Facility. Eighth National Communication and Fifth Biennial Report of the Republic of Kazakhstan to the UN Framework Convention on Climate Change. Astana, 2022 // https://unfccc.int/sites/default/files/resource/684371_Kazakhstan-NC8-BR5-2-8NC_final_ru.pdf.
[16]Analytical Center Halyk Finance. Oil sector review 2023. // https://halykfinance.kz/download/files/analytics/HF_-_Neftyanoy_sektor.pdf

other two major fields – Tengiz and Karachaganak – showed subdued dynamics last year.

In addition, 30 hydrocarbon fields moved from the exploration stage to the production stage in 2023. The increase in recoverable reserves at these fields amounts to 115.4 million tonnes of oil and 25.5 billion m3 of gas. Commercial production at these fields will start within 3 years after their development (oil: Akzhar East – 51.4 million tonnes, Kul-Bas – 17.3 million tonnes, North Maybulak – 5.9 million tonnes, Bestobe – 5.0 million tonnes; gas: Kubasay – 6.6 billion m3, Ayrakty – 5.9 billion m3)[17].

The subsoil users are carrying out a number of measures for additional exploration of the fields (high-resolution seismic, processing and re-interpretation of data from previous seismic surveys, drilling of appraisal wells, re-interpretation of geophysical studies in wells, etc.). As a result of these works, the increase in geological oil reserves of the Uzen field amounted to 88.5 million tonnes (Ozenmunaigas JSC), Kalamkas field – 18.5 million tonnes (Mangistaumunaigas JSC), Karazhanbas field – 9.8 million tonnes (JSC Karazhanbasmunai), Asar field – 6.8 million tonnes (JSC Mangistaumunaigas), etc.[18]

Thanks to a favorable investment climate, the world's largest oil corporations from Europe, China, Russia and the USA operate in Kazakhstan. Over the years of independence, the volume of foreign direct investment in the industry amounted to more than 200 billion USD[19].

At the same time, the foreign investment in the oil industry declined in 2023. Lawsuits against the operators of Kashagan and Karachaganak, environmental fines, oil price volatility and the postponement of expansion projects at the Tengiz field contributed to the decline. Oil revenues to the consolidated budget and revenues from oil exports also fell amid the decline in oil prices, especially in the fourth quarter of 2023.

Throughout the period of Kazakhstan's independence, hydrocarbon resources have been and continue to be an extremely important factor for the country's economy, making a significant contribution to it. Since 2000, revenues from hydrocarbon exports (crude oil, gas condensate, oil products, natural gas) have grown manifold and account for more than half of the country's total export revenues (e.g. $50.7 billion in 2022, or 60% of the total of $84.4 billion); they also account for a significant percentage of total budget revenues and foreign direct investment[20].

The key role that the hydrocarbon industry has played in Kazakhstan since the beginning of this century also means that the country's macroeconomic trends are highly sensitive to the situation in world oil markets and oil prices, which can prove to be a decisive factor in the surplus or deficit of the state budget, as well as the profitability or unprofitability of investments in exploration and production.

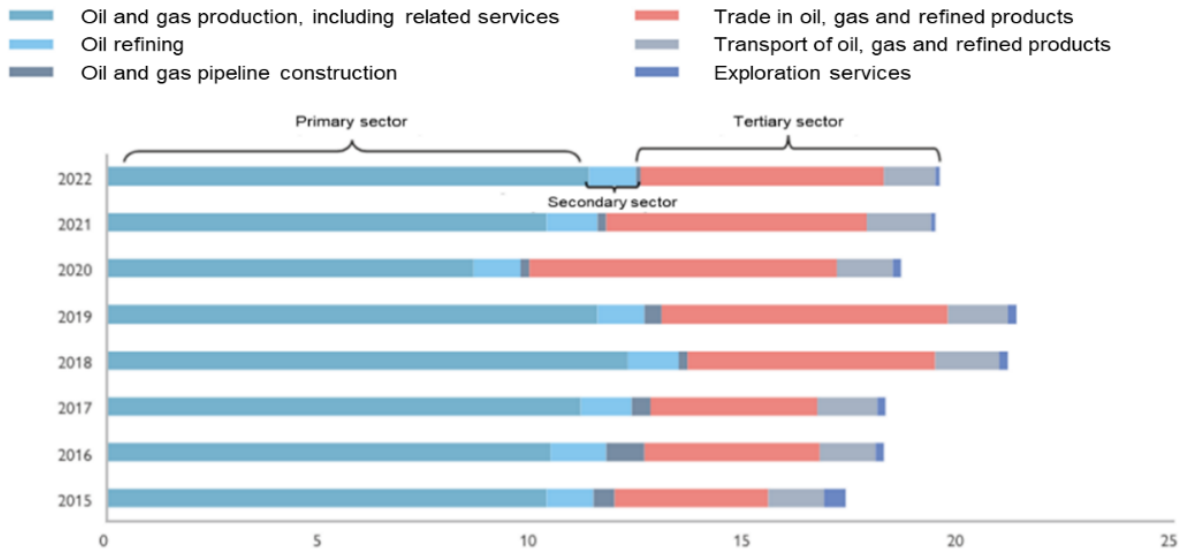
In 2020 GDP fell by 2.5% as a result of reduced external demand and lower prices for hydrocarbons exported from Kazakhstan in the midst of the COVID-19 pandemic. The economy was revived in 2021 reaching 4.3% GDP growth as economic activity returned to pre-pandemic levels and oil prices increased. GDP growth began to slow down in 2022 due to geopolitical tensions, and a weakening in oil price growth. Kazakhstan’s economic forecast for the next two years is steady growth. After rebounding from the adverse

[17]Ministry of Energy of the Republic of Kazakhstan. On reforms in the sphere of subsoil use // https://www.gov.kz/memleket/entities/energo/press/news/details/761668?lang=ru
[18]Ibid.
[19] Minister of Energy of the Republic of Kazakhstan. // https://informburo.kz/stati/nuzny-investicii-cto-proisxodit-s-neftegazovym-rynkom-kazaxstana
[20]Kazakhstan Association of Organizations of Oil, Gas and Energy Complex "KAZENERGY". National Energy Report KAZENERGY 2023 // https://www.kazenergy.com/upload/document/energy-report/NationalReport23_ru.pdf

impacts of Russia's invasion of Ukraine in 2023, growth is expected to slow to 3.4% year-on-year in 2024 due to lower-than-expected oil production[21].

The oil and gas industry provides a significant portion of government revenues and receipts to the country's consolidated budget. In addition, oil exports, as the "bedrock of the economy", account for a large share of total exports (54,2%)[22], making it one of the most important sources of foreign exchange earnings and the main source of the formation of the National Fund.

Figure 2. *Contribution of oil and gas industry to GDP of the Republic of Kazakhstan (% of GDP)*



Source: National Energy Report KAZENERGY 2023

Of the top 10 taxpayers in the country, 7 are from the oil and gas sector, and the top three are also occupied by hydrocarbon companies[23] (see Table 1 for more details).

Table 1. Top 10 taxpayers in Kazakhstan

Sub-item no.	Company name	Business direction	Origin of capital
1.	Tengizchevroil LLP	Oil and gas production	KazMunaiGas (20%),Chevron (50%), ExxonMobil (25%), Lukoil (5%)

[21]Kazakhstan Economic Update : Shaping Tomorrow: Reforms for Lasting Prosperity (English). Kazakhstan Economic Update Washington, D.C. : World Bank Group. // http://documents.worldbank.org/curated/en/099759502082435630/IDU133466db918b7c14af01903b1ab7f20dfb809

[22]https://stat.gov.kz/ru/industries/economy/foreign-market/publications/115718/

[23]Who pays the most taxes to the budget: top 10 companies named by the State Revenue Committee. https://tengrinews.kz/kazakhstan_news/platit-vsego-nalogov-byudjet-top-10-kompaniy-nazvali-533780/

2.	Karachaganak Petroleum Operating B.V.	Oil and gas production	ENI SpA (29.25%), Shell plc (29.25%), Chevron (18%), Lukoil (13.5%) and KazMunaiGas (10%)
3.	Mangistaumunaigas JSC	Oil and gas production	Share of China's CNPC (50%) and Kazakhstan's state-owned KazMunaiGas (50%)
4.	KAZ Minerals Aktogay LLP	Mining	Private enterprise
5.	Halyk Savings Bank of Kazakhstan JSC	Finance	Private companies (94%) and the Unified Accumulation Pension Fund of Kazakhstan (6%)
6.	North Caspian Operating Company N.V.	Oil and gas production	KazMunayGas (16.88%), Eni (16.81%), Shell (16.81%), ExxonMobil (16.81%), TotalEnergies (16.81%), CNPC (8.33%) and Inpex (7.56%)
7.	Ozenmunaigas JSC	Oil and gas production	Subsidiary of state-owned KazMunaiGas
8.	PetroKazakhstan Oil Products LLP	Oil refining	Share of China's CNPC (50%) and Kazakhstan's state-owned KazMunaiGas (50%)
9.	Philip Morris Kazakhstan LLP	Tobacco company	Philippe Morris International subsidiary
10	Asian Gas Pipeline LLP	Gas transport	Share of China's CNPC (50%) and Kazakhstan's state-owned QazaqGaz (50%)

The country hosts 79 enterprises engaged in associated gas extraction, about 23 of which supply gas to the gas transportation system to meet domestic market needs and for export. Both private Kazakhstani and foreign companies and Kazakhstan's state-owned companies, KazMunaiGas and QazaqGaz, are involved in the production of associated gas, while only QazaqGaz is involved in the transportation and sale of marketable gas. According to 2020 data, the volume of gas produced by these 79 companies amounted to 55.1 billion cubic meters. Approximately 90% of gas production in Kazakhstan is also attributed to projects in Tengiz, Kashagan, Karachaganak, and Zhanazhol[24].

Both national companies and private sector companies, including large international majors, are widely represented in Kazakhstan's oil and gas industry. KazMunayGas (KMG), the state-owned National Oil Company, stands at the forefront of Kazakhstan's oil and gas sector. As a government entity, KMG is entrusted with overseeing a wide array of activities within the industry, including exploration, production, refining, and transportation of hydrocarbons. The other national company – JSC NC "QazaqGaz" – is a vertically integrated national gas company operating along the entire chain from exploration and production to the sale of final products.

This structured approach allows for a comprehensive and integrated management of the country's hydrocarbon resources. Parallel to the operations of KMG, QazaqGaz and its subsidiaries, are the activities of private companies in Kazakhstan's oil and gas sector. These entities range from local firms to international majors, contributing to the diversity and dynamism of the industry. International corporations such as Chevron, ExxonMobil, and Shell have made significant inroads into the Kazakh market, primarily through substantial investments in joint ventures and consortia like the Tengizchevroil project, which manages the colossal Tengiz and Korolev fields. These private companies usually engage with the Kazakh government through production sharing agreements (PSAs), a

[24] https://primeminister.kz/ru/news/reviews/perehod-na-elektronnye-aukciony-popravki-v-kodeks-o-nedrah-i-nedropolzovanii-i-dobycha-gaza-zh-karagaev-o-razvitii-sfery-nedropolzovaniya-2471017

framework that allows them to explore and exploit hydrocarbon reserves while the state benefits from royalties, taxes, and a share of the profit oil. This model of engagement ensures that while the state does not directly own these enterprises, it still reaps considerable economic benefits from the private sector's investment, technological input, and expertise.

Over the past few decades, Kazakhstan has become a major player in the global oil and gas market thanks to three oil megaprojects – Tengiz, Kashagan and Karachaganak. Today, these fields account for about two-thirds of the country's total oil production. At the same time, as noted above, under the terms of the Production Sharing Agreements (PSAs), all oil produced from these fields is exported, which is of strategic importance for the country's economic development and for revenues to the Consolidated Budget and the National Fund[25].

Kazakhstan exports about 80% of crude oil produced, with the main buyers being countries in Europe (Italy, Netherlands, France, Spain, Romania, Greece), as well as China, Türkiye, and South Korea[26].

Kazakhstan, with its significant oil reserves, relies on a reliable transport infrastructure to move its oil resources efficiently. Oil transportation in Kazakhstan is predominantly through pipelines, valued for their cost-effectiveness and environmental friendliness. These pipelines form a vital network connecting oil fields to domestic refineries and international markets. The country has several major pipelines operated by key companies, each serving different routes and capacities.

The Caspian Pipeline Consortium is the cornerstone of Kazakhstan's oil transportation landscape, operating the Tengiz-Novorossiysk route with a capacity of 67.0 million tonnes. KazTransOil JSC, another major player, operates an extensive network including refineries in Kazakhstan, the Uzen-Atyrau-Samara route, the port of Aktau, as well as connections to CPC and Atasu-Alashankou with a capacity of 17.5 million tonnes and 5.2 million tonnes respectively. In addition, Kazakhstan-China Pipeline LLP operates the Atasu-Alashankou and Kenkiyak-Kumkol routes, which contribute significantly to cross-border oil trade and have a capacity of 20.0 million tonnes. MunaiTas LLP operates the Kenkiyak-Atyrau route, which contributes to increased domestic oil distribution with a capacity of 6.0 million tonnes[27].

Kazakhstan's gas transportation system plays a crucial role in transporting gas from Uzbekistan and Turkmenistan to Russia and China. Notable pipelines include the CAC Pipeline (with a capacity of 54 bcm/year), Makat-North Caucasus Pipeline (24.4 bcm/year), Bukhara-Urals Pipeline (26 bcm/year), and the Chinese-financed CAGP Pipeline (55 bcm/year). Additionally, the Zaysan-Jeminay Pipeline moves small amounts of Kazakh gas to China, while the Beyneu-Bozoy-Shymkent (BBS) Pipeline connects western Kazakhstan to China and fills domestic network gaps. The Bukhara-Tashkent-Bishkek-Almaty Pipeline supplies Uzbek gas to Kyrgyzstan and Almaty, and the Okarem-

[25]The National Fund of the Republic of Kazakhstan (the National Fund) is a state fund of the Republic of Kazakhstan, which is a collection of financial assets concentrated in the National Bank of the Republic of Kazakhstan on behalf of the Government of the Republic of Kazakhstan. The Fund was established in 2000 to ensure stable social and economic development of the country and accumulation of financial resources for future generations.
The Fund has two functions: Saving: provides for the accumulation of financial assets and Stabilisation: to maintain a sufficient level of liquidity.
The National Fund has several sources of financing: the budget, investment income from the administration, other unallocated income and from oil sector companies. The latter source is the largest.
The National Bank of the Republic of Kazakhstan performs trust management of the National Fund of the Republic of Kazakhstan on the basis of a trust management agreement concluded between the National Bank of the Republic of Kazakhstan and the Government of the Republic of Kazakhstan.
[26]https://lsm.kz/eksport-kazahstanskoj-nefti-v-2021-godu-infografika
[27]Jusan Analytics, Kazakhstan's oil and gas industry review, (2022). https://jusananalytics.kz/wp-content/uploads/2022/08/kazakhstans-oil-and-gas-industry-review.pdf

Beyneu Pipeline transports Turkmen gas to the CAC line at Beyneu. Kazakhstan also sends raw gas to Russia's Orenburg refinery via the Soyuz-Orenburg-Novopskov Line. These pipelines facilitate energy transit and trade in the region, connecting Central Asian producers to major markets[28].

However, despite the significant achievements in the development of Kazakhstan's oil and gas sector, there are certain issues in the industry.

One of the key issues facing Kazakhstan's oil industry today is the high cost of oil exploration and production, particularly for new projects. For example, according to S&P Global estimates in the KAZENERGY National Energy Report, the breakeven price for a typical new oil project in Kazakhstan in 2022 is approximately $67 per barrel[29], which generally puts the country on the right side of the global average cost curve, where costs are higher. In other words, the cost of new oil exploration and production projects in the country is extremely high. This level is even higher than the regional average for Eurasia, where the break-even point for a typical project is around $66.35 per barrel – the highest of any region. According to S&P, it will be very difficult for Kazakhstan to compete with other oil-producing countries and even to maintain its share of the global oil market, let alone increase it.

At the same time, S&P Global forecasts that the cost of Kazakh oil will remain relatively high due to geological (depletion of oil fields, high water content of deposits, high oil viscosity and hard-to-recover reserves) and non-geological (tax and financial environment) factors in the long term compared to international levels. For example, in 2040, the breakeven point for new Kazakh oil projects producing in that year will be around $70 per barrel, while for about 65 per cent of new global crude oil production in other countries, this figure will not exceed $50 per barrel by 2040[30].

This situation makes the oil industry of the Republic of Kazakhstan extremely dependent on world oil prices, which can prove to be a decisive factor in the profitability or otherwise of investments in the exploration and production of new fields.

Another important issue is the regulation of the domestic market for oil and oil products. Under the terms of production-sharing agreements for three oil mega-projects (Tengiz, Kashagan, Karachaganak) with major foreign investors, all oil produced from these three fields is exported. Other oil producers are obliged to supply oil to the domestic market first, according to a quota set by the government. There is a significant difference between export and domestic oil prices. According to some estimates, the domestic price of crude oil is almost 55-70%[31] lower than the export price due to the government's policy of subsidizing domestic prices at the expense of oil producers. Thus, the state obliges subsoil users to send a certain share of the produced oil to the domestic market at low prices, calling it a "social burden". Such a condition is unfavorable to private investors, which leads to stagnation of investments in new fields.

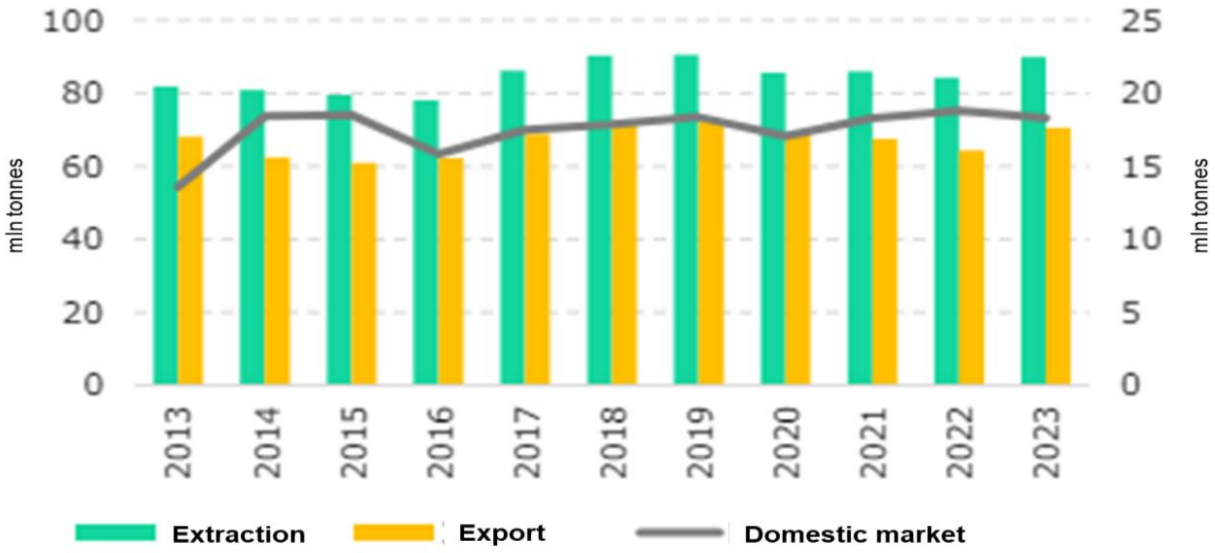
State regulation of prices for oil and oil products in the domestic market of Kazakhstan has a socio-economic justification and is part of the comprehensive development strategy of the country. However, this situation leads to a decrease in financial stability of oil and gas enterprises, which is reflected in the reduction of investments in new projects, modernization of infrastructure, introduction of new technologies and improvement of production processes. In addition, budget revenues are reduced and

[28]International Energy Agency, Kazakhstan 2022 - Energy Sector Review, (2022). https://iea.blob.core.windows.net/assets/fc84229e-6014-4400-a963-bccea29e0387/Kazakhstan2022.pdf
[29]Analytical Center Halyk Finance. Oil sector review 2023. // https://halykfinance.kz/download/files/analytics/HF_-_Neftyanoy_sektor.pdf
[30]Ibid.
[31]Analytical Center Halyk Finance. Oil sector review 2023. // https://halykfinance.kz/download/files/analytics/HF_-_Neftyanoy_sektor.pdf.

price disparities with neighboring countries with which we are in a common economic space are increasing, which leads to an increase in the gray market.

Secondly, domestic oil consumption in Kazakhstan is growing rapidly and there is no guarantee that the government will not put even more pressure on oil companies in the future to increase oil sales to the domestic market at a loss to investors. Today, about 20% or 18-19 million tonnes of all oil produced in Kazakhstan goes to the domestic market, but this may not be enough to meet future consumption, which has grown by almost a third in the last 10 years[32]. The situation is exacerbated by weak prospects for oil production growth in the country, which is unlikely to continue to grow rapidly after the Future Growth Project in Tengiz is implemented. If the current situation continues, the oil producers' ability to subsidize the domestic market will be exhausted by 2030.

Figure 3. *Oil production and consumption balance*



Source: Analytical Center Halyk Finance. Oil sector review 2023

The current situation of the domestic market for oil and oil products is also described in the KAZENERGY National Energy Report. As noted in the report, there is a very high degree of administrative control over the prices of oil products, which are kept lower, sometimes significantly lower, than prices in other EAEU member countries. This discourages Kazakhstan's oil producers, as well as refiners and wholesalers, who receive very limited margins, from supplying the domestic market. This is particularly relevant for independent oil producers, who traditionally have less access to export markets and are therefore more likely to cut costs, including avoiding investments in decarbonization.

[32]Ibid.

1.3 Review of GHG emissions in the oil and gas sector and evaluation of key trends.

The structure of national greenhouse gas emissions is dominated by three types of gases with a total share of more than 99.5%:

- 81.6% of national GHG emissions are carbon dioxide (CO2), emitted mainly from fossil fuel combustion and agriculture.
- 12.4% - methane (CH4), which is mainly emitted during the extraction, transport, transshipment/storage of fuels, biodegradation of organic waste and the raising of animals for meat, milk, wool and skins.
- 5.6% – Nitrous oxide (N2O)[33].

The economic situation in the last decade of the 20th century with the end of the Soviet system led to a decrease in the consumption of fuel and energy resources, which was reflected in a decrease in GHG emissions. Since the early 2000s, as economic recovery accelerated, GHG emissions also showed an upward trend. In 2018, net emissions totalled 401.7 million tonnes CO2-eq, which was 5.2% above the 1990 emission level[34].

In 2019, there was a downward trend in GHG emissions, which were 364.7 million tonnes CO2-eq, 4.5% lower than in 1990[35]. The decrease in emissions was due to a reduction in fuel consumption.

In 2020, national net emissions – 351.2 Mt CO2-eq. – were 8% lower than in 1990[36]. The continued decline was driven by the COVID-19 pandemic, which significantly reduced transport and production.

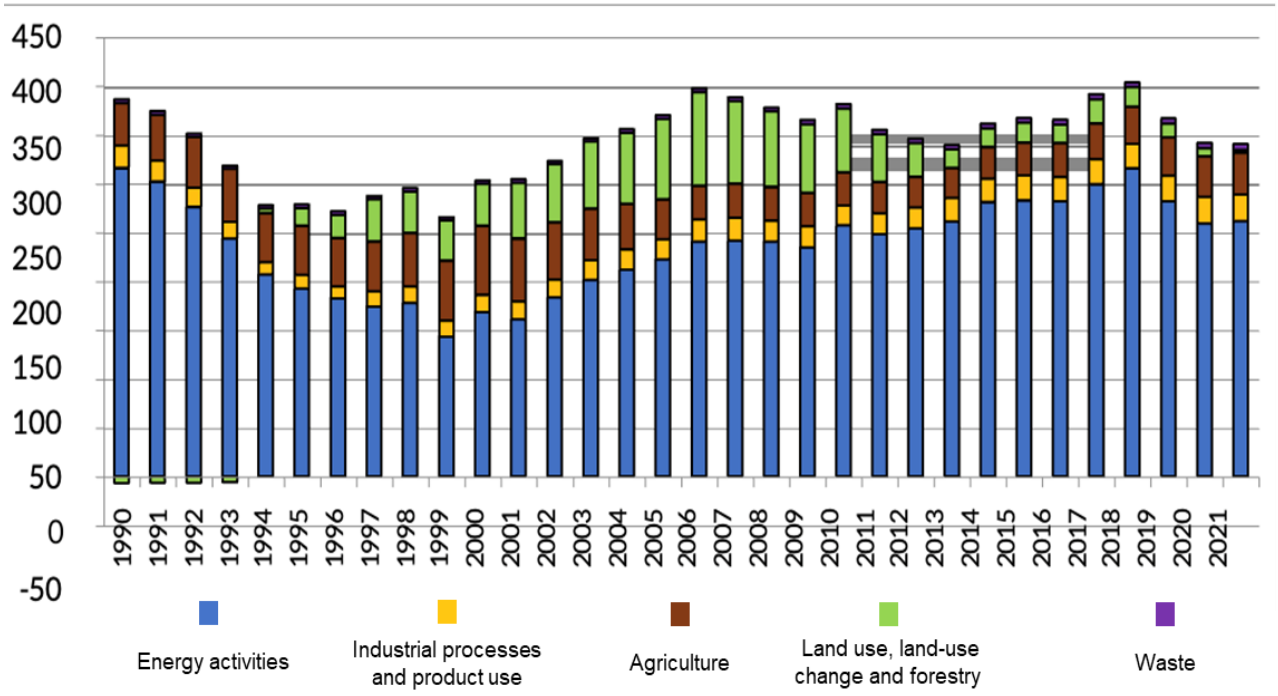
In 2021, the quarantine was lifted and the economy began to recover from the pandemic. Despite this, national net emissions decreased by 0.4% compared to the previous year. Net emissions were 340.8 million tonnes of CO2-eq, 4% below 1990 levels.

The allocation of emission allowances for 2022 under the National Greenhouse Gas Allocation Plan 2022-2025 for the oil and gas industry was 23,039,146 units for 49 installations. Total CO2 emissions from the oil and gas industry amounted to 19,546,927 tonnes. According to calculations based on the list of oil and gas operators, 1,412,463 tonnes of allowances should be withdrawn. The total surplus of installations is 3,712,154 and the deficit is 1,632,398. The total balance including exemptions is 2,079,756 tonnes of allowances[37].

Approximately 60% of all greenhouse gas emissions in the country comes to the “Energy Activities” sector amounting to 262 mln. tCO2-eq. in 2021. This sector includes several categories according to the 2006 IPCC Guidelines, such as the Energy industry (1.A.1), Manufacturing and Construction (1.A.2), Transportation (1.A.3), Other sectors (1.A.5), Other Sources (1.A.5) and Fugitive emissions (1.B).

[33]Decree of the President of the Republic of Kazakhstan of 2 February 2023 No. 121 "On Approval of the Strategy for Achieving Carbon Neutrality of the Republic of Kazakhstan by 2060" // https://adilet.zan.kz/rus/docs/U2300000121#z67
[34]Ibid.
[35]Ibid.
[36]Ibid.
[37]Zhasyl Damu JSC Emissions Trading System // https://recycle.kz/ru/parnikovye-gazy

Figure 4. *Dynamics of national greenhouse gas emissions by IPCC sectors in Kazakhstan for 1990-2021*

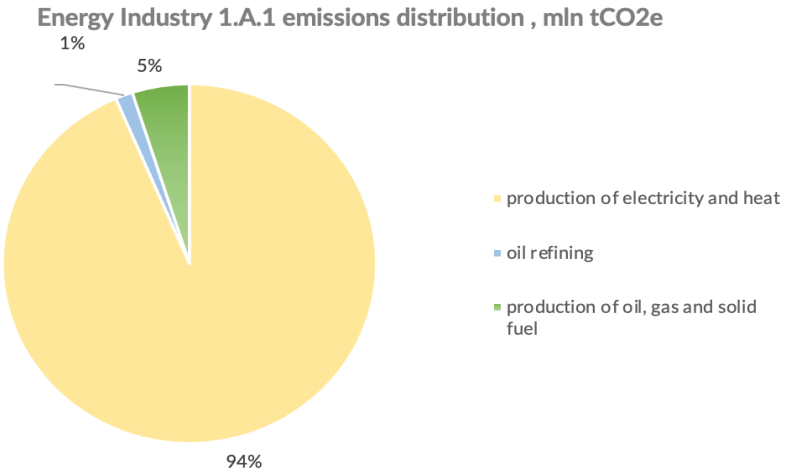


Source: The Eighth National Communication of the Republic of Kazakhstan and the Fifth Biennial Report to the UN Framework Convention on Climate Change

The Category 1.A.1 Energy industry includes emissions from subcategories Production of heat and electricity (1.A.1a), Oil refining (1.A.1b), Production of oil, gas and solid fuels (1.A.1c). Every year, about half of all greenhouse gas emissions in the Energy sector come from heat and electricity production. In 2021 according to the sectoral approach the GHG emissions from this category were 127 mln. tCO2-eq, of which CO2 emissions – 126 mln. tCO2-eq, CH4 – 1.8 thousand tCO2-eq, N2O – 1.7 thousand tCO2-eq. The Energy Industry category is divided primarily into three sectors. The largest share belongs to the production of electricity and heat, which accounts for the vast majority of emissions. The smallest share is held by oil refining, which constitutes a minor percentage. Finally, the production of oil, gas, and solid fuel holds a small but notable fraction, under five percent (Figure 5).

The subcategories of GHG emissions, specifically Oil refining (1.A.1b) and Production of oil, gas, and solid fuels (1.A.1c) represent the emissions from the combustion of fuel in oil and gas sector and mining. These emissions are calculated based on the statistical data of the report “Fuel and Energy Balance of the country”, and do not include emissions from flaring and venting.

Figure 5. *Distribution of 2021 GHG emissions between subcategories in the Energy Industry (1.A.1) category*



Source: "Zhasyl Damu" JSC

The flaring and venting emissions in the national inventory are presented in the Fugitive emissions category (1.B). The primary greenhouse gas accounted for in these categories is methane. However, for certain associated processes, such as "Gas Flaring", the share of carbon dioxide can be significant and exceed methane emissions.

In 2021, Fugitive emissions category in the country accounted for 41.54 mln tCO2-eq. The category includes two main subcategories – "Emissions from Solid fuels. Coal deposit development" (1.B.1) and "Emissions from Exploration, Processing, and Other Processes for Oil and Natural Gas" (1.B.2.).

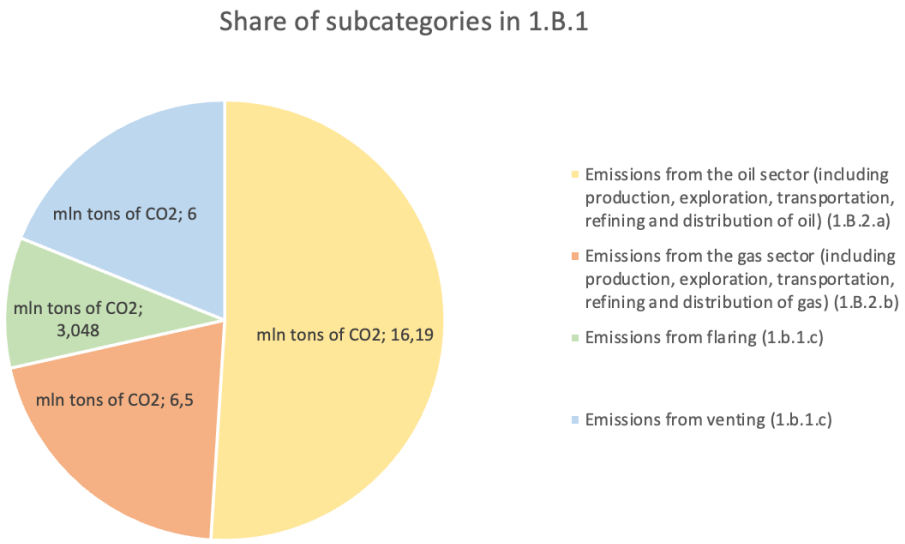
Sub-category "Emissions from Exploration, Processing, and Other Processes for Oil and Natural Gas" (1.B.2.) includes the following emissions:

- Emissions from the oil sector (including production, exploration, transportation, refining and distribution of oil) (1.B.2.a);
- Emissions from gas sector (including production, exploration, transportation, refining and distribution of gas) (1.B.2.b);
- Emissions from flaring and venting (1.B.2.c).

Fugitive emissions from the oil sector sub-category (including production, exploration, transportation, refining and distribution of oil) in 2021 was responsible for 16.19 mln tCO2-eq, gas sector (including production, exploration, transportation, refining and distribution of gas) – 6.5 mln tonnes of CO2-eq, and emissions from flaring and venting – 9.048 mln tCO2-eq (flaring – 3.048 mln tCO2-eq, venting – 6 mln tCO2-eq) (Figure 6).

"Zhasyl Damu" JSC uses official data from the Bureau of National Statistics for the National inventory purposes. As flaring and venting in the Republic of Kazakhstan are prohibited by law, the Bureau of National Statistics does not collect actual flared and vented gas volumes. Therefore, according to the IPCC methodology for the estimation of GHG emissions for flaring and venting in the national inventory, JSC "Zhasyl Damu" use data on the total amount of oil and gas production and multiples it to the IPCC default coefficients for flaring and venting. Such an approach to calculation could bring a big deviation from the actual situation, as it implies the assumption that GHG emissions from flaring and venting occur in the production of all oil and gas in the country, which is not always the case.

Figure 6. *Share of emissions in the Sub-category of Fugitive Emissions from Exploration, Processing, and Other Processes for Oil and Natural Gas (1.B.2)*



Source: "Zhasyl Damu" JSC

According to the National Greenhouse Gas Emission Allocation Plan 2022-2025 for Kazakhstan's ETS, the oil and gas sector includes 36 companies with 49 installations, covering upstream, midstream, and downstream operations. 42% percent of these companies are private, and 58% percent are with state participation. A detailed ownership structure is provided in Annex 1.

The main sources of emissions are related to the combustion of carbon fuels in furnaces, gas flaring and venting and leaks. More detailed information for 2021 is given in Table 2.

Table 2. *GHG emissions profile of the Oil and Gas sector 2021 based on the company's reports regulated by the ETS*

Type of process	Total in CO_2 equivalent
GHG emissions stationary combustion, excluding flaring:	**19 413 620 $tCO_{2\text{-eq}}$**
• CO_2 emissions	19 325 645 $tCO_{2\text{-eq}}$
• CH_4 emissions	6 822 $tCO_{2\text{-eq}}$
GHG emissions from Flaring:	**1 165 942 $tCO_{2\text{-eq}}$**
• CO_2 emissions	1 164 973,80 $tCO_{2\text{-eq}}$
• CH_4 emissions	759 $tCO_{2\text{-eq}}$

GHG Fugitive leaks, including venting:	**10 612 204 tCO_{2-eq}**
• CO_2 emissions	16 654 tCO_{2-eq}
• CH_4 emissions	10 595 551 tCO_{2-eq}
GHG emissions from Venting:	**110 894 tCO_{2-eq}**
• CO_2 emissions	110 784 tCO_{2-eq}
• CH_4 emissions	111 tCO_{2-eq}
Total GHG emissions from oil and gas sector:	31 035 059 tCO_{2-eq}
• CO_2 emissions	20 350 882 tCO_{2-eq}
• CH_4 emissions	10 603 132 tCO_{2-eq}

Source: “Zhasyl Damu” JSC

GHG emissions from the oil and gas sector are still smaller than those from the power or metals sectors, accounting for no more than 6% of the country's emissions.

At the same time, the number of regulated installations in the oil and gas sector is decreasing: 63 units in 2013[38], 60 in 2014-2015[39], 67 in 2018-2020[40], 61 in 2021[41] and 44 in 2022-2025[42].

Meanwhile, the free allocation of greenhouse gas emission allowances increased from 19,055,377 units in 2013[43] to 23,039,146 units in 2023 and gradually decrease to 22,379,767 units in 2025[44].

It is clear that the amount of free allowances is much larger than the emissions themselves, so carbon prices in Kazakhstan remain low and do not provide strong economic incentives for decarbonization.

In this regard, two opposing trends have emerged in the oil and gas sector of the Republic of Kazakhstan: on the one hand, the state is developing the oil and gas chemical complex (a polypropylene plant has been commissioned, a polyethylene plant is under construction), with plans to expand the capacity of the Shymkent refinery from 6 million tonnes of oil to 12 million tonnes of oil, and to increase oil production by a further 12 million tonnes per year through a future expansion project at Tengiz, not counting other facilities in the country. On the other hand – Kazakhstan's oil and gas companies

[38]Resolution of the Government of the Republic of Kazakhstan dated 13 December 2012 No. 1588 "On Approval of the National Plan of Allocation of Quotas for Greenhouse Gas Emissions for 2013" // https://adilet.zan.kz/rus/docs/P1200001588

[39]Resolution of the Government of the Republic of Kazakhstan dated 31 December 2013 No. 1536 "On Approval of the National Plan of Allocation of Quotas for Greenhouse Gas Emissions for 2014 - 2015" // https://adilet.zan.kz/rus/docs/P1300001536

[40]Resolution of the Government of the Republic of Kazakhstan dated 26 December 2017 No. 873 "On Approval of the National Plan of Allocation of Quotas for Greenhouse Gas Emissions for 2018 - 2020" // https://adilet.zan.kz/rus/docs/P1700000873

[41]Resolution of the Government of the Republic of Kazakhstan dated 13 January 2021 No. 6 "On Approval of the National Plan of Allocation of Quotas for Greenhouse Gas Emissions for 2021" // https://adilet.zan.kz/rus/docs/P2100000006

[42]Order of the Minister of Ecology, Geology and Natural Resources of the Republic of Kazakhstan dated 11 July 2022 No. 525 "On Approval of the National Carbon Plan" // https://adilet.zan.kz/rus/docs/V2200028798

[43]Resolution of the Government of the Republic of Kazakhstan dated 13 December 2012 No. 1588 "On Approval of the National Plan of Allocation of Quotas for Greenhouse Gas Emissions for 2013" // https://adilet.zan.kz/rus/docs/P1200001588

[44]Order of the Minister of Ecology, Geology and Natural Resources of the Republic of Kazakhstan dated 11 July 2022 No. 525 "On Approval of the National Carbon Plan" // https://adilet.zan.kz/rus/docs/V2200028798

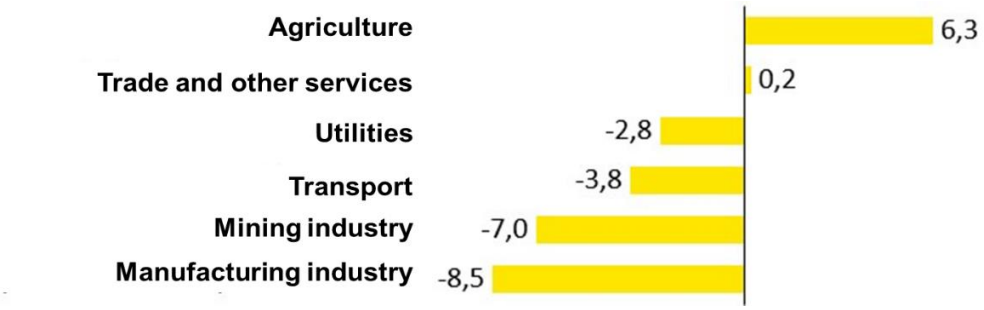
(KazMunaiGas, QazaqGaz, TCO, KPO, etc.) are developing programs and plans to reduce greenhouse gas emissions, the implementation of which will depend on the value of carbon prices, as well as requirements from international partners to reduce carbon footprint and methane emissions, and to disclose information on the companies' impact on climate change.

At the same time, the carbon price is not the only factor influencing the success of the decarbonization of Kazakhstan's oil and gas sector. Changes in energy prices will also be important in the energy transition, which will involve not only the purchase of carbon credits but also the construction of new power plants. For example, according to Ernst & Young's estimates based on the approaches proposed by the Kazakhstan Electricity Association, in order to meet Kazakhstan's 2030 NDC target, the price of electricity to end users may increase by 24.12 KZT/kWh (0,05 USD/kWh). This figure consists of 17.55 KZT/kWh (0,04 USD/kWh) due to a capital cost allowance and 6.57 KZT/kWh (0,04 USD/kWh) due to the cost of purchasing carbon units[45].

In addition, the growth of renewables and the reduction of coal-fired power generation will stimulate an increase in gas consumption to provide the flexibility needed to ensure the stability of the energy system. At the same time, the growth in gas consumption poses two challenges: gas scarcity, which will encourage the rejection of gas exports and thus the cross-subsidisation of domestic gas prices at the expense of exports. For example, today the highest possible price for natural gas in Kazakhstan is USD 58.13[46] per 1000 m3, while the London Exchange price for natural gas is USD 379.2[47] per 1000 m3.

For example, according to Ernst & Young, an increase in the cost of hydrocarbon fuels and higher electricity prices by 2030 will increase companies' costs, which in turn may have a negative impact on the demand for and production of goods and services in the relevant sectors of the economy. At the same time, sectors that use hydrocarbon energy resources may suffer the most: manufacturing and extractive industries, transport and utilities[48].

Figure 7. *Impact of carbon regulation on output in 2030 relative to a non-carbon economic scenario, %*



Source: EY

[45]Victor Kovalenko, EY, Is your business ready for the expected strengthening of carbon regulation? // https://www.ey.com/ru_kz/climate-change-sustainability-services/is-your-business-ready-for-expected-increase-in-carbon-regulation

[46]Order of the Minister of Energy of the Republic of Kazakhstan dated 14 May 2022 No. 172. "On Approval of the Limit Prices for Wholesale Sales of Marketable Gas in the Domestic Market of the Republic of Kazakhstan" // https://adilet.zan.kz/rus/docs/V2200028050

[47]https://index.minfin.com.ua/markets/gas/london/

[48]Victor Kovalenko, EY, Is your business ready for the expected strengthening of carbon regulation? // https://www.ey.com/ru_kz/climate-change-sustainability-services/is-your-business-ready-for-expected-increase-in-carbon-regulation

2. Legal framework analysis

Recognizing the importance of global efforts to combat climate change, including a paradigm shift in economic development, the Government of Kazakhstan is paying special attention to the transformation of sectors of the national economy towards its decarbonization. Over the past 10 years, a number of strategic documents on sustainable development, transition to a green economy and carbon neutrality have been adopted, outlining practical steps to move the country towards a low-carbon development path. In 2013, Presidential Decree No. 577 approved the Concept for the Transition of the Republic of Kazakhstan to a Green Economy, which was revised in 2019. In 2016, Kazakhstan signed the Paris Agreement and adopted the Nationally Determined Contribution (NDC). In 2023, an updated NDC was adopted with justification of the ambition of the targets. In December 2020, at the Climate Change Ambition Summit, the President of Kazakhstan announced a new target for Kazakhstan to achieve carbon neutrality by 2060, and in February 2023, the Strategy for Achieving Carbon Neutrality of the Republic of Kazakhstan by 2060 was adopted.

2.1 Nationally Determined Contribution (NDC) of Kazakhstan (Decision of the Government of the Republic of Kazakhstan of 19 April 2023 No. 313).

The updated version, submitted to the UNFCCC, expresses Kazakhstan's unconditional willingness to reduce its GHG emissions (including LULUCF) by 15% below 1990 levels by 2030 and, subject to external support (in the form of transfer of new technologies, climate finance) and favorable economic conditions, to increase the reduction to 25%. The main documents that form the basis of the institutional framework facilitating the implementation of the updated NDC of the Republic of Kazakhstan are provided in Annex 2.

In 2021, a roadmap for the implementation of the NDC 2021-2025 was developed and discussed with all stakeholders. As part of the preparation, sectoral and institutional decarbonization measures were analyzed. For each measure, the GHG emission reduction potential, the investment needs with a breakdown by funding sources were calculated. The associated impacts and possible barriers/risks were assessed and measures to address them were proposed. Proposals to improve the national monitoring, reporting and verification (MRV) system with key indicators to track progress towards achieving GHG emission reductions are considered.

2.2 The Strategy for Achieving Carbon Neutrality of the Republic of Kazakhstan by 2060 (Decree of the President of the Republic of Kazakhstan of 2 February 2023 №121).

The Strategy defines the strategic course for transforming the economy of Kazakhstan by 2060. The indicators of the NDC are used as medium-term target indicators in the strategy:

- reduce absolute greenhouse gas emissions by 15% by 2030 compared to 1990 levels (unconditional target);
- 25% reduction in absolute greenhouse gas emissions, subject to international support for decarbonizing the economy (conditional target).

The long-term goal of the strategy is to achieve carbon neutrality by 2060. This will be achieved by implementing initiatives in three key areas:

- decarbonization of fossil fuel industries and processes;
- decarbonization of non-fossil fuel industries and processes;
- developing natural sources of emissions capture and implementing industrial solutions for carbon capture, utilisation, long-term storage and sequestration;

Greenhouse gas emissions associated with fossil fuels will be reduced by:

- shifting from the use of fossil fuels and their derivatives to alternative and renewable energy sources;
- improving energy efficiency and conservation;
- electrification - replacing fuel-fired power plants with electricity-based technologies.

One of the key measures to decarbonize the energy sector will be the replacement of coal – currently burned to generate electricity and heat - by renewable energy sources (wind, solar). In the long term, the use of RES will be accompanied by energy storage systems (ESS), which will allow the regulation of electricity supply and better integration of RES into the grid.

For GHG emissions not related to energy use, carbon efficiency will be improved through the application of Best Available Techniques (BAT) in industrial processes and the use of carbon-free products, the development of sustainable agriculture and waste management.

The Government is currently working on the development of a Roadmap for Strategy implementation.

2.3 The Concept for the Transition of the Republic of Kazakhstan to a Green Economy (Presidential Decree No. 577 of 30 May 2013).

The Concept provides the basis for deep systemic changes in the economy. The long-term goals of the Concept include: reducing the energy intensity of GDP by 50% by 2050 compared to 2008 levels, and increasing the share of alternative sources in electricity generation to 50% by 2050.

The Action Plan for the Implementation of the Concept for the Transition of the Republic of Kazakhstan to a Green Economy for 2021-2030 (Resolution of the Government of the Republic of Kazakhstan No. 479 of 29 July 2020) provides for the reduction of greenhouse gas emissions in the energy sector; energy efficiency and energy saving measures; development of sustainable transport, infrastructure for electric and gas vehicles, intelligent traffic management systems; sustainable municipal waste management; transition to sustainable land use practices and organic agriculture.

The main priority tasks for the transition to a "green economy" in the concept include:

- increasing the efficiency of the use and management of natural resources (water, land, biological resources, etc.);
- modernising existing and building new infrastructure;
- improving public welfare and environmental quality through cost-effective ways of reducing environmental pressures;

- enhancing national security, including water security.

2.4 Greenhouse gas emissions trading system.

In order to fulfil international obligations in the field of GHG emission reduction, Kazakhstan has been implementing a GHG emissions trading system since 2013, to which chapter 20 of the Environmental Code of the Republic of Kazakhstan dated 2 January 2021 is dedicated.

The main purpose of the system implementation is to limit GHG emissions and create a market mechanism for GHG emissions trading, which should stimulate users of nature to invest funds in the acquisition of "clean, green" technologies, creation of new production, renewal of technical capacities, and thereby reduce GHG emissions from production.

The basic instrument of the quota trading system is the National Greenhouse Gas Emission Allocation Plan (hereinafter referred to as the National Plan), which includes large installations of the most energy-intensive sectors of the economy whose emissions exceed 20 thousand tonnes of CO2 per year. From 2021, a linear reduction factor in National Plan quotas of at least 1.5% per year is applied.

The first pilot phase of the ETS started in 2013 and the second phase in 2014-2015. It should be noted that it was during this period in 2014 that quotas were sold on the exchange for the first time. In 2015, the 3rd National Greenhouse Gas Emission Allocation Plan was developed, but the system had to be suspended in 2016 for improvements, especially in the allocation of allowances. After extensive amendments, the third trading period of the ETS was launched on 1 January 2018.

Kazakhstan's ETS covers oil and gas industry, power sector, mining, metallurgy, chemicals and manufacturing industries related to the production of construction materials such as cement, lime, gypsum and bricks. So far, only carbon dioxide emissions are covered by the ETS (quota).

The monitoring, reporting and verification (MRV) requirements use an estimation method with third-party verification.

During the two-year break, the following improvements were made:

- introduction of electronic reporting of greenhouse gas emissions;
- the competence for accreditation of validation and verification bodies was transferred to the National Accreditation Centre;
- adoption of specific greenhouse gas emission factors (benchmarks).

The benchmark for the purpose of quotas in the ETS of the Kazakhstan is the indicator of CO2 emissions per unit of products produced by the subject of the quota. The current benchmarks were calculated by calculating CO2 emissions from the production of products for 2013-2015 (average value). 52 benchmarks have been developed and approved for the electricity, industry and oil and gas sectors.

In the National Plan for 2022-2025, the allowances for the quota installations were also fully calculated using the benchmarking method. The allowances in the National Plan for 2022-2025 were calculated by multiplying the benchmarks by the average product production for 2017-2019, taking into account the GHG reduction commitments.

Short algorithm of the functioning of the ETS of the Republic of Kazakhstan.

The subject of the quota is obliged to fill in the electronic form of the report on the inventory of greenhouse gas emissions for the previous year in the State Register of Carbon Units (Cadastre) before the first of April of the current year.

On the basis of the greenhouse gas emissions inventory reports, a list of quota units to be included in the national carbon quota plan is drawn up. The number of carbon quota units for quota installations subject to free allocation is calculated by applying benchmarks.

The National Plan is prepared and approved for the relevant five-year period.

The carbon quota determined in the National Plan for each quota unit shall be credited to the relevant account of the operator of the quota unit in the State Register of Carbon Units.

After the quota holder submits an annual greenhouse gas emissions inventory report, the quota is redeemed (carbon units are withdrawn from circulation in accordance with verified CO2 emissions).

Carbon units generated by capacity reduction cannot be sold and must be returned to the reserve of the National Plan.

Capacity reduction means a reduction in the annual volume of extraction, production, processing and/or transport of products.

When increasing the capacity of the quoted installation, the subject of the quota shall apply to the authorised body in the field of environmental protection for additional emission allowances. In addition, a quota holder with a surplus/deficit of quotas may sell/buy carbon quotas via the commodity exchange or by concluding a direct transaction in the manner prescribed by the Rules of Trading in Carbon Units.

All transactions with carbon units (withdrawal, redemption, purchase, sale, receipt of basic/additional quota, etc.) are recorded in the State Register of Carbon Units.

The State Register of Carbon Units contains in electronic form the reporting data of enterprises (reports on the inventory of greenhouse gas emissions).

Carbon quota units can be transferred from one reporting period to another within the framework of the National Plan. Unused (unredeemed) carbon quota units are not transferred to the next National Plan. The validity of carbon quota units is limited to ninety working days after the end of the reporting period for the last reporting year of the relevant National Plan under which they were allocated.

2.5 Development of renewable energy sources.

Renewable energy sources (RES) have been positioned as one of the vectors of development of the energy complex of Kazakhstan in recent years. The current system of state support for RES development has been enshrined in the legislation of the Republic of Kazakhstan since 2009.

Current legislation provides for the following measures of state support:

- guaranteed power purchase and payment at auction price for 20 years;
- annual indexation of auction prices taking into account inflation and currency exchange rate changes;
- exemption from payment for the services of electric grid organizations for the transmission of electric power;
- priority dispatching of electricity generated using RES;
- provision of investment preferences in accordance with the Entrepreneurial Code of the RK;
- support of consumers in RES utilization issues;
- providing financial support from the Government of the “Financial Settlement Center” LLP (off-taker) in case of default on its payment obligations to RES projects (in order to improve the creditworthiness of the Center).

These state support measures are aimed at stimulating the dynamic development of the RES sector and are aimed at achieving the adopted target indicators of RES development - 6% in 2025, 15% by 2030, 50% by 2050 (taking into account alternative sources).

Currently, 148 RES facilities (over 100 kW) with an installed capacity of 2,903.7 MW are operating in the Republic:

- 59 wind power plant facilities with a capacity of 1,409.55 MW;
- 46 solar power plant facilities with capacity – 1,222.61 MW;
- 40 hydroelectric power plant facilities with a capacity of 269.785 MW;
- 3 biogas power plant facilities with capacity – 1.77 MW.

At the end of 2023, the volume of electricity generated by renewable energy facilities amounted to 6.67 billion kWh (wind – 3824.99 million kWh; solar – 1853.95 million kWh; hydro – 993.87 million kWh; bioenergy – 2.71 million kWh) or 5.92% of the total volume of electricity generation.

Since 2018, the selection of RES projects has been based on an auction mechanism. This allowed, on the one hand, to make the process of selecting projects and investors transparent and understandable, and, on the other hand, to bet on more efficient technologies and projects that minimize the impact on end-user tariffs from the commissioning of RES capacities.

A total of 70 RES auctions were held for the period 2018-2023 for a total installed capacity of 3,255 MW. Of these, 2,496.032 MW of installed capacity was selected with the following breakdown by RES type: wind – 1,534.79 MW; solar – 566.5 MW; hydro – 374.19 MW; Bioenergy – 20.55 MW.

The Ministry of Energy has approved an auction schedule from 2023 to 2027 with a total capacity of 6,720 MW, divided by power plant type.

Taking into account the availability of the necessary legislative framework, as well as support instruments, some oil and gas companies are already implementing a number of projects in the field of renewable energy both for the country's Unified Energy System and for their own consumption, thereby stimulating the reduction of the country's greenhouse gas emissions. For example, TotalEnergies commissioned two solar stations with a total capacity of 128 MW, Eni launched two stages of a wind station with a capacity of 96 MW. Currently, KMG is working together with TotalEnergies and Samruk Kazyna JSC on the construction of a 1 GW wind farm with an energy storage system, as well as with Eni on the construction of a 120 MW hybrid (wind, solar, gas) RES power plant for its own consumption.

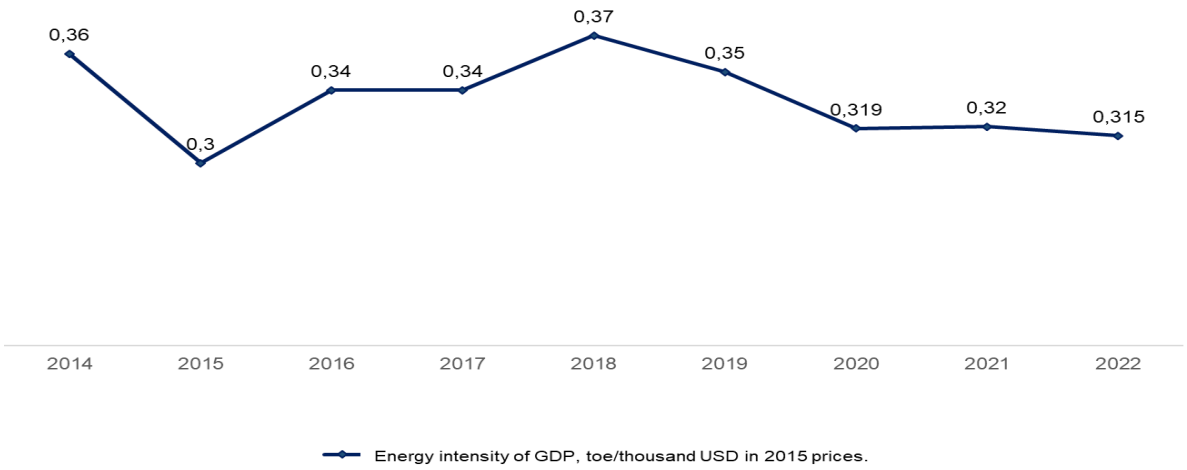
2.6 Energy saving and energy efficiency policy.

The Kazakh economy is characterized by a high level of energy intensity. In order to correct the situation, modernize industry and reduce energy and resource consumption, the Law "On Energy Saving and Energy Efficiency Improvement" was adopted in 2012. The Concept on the transition of the Republic of Kazakhstan to a green economy, already mentioned above, sets the target to reduce energy intensity of GDP by 30% by 2030 and 50% by 2050 from the 2008 level.

The State Energy Register has become a key tool of the energy saving system. All industrial organizations consuming more than 1,500 tons of fuel equivalent per year must conduct mandatory energy audits and submit reports to the operator of the State Energy Register. To date, the Register has been used to monitor about 82,000 organizations. The Register is fully automated with BIG DATA elements and a ten-year retrospective.

As a result, energy intensity of the GDP was reduced by 39% (from the 2008 level) to 0.315 tons of oil equivalent (toe)/thousand US dollars in 2022.

Figure 8. *Energy Intensity of GDP, toe/thousand USD in 2015 prices*



Source: JCS, Electric power and energy saving development institute, Ministry of industry and construction of the Republic of Kazakhstan.

The change in energy intensity by economic sectors had different trends. For example, during the mentioned period there was a significant decrease in the energy intensity of the manufacturing sector – 53%, oil, gas and coal production sector – 18%, agriculture – 25%.

In order to ensure further reduction of energy intensity of the economy, conceptual amendments to the Law of the RK "On Energy Saving and Energy Efficiency Improvement" were adopted to improve the energy saving system, providing for: improvement of energy auditing activities; appointment of energy managers at large industrial entities of the State Energy Registry; energy efficiency requirements for the most energy-intensive enterprises (top 109 organizations including oil&gas companies) with fixing of specific indicators to reduce their energy intensity; monitoring of public procurement of goods/purchases of energy-intensive products and services; implementation of the energy efficiency program; and improvement of the energy efficiency system.

In 2023, the Concept for the Development of Energy Saving and Energy Efficiency in the Republic of Kazakhstan for 2023-2029 was adopted, covering the industrial sector, energy, transportation, buildings sector and population.

3. Analysis of the key challenges and opportunities to decarbonize the sector

Decarbonizing Kazakhstan's oil and gas sector presents numerous challenges, including economic, technological, regulatory, and social dimensions.

International carbon regulation, including Kazakhstan’s major trade partners, is actively tightening. In 2015 the Paris Agreement was adopted. As part of the agreement, countries commit to NDCs to reduce greenhouse gas emissions. The European Commission approved in 2020 the European Green Deal which is a set of policy initiatives to reduce GHG emissions by 55% by 2030 from 1990 levels and become climate neutral by 2050. In order to prevent “carbon leakage” the EU approved in 2023 the Carbon Border Adjustment Mechanism (CBAM) – a carbon tariff on carbon intensive products imported to the EU market. In late May 2024, the European Union approved strong new regulations for energy sector methane emissions. This new regulation will require exporters of fossil oil, gas and coal to measure, monitor, report and verify their methane emissions according to the highest monitoring standards, and to take action to reduce them. China commenced operations of the national carbon emissions trading market in July 2021, aiming to peak carbon dioxide emissions by 2030 and achieve carbon neutrality by 2060.

At the same time, the results of preliminary assessments indicate that Kazakhstan ETS as presented in the Environmental Code will be insufficient to achieve the NDC targets. Therefore, it is logical to assume that further national carbon regulation will be tightened.

These measures require oil and gas companies in Kazakhstan to take urgent measures to adapt to the new conditions and maintain their market competitiveness in the future.

In addition to the previously mentioned challenges related to the high cost of Kazakhstani oil, issues of domestic market regulation, Kazakhstani oil and gas companies face a lack of incentive mechanisms for the implementation of decarbonization projects and imperfect climate change legislation.

The current system of carbon regulation in the Republic of Kazakhstan requires significant reform. The current mechanism for reducing greenhouse gas emissions only through the ETS system has a number of limitations and is insufficient to fulfill the international obligations of the country.

Key limitations include:

1) extension of regulation only to quota installations, which creates an unfair burden to reduce country-wide emissions only at the expense of the industrial sector;

2) lack of guarantees to maintain the cash flow associated with GHG reductions for decarbonization projects;

3) lack of a clear and correct system for setting and applying benchmarks;

4) regulatory setting of a strict emission cap (limit) does not create market incentives for investment in emission reduction projects;

5) it is necessary to ensure market participants' confidence in the applied regulatory instruments and allow managing the volume of surplus quotas from previous periods.

With appropriate policies, emission reductions can support processes to increase economic resilience and sustainable growth.

Under these conditions, the most promising areas for decarbonization of the oil and gas industry at the moment appear to be improving operational efficiency and energy efficiency, as well as increasing the share of RES of sufficient ambition to achieve the goals of decarbonization of companies.

Energy efficiency is one of the most effective approaches in this sector. According to research by the International Renewable Energy Agency (IRENA), a rapid transition to renewable energy combined with energy efficiency strategies can deliver more than 90% of the energy-related CO2 reductions to meet nationally declared climate targets. In addition, efficient resource utilization and reductions in hydrocarbon leaks and emissions and their own use by the oil and gas sector also help to reduce GHG emissions.

These measures represent the directions of so-called organic and inorganic reduction of GHG emissions:

- organic emission reductions are achieved through the implementation of operational efficiency measures and reconstruction of production facilities, taking into account further plans to increase or reduce production volumes.
- inorganic reduction – through new facilities implemented at the general corporate level and contributing to the reduction of the company's carbon footprint as a whole. This scenario considers construction of RES facilities and/or purchase of the required volume of electricity from RES facilities with subsequent distribution among subsidiaries and affiliates under intra-group contracts.

The main levers of decarbonization of oil and gas companies by groups of emission sources in the direction of energy efficiency are:

- optimization of furnaces and track heaters – program to control parameters and improve fuel efficiency;
- mechanical fund optimization program – optimization of pumping and auxiliary equipment sizes and operating modes to improve energy consumption efficiency;
- optimization of electricity and heat supply at upstream assets;
- improving refinery efficiency – defining efficiency targets (EII) and a program to achieve it, improving furnace efficiency;
- methane leakage reduction – Methane Leak Detection and Repair program (LDAR);
- elimination of fuel oil combustion at oil refineries – increasing the share of gas combustion at refineries;
- improvement and implementation of the energy management system.

GHG emission reduction potential through the implementation of RES projects.

Recently, there has been a steady trend towards increasing the role of renewable energy sources in the oil and gas industry, primarily due to the issues of controlling CO2 emissions and reducing the cost of renewable energy technologies. At the same time, renewable energy technologies should be competitive and relevant to the operations of oil and gas companies. Industry personnel must have an understanding of the differences of RE technologies in the oil and gas industry. It is important to note that enhanced oil recovery techniques can already integrate RES technologies, for example: water or steam reinjection for secondary/tertiary recovery[49]. Electrification of drilling rigs

[49] Sandler, Fowler, et al. 2012

can also be realized through microgrids combined with RES technologies (solar/wind power plants). In the downstream sector, renewable heat generation technologies (solar collectors/CSP technologies) can also be integrated, but an understanding of the availability of solar resources and available space within the plant or perimeter is needed to avoid significant capital costs associated with infrastructure construction.

Trends and Opportunities:

- depletion of reserves due to field depletion and ever-increasing energy intensity of resource extraction;
- climate agenda;
- reducing the cost of renewable energy technologies.

Reliability and sustainability:

Equipment and mechanisms in all segments of the oil and gas sector require high reliability, often the equipment is operated in very harsh natural, climatic and operational conditions. Therefore, when integrating RES technologies, reliability parameters should be taken into account first and foremost, for example: for the integration of solar and wind power plants, it is necessary to provide for energy storage systems and/or backup from, for example, gas plants.

Upstream sector:

Depending on the conditions of oil production, oil fields are divided into those where it is necessary to maintain reservoir pressure and those where it is not. The energy intensity of oil and gas production increases as the field is depleted.

A common factor for the whole period of the field operation is electricity consumption for oil lifting by electric pumps. Electric power plants using RES can be integrated to reduce the consumption of conventional fuel and/or grid electricity. The secondary and tertiary phases require additional manipulation, for example: steam injection to reduce oil viscosity, traditionally gas or other fossil fuels available in the field are used for steam generation. To save conventional resources, CSP and solar collector technologies are used and integrated into the existing process chain. However, CSP technology is still considerably expensive, so the following factors need to be taken into account to choose one or the other technology: the availability of renewable resources and the cost of the conventional fuel used in the field (gas).

Midstream sector:

Oil and gas transportation is carried out by different modes and means, since rail, road and sea transportation are difficult to integrate with RES technologies (except for biodiesel or railroad electrification), we will talk about pipeline transportation. RES technologies – solar or wind power plants can be relatively quickly integrated into the pipeline system, since pipelines are mostly powered by powerful electric transfer pumps.

An interesting case study on RES technology integration can be highlighted - the use of solar collectors at gas depressurizing stations upstream of gas distribution networks. The gas must be heated before it is depressurized in order to avoid dew point formation. For this purpose, e.g. in Germany, solar collectors have started to be used, as well as replacing fossil-fueled gas compressors with electric compressors.

Downstream sector:

Oil refining is a complex process that requires a large amount of energy resources for the operation of the main and auxiliary equipment. The following RES technologies can be integrated in this segment: solar and wind power plants, solar collectors for preheating of raw materials or water in the production chain. The main constraints for the implementation of RES projects will be resource potential and availability of free space for installation of RES technologies.

The application of RES technologies in all segments for municipal and domestic needs: hot water supply, heating, air conditioning can be integrated without any significant limitations, but such integration should be combined with energy efficiency measures and taking into account the cost of fuel and energy resources.

A company, responding to the current realities in terms of meeting ambitious country targets for achieving carbon neutrality, should apply RES technologies in production chains as well.

The application of RES technologies can be divided into 4 main blocks:

- Large-scale renewable energy projects– for supplying electricity to own enterprises and/or selling electricity to a single RES power purchaser LLP "Financial Settlement Center" or third parties;
- Renewable energy projects for use in the municipal and domestic sectors (shift camps, canteens, office buildings);
- RES projects integrated into the technological cycle of production;
- Purchase of green electricity through the existing country support mechanism for the implementation of RES projects and/or under corporate PPAs from existing or prospective RES facilities.

Requires a separate serious study and implementation of pilot projects in the direction of using geothermal energy sources for heat supply and possibly electricity.

The main strategies for the development of RES projects can be identified for each block:

Block 1 - Large-scale renewable energy projects:

- Realization through acquisition of existing assets and/or in cooperation with technology partners;

Block 2 - RES projects for use in the municipal and household sector:

- Implementation in-house and/or by engaging Engineering, Procurement and Construction contractors (EPC contractors), possibly through an Energy Service Companies (ESCOs) contracts;

Block 3 - RES projects integrated in the technological cycle of production facilities:

- Implementation in-house and/or by engaging EPC contractors;

Block 4 - Purchase of green electricity:

- Bilateral green power purchase contracts with existing, prospective RES and/or LLP "Financial Settlement Center".

4. Key policy recommendations to foster decarbonization

4.1 Recommendations for public authorities.

Kazakhstan, a country rich in natural resources, has long depended on its oil and gas sector as a cornerstone of its economy. However, with the growing global emphasis on combating climate change and reducing carbon emissions, Kazakhstan faces significant pressure to decarbonize its energy sector.

To effectively promote decarbonization in its oil and gas sector, Kazakhstan needs a multifaceted strategy encompassing regulatory reforms, financial incentives, technological advancements, and stakeholder engagement. This document outlines key policy recommendations designed to facilitate this transition, ensuring that the nation can continue to harness its energy resources while minimizing its environmental impact.

Based on the results of the analysis, the following recommendations for government agencies to further improve the system of carbon regulation in the Republic of Kazakhstan were developed:

- ensure consistency and systematicity of policies to support the achievement of NDC in the context of the commitments made;

- change the system of free quota allocation, regulation of quota price on the market, transfer and borrowing of quotas between periods to ensure financial additionally of decarbonization projects of the facilities listed on KazETS;

- consider the possibility of setting a fixed minimum and maximum price for quotas (price corridor) to increase the confidence of quota installations in the financial planning of decarbonization projects;

- guaranteed purchase of quotas generated by the decarbonization project of non-quota facilities during the guaranteed period under the established pricing mechanism;

- provide incentives for operators of quota plants to improve their efficiency, both in Scope 1 and Scope 2;

- as part of the current plan in 2023-2025, introduce a share of paid allowances for all installations, e.g. - 5% to be purchased from the regulator, if emissions remain the same;

- instead of a fine under the Code of Administrative Offenses, an upper price should be introduced and at this price at any time any plant operator should be able to buy any number of quotas;

- consider mitigating the factor of reducing overall emissions, and increasing the share of paid allowances for all installations;

- consider applying scientific methods on the determination of the auctioning percentage;

- to ensure that market participants have confidence in the regulatory tools applied and to allow the volume of surplus quota from past periods to be managed or quota to be borrowed from future periods;

- the introduction of a national carbon tax in selected sectors, such as non-quota sectors, to mitigate the burden of decarbonization as part of achieving NDC from exclusively quota-based facilities;

- revision of the benchmarking system by linking it to the technological process.

4.2 Recommendations for companies.

Decarbonizing Kazakhstan's oil and gas sector is a complex but essential task that requires a holistic approach encompassing regulatory reforms, financial incentives, technological advancements, stakeholder engagement, international collaboration, and robust governance. By implementing these key policy recommendations, Kazakhstan can transition towards a more sustainable and low-carbon future while maintaining its economic competitiveness and fulfilling its international climate commitments.

The journey towards decarbonization will involve significant challenges, including financial costs (it should be noted that the investments required to decarbonise the oil and gas sector are not published anywhere, but in general, to achieve carbon neutrality of the Republic of Kazakhstan it is necessary to attract USD 610 billion[50], or USD 17 billion per year. At the same time, the state-owned company KazMunaiGas plans to invest more than USD 1 billion to reduce direct and indirect greenhouse gas emissions by 15% by 2030 compared to 2019, which confirms the large financial needs of the oil and gas industry to implement decarbonisation targets), technological hurdles, and potential resistance from established industry players. However, with strong political will, collaborative efforts, and strategic planning, Kazakhstan can successfully navigate these challenges and emerge as a leader in sustainable energy practices. The benefits of this transition extend beyond environmental protection, offering opportunities for economic diversification, job creation, and enhanced energy security.

Decarbonization of oil and gas companies is a complex and multi-stage process. None of the companies in the industry has yet developed comprehensive competencies in this area, so each company is searching for its own set of measures and initiatives by trial and error to achieve the stated emission reduction targets. At the same time, it is important to emphasize that it is hardly possible to find a universal approach to decarbonization that will be optimal for all companies in the industry, both in terms of emissions reduction and economic efficiency.

Despite the common ultimate goal of reducing carbon footprint, companies differ in their technological processes, geography, structure and quality of assets, including specific carbon footprint per ton of production. As such, companies choose the most appropriate decarbonization pathways for their operating assets, creating the most appropriate investment portfolio structure. For example, there is a clear distinction between decarbonization options for oil and gas businesses - the gas company should focus more on reducing emissions in transportation and distribution segments. As a first step, all companies need to take a number of initial organizational and management steps, without which decarbonization usually does not progress.

A template for a set of baseline activities to develop a decarbonization strategy for oil and gas enterprises is presented in Annex 3.

[50]Decree of the President of the Republic of Kazakhstan of 2 February 2023 No. 121 "On Approval of the Strategy for Achieving Carbon Neutrality of the Republic of Kazakhstan by 2060" // https://adilet.zan.kz/rus/docs/U2300000121#z67

Appendix

Table A1. List of oil and gas companies with emission allowances

Company name	Form of ownership	Type of activity
Caspian Oil JSC	Private company	Upstream
Karakudukmunai LLP	Private company	Upstream
Kazgermunai Joint Venture LLP	Share of China's CNPC and Kazakhstan's state-owned KazMunaiGas	Upstream
Buzachi Operating Ltd.	Chinese investor	Upstream
COM MUNAI LLP	Private company	Upstream
PetroKazakhstan Kumkol Resources JSC	Share of China's CNPC and Kazakhstan's state-owned KazMunaiGas	Upstream
CNPC Aktobemunaigas JSC	Chinese investor	Upstream
Embamunaigas JSC	Subsidiary of state-owned KazMunaiGas	Upstream
Karachaganak Petroleum Operating B.V.	ENI SpA (29.25%), Shell plc (29.25%), Chevron (18%), Lukoil (13.5%) and KazMunaiGas (10%)	Upstream
Ozenmunaigas JSC	Subsidiary of state-owned KazMunaiGas	Upstream
Mangistaumunaigas JSC	Share of China's CNPC and Kazakhstan's state-owned KazMunaiGas	Upstream
Kuatamlongmunai Joint Venture LLP	Share of China's CNPC and private Kazakhstan company Kuat	Upstream
Tengizchevroil LLP	KazMunaiGas (20%), the US companies Chevron (50%) and ExxonMobil (25%), and Russia's Lukoil (5%)	Upstream
SNPS-Ai Dan Munai JSC	Chinese investor	Upstream
Tuzkol MunaiGas Operating LLP	Private company	Upstream
Offshore Oil Company KazMunaiTeniz LLP	Private company	Upstream
Zhaikmunai LLP	Private company	Upstream
Kazakhoil Aktobe LLP	Share of China's Sinopec and Kazakhstan's state-owned KazMunaiGas	Upstream
SOUTH-OIL LLP	Private company	Upstream
Karazhanbasmunai JSC	Share of China's CITIC and Kazakhstan's state-owned KazMunaiGas	Upstream
Kazakh Gas Processing Plant LLP	Subsidiary of state-owned KazMunaiGas	Downstream

KMK Munai JSC	Private company	Upstream
Ken-Sary LLP	Private company	Upstream
North Caspian Operating Company	KazMunayGas (16.88%), Eni (16.81%), Shell (16.81%), ExxonMobil (16.81%), TotalEnergies (16.81%), CNPC (8.33%) and Inpex (7.56%)	Upstream
Pavlodar Petrochemical Plant LLP	Subsidiary of state-owned KazMunaiGas	Downstream
PetroKazakhstan Oil Products LLP	Share of China's CNPC and Kazakhstan's state-owned KazMunaiGas	Downstream
Atyrau Refinery LLP	Subsidiary of state-owned KazMunaiGas	Downstream
CASPI BITUM Joint Venture LLP	Share of China's CITIC and Kazakhstan's state-owned KazMunaiGas	Downstream
Condensate JSC	Private company	Downstream
Total E & PDunga GmbH	Private company	Upstream
Kozhan JSC	Private company	Upstream
Caspian Pipeline Consortium - K JSC	Transneft (24%), KazMunaiGas (19%), Chevron Caspian Pipeline Consortium Company (15%), LUKARCO B.V. (12.5%), Mobil Caspian Pipeline Company (7.5%), Rosneft-Shell Caspian Ventures Limited (7.5%), CPC Company represented by Transneft (7%), BG Overseas Holding Limited (2%), Eni International N.A.N.V. (2%), Kazakhstan Pipeline Ventures LLC (1.75%), Oryx Caspian Pipeline LLC (1.75%).	Midstream
KazTransOil JSC	Subsidiary of state-owned KazMunaiGas	Midstream
Intergas Central Asia JSC	Subsidiary of state-owned QazaqGaz	Midstream
Beineu-Shymkent Gas Pipeline LLP	Share of China's CNPC and Kazakhstan's state-owned QazaqGaz	Midstream
Asian Gas Pipeline LLP	Share of China's CNPC and Kazakhstan's state-owned QazaqGaz	Midstream

Table A2. Institutional framework for the implementation of NDC

Document	References	Description
Environmental Code of 2.01.2021 #400-VI Law of the Republic of Kazakhstan	Article 283	Provides for a reduction in absolute national emissions by 31 December 2030 by at least fifteen per cent of the 1990 carbon balance.
	Article 283	Defines the working body (Ministry of Ecology and Natural Resources) that implements government regulation related to GHG emissions to ensure achievement of the NDC.
	Article 284	Establishes a mechanism for trading carbon units, covering about half of national emissions. The value of the carbon budget will be reduced annually by at least 1.5% from the previous year's level. From 2026 to 2030, the carbon budget for each calendar year will be reduced from 1.5% to between 2.25% and 5.1% of the previous year's carbon budget. Options for introducing carbon pricing for non-regulated sectors are being considered.
Green taxonomy	Decision of the Cabinet of Ministers of the Republic of Kazakhstan of 15 July 2022 No. 482	The Investment Policy Concept of Kazakhstan until 2026 defines the main principles of investment policy, including the transition to green growth, the development of sustainable and green financial instruments, and the introduction of environmental, social and corporate governance principles.
	Decision of the Cabinet of Ministers of the Republic of Kazakhstan of 31 December 2021 No. 996	The Green Project Taxonomy defines the classification of green projects to be financed by green bonds and green loans. The taxonomy projects environmental and low-carbon policies into different financial instruments and institutions to create favourable conditions for projects with environmental benefits.

Table A3. A template for a set of baseline activities to develop a decarbonization strategy for oil and gas enterprises

№	Name of activities
I - Organizational and management activities	
1.1.	Analysis of direct and indirect greenhouse gas emissions.
1.2.	Assessment of carbon footprint and carbon intensity of products.
1.3.	Development of methodological recommendations for calculating the carbon footprint of products and relevant forms of data collection on the activities of production assets.
1.4.	Analyzing the impact of carbon regulation on the company's operations.
1.5.	Development of a Low Carbon Development Strategy with the establishment of medium- and long-term climate targets for the company in terms of GHG emissions.
1.6.	Implementation of GHG emissions reporting and monitoring system.
1.7.	Development and implementation of a GHG emissions inventory.
1.8.	Diagnosing the impact of climate risks on the company's operations and conducting stress testing.
1.9.	Organization of the work on the disclosure of the non-financial reporting of the company.
1.10.	Development of proposals for changes to the corporate management system with the introduction of centralized decarbonization targets and related KPIs in the motivation system.
1.11.	Organization of work with interested government agencies to sell carbon offsets and receive offset units in order to reduce the repayment of carbon offset units.
II - Resource Conservation and Energy Efficiency Program Development	
2.1.	Determination of the baseline level of fuel and energy resources (FER) consumption to analyze information on consumption by key sectors of activity in order to determine the potential for reducing Energy Intensity and losses of other resources.
2.2.	In order to identify the real levels of normative indicators on FER consumption, conduct local surveys of sites/installations with the highest FER consumption by main operating assets.
2.3.	Develop and approve the methodology for monitoring energy and resource conservation indicators for key operating assets.
2.4.	To make a proposal to introduce targets for reducing energy intensity (by year) of main assets by sectors of activity.
2.5.	Develop and make proposals on the need to introduce an information system for reliable accounting and monitoring of energy and resource consumption by main assets.

2.6.	Develop proposals for the implementation of projects that have a significant effect with a small investment.
2.7.	Develop proposals for the implementation of projects with significant potential in the medium term.
2.8.	Improvement of the energy management system complying with the requirements of ISO 50001 international standard.
2.9.	Development of a comprehensive resource conservation and energy efficiency program with a detailed action plan.
III - Transition to low-carbon energy sources	
3.1.	Study energy-intensive production chains: consumption of FER for heat generation and/or process support (direct combustion of FER in plants/furnaces/boilers).
3.2.	Investigate the feasibility of utilizing RES facilities for power generation (solar/wind), including the combined use of storage.
3.3.	Assist in the realization of new large-scale RES projects through the acquisition of existing assets, as well as through the construction of new facilities together with partners.
3.4.	Explore the potential for low carbon technologies (RES, etc.) for utility use for operational assets and new projects in the development phase.
3.5.	Study of the possibility of alternative application of RES technologies in production processes.
3.6.	Developing the issue of applying "green" certificate mechanism.
3.7.	Conducting a comprehensive assessment of the feasibility of implementing RES projects to reduce the company's carbon footprint, setting medium- and long-term targets for the company in terms of the volume of installed RES capacity.
3.8.	Development of a comprehensive program in the field of RES development to reduce the carbon footprint with a detailed action plan.
IV - Additional methods of decarbonization	
4.1.	Explore the applications of CCS/CCUS technology.
4.2.	Consideration of the possibility of implementing a pilot project using CCUS technology to enhance oil recovery.
4.3.	Consideration of the possibility of providing CO_2 storage and utilization services to other oil and gas companies in the region (potential commercialization of the project).
4.4.	Conducting work with interested government agencies to create a legislative framework for the implementation of CCUS projects.
4.5.	Consideration of forest carbon projects or other Nature-Based Solutions.
4.6.	Study of prospects for production, transportation and use of low-carbon hydrogen ("green" and "blue" hydrogen).
4.7.	Study of the prospects of application of innovations and new technologies for mitigation of methane leaks, as well as APG utilization.
V - Introduce financial mechanisms to attract investment in low-carbon projects.	

5.1.	Explore the possibility of establishing a Fund to finance low-carbon and offset projects (with funds accumulated from the implementation of energy efficiency measures and low-carbon technologies).
5.2.	Analyze prospects and develop recommendations for using the green bond mechanism to attract additional investment in low-carbon projects.
5.3.	Consideration of the possibility of introduction of an internal carbon pricing system.