01

INTRODUCTION

LETTER FROM GENERAL DIRECTOR GRI 102-14

Dear readers,

I am pleased to present to you the 14th Sustainability Report of the Karachaganak Petroleum Operating B.V. Kazakhstan Branch, covering the year 2021.

I have worked at KPO as General Director for a year now. Over this time, I can say that I feel proud to lead and be a part of such a unique and fascinating world-class project.

In 2021, despite the COVID-19 challenges, we achieved a remarkable performance in hitting production and marketing targets as well as delivering large and complex projects, such as the Turnaround and the start-up of the Karachaganak Gas Debottlenecking Project. The 4th Gas Reinjection Compressor project also achieved mechanical completion.

It is worth noting that in 2021 all projects and production and maintenance activities were carried out safely. Thanks to the HSE continuous improvement programmes KPO LTI rate improved from 0.06 in 2020 (two injuries) to 0.03 (one injury) in 2021, TRI rate – from 0.18 in 2020 to 0.09 in 2021. Our comprehensive approach to Asset Integrity also complemented the higher rate of the LTI. The Life Saving Rules and the Golden Rules of Comply, Intervene and Respect have long been embedded in all operations.

In 2021, with the view of reaching carbon neutrality and stabilising revenue, we made a decision to transit to green technologies and to ensure the project economy is diversified. Subsequently, this strategy had necessitated that all our processes undergo a number of changes. The selected directions for transformation were diversification and revenue improvement, cost base management, and transition to 'Green KPO'.

In 2021, KPO achieved a world-class gas utilisation rate of 99.94% representing only 0.06% of flaring. We conduct a full-scale monitoring of environmental components, including air, surface water, subsurface water and soil, and implement emissions monitoring for air and wastewater discharges. We work on introducing 'green' technologies including GHG emissions reduction measures and efficient waste management techniques.

Our environmental and energy management systems have been continuously recognized as effective and in compliance with international standards ISO 14001:2015 and ISO 50001:2018. As of end 2021, KPO had invested US$ 445.4 mln into various environmental activities.

The Company had also been consistent in implementing personnel training and development programmes. In 2021, KPO local content in staff reached 98% in professional and technical and 85% in managerial positions. Our local content in goods, works and services exceeded 68,5% or over US$ 564 mln.

In terms of social performance, KPO has kept investing into social infrastructure projects, such as Aksai Hospital Upgrade, construction of schools, sport and health centres, and residential houses in West Qazaqstan region. I am also proud to share that in December 2021, KPO received the Grand Prix Award at the National Contest of Social Responsibility of Business – Paryz-2021, in recognition of the Venture's strong commitment to community, its own people and environment.

As the largest industry in the area, KPO creates value for a wide range of stakeholder groups and this in turn imposes responsibility on how we should operate our business. Trustful relationships and transparency with all our stakeholders become key to achieving sustainability goals. Leadership, innovation and co-operation will remain our main drives on this path.

Welcome to KPO 2021 sustainability highlights and please feel free to revert with questions or comments. Your feedbacks will be most appreciated and used to make our future reports better.

Yours truly,

Giancarlo Ruiu
KPO General Director

ABOUT THIS REPORT

Karachaganak Petroleum Operating B.V. Kazakhstan branch (KPO) is an international oil and gas condensate company that carries out production and exploration of hydrocarbons in West Qazaqstan region of the Republic of Qazaqstan. On behalf of its parent companies Shell, Eni, Chevron, Lukoil and KazMunayGas, KPO is an operator of the Karachaganak Field, one of the world's largest oil and gas condensate fields.
GRI 102-1, 102-3, 102-4, 103-1 (2-1, 3-3)

In the past 14 years, starting from 2008, we have been reporting to stakeholders about our efforts in sustainable development. This Report is the fourteenth in a row. Traditionally, the Report outlines our performance for the preceding year through the prism of three pillars of sustainable development: social, environmental, and economic. This approach is in line with the global ESG-agenda. Furthermore, here we disclose our management approach, social partnerships and environmental initiatives implemented through engagement with key stakeholder groups.

Sustainability fidelity is our license to operate when contributing to society goes alongside with the subsoil use. KPO is committed to the principles of its Sustainable Development Charter. These principles meet the widely acknowledged definition of Sustainable Development as "development that meets the needs of the present without compromising the ability of future generations to meet their needs".

OUR MISSION

Mission of the Karachaganak Petroleum Operating B.V. is to develop the Karachaganak Field in an environmentally and economically sound manner while simultaneously creating the socio-economic development opportunities for local communities.

To support the achievement of our mission, we continue embedding sustainable development thinking into the way we do business. This means that in all our activities we shall:

- look to minimise impacts and maximise opportunities linked with its presence;
- consider the consequences of our decisions in the long-term;
- engage our stakeholders in a constructive dialogue;
- incorporate strong governance and transparency.

REPORT SCOPE AND BOUNDARIES

GRI 102-7, 102-46, 102-50, 102-51, 102-52, 103-1 (2-6, 3-1, 2-3, 3-3)

The boundaries of the KPO Sustainability Report relate to all Company operations in the allotment area of the Karachaganak Oil & Gas Condensate Field and export pipeline systems: Karachaganak-Orenburg Transportation System (KOTS) and Karachaganak-Atyrau Transportation System (KATS).

The Sustainability Report is for the KPO performance in 2021 calendar year. This document presents an overview of our performance in 2021 and plans for the following 2022 year. In order to demonstrate our sustainability commitments, the data disclosed in the Report is presented in comparison with previous years. Following the established practice and as per the GRI Standards principles, we disclose both our achievements and issues. Our material topics are reflected in the Contents of the Report and listed in the relevant chapter. This Report has been endorsed by the KPO Directors` Committee and reviewed by the members of the Operators' Sustainability Sub-Committee.

Our previous Sustainability Report for 2020 was issued in late August 2021. The archive of all our issued sustainability reports is available on our website at www.kpo.kz/en/sustainability. In addition, our reports are posted at the Corporate Register web database, one of the largest global online directories for corporate responsibility reports, available at www.corporateregister.com.

KPO acts as an Operator in accordance with the Final Production Sharing Agreement (FPSA) signed between the shareholders of the Karachaganak Project and the Government of the Republic of Qazaqstan.
GRI 102-5 (2-1)

Funding for the Branch is provided by the shareholders, and all capital assets constructed or purchased by KPO are not depreciated, depleted or amortized given the retained right to use the assets by the shareholders as per the FPSA. The FPSA does not foresee capitalisation in terms of debt and equity. Accordingly, no sales and results are recorded in the financial statements of KPO. Revenues from the KPO activities are shared between the Government of the Republic of Qazaqstan and the shareholders, who solely report about their financial accounts, including revenues, net sales, capitalisation, etc. in their own financial reports.
GRI 102-7 (2-6)

APPLICABLE GLOBAL REPORTING INITIATIVE STANDARDS GRI 102-54

This Report and has been prepared in accordance with the requirements of the GRI Standards of 2016 and 2018 in the 'Core' option and the Oil and Gas Sector GRI Standards of 2021. The Report provides disclosure of indicators related to our most significant material topics.

Our goal is to ensure the appropriate level of transparency and reliability in our sustainability report, as required by the GRI Standards, which we consider as most applicable for us in sustainability reporting.

KPO has been reporting on its sustainable development since 2008.

- From 2008 through 2012, our early publications were prepared in accordance with the GRI Guidelines 3.
- From 2013 through 2016 KPO reports were issued in accordance with the Fourth Guideline of the Global Reporting Initiative (GRI G4). In 2014, KPO was one the first companies in Qazaqstan to have applied the requirements of the GRI G4.
- From 2017 to 2020 KPO sustainability reports were issued in accordance with the requirements of the GRI Standards.

INDEPENDENT ASSURANCE GRI 102-56 (2-5)

When preparing this issue in 2022, KPO has not applied for independent assurance due to budget unavailability and time constraints.

The archive of all our issued sustainability reports is available on our website.

MATERIAL TOPICS AND STAKEHOLDER ENGAGEMENT

MATERIAL TOPICS GRI 102-44, 102-46, 103-1 (3-1, 3-3)

The KPO Sustainability Report is one of the important tools for building effective communication with the Company's stakeholders. The aim of this document is to inform the stakeholders about material topics and solutions of issues related to them, and how the related changes have impacted both the organization and its stakeholders during the reporting period.

It is important for us to maintain a constructive dialogue with our stakeholders and implement mutually beneficial solutions. Decisions are usually made through the engagement process of the two.

While working on this Report we rely on extensive experience of our Parent Companies and follow the requirements of the recognized best practices in non-financial reporting.

For a number of years, we have identified a number of topics material for us, which are reviewed annually in order to disclose the most relevant and critical to our activities. In this Report, we continue sharing the dynamics of the topics progress.

The process of compiling a sustainability report involves the exchange of information and data collection through interaction between various departments within the Company, as well as with stakeholders externally.

To define boundaries of our material topics, we are guided by the Standards of the Global Reporting Initiative (GRI) and their Standards for oil and gas sector. The most critical Key Performance Indicators are disclosed compared to those of the International Association of Oil and Gas Producers (IOGP). We report on the applicable GRI standards taking into account management approaches and Key Performance Indicators of the Company. At the same time, risk and opportunities are assessed, as well as set goals are quantified in comparison with achievements of previous periods.

Regardless of various standards` requirements, we do our best to provide more detailed information about the Company`s activities and material topics in sustainable development. Therefore, the information presented in the Report goes far beyond the GRI indicators alone.

Considered in the Report material topics tend to address issues related to the economic, environmental and social impacts of the KPO's activities in general, as well as separately in the process of implementation of particular production operations.

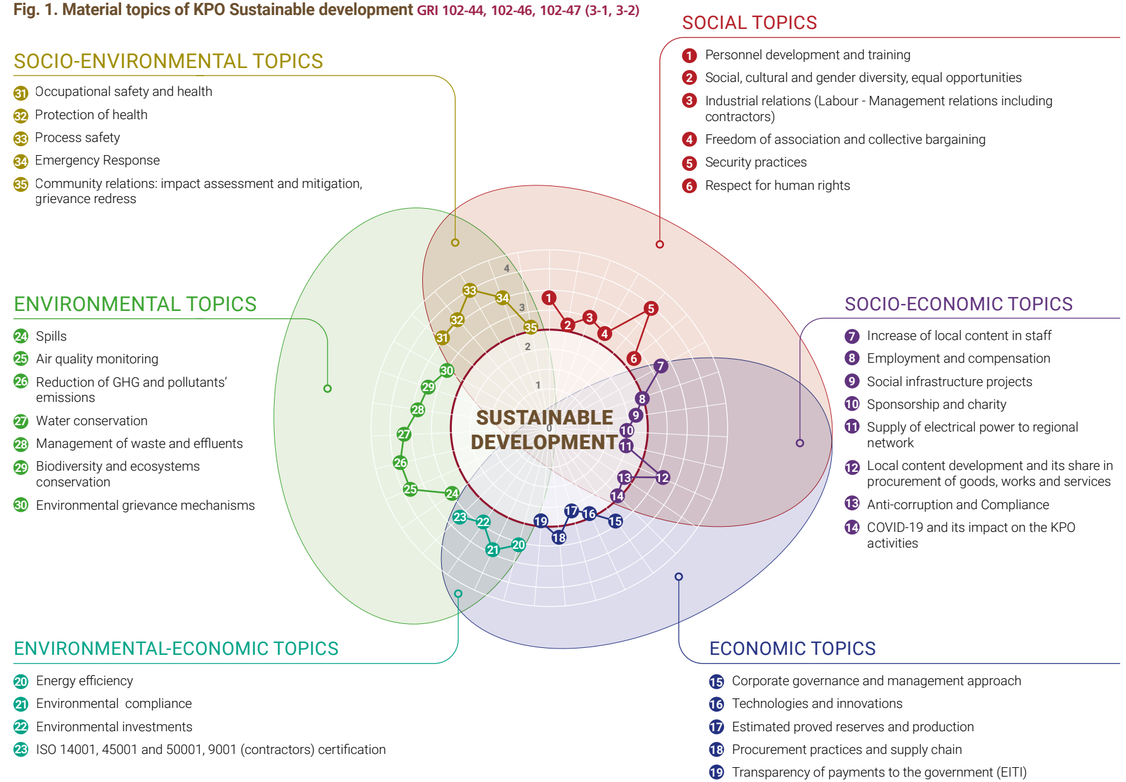
At the end of 2021, in order to identify the most material topics for disclosing in this issue, we have conducted a survey amongst the key stakeholders. This survey has helped us analyse our reporting process and prioritise our material topics.

In 2021, all the topics listed in Figure 1 have remained important for KPO and its stakeholders. The evaluation of the materiality of each topic based on the survey results is shown on the diagram in a ranking from 2 to 5 with a "threshold" value of 2.5. According to stakeholders, the key material topics identified include:

- Security practices,
- Occupational Health and Safety,
- Protection of employees health,
- Asset Integrity,
- Emergency response,
- Monitoring of air quality,
- Reduction of GHG and pollutants' emissions,
- Water conservation.

The degree of value of material topics disclosed in this Report can be seen on Figure 1.

Fig. 1. Material topics of KPO Sustainable development GRI 102-44, 102-46, 102-47 (3-1, 3-2)



Drawing by Nazerke Sailau (12 years), winner of the contest 'Energy Saving By Children's Eyes', nomination 'The Best Technique'

The topics disclosed for the reporting period are tracked regularly in the process of multilateral interaction with our Parent Companies, the PSA LLP Authority, various regulatory bodies, contractors, industry partners, employees, trade unions, local communities and the media. The stakeholders raise their issues at various sessions, from meetings of the Village Councils to forums, conferences, public hearings, social surveys, audits, and by addressing them directly to the Company **GRI 102-43**

As part of the Report's preparation, we aim to continuously raise public awareness of the material topics disclosed in the Report, both internal and external. Inside the printed copies of our Sustainability Reports there are loose-leaf feedback forms for readers to fill in. We have also placed an online feedback form on our website.

STAKEHOLDER ENGAGEMENT GRI 102-42, 102-43 (2-29)

Success of sustainable development depends on effective dialogue between business and its stakeholders. We are bound with our stakeholders by multiple ties and are interested to hear their opinions.

In 2021, despite the impact of the COVID-19, KPO has successfully completed all its operational plans, including implementation of the expansion projects. The consequences of the COVID-19 pandemic continued affecting the processes of engagement with stakeholders, while there was an increase in terms of the dynamics of contacts and, accordingly, the volume of feedback received. During the year, online format of interaction was continued largely, along with the increase in the number of live meetings, mainly at the higher level. Some events were postponed to the next period.

Our interaction with stakeholders is an integral part of the Company`s activities. It is planned, documented and carried out in accordance with the legislation and internal policies. KPO departments determine their stakeholders based on the analysis of risks and material topics, and share their experience of engagement in this Report. Given the scale of the KPO's activities, our stakeholders are a large number of diverse groups and organizations. The most significant groups of stakeholders and ways of interaction in 2021 are presented on the figure 2.

Feedback on the issued Sustainability Reports is obtained using different channels, including telephone and e-mail communications through Sustainability@kpo.kz address, as well as KPO's official website www.kpo.kz. All received comments and suggestions are reviewed in preparation of the next Report.

Fig. 2. KPO engagement with stakeholders in 2021 GRI 102-40, 102-42, 102-43, 102-44 (2-29)

LOCAL AUTHORITIES
- Business meetings
- Forums, conferences
- JOC meetings
- Public events

LOCAL COMMUNITIES
(residents of Aksai town and nearby rural districts)
- Village Councils, meetings, requests, grievance mechanism
- Online public hearings
- Social and educational events

PSA LLP AUTHORITY
- Technical budget and operations meetings
- Joint Operating Committee (JOC) meetings
- Joint Procurement Committee (JPC) meetings
- Joint Marketing Committee (JMC) meetings
- Local Content Sub-Committee meetings

REGULATORS
- Inspections, audits
- Status update reports, meetings
- Integrated emergency exercises
- Litigations

RoQ MINISTRIES/AGENCIES
- Business meetings and visits
- Foreign Investors' Council sessions
- Working Group sessions

PARENT COMPANIES
(Eni, Shell, Chevron, Lukoil, KazMunayGas)
- Directors Committee meetings
- ConCom meetings
- OpCom meetings
- ConCom Sub-Committees meetings
- OpCom Sub-Committees meetings

EMPLOYEES
- Meetings, written applications
- Corporate events, contests, award ceremonies
- Communication and training on Business Principles and Code of Conduct
- Application by employees about operational and social & labour matters to HR and via the Hotline
- Quarterly and annual HSE Awards ceremony for KPO employees and contractors
- Safety Stand Down meetings
- Online training on health, safety, emergency response, security, civil defence topics
- Electronic surveys on IT&T support service
- Professional holiday celebrations
- Communication via corporate media, corporate intranet portal, electronic displays in KPO offices, distribution of brochures
- Public work

Karachaganak

COUNTERPARTIES
(suppliers/contractors, customers, banks)
- Online forums, conferences
- Business meetings, familiarization visits
- Online training for suppliers

INDUSTRY PARTNERS
(O&G companies, business associations)
- Conferences, forums, visits
- Joint meetings with RoQ authorities and working groups

NGOs
(non-profit organizations, initiative groups, public foundations)
- Online public hearings
- Local community grievances
- Direct queries

MEDIA
(national, regional, local)
- Regular interaction by correspondence, press releases, articles, meetings, public events and VIP visits
- Communication via social networks (LinkedIn, Facebook, YouTube, Instagram, Vkontakte), Sustainability Report, website, publications, interview, videos in different media, corporate videos, corporate magazine

TRADE UNIONS
- Grievance mechanism for employees' appeals on social and labour issues to HR
- Collective Agreement discussions
- Sport and cultural events

OUR SUSTAINABILITY PRINCIPLES GRI 103-1 (3-3)

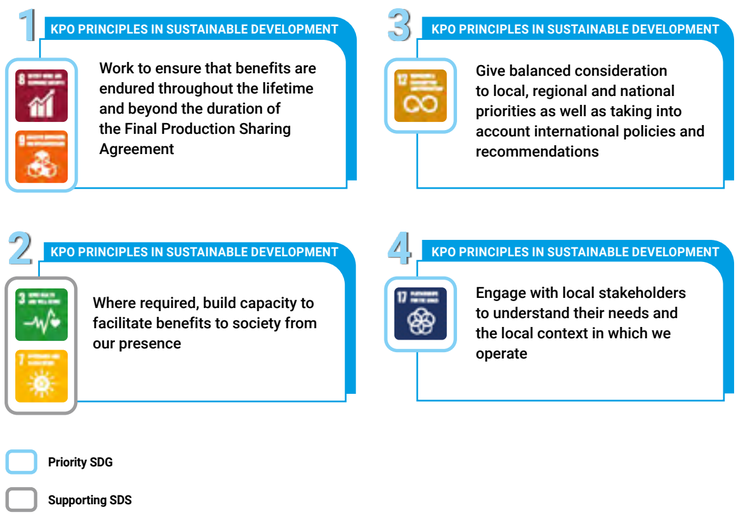
KPO is guided by the 10 principles of sustainable development, which were established in the Sustainable Development Charter.

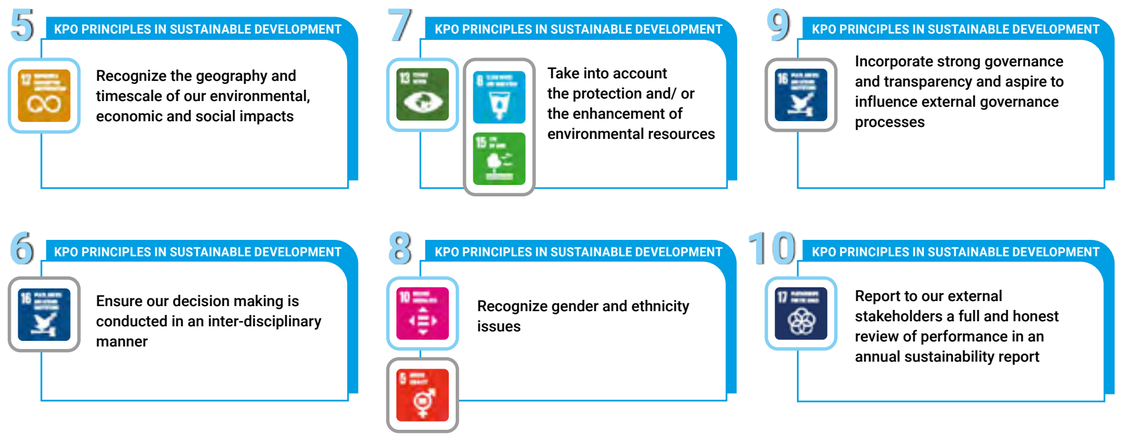
Amongst the 17 Sustainable Development Goals of the United Nations, we have identified 12 Goals having considered 10 Principles of our Sustainable Development Charter as well as our programmes in occupational health and safety, environmental protection, social investment, local content and other.

Besides, taking into account the opinion of sustainability experts, in 2021 we have identified six key Sustainable Development Goals to focus on while pursuing sustainability. These goals include:

- **Goal 12** – Responsible consumption and production,
- **Goal 13** – Climate action,
- **Goal 8** – Decent work and economic growth,
- **Goal 9** – Industry, innovation and infrastructure,
- **Goal 10** – Reduced inequalities,
- **Goal 17** – Partnership for the goals.

Fig. 3. Achievement of Sustainable Development Goals through principles of the KPO Sustainable Development Charter





OPERATIONS AND PROJECTS

OVERVIEW GRI 102-3, 102-4 (2-1), 103-1 (3-3), OG-1

KPO is the Operator of the Karachaganak oil and gas condensate field (KOGCF) is located in north-west Qazaqstan and covers an area of over 280 km^2. Karachaganak is a unique field with complex operating conditions also due to extreme continental climate. The field is some 1,600 m thick and very complex and unique with its top at a depth of around 3,500 m. The extracted hydrocarbons contain up to 4.5% of highly toxic and corrosive hydrogen sulphide (H_2S), as well as carbon dioxide (CO_2) which can be highly corrosive in certain conditions.

According to the latest Reserves Re-Determination Report for the Karachaganak field (accepted by the RoQ State Reserves Committee (GKZ) on 17.11.2017), it is estimated that the Karachaganak Field contains some 13.6 billion barrels of liquids and 59.4 trillion cubic feet of gas, of which approximately 14.2% of liquids and 13.5% of gas have been recovered as of 2021. **OG-1**

The Company annually invests the funds in the application of leading-edge technologies to maximize sustainable economic value and minimise environmental impact. The total investment in the development of the Karachaganak oil & gas condensate field since the signing of the FPSA in 1997 to 31.12.2021 has totalled over USD 28.4 bln. As of end 2020, 4,076 people worked in the KPO organisation. **GRI 102-7 (2-6)**

KPO FACILITIES GRI 102-7 (2-6), 102-4 (2-1)

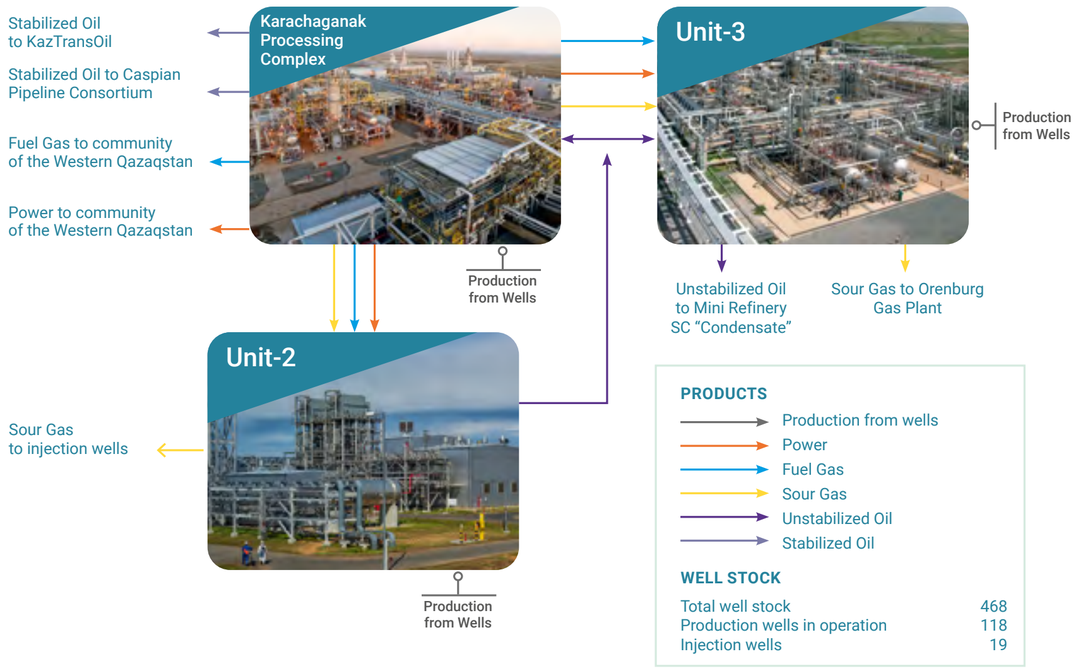
Hydrocarbon production and processing occurs at the three major interconnected units: the Karachaganak Processing Complex (KPC), Unit 2 and Unit 3. Approximately 2,000 kilometres of pipelines make up the infield system linking the major facilities and allowing efficient flows of production from the wells and among the units. Amongst the facilities, there is an Early Oil Production Satellite (EOPS) and Eco Centre. An overall view of the facilities is graphically presented on the Figure 4.

The transportation system operated by KPO includes the main export route for stabilised liquid hydrocarbons – Karachaganak – Atyrau Transportation System (KATS) with two pumping stations: one at KPC and the other at Bolshoi Chagan, and a receiving and storage facility in KPO Terminal in Atyrau. The other export route is the Karachaganak – Orenburg Transportation System (KOTS), which is used by KPO for transporting gas to Orenburg Gas Plant in the Russian Federation.

In the first half of 2021, the COVID-19 pandemic has still affected our activities. Drilling was resumed in September 2021.

As of end 2021, 118 producing and 19 re-injection wells were online at Karachaganak, from a total well stock of 468 wells. In 2021, KPO well stock was increased by one new horizontal well compared to the previous year: 468 wells in 2021 versus 467 wells in 2020. One more well has been started in 2021 and ongoing through 2022; two wells were worked over.

Fig. 4. Karachaganak facilities and products (as of end 2021) GRI 102-7 (2-6)



OUR PRODUCTS AND EXPORT ROUTES GRI 102-2, 102-6 (2-6)

KPO extracts and processes stabilised and unstabilised liquid hydrocarbons, raw gas and fuel gas. The majority of hydrocarbons produced in the Karachaganak Field are exported to maximize net sales revenues.

In 2021, around 99.98% of liquid production was sold as stabilised oil to the Western markets via the following routes:

- the Caspian Pipeline Consortium (CPC) pipeline,
- the Atyrau – Samara pipeline and further through the Transneft system.

The CPC pipeline delivers KPO oil to the Black Sea port of Novorossiysk (Yuzhnaya Ozereyevka), whereas the Atyrau-Samara pipeline is used to deliver oil to the Ust-Luga port in the Baltic Sea (see Fig. 5). The key marketing objective is to maximize oil export via CPC pipeline, which is the main export route with the highest netback cost. The Atyrau-Samara route is used as an insurance backup in case of disruptions of the export through CPC.

In 2021, KPO exported total of 10.34 mln tonnes of stabilised oil, out of which 10.25 mln tonnes were delivered through CPC. To maximize revenue, nearly 0.085 mln tonnes of oil were exported via the Atyrau-Samara pipeline. As part of maintenance at the Karachaganak Processing Complex during the reboilers' washing, liquids were delivered to Condensate SC`s refinery.

Fig. 5. KPO export routes GRI 103-1 (3-3)

The gas produced from the Karachaganak Field is:

- re-injected into the reservoir to maintain reservoir pressure,
- sold as raw gas to KazRosGas LLP under the long-term Gas Sales Agreement,
- sweetened (i.e. cleared from H_2S) to generate electricity for KPO facilities including Gas Turbine Power Plant and for local power distribution companies.

In 2021, KPO sold 8.2 bln m^3 of raw gas to KazRosGaz for processing at the Orenburg Gas Plant.

OPERATIONS AND SALES IN 2021 GRI 102-2, 102-7 (2-6)

In 2021, KPO produced 134.1 mln barrels of oil equivalent (BOE) in the form of stable and unstable liquids and gas. Gas production in 2021 reached 19 mln m^3. To maintain reservoir pressure, KPO re-injected ~ 10 bln m^3 of gas into the reservoir, a volume equivalent to about 52.7% of the total gas extracted.

Tab. 1. Production in 2021

		2021	2020	2019*
Total Production (gas injection exclusive)	Mboe	**134.1**	143.9	137.9
Total equivalent stable oil	Kt	**10,338**	10,941	10,147
Total gas production	Mscm	**18,980**	20,214	18,614
Gas Injection into a reservoir	Mscm	**9,998**	10,362	8,710
Sweet Gas for internal needs	Mscm	**789**	761	685.4

** Full turnaround year*

Tab. 2. Sales in 2021

		2021	2020	2019
Total Sales	Mboe	**130.7**	139.4	134.7
Stable Liquids Oil and stabilised condensate to CPC and Atyrau-Samara	kt	**10,366**	10,857	10,160
Unstable Liquids Unstabilised condensate to Condensate SC`s refinery	kt	**1.5**	24	9.9
Raw Gas to Orenburg Gas Plant	Mscm	**8,182**	8,986	9,113
Sweet Gas to the West Qazaqstan Oblast to generate electricity for community	Mscm	**70**	90	89

POWER GENERATION

For production needs within the Karachaganak field, KPO generates electrical power at its own Gas Turbine Power Plant (further as GTPP). Generated power is transmitted to the own production units throughout the Field, which include Karachaganak Processing Complex, Unit-2, Unit-3, Gathering system, Eco Centre, Pilot Camp, IT&T Data Centre in Aksai and the Karachaganak – Atyrau transportation system covering the oil pumping station in Bolshoi Chagan and block valve stations 1-26.

Four turbines, three of which are dual-fueled, are installed and operating at the KPO Gas Turbine Power Plant. In addition, KPO supplies electricity for the needs of the Western Qazaqstan Oblast communities with capacity of circa 25 MW in winter and circa 20 MW in summer.

In 2021, at the GTPP minor inspection of gas turbine generators (GTG) #1 and #2 was completed, as well as the overhaul of GTG #3. The overhaul of GTG #4 has lasted from October 2020 to May 2021 due to extra scope of dismantling of the old stator rewinding because of the insulation damage defect identified in the course of the routine inspection. Manufacture, delivery and installation of the new stator winding were carried out at the GTPP without removing the generator to the producer. The activities took longer than expected also due to the COVID impact and delays in spare parts delivery.

Besides, in 2021, the inspection of the hot-gas-path of turbines ##1, 2 and 3 was carried out, as well as the overhaul of turbine #4. During the year, the work was carried out to implement the option of energizing a block transformer from the generator itself on three turbines, which allowed reducing the number of switches and the associated risks when restarting the turbines after repairs.

POWER EXPORT TO WEST QAZAQSTAN OBLAST GRI 203-1

As part of the Karachaganak Field's Final Production Sharing Agreement (Art.I, Section 1.1.), KPO generates and exports power to the West Qazaqstan Oblast.

KPO exports power to electricity suppliers, such as AksaiEnergo LLP and Batys EnergoResursy LLP, who in their turn supply the power to the communities and other end consumers in West Qazaqstan Oblast.

Throughout 2021, KPO exported power from 20 to 34 MW to the regional grid, while the total volume of power export to WQO equalled ~ 225.6 mln kW-h or about 35% of the total volume of the regional energy consumption. Reduction of the power export in 2021 by some 20% compared to 2020 was due to the unplanned overhaul of the Gas Turbine Generator #4, and the major routine maintenance of other three turbines. That had led to decline of total power generation at the KPO GTPP and, hence the decrease of power volumes available for the region. One more notable factor in the decline was the launch of a new section of the Karachaganak Gas Debottlenecking Project (KGDBN) at KPC, which has led to a gradual increase of KPO's own energy consumption by 7-8 MW starting from the second quarter of 2021.

Supply of power and fuel gas in the period of 2019 – 2021 is shown in Table 3.

In 2021, KPO used mainly its own gas for power generation. Purchases of gas from the third-party supplier to generate power for the WQO needs made circa 6.5% of the GTPP total gas consumption. Those purchases were made mostly during the unstable operation of the Fuel Gas Sweetening unit at KPC (5-339 area).

In May and October 2021, disturbances (alarm events) have occurred in the external electrical power networks of the West Qazaqstan Regional Electricity Company, leading to trivial losses in KPO's production.

Tab. 3. Supply of power and fuel gas, 2019–2021

Description	Unit of meas.	2021	2020	2019
Electrical power exported to West Qazaqstan, including:	mln kW-h	**225.56**	296.93	330.26
to AksaiEnergo LLP	mln kW-h	**26.28**	26.35	26.28
to Batys EnergoResursy LLP	mln kW-h	**199.28**	270.58	303.98
Use of fuel gas to generate electrical power for West Qazaqstan, including:	mln m^3	**75.88**	99.35	112.06
Own gas sales	mln m^3	**70.98**	89.95	88.98
From third party supplier	mln m^3	**4.90**	9.40	23.08

TECHNOLOGIES IN DRILLING

In 2021, KPO continued building on the strong foundation laid in the past years, working on minimization of the impact from drilling and well services operations on the environment. As previously, we continued our journey towards zero emission and applied measures listed below to reduce greenhouse gas (GHG) emissions, and consumption of water and resources:

- Continued initiatives such as using wireline instead of coiled tubing for post stimulation.
- Milling of downhole hardware and high-efficient environmental friendly burners to eliminate where possible / reduce the need for flaring and the need for disposal of contaminated fluids.
- Restarting our drilling campaign, delivering wells that will allow increased oil production offsetting existing high gas producing (GOR) wells.
- High Rate Well Test setup with High Pressure Separators combined with multiphase high rate flow pumps (High Gas Volume Fraction Pumps – HGVF) to enable 'zero' flaring well test / clean-up activity on new wells. Successfully implemented on 4 wells in 2020 / 2021 with ~24 Kt of CO_2-eq emission reduction and ~53Kbbl of additional liquid production achieved per well.
- Use of the light workover rigs (ZJ-20) instead of the 3000HP heavy rigs to complete intervention and workovers on wells 628 and RP-4. This ensured lower emissions and lower environmental footprint to achieve our objectives.
- Our in-field Eco Centre or waste management centre enables recovery of base oil from contaminated drilling fluids and drilled cuttings for re-use in well intervention activities.

The KPO Well Operations team continuously works on developing internal procedures, workflows, technology improvements and innovations aimed at improving efficiency and well operations performance. The following was achieved throughout the year 2021:

- Development and implementation of a "Business Improvement Plan" to drive efficiency of well delivery with strong focus on digitalisation and performance improvement.
- Step-up in well integrity monitoring and well integrity status – preventing and reducing the possibility of well integrity related environmental emissions.
- New technologies like local expander (ability to repair the well locally, thereby avoiding the need to re-drill) and tracer technology – driving efficient production.


Drilling rig № 249

TURNAROUND

The KPO Shutdown strategy is focused on optimisation of production and minimisation of cost by extending intervals between shutdowns and reduction of actual shutdown durations whilst ensuring safe continuous operations and regulatory compliance.

The strategies for the turnarounds in 2021 were affected by the impact of the COVID-19 pandemic, having resulted in transfer of scope to 2021. The major drivers for the turnarounds in 2021 were integrity and reliability. In addition to routine inspections and statutory maintenance, the main scope covered the replacement of nine vessels at Unit 3, and upgrading the centrifugal flash gas compressor. This upgrade resulted in the reciprocating compressors being removed from service as part of long-term Unit-3 Risk Reduction programme.

Unit-3 had train-by-train turnarounds in June – August 2021: scope covering routine Production and Maintenance scope and minor modifications. This resulted in a major reduction in complexity and concurrent operations risks for the total Unit 3 turnaround in September and October 2021.

In September-October 2021, KPC held a Train D turnaround aligned with Unit-3 outage focussing on replacement of the disulphide separator turret, oxidiser repairs and the upgrading of the top trays in the splitter column, compressor re-bundling apart from regular P&M scopes.

In September 2021, Unit 2 executed routine dry gas seal replacements on re-injection compressors A and B, as well as statutory maintenance, whereas they replaced dry gas seal for compressor C in April short pit-stop. The remote manifold station RMS H jump-over project in Gathering and valve replacements in KOTS were also executed in September 2021.

In addition to the regular HSE control activities and to the standard COVID-19 regulations, HSE Turnaround Plan was created by the KPO Operations HSE department identifying key areas of improvements from the previous turnarounds.

KPO's attention on mitigating the risks of a COVID-19 outbreak focused on encouraging contractor and KPO staff to be fully vaccinated prior to the turnarounds. Contractors were reporting their vaccination percentages weekly for the two-month period leading up to the turnaround. KPO managed and motivated staff to be vaccinated as part of an ongoing company-wide initiative. Staff who had not been vaccinated were required to have weekly PCR tests throughout the turnaround execution. In addition to the vaccination effort, the statutory protocols and KPO rules were fully applied throughout the turnaround period. Due to strict application of these rules, there were no COVID-19 outbreaks or influence.

Additional risk assessments were held for two main issues at Unit 3. The first sessions related to identifying and mitigating the risks associated with the execution of train-by-train turnarounds in the summer. Also, a workshop was held to assess and mitigate risks associated with the full turnaround including risks associated with the large number of staff on-site while the 190 area of Unit 3 and nearby mini-refinery (MTU) still being in production, and the restart of Unit 3 whilst Train 4 and the condensate/flash gas systems were still in turnaround execution mode.

KPO continued to focus on safe lifting operation including awareness sessions for lifting teams, review of non-routine lifting plan by specialist and focussing on rigger and banksman roles. In addition, management and HSE team agreed that heavy lifting operations would be executed during daylight hours only.

A total of just over 495,527 man-hours were registered during the turnaround: these were completed with zero reportable cases. Overall, the planned scope of the turnaround was delivered ahead of schedule.

FIELD DEVELOPMENT PROJECTS

As the Contractor to the Republic of Qazaqstan, KPO has an obligation to conduct all operations necessary to carry out the development and production of petroleum in the contract area in accordance with International Good Oil Field Practice[1].

Following the completion of the Karachaganak Phase II Initial Programme in 2003, KPO has been funding and implementing the Phase II Maintenance Programme (Phase II M). This phase includes the further activities, such as drilling of new development wells, undertaking workovers on existing wells, upgrading production facilities and other projects required to maintain a high production level for the benefit of the Republic of Qazaqstan.

From 2014, in order to avoid the increasing gas-oil-ratio causing the existing facilities to become gas constrained, KPO has been working on a programme of production Plateau Extension Projects (PEP) comprised of:

- KPC Gas De-bottlenecking project aimed at increasing the overall KPC gas processing by expanding the gas handling capacity;
- 4th Gas Reinjection Compressor project aiming to increase the annual daily average volume of gas re-injected into the reservoir and improve reservoir pressure support;
- 5th Trunkline and Gas reinjection wells project upgrading the injection network capacity downstream of Unit 2 through installation of a new trunk line, and drilling and completion of new gas injection wells.

PEP projects portfolio was maturing and developing over the years, resulting in start-up of the 5th Trunkline and Gas reinjection wells project in December 2019 with first of the three injection wells.

In 2021, the COVID-19 pandemic impact has been continuing as well, still causing some accumulated delays, including procurement delays, Force Majeure declared by some vendors, limitations imposed on travelling for the projects execution team, limited presence on site, foci of pandemic among the personnel, and many others. However, the project teams learned to progress and deliver in the emerging and challenging reality with the help of vaccination campaigns, etc.

In March 2021, KPC Gas Debottlenecking project has been successfully completed and the plant has been brought in production. Final project handover to Operations was achieved in December 2021.

The 4th Gas Reinjection Compressor project has been successfully completed and the plant was brought in production in May 2022. Final project handover to Operations is planned for June 2022.

[1] *International Good Oil Industry Practices* means the good, safe and efficient operations and procedures commonly employed by sensible and diligent operators in the international petroleum industry, mainly regarding aspects related to the use of adequate methods and processes for obtaining maximum economic benefit in the final recovery of reserves, for minimizing losses, for operational security and for environmental protection. This definition is given in the «Agencia Nacional de Hidrocarburos, Hydrocarbon Exploration and Production Contract No. 09 OF 2008, la Cuerva».

On site activities during the Turnaround 2021

KARACHAGANAK EXPANSION PROJECT

KPO continues development of the Karachaganak field via the Karachaganak Expansion Project Phase 1 (KEP1), scheduled in a phased manner. The KEP1 project will create additional value for the Karachaganak Parent Companies and the Republic of Qazaqstan by maintaining the stabilised liquid plateau through the provision of additional wells, process facilities and gas reinjection to manage the increasing gas oil ratio (GOR) of the field.

In December 2020, the Karachaganak Parent Companies signed the agreement sanctioning the KEP1A Project. That was another major achievement representing a new milestone in the continued development of the Karachaganak Field, building further on the achievements of Karachaganak Gas Debottlenecking Project (KGDBN) and the Fourth Injection Compressor (4IC) Project. One of the KPO's key priorities in execution of KEP1A is maximizing the Local Content aimed at growing the local contractors' competitiveness. The project will also create job opportunities for Qazaqstani workers.

The KEP1A Project represents the first phase of the KEP1 scope and comprises of the 5th Injection Compressor and associated facilities. The KEP1A Project pursues the opportunity to utilise the available dehydration capacity installed by KGDBN in the Karachaganak Processing Complex to increase gas re-injection capacity and integrate its scope within existing systems, utilities and facilities. The integration philosophy creates synergies and reduces CAPEX exposure. In 2021, early works have been completed ahead of plan, temporary construction facilities were also completed, compressor manufacturing commenced together with long lead items' procurement. In 2022 to date, engineering and procurement are progressing as planned, contractor has mobilised to site and the compressor string test was successfully completed.

The KEP1B Project represents the second phase of the KEP1 scope and comprises of the 6th Injection Compressor and associated facilities. Similarly to the KEP1A, the project has the objective of increasing the liquid recovery by maximization of the production capacities of the existing facilities. The scope of project is also similar to that of KEP1A but also includes additional dehydration capacity to be installed at KPC. In 2021, the team started value assurance activities for KEP1B to be continued in 2022 leading to final investment decision.

The 6th Trunkline and 3 Injection Wells Project, which was decoupled from the KEP1A programme in March 2020 as a result of a Subsurface Technical Review, has the objective to maximise liquid recovery by increasing the field injection area. The project will re-distribute injection gas into South West Frank area of the field for pressure support of nearby low Gas-Oil-Ratio wells and better reservoir management.

In 2021, detailed design has been completed. Critical Long Lead Items, such as the 12-inch and 8-inch line pipes have been delivered; procurement of other equipment and materials has been initiated and proceeding with a good progress. Early civil construction works and double jointing of 12-inch line pipes have been completed and pipe-laying works commenced in Q2 2022.

> *One of the KPO's key priorities in execution of KEP1A is maximizing the Local Content aimed at growing the local contractors' competitiveness.*

DIGITAL TRANSFORMATION PROGRAMME

The whole world is going digital and KPO cannot stay apart if we want to keep this business attractive both for the country and for investors. Some of the pilot projects implemented in KPO have already demonstrated a real business impact, such as reducing the personnel exposure, more effective business processes, cost efficiency and many more.

Driven by the Digital Kazakhstan programme introduced in 2017 by the RoK Government, KPO has launched its Digital Roadmap for 2018–2021. The roadmap is aimed in making the organisation safer, more effective and the more agile place. Eleven focus areas were introduced, which cover digitalization opportunities from production optimisation to process efficiency.

For example, the Telemetry Phase I project as part of the Production Optimization focus area was successfully executed in 2021, which allows acquiring real-time data from wells thus helping to significantly reduce the personnel exposure to well sites and better tune the Integrated Network Model for production optimisation purposes.

Also, some smaller projects like, Digital Signature or Launching the drones for remote inspection, being part of the Streamlining Document management focus area, were completed and have already demonstrated their benefits in daily activities.

Warehouse Management including implementation of a barcoding system was also completed, having increased the efficiency in warehouse management and stock reduction.

One of the significant digital projects in the Company is e-Procurement aimed in creation of more efficient platform with transparent process and direct sharing of data with parties involved in the authorization process. This project is ongoing and will continue in 2022.

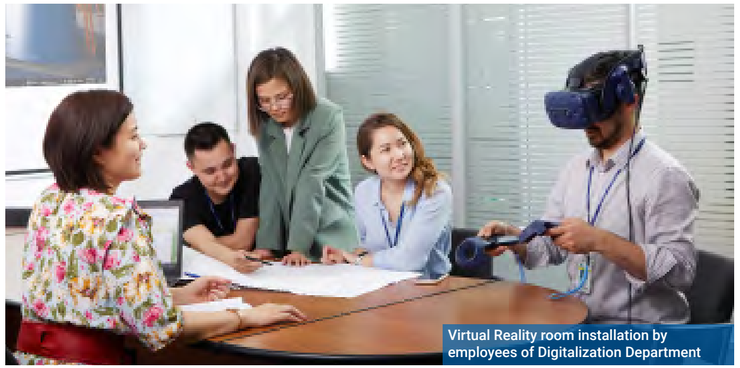
Advanced virtual reality room with the technology for training and engineering design will allow KPO personnel to visualize information – static and dynamic data, models, simulations and interact exploiting immersive, collaborative and Virtual Reality-based solutions.

Starting from December 2020, seven E-medical examination units were installed in KPO and at present the systems are fully functional.

Besides, in collaboration with the KAZENERGY Association, KPO annually supports the Student Digital Fest (SDF) contest having engaged students of major universities in Qazaqstan. The SDF-2021 contest final stage was successfully completed in October 2021.

Since the current Digital Roadmap is scheduled for completion in 2022, KPO is planning to develop a new Digitalization and Continuous Improvement Strategy to be aligned and adopted to the new reality and external trends.

Current Pre-Strategy view is that the New 2022–2025 Roadmap will consist of five buckets around Digital Oil Field, Asset, Processes, HSSE and Enablers. Some of the projects from the new Roadmap have already been started.



Virtual Reality room installation by employees of Digitalization Department