

ENVIRONMENTAL IMPACT

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KPO is committed to minimizing its impact on the environment while developing the Karachaganak oil & gas condensate field.

KPO carries out its operations based on the principles of sustainable development and in compliance with high environmental standards observing the common human right for a favourable environment, as specified in the current Environmental Code of the Republic of Qazaqstan.

The key environmental commitments of the Company's HSE Policy include the following significant impacts: **GRI 103-1, 103-2 (3-3)**

- ▶ prevention of the environmental pollution,
- ▶ reduction of GHG emissions,
- ▶ conservation of biodiversity and ecosystems,
- ▶ conservation of natural resources,
- ▶ continuous improvement of environmental performance.

As part of its environmental commitments, the Company applies state-of-the-art methods and world-class best available technologies.

The new Environmental Code of the Republic of Qazaqstan, which came into legal force on July 1, 2021, has brought many changes, including new approaches in environmental impact assessment, in obtaining an integrated environmental permit by the Operator, in introducing automated emission monitoring systems, application of the best available techniques allowing emissions fees' exemption, the waste management system improvement and more. In 2022, KPO has adopted an Action Plan to implement the requirements of the new Environmental Code in its environmental activities.

As the Operator of the Karachaganak field, in line with the new Eco Code, KPO bears environmental responsibility for the emissions of contractors involved in activities at the Field. During 2021, the Company has put a lot of efforts on accounting for contractor emissions for inclusion in the Environmental Impact permit, eventually received at the end of 2021. Going forward, we are reviewing the environmental control workflows of contractors whose emissions are included in the overall permit. **GRI 308-1**

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During 2021, the Company has put a lot of efforts on accounting for contractor emissions for inclusion in the integrated emissions permit, eventually received at the end of 2021.

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Why is it important to us?

The Company has identified the following environmental aspects, which in the process of operation, have or may have a material impact on the environment:

1. Air pollutants and GHG emissions;
2. Leaks of gas, condensate, hydrocarbons and chemical substances;
3. Industrial wastewater generation and disposal;
4. Waste generation and handling;
5. Illegal dumping and unauthorized waste disposal;
6. Domestic wastewater treatment and discharge;
7. Use of natural resources (water, energy, soil).

To reduce the risk levels for each of these aspects, KPO develops annual Environmental Protective Measures Plans. **GRI 103-1, 103-2 (3-3), 102-15**



Drawing by Danial Nuradin, 13 years old, winner of the contest «Energy Saving By the Eyes of Children», nomination “The Best Drawing in the age group from 12 to 17”

TRANSITION TO CARBON NEUTRALITY

Addressing climate change is the biggest challenge that the world is facing today. The new Environmental Code of the Republic of Qazaqstan is aimed at stimulating the decarbonization of the country's economy and “green” development.

In its turn, KPO works toward contributing to decarbonisation of the economy of Qazaqstan. In late 2021, KPO management has declared the launch of a Project 365 targeting to achieve a number of ambitious goals covering three areas: diversification and revenue growth, cost base management and the “green” transformation.

In September 2021, KPO held a seminar solely on green transition with engagement of its Parent Companies. As a result, a vision for the decarbonization of the Karachaganak Field was devised, which is to become one of the world's biggest producers of hydrocarbons and energy with achieved carbon neutrality in scopes 1 and 2 by 2037. Furthermore, KPO has set a goal to develop a clear strategy of achieving carbon neutrality by end 2023 with definition of all interim steps for reducing GHG emissions.

REDUCTION OF GHG EMISSIONS GRI 305-5

In order to support the goal of reaching carbon neutrality (scopes 1 and 2) by 2037, the Company has initiated extensive work to study opportunities of reducing GHG emissions. In 2021, research studies were started to explore options, such as waste heat recovery, CO₂ capture and storage, renewable energy supplies, participation in carbon trading, enhancement of energy efficiency, and other. The activities are ongoing with plans for expansion in 2022.

” Addressing climate change is the biggest challenge that the world is facing today. “

ENVIRONMENTAL PROTECTIVE MEASURES PLAN 2021

GRI 103-2 (3-3), 102-44

To achieve the goals set in the area of environmental protection, KPO annually develops Environmental Protective Measures Plans (further as the EPMP). Measures set forth in the Plan are focused on ensuring environmental safety, improving environmental protection methods and technologies, rational use of natural resources and maintaining compliance with the ISO 14001 and ISO 50001 international standards.

In 2021, KPO performed its production activities according to the obtained Environmental Emissions Permits and approved EPMPs. In 2021, nine Permits for each emission type were obtained for the Karachaganak Field facilities and the KPC-Bolshoi Chagan-Atyrau condensate export pipeline. The EPMPs were developed and approved for each of the Permits obtained.

In 2021, the total actual costs incurred for implementation of the environmental measures at the Karachaganak Field have amounted to KZT 5.97 bln, constituting 88% of the allocated funds from the planned while 96% of the scheduled work scope was performed. The 2021 target costs for the Field were KZT 6.8 bln. The slight variance between the planned and actual costs in 2021 was due to the more rational use of funds, as well as incomplete implementation of the planned scope of work for individual activities. For example, the costs for the relocation of two environmental monitoring stations was 47% less than it was planned; while the work was performed by 100%.

Tab. 26. KPO Environmental Protective Measures Plans for 2021 and Emissions Permits issued

No.	Environmental Protective Measures Plans approved for 2021	Valid Permits for 2021	Authority Agency that issued the permit
1	2021 KPO EPMP for the Karachaganak Field (KOGCF)	Environmental Emissions Permits (effective period: 01.01.2021 – 31.12.2021) for: 1. Air pollutant emissions; 2. Discharges of pollutants during the injection of wastewater into the aquifers of the KOGCF at Landfills No. 1, No. 2 with a validity period of 01.01 – 12.05.21; 3. Discharges of pollutants during the injection of wastewater into the aquifers of the KOGCF at Landfills No. 1, No. 2 with a validity period of 13.05 – 31.12.2021; 4. Wastewater discharge into Holding Ponds No. 1 and 2 at KCC of the KOGCF; 5. Production and consumption waste disposal.	Committee for Environmental Regulation and Control of the RoQ Ministry of Ecology, Geology and Natural Resources
2	2021–2030 KPO EPMP for the KPC-Bolshoi Chagan-Atyrau condensate export pipeline (WQO)	Environmental Emissions Permits in 2020 (effective period: 01.01.2021 – 31.12.2030) for: 1. Air pollutant emissions; 2. Pollutants discharged with wastewater.	WQO Akimat, WQO Department of Natural Resources and Nature Use Control
3	2021–2030 KPO EPMP (Atyrau Oblast)	Environmental Emissions Permit for: 1. Air pollutant emissions; 2. Pollutants discharged with wastewater.	Atyrau Oblast Akimat, Atyrau Oblast Department of Natural Resources and Nature Use Control

The 2021 KPO EPMP implementation by sections is shown in Table 27.

Tab. 27. Environmental Protective Measures Plan implementation in 2021 (%) GRI 102-44, 103-2 (3-3)

No.	Sections of Environmental Protective Measures Plan	KPO measures implementation:		
		- within the Karachaganak Field	- at the KPC-Bolshoi Chagan-Atyrau export condensate pipeline (WQO)	- at the KPC-Bolshoi Chagan-Atyrau export condensate pipeline (Atyrau Oblast)
1	Air pollution control	97%	100%	100%
2	Conservation and rational use of water resources	83%	NA*	NA*
3	Land conservation	0% **	NA*	NA*
4	Subsoil conservation and rational use	93%	NA*	NA*
5	Flora and fauna conservation	100%	N/A*	100%
6	Management of production and consumption waste	141%	NA*	NA*
7	Radiation, biological and chemical safety	20%***	NA*	NA*
8	Introduction of management systems and best safe technologies	100%	NA*	NA*
9	Scientific researches and design-survey activities in environmental protection	100%	100%	100%
10	Environmental awareness and promotion	98%	100%	100%
TOTAL:		96% (KZT 5.97 bln)	100% (KZT 10.343 mln)	100% (KZT 10.984 mln)

* NA – measures are not applicable.

** The EPMP for 2021 did not include reclamation of a land plot for temporary camp of the KGDBN Project. Though, KPO management decided to further use this plot for the KPC technical needs. In this view, there was no need to cultivate this land in 2021.

*** The EPMP for 2021 provided for a radiological examination of production tubing after the workover of five wells. Owing to the reduction of a workover programme scope for 2021, radiation control was done for one batch of tubes.

Environmental benefits from the EPMP implementation are provided in Table 28.

Tab. 28. Environmental impact of the KPO environmental protection measures implemented in 2021

Air emissions	<ul style="list-style-type: none"> ▶ Use of a surface pump to transfer product with high gas volume fraction during the test of four wells has resulted in reduction of emissions by 2,571 tonnes versus the expected 194 tonnes; ▶ Use of high pressure separators during the test of one well has helped reduce air pollutant emissions by 223 tonnes versus the expected 4,559 tonnes, caused by the drilling programme cuts due to the pandemic; ▶ Use of hydrocarbon-based fluid for the reservoir stimulation (Lamix or Deisel) helped reduce air pollutant emissions by 16 tonnes versus the expected 259 tonnes, also caused by the drilling programme cuts due to the pandemic.
Waste and wastewater management	<ul style="list-style-type: none"> ▶ In 2021, 793 tonnes of non-recyclable production and consumption waste were disposed by high-temperature incineration, including residues received after segregation of solid municipal waste, food waste and epidemiologically hazardous waste (medical waste, dewatered sludge from silt areas); ▶ Useful components recovered from the total municipal waste delivered for segregation to be further transferred to specialized companies for recycling and (or) reuse: <ul style="list-style-type: none"> ▶ waste paper – 103 tonnes, ▶ plastics – 221 tonnes, ▶ scrap metal – 8 tonnes, ▶ waste glass (crushed glass) – 6 tonnes. ▶ Volume of treated liquid waste amounted to 6,110 tonnes. ▶ Volume of reused treated wastewater for technical and production needs at the Karachaganak Field amounted to 31,699 m³. Volume of technical water consumed from the Konchubai Gully made 313,714 m³. Thus, the volume of the reused treated water from the volume of technical water consumed from the Konchubai Gully amounted to 10.1% against the planned 10%. Due to the reduction of work on the drilling program, less treated wastewater for drilling needs was used. Major volume of treated wastewater was used during the warm season for dust suppression at construction sites and for the KPC technical needs.
Land reclamation GRI 304-3	<ul style="list-style-type: none"> ▶ In 2021, the 7.4 ha of the KGDBN Project planned for reclamation was decided to be further used for the KPC technical needs during shutdown.

ELECTRONIC ENVIRONMENTAL ASPECTS MANAGEMENT SYSTEM

In 2020, as part of the Digitization Roadmap, in order to minimize paper-intensive processes and optimization, KPO has developed an electronic register for managing environmental aspects EnvAR. The developed system is a convenient tool for managing the environmental aspects, and has greatly facilitated the process of their identification. The list of aspects is presented earlier in this chapter.

Starting from the IV quarter of 2020, 24 KPO divisions have completely switched to working with environmental aspects in the electronic system. For each environmental aspect, control measures were developed, risk assessment was carried out, and a Consolidated Register of the most significant environmental aspects was compiled. Each environmental aspect is negotiated with the registry owner. Registers of Environmental Aspects are reviewed annually.

At the end of 2021, all divisions reviewed and updated their environmental aspects' registers. For all significant environmental aspects, additional measures have been proposed, the implementation of which is expected to reduce the levels of risks.

The EnvAr electronic system's read mode is available to every employee of the Company. KPO employees can obtain information on departmental environmental aspects, including the most material, and about the environmental control measures implemented at the Company.

SANITARY PROTECTION ZONE

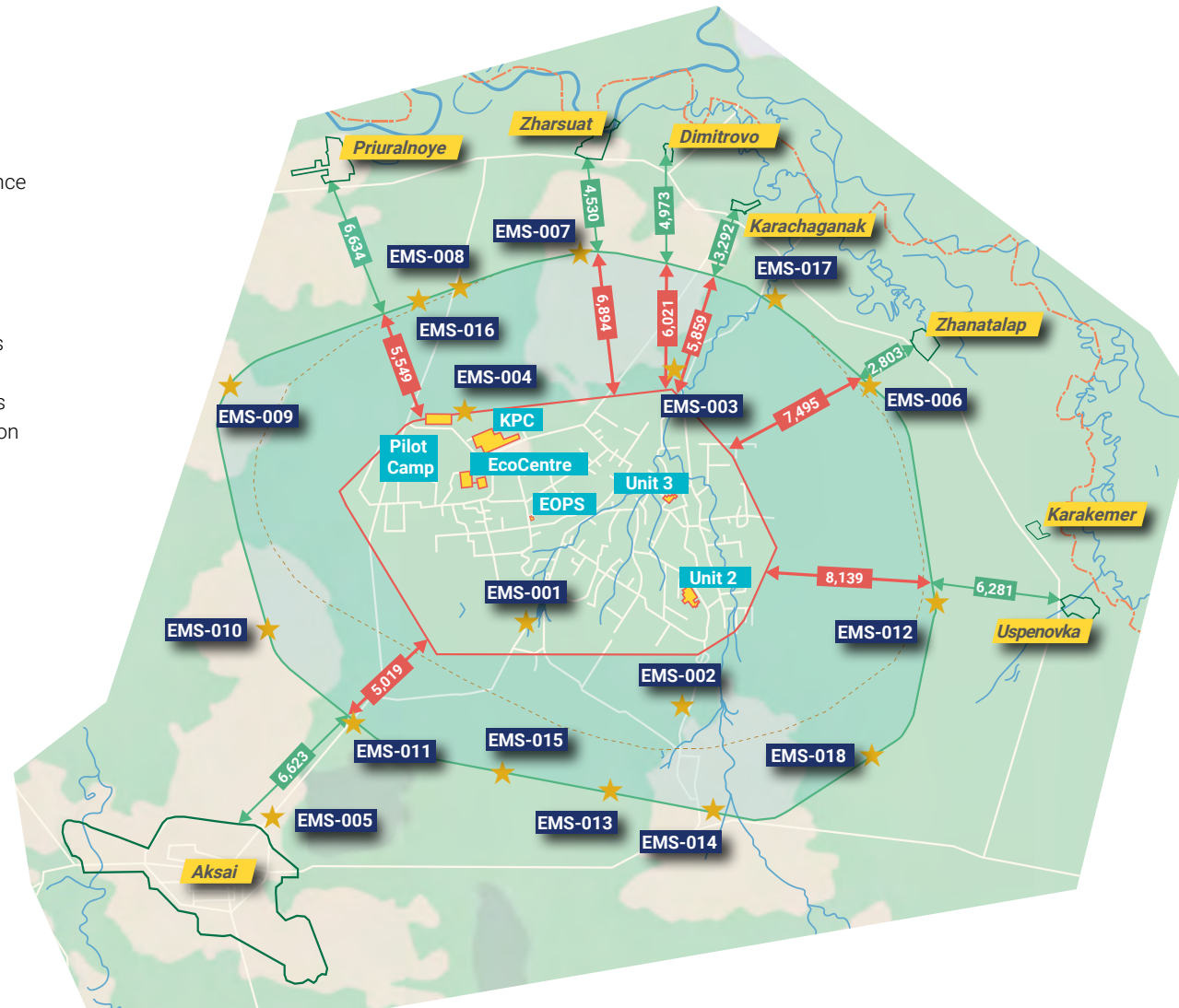
New estimated Sanitary Protection Zone (SPZ) established within the Karachaganak field has been effective from 1st January 2018.

During 2018–2021, KPO has successfully completed the relocation of eleven of the existing eighteen air environmental monitoring stations. The relocation of these stations was scheduled due to the change of Sanitary Protection Zone to ensure correct performance of the continuous air monitoring and to comply with the RoQ legal requirements.

As part of the project “Development and upgrade of the Estimated Sanitary Protection Zone in the Karachaganak Field”, KPO contemplates activities for planting new trees and caring for existing tree-planting. Additionally, to inform the local communities and personnel, KPO provides installation of information signs at the SPZ boundary.

- ★ Automatic Environmental Monitoring Stations (EMS)
- ↔ Distance between line of boundary sources and sanitary protection zone
- ↔ Distance from Designed-based sanitary-protection zone to Settlements
- State boundary
- Line of the outermost sources
- Designed based Sanitary Protection Zone (effective from 1st January 2018)
- Sanitary Protection Zone (till 2018 year)
- KPO Production Units
- Settlements
- Roads

Fig. 11. Map of the Karachaganak field with SPZ marked, as of end 2021



In order to protect historical and cultural heritage sites from potential negative impact, the project also provides for the installation of appropriate signs at the boundaries of the protected heritage sites. Earlier, in 2019, KPO organized the large-scale archaeological research on this topic (see the details in the [KPO Sustainability Report 2019](#), pp. 85-88).

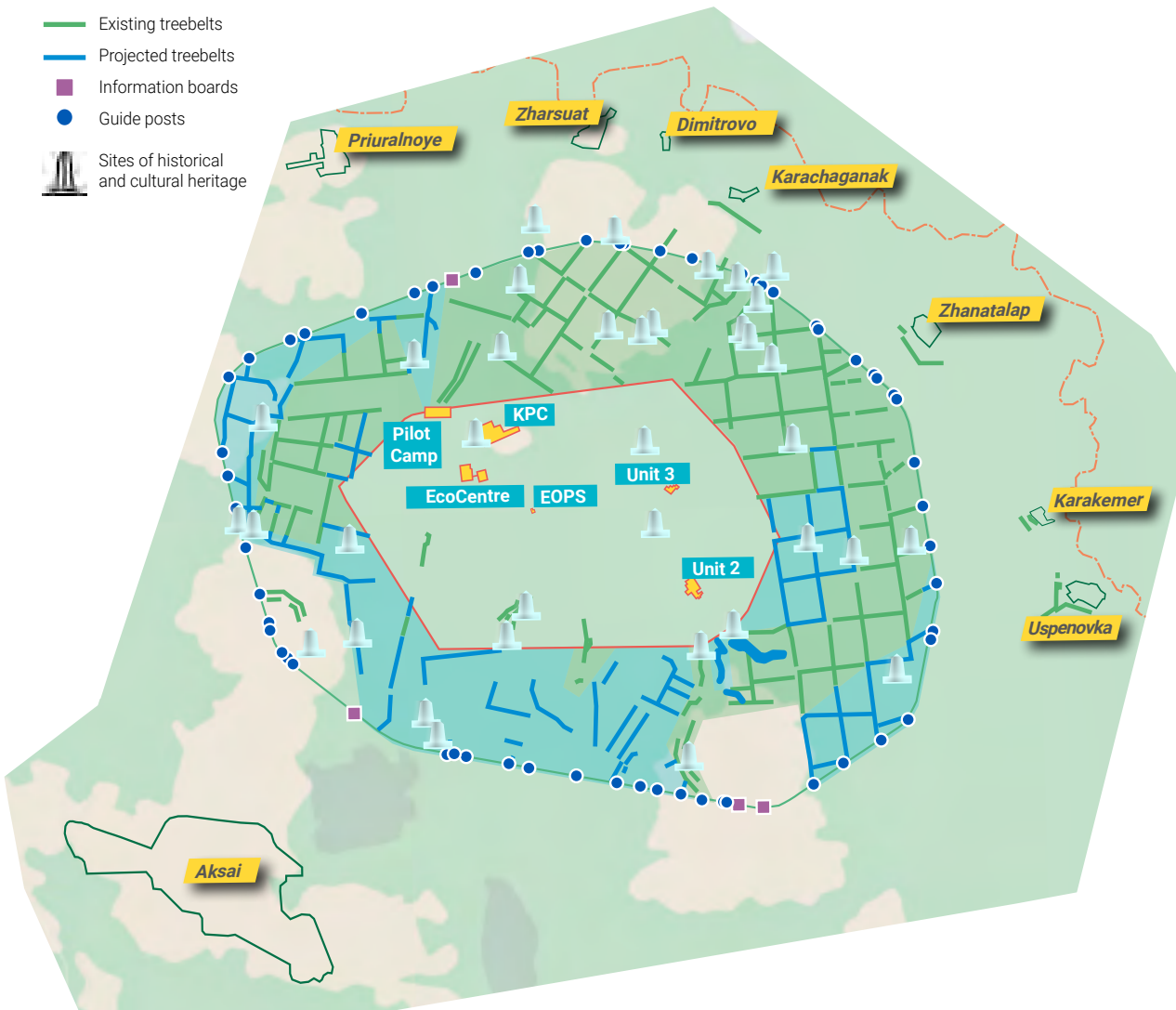
In 2021, as part of this project, the Company performed the following activities:

- ▶ the full-scale inventory of all KPO tree-plantings within the Karachaganak Field and its SPZ was carried out;
- ▶ the sites were determined and the maintenance measures for the existing planted forest were suggested;
- ▶ the field-based survey was carried out and the new forestation was planned;
- ▶ SPZ demarcation was planned;
- ▶ suggestions for installing information boards at the boundaries of the protected historical and cultural heritage sites were developed;
- ▶ key project performance indicators were defined.

In 2022, completion of the third and final stage of the SPZ improvement project is scheduled – development of the detailed design documentation ‘The first landscaping phase and demarcation of the estimated SPZ’. The overall timeline of the entire project implementation includes the period from spring 2023 down to 2028. The total area of the sites planned for green construction for the entire project period will be 249 ha, of which 151 ha are covered by the existing plants, and 97.25 ha – the new ones. Construction of capital facilities in the process of project implementation is not foreseen. The work is expected to be carried out by a contractor.

Approvals on the project will engage all stakeholders: state authorities, economic organizations and agricultural producers.

Fig. 12. Key design solutions of the development and upgrade of the estimated SPZ of Karachaganak Project for 2023 – 2028



ENVIRONMENTAL COMPLIANCE

ENVIRONMENTAL FINES

GRI 307-1 (2-27)

KPO runs its business in accordance with the environmental legislation of the Republic of Qazaqstan (RoQ). KPO annually requests and obtains an Environmental Impact Permit (EEP) from the RoQ Ministry of Environmental Protection, Geology and Natural Resources. This permit sets the limits for air emissions, discharges and storage of production and consumption waste.

In 2021, KPO did not exceed overall limits of emissions set in the Environmental Impact Permits. Further to the findings of the environmental inspections held during the reporting period, the Company was not held administratively liable. No environmental civil lawsuits were filed in 2021 either.

IMPLEMENTATION OF THE NEW ENVIRONMENTAL CODE

GRI 102-44

In 2021, as part of the efforts over the new Environmental Code by the Company's employees, critical production issues were resolved on the legislative level, such as:

- ▶ Obtaining new environmental impact permit for 2022;
- ▶ Activities related to the Plan of implementation of the requirements of the new RoQ Environmental Code;
- ▶ Analysis of the provisions of over 90 new RoQ subordinate laws in environment protection and informing the Company employees about the main

environmental requirements through online workshops on the "New RoQ Environmental Code";

- ▶ Participation in development of the new environmental requirements and submission of comments and proposals for over 120 reviewed draft regulatory acts and subordinate laws of the Republic of Qazaqstan in environment protection by KPO environmental specialists as members of the working groups under the Ministry of Environmental Protection, Geology and Natural Resources and Association of organizations of oil and gas and energy complex "KAZENERGY".

ENVIRONMENTAL MONITORING

GRI 103-2 (3-3), 413-1

KPO implements a number of environmental programmes, which cover all areas of its production activities. One of the key programmes is a Production Environmental Control (PEC) Programme developed in line with the RoQ Environmental Code requirements to meet the following objectives:

- ▶ obtaining reliable data about the Company's emissions and impact of production activities on the environment;
- ▶ minimizing the impact on the environment and human health;
- ▶ rapid and proactive response to emergencies;
- ▶ communication with stakeholders: local communities, state regulatory authorities, partner companies, about the environmental activities of the Company and risks for human health.

As part of the PEC Programme, the environmental emissions such as air emissions, wastewater discharge, waste treatment, accumulation and disposal, and the quality of environmental components such as air, surface and ground water, and soil are monitored.

The PEC monitoring of the quality of soils, surface and ground water in 2021 has demonstrated that concentrations of target substances were on a par with those observed in previous years. No the KOGCF operation negative impact on the environment components was identified.

Also, KPO regularly monitors the production environmental control over the environmental condition at the field waste disposal facilities. In 2021, as a result of monitoring of ground water and soil at the Eco Centre's Solid Industrial Waste Burial Landfill and the Temporary Liquid Drilling Waste Storage Site, as well as in checks 35A and 35B, no direct negative impact on the environmental protection components is noted. Quantitative control over the movement of waste is carried out in order to take into account the volume of burial, as well as the volumes and time of waste accumulation.

Air quality is monitored by ways of collecting and testing the samples. The job is performed by an accredited laboratory, as well as 18 stationary automatic EMSs. Air quality is assessed based on the sanitary and hygienic limits, i.e. maximum permissible concentrations (MPC). To identify the level of air pollution, the recorded concentrations of monitored components are compared with MPC and quantified in fractions.

In 2021, as part of the PEC Programme, the laboratory took more than 100 thousand samples, about 115 thousand laboratory analyses and approximately 28 thousand measurements were completed.

The Company pays particular attention to protection of air quality across the Karachaganak Field, at the SPZ boundaries and the settlements adjacent to the Field.

AIR MONITORING BY AUTOMATIC ENVIRONMENTAL MONITORING STATIONS

GRI 413-1

18 stationary automatic environmental monitoring stations are installed along the perimeter of the KOGCF and SPZ (EMSs 001 – 018) and integrated into a single automatic environmental monitoring system.

Four out of 18 EMSs are located at the field and within the SPZ. The stations 005 – 018 were relocated to new spots in accordance with the Project for EMS relocation to the boundary of the new estimated SPZ, which was completed in December 2021. As of end 2021, there are 13 EMSs located at the estimated SPZ boundary: 006 – 018; the EMS 005 was relocated to a site near Aksai.

Annual average concentrations of the monitored components recorded by EMSs in 2021 at the KOGCF SPZ boundary are shown in Table 29. The column "Actual annual average concentration" shows the minimum and maximum annual average concentrations of the monitored components recorded by each EMS.

Tab. 29. Annual average concentrations of the monitored components recorded by EMS in 2021

Monitored components	Actual annual average concentration, mg/m ³	MPC one-time ⁶ , mg/m ³	Exceedance of MPC one-time*
H ₂ S	0 – 0.001	0.008	no
SO ₂	0.002 – 0.005	0.5	no
NO ₂	0.002 – 0.006	0.2	no
CO	0.1 – 0.2	5.0	no

* Criteria of air quality assessment at the SPZ boundary is MPC one-time. EMS are configured to give a signal when the MPC one-time is exceeded.

All the EMSs take measurements of the four main pollutants (H₂S, SO₂, NO₂, CO) on a continuous basis, i.e. 24/7.

According to the data received from EMSs in 2021, the actual daily, monthly, quarterly and annual average concentrations of the monitored components did not exceed the established sanitary and hygienic limits. However, on 31st August 2021, the EMS-016 recorded MPC one-time exceedance for hydrogen sulphide measured within a short period of 20 minutes. Pursuant to the requirement of the RoQ Environmental Code (Sub-item 6 Item 1 Article 130), the Company sent a notification regarding the exceedance recorded at EMS-016 to the WQO Environmental Department.

It should be noted that no connection was found between the exceedance shown in Table 30 and

the KPO field operations. The review of the KPO field operations, taking into account the meteorological parameters at the time of the MPC one-time exceedance, has shown that all production facilities were in normal operation with no flaring events, no equipment failures or emergencies recorded.

Based on weather conditions at the time of recording NW wind was registered whereby the KPO field operations could not have affected the atmospheric air in the area of EMS-016 (from EMS-016 towards the field). No gas odour complaints from the local communities adjacent to the KOGCF were raised on the date the MPC exceedances were recorded.

Air quality data from all 18 KPO automatic EMSs are transmitted online to the West Qazaqstan Oblast Environmental Department via the Ecomonitor portal.

Tab. 30. One-time MPC exceedances recorded by EMS in 2021

EMS No.	Monitored components	Actual one-time concentrations recorded in 2021, mg/m ³	MPC one-time, mg/m ³	Frequency ratio of MPC one-time exceedance	Number of exceedances
EMS-016	H ₂ S	0.010	0.008	1.25	1

⁶ MPC one-time is a maximum permissible one-time concentration of a chemical substance (in mg/m³) in the ambient air of settlements. This concentration shall not cause a reflex response in human bodies (holding of breath, irritation of eyes, upper respiratory tract, etc.) in case of 20-30 min of inhalation.

ATMOSPHERIC AIR MONITORING IN THE VILLAGES ADJACENT TO THE KARACHAGANAK FIELD GRI 413-1

There are stationary air monitoring posts in six settlements located along the perimeter of the field – Zharsuat, Zhanatalap, Dimitrovo, Karachaganak, Priuralnoye, Uspenovka, and in Aksai town. The air sampling is carried out four (4) times a day (at 1, 7, 13 and 19 hours according to the State Standard) by the permanent personnel of the contracting laboratory, who reside in the specified villages. Approximately 52,000 air samples were collected and analyzed at the stationary posts in 2021.

Air samples are chemically tested in the laboratory in Aksai for the content of five main components in accordance with the State Standard and ruling documents: hydrogen sulphide (H₂S), sulphur dioxide (SO₂), nitrogen dioxide (NO₂), carbon oxide/monoxide (CO), and methyl mercaptan (CH₃SH). In addition, every 10 days the air is monitored for the concentration of volatile organic components: benzene (C₆H₆), toluene (C₇H₈), xylene (C₈H₁₀).

Monthly results of air monitoring are published in local print media and distributed to the villages for posting on the information boards, as well as published on the KPO web-site on a monthly basis. If any gas odour complaint is raised by someone of the community, an unscheduled air sampling is performed at the stationary posts.

In 2021, no MPC exceedances were recorded for the daily average concentrations of the monitored air components in the villages.

In 2021, three complaints with respect to gas odour were raised by the village communities adjacent to the Karachaganak Field. The unscheduled air sampling was carried out in the villages, the analysis results of which indicated that the concentrations of the monitored components did not exceed the established MPC one-time. Each complaint from an initiator with respect to gas odour was addressed.

The annual average concentrations of the monitored air components in the seven villages in 2021 are shown in Table 31. The column “Actual annual average concentration” shows the minimum and maximum annual average concentrations of the monitored components. Criterion for assessing air quality in settlements is MPC daily average.

Tab. 31. Annual average concentrations of the monitored air components in the villages adjacent to the KOGCF in 2021 GRI 413-1

Monitored components	Actual annual average concentration, mg/m ³	MPC daily average ⁷ , mg/m ³	Exceedance of MPC daily average
H ₂ S	0.001 – 0.002	0.008**	no
SO ₂	0.003	0.05	no
NO ₂	0.022 – 0.025	0.04	no
CO	0.428 – 0.432	3.0	no
C ₆ H ₆	0.173 – 0.188	0.3**	no
C ₇ H ₈	below MDL*	0.6**	no
C ₈ H ₁₀	below MDL*	0.2**	no
CH ₃ SH	Not detected	0.006**	no

* Measurements recorded were below the method's minimal detection limit (MDL). MDLs for the monitored components: C₆H₆ – 0.14 mg/m³; C₇H₈ – 0.14 mg/m³.

** MPC one-time. MPC daily average for hydrogen sulphide and methyl mercaptan is not established, therefore, MPC one-time is referred to for comparison purpose; MPC one-time is also applied in order to assess the content of benzene, toluene and xylene in the air as the frequency of components' sample collection and analysis is once in ten days.

⁷ MPC daily average – maximum permissible daily average concentration of chemical substance [in mg/m³] in the ambient air of settlements. This concentration shall not have direct or indirect adverse effect on human body in case of inhalation during indefinitely long-term period (years).



Fixed Environmental Monitoring Station

Why is it important to us?

Activity of such industrial enterprises as KPO is always associated with air emissions. Emissions of harmful substances into the air leads to environmental disorder. In this regard, KPO's goal is to reduce the negative effect of its activities.

In 2021, the Company continued testing new methods to reduce hydrocarbon flaring during well development. In the result of testing a technology with a high-pressure separator in combination with high flow pumps applied on the four wells in 2020 (3 wells) and 2021 (1 well), a reduction of emissions by ~24 thousand tons of CO₂-equivalent and additional production of ~53 thousand barrels was achieved.

GRI 102-15, 103-1 (3-3), 305-5

AIR EMISSIONS

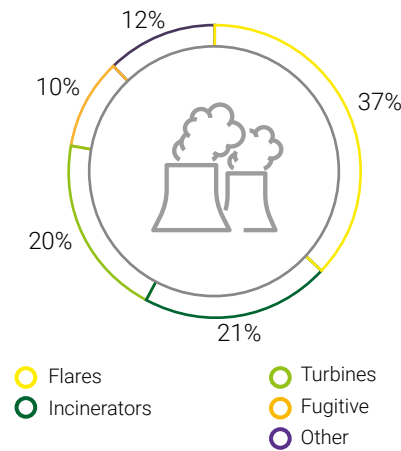
KPO manages air pollutant emissions based on the limits established in the Environmental Impact Permit.

The main volume of emissions is generated as a result of gas combustion in flares (37%), incinerators (21%), gas turbine units (20%), boilers, process heaters and compressors (12%), as well as from fugitive sources (10%) as shown in Graph 17.

Regulation of direct greenhouse gas (GHG) emissions in KPO is carried within the framework of the current national emissions trading system.

In 2021, total air emissions decreased by 37% compared to 2020 and amounted to 4,798 tons. The reduction in emissions is mainly due to the absence of well operations in 2021, accompanied by hydrocarbons well flaring.

Graph 17. Pollutant emissions in KPO by main air pollution sources, in 2021



Tab. 32. Targets in managing emissions GRI 103-2 (3-3)

Our 2021 targets	Target achievement	Actions taken in 2021	Targets for 2022
Ensure that specific GHG emissions do not exceed 67 tonnes of CO ₂ per one thousand tonnes of produced hydrocarbons	Completed	Specific GHG emissions amounted to 62 tonnes of CO ₂ per one thousand tonnes of produced hydrocarbons	
Ensure that the throughput losses do not exceed 3.82%	Completed	Throughput losses amounted to 3.54%.	
	New targets		Develop and pass verification/validation of regulatory and technical documentation to obtain a quota for 2022–2025 GHG emissions Obtain a quota for GHG emissions for 2022–2025

Table 33 shows data on the permissible and actual KPO emissions for the period of 2019 – 2021.

Tab. 33. Permitted and actual volumes of pollutant emissions, 2019–2021 GRI 305-7

Annual volume of emissions by pollutants, in tonnes:	2021	2020	2019
Permitted:	13,219	17,527	18,544
Actual, including:	4,798	7,591	7,597
Nitrogen oxides	1,197	1,637	1,636
Sulphur dioxide	1,989	3,315	3,281
Carbon monoxide	1,039	1,145	1,205
Volatile organic compounds	452	1,352	1,329
H ₂ S	3	3	3
Solid particles	71	74	80
Other	47	65	63

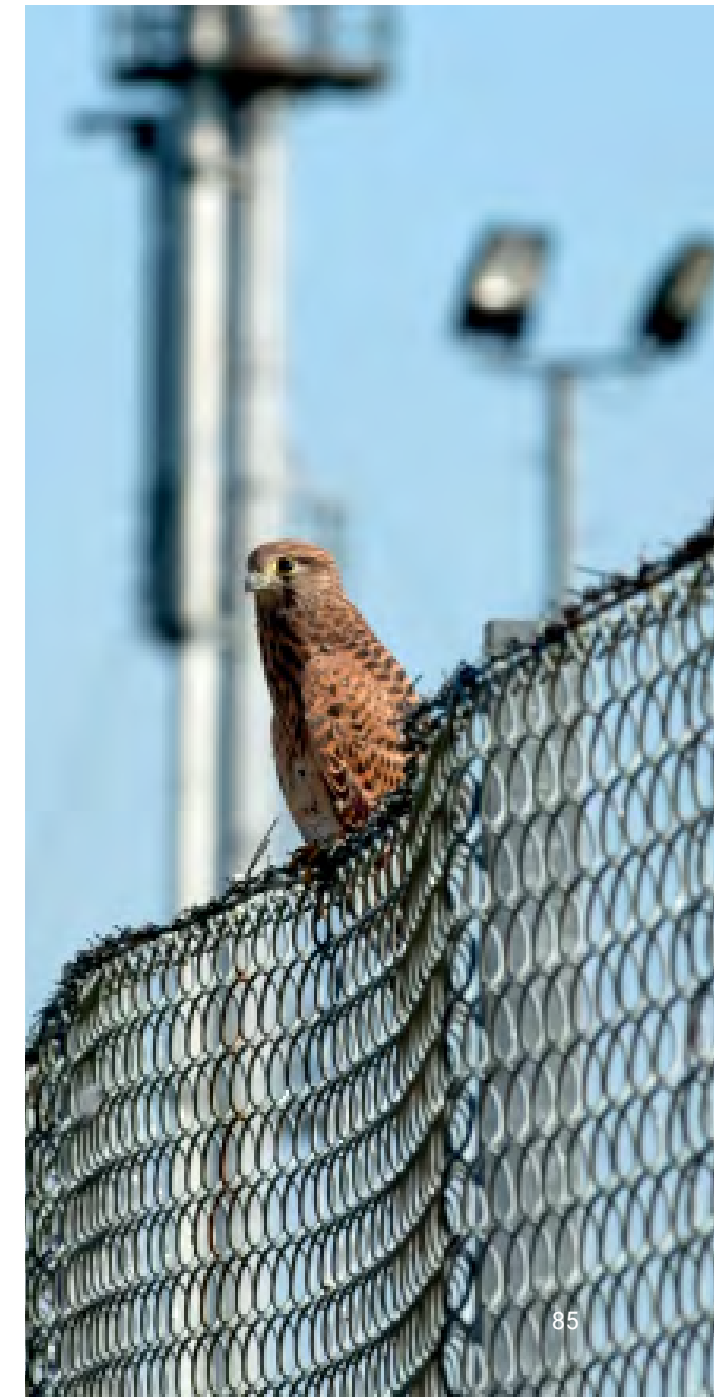
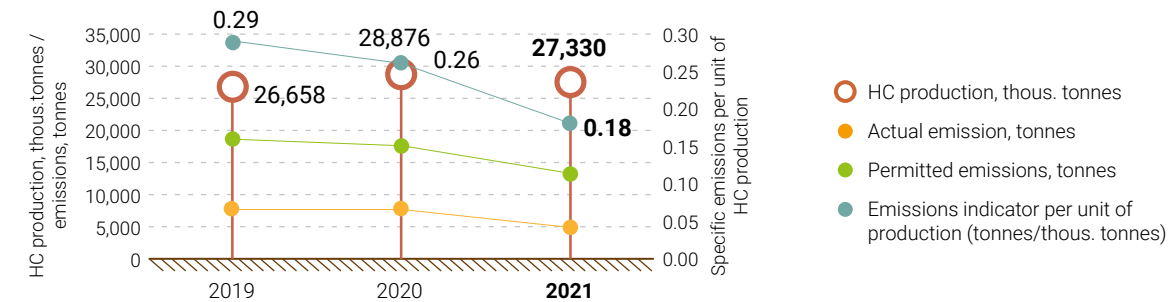
Note: Emission volumes data are provided in accordance with the data of statistical report «2-TP Air».

In KPO, the emissions are calculated using the technics specified in the statutory emissions limits and recommended for use in the Republic of Qazaqstan.

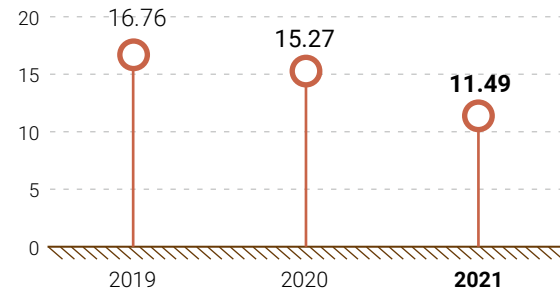
In 2021, the specific emissions per unit of production amounted to 0.18 tonnes per 1,000 tonne of hydrocarbons (HC) produced. Reduction in specific

emissions in 2021 versus 2020 is attributed to reduction of total emissions, due to the lack of work on wells followed by hydrocarbon combustion, as well as a shorter operating time of equipment that makes the main contribution to gross emissions.

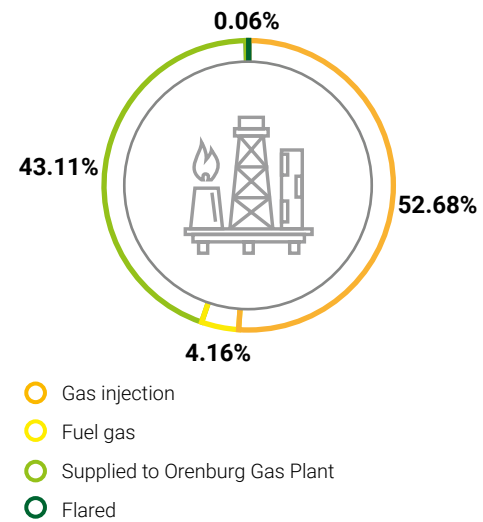
Graph. 18. Hydrocarbons production and environmental emissions in 2019–2021



Graph 19. Volume of associated gas flared, 2019–2021 (mln m³)



Graph 20. Gas utilization and flaring in 2021



GAS FLARING OG-6

In 2021, the total amount of flared gas was 0.06% (0.08% in 2020) of the total volume of gas produced or 0.38 tonnes per thousand tonnes of produced hydrocarbons. Such a low flaring emission rate resultant from flaring testifies to high operational performance against the global industrial average rate of 8.0 tonnes per one thousand tonnes and European average rate of 2.4 tonnes per one thousand tonnes⁸, as follows from the IOGP 2020's Report. Reduction in gas flaring volumes in 2021 versus 2020 was due to the absence of well operations associated with hydrocarbon flaring and full shutdown.

GAS UTILIZATION OG-6

In 2021, KPO's gas utilization rate reached 99.94% (99.92% in 2020). The performance target approved by the RoQ Authority under the 2021 Associated Gas Processing Development Programme was 99.69%.

In 2021, KPO's gas utilization rate reached

99.94%

⁸ Data source: Annual reports of the International Association of Oil and Gas Producers (IOGP) – 'Environmental Performance Indicators – 2020 Data'.

DIRECT GREENHOUSE GAS EMISSIONS

GRI 305-1, 305-7

Direct greenhouse gas (GHG) emissions are regulated across KPO in line with the national quotas trading system. KPO has obtained quotas for the 2021 GHG emissions (CO₂) in the amount of 2,369,945 tonnes on the basis of specific emissions indicators (benchmark). In 2021, actual emissions amounted to 1,727,683 tonnes of CO₂, which made 73% of the quota.

Assessment of GHG emissions is performed for carbon dioxide (CO₂), methane (CH₄) and nitrogen oxide (N₂O), using the calculation method based on the Company's operations data (in terms of fuel consumption and laboratory data on fuel composition).

According to the verified GHG Emissions Inventory Report for 2020, the total volume of GHG emissions amounted to **1,745,768** tonnes in CO₂-equivalent, of which CO₂ contribution equalled to 1,727,683 tonnes of CO₂-equivalent (99%), CH₄ – 9,586 tonnes of CO₂-equivalent (0.5%), N₂O – 8,499 tonnes of CO₂-equivalent (0.5%).

Information on the dynamics of generated GHG emissions is provided in Table 34. In 2021, minor reduction in GHG emissions (by 4%) versus 2020 is attributed to a decrease in hydrocarbon production capacity in the reporting year.

Tab. 34. Dynamics of GHG emissions generated from KPO production activities, 2019–2021

Total volume of greenhouse gas emissions (tonnes of CO ₂ equivalent)					
From fuel combustion at stationary sources	From fuel combustion at flares and incinerators	Fugitive emissions*	Total GHG emissions in 2021	Total GHG emissions in 2020	Total GHG emissions in 2019
1,602,469	136,211	7,088	1,745,768	1,821,604	1,870,324

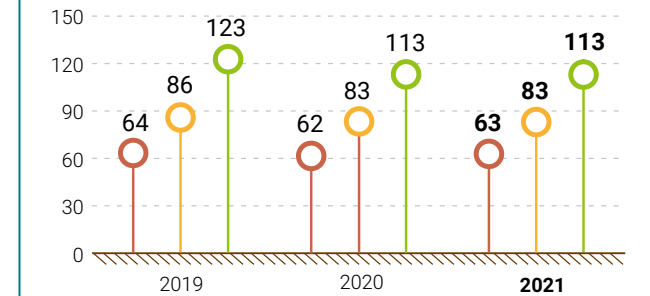
* Considering the use of internal calculation methodology for fugitive GHG emissions approved for use for the purposes of inventory by the RoQ Ministry of Environment, Geology and Natural Resources. The volume of fugitive GHG emissions in 2021 calculated by the methodology applied at the GHG emissions inventory for 2018–2019 made up 151,916 of CO₂-equivalent.

SPECIFIC GREENHOUSE GAS EMISSIONS GRI 305-4

In 2021, KPO specific GHG emissions amounted to 63 tonnes of CO₂ per thousand tonnes of produced hydrocarbons, which is consistent with the target indicators of the specific GHG emissions of no more than 67 tonnes of CO₂ per thousand tonnes of hydrocarbon produced.

Graph 21 shows the dynamics of specific GHG emissions comparing to the specific emissions data provided by the IOGP. The actual specific GHG emissions at KPO are 23% lower than the European indicators and 44% lower than the international ones.

Graph. 21. Dynamics of specific GHG emissions per unit of produced hydrocarbons (HC)*, 2019 – 2020



○ KPO data – tonnes of CO₂/ thousand tonnes of produced HC
 ○ IOGP data – tonnes of CO₂/ thousand tonnes of produced HC (European index)
 ○ IOGP data – tonnes of CO₂/ thousand tonnes of produced HC (International index)

*The data was sourced by Annual report of the International Associations of Oil and Gas Producers (IOGP) – 'Environmental Performance Indicators – 2020 data'. The 2020 data was used for comparison purpose in 2021, as the 2021 IOGP Report was not available at the time this issue was prepared.



Why is it important to us?

To ensure production of hydrocarbons while making the transition to low-carbon technologies is one of the challenges faced by KPO.

Our targets include implementation of energy efficiency measures and their evaluation, covering best available technologies, energy-saving equipment, and eco-friendly materials. **GRI 102-15, 103-1 (3-3)**

ENERGY EFFICIENCY

As part of the energy efficiency activities, KPO conducts energy analysis and energy efficiency monitoring. Based on the analysis results, KPO energy intensity has been relatively stable in the period of 2014–2020 with 1-2% variation. In 2021, there was an increase in KPO energy intensity by 6.5% compared to 2014, which is associated with a decrease in hydrocarbon production due to limited gas supplies to the Orenburg Gas Processing plant and shutdowns at Unit 2.

The benchmarking has shown that KPO's energy intensity is below the average indicator of

the companies reporting to IOGP. The results of this analysis have shaped the basis for defining our energy policy, goals and objectives, and measures for energy saving and efficiency improvement of the Company. **GRI 3-3**

In order to minimize energy efficiency risks and impact of the Company, we have set a number of targets. The results of their implementation are presented further in the text.



Tab. 35. Targets in energy efficiency GRI 103-2 (3-3)

Our 2021 targets	Target achievement	Actions taken in 2021	Targets for 2022
Complete the energy audit and develop a five-year energy saving and energy efficiency improvement action plan	Partially completed	Energy audit completed. A draft five-year energy saving and energy efficiency improvement action plan has been prepared.	Conduct an annual energy analysis of the Company and continue monitoring energy efficiency indicators for equipment/processes that have a material impact on KPO's energy intensity
Conduct a surveillance audit of the Energy Management System for compliance with the ISO 50001:2018 standard	Completed	A surveillance audit of the Energy Management System against the ISO 50001:2018 standard was successfully conducted in August 2021.	Conduct a surveillance audit of the Energy Management System against the ISO 50001:2018 standard

ENERGY MANAGEMENT SYSTEM **GRI 103-2, 103-3 (3-3)**

The ISO certification contributes to enhancement of the KPO reputation as a reliable partner to the Republic of Qazaqstan that takes appropriate actions to meet both regulatory requirements and international standards.

In August 2021, KPO has successfully conducted a certification audit against the ISO 50001:2018 standard. Following the audit, the KPO Energy Management System was recognized as corresponding to the international standards.

ENERGY CONSUMPTION **GRI 302-1**

In accordance with the energy saving and energy efficiency legislation requirements, KPO conducts a mandatory energy audit every five years.

The targets of an energy audit is to assess the Company's efficiency in using fuel and energy resources and to develop measures ensuring rational energy consumption and increasing energy efficiency.

In 2021, a mandatory energy audit was completed at KPO by a specialized company in line with which, the overall KPO's energy saving and energy efficiency

activities were rated as 'excellent'. Also, energy efficiency improvement measures were proposed, featuring economic feasibility and practical application. One of the measures was the installation of a waste heat boiler at the gas turbine power plant is scheduled to include in the Energy Saving and Energy Efficiency Action Plan for 2022–2025.

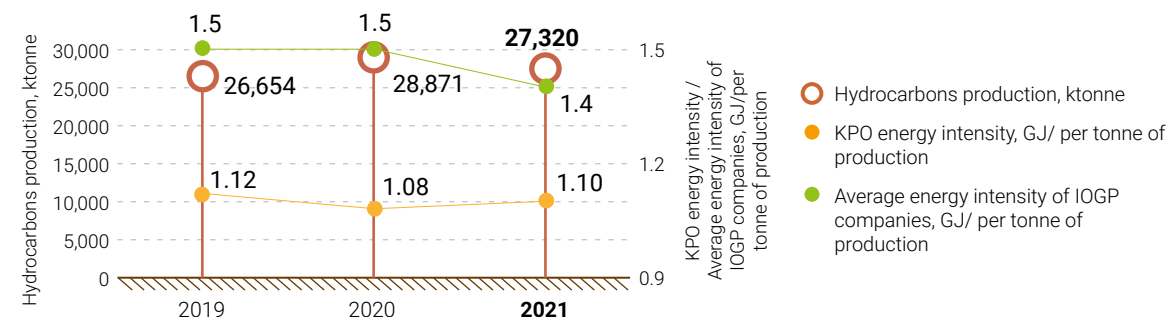
In 2021, the energy consumption totalled 1,029,538 tonnes of coal equivalent compared to 1,067,135 tonnes of coal equivalent in 2020. The decrease in energy consumption is related to the repair works on gas turbine generators. Table 36 shows energy consumption volumes broken down by energy type.

Tab. 36. KPO energy consumption in 2019 – 2021 GRI 302-1

Type of energy	Unit of meas.	Energy consumption, physical units			Energy consumption, tonnes of coal equivalent			Energy consumption, GJ		
		2021	2020	2019	2021	2020	2019	2021	2020	2019
Fuel gas	Thous.m ³	832,863	863,029	826,806	1,026,088	1,063,251	1,018,625	30,074,639	31,163,893	29,855,886
Electric power (purchased)	MW/h	6,710	6,236	7,244	825	767	891	24,181	22,482	26,115
Diesel fuel	m ³	705	1,188	739	888	1,498	932	26,027	43,905	27,468
Gasoline	m ³	228	199	226	251	220	249	7,357	6,439	7,301
Heating (in rented offices)	Gcal	10,388	9,781	8,731	1,486	1,399	1,249	43,555	40,994	36,595
TOTAL					1,029,538	1,067,135	1,021,946	30,175,759	31,277,713	29,953,365

In 2021, the energy intensity indicator was 1.10 GJ /tonnes of hydrocarbons, which was below the average energy intensity indicator of the companies that submitted their reports to the IOGP⁹ (1.4).

Graph 22. Dynamics of energy intensity, 2019 – 2021 GRI 302-3



ENERGY SAVING ACTIVITIES

Pursuant to the approved Energy Saving and Energy Efficiency Improvement Action Plan, KPO took the following actions in 2021:

- ▶ The activities on replacement of traditional lamps with LEDs bulbs at production and ancillary facilities were continued. In 2021, 4,917 lamps were replaced at the Company’s facilities. Estimated economy of energy consumption from the traditional lamps replacement was about 754,600 KW/h. In the period of 2019 – 2021, 10,385 lamps were replaced and around 1,271,230 KW/h saved.
- ▶ Enhancement of fuel gas accounting continued including:
 - ▶ installation of an ultrasonic flow meter at KPC section 5-340 – planned for III quarter of 2022;
 - ▶ installation of the metering device on the gas turbine of the re-injection compressors.
- ▶ Training sessions were held for Production Department’s employees on the energy management system ISO 50001:2018.

⁹ Data source: Annual reports of the International Association of Oil and Gas Producers (IOGP) – ‘Environmental Performance Indicators – 2020 Data’.



In December 2021 KPO became the winner of the II Republican Contest ‘Green Office 2021’ in nomination for industrial organisations

CASE STUDY 3: GRI 102-44

KPO ‘GREEN’ OFFICE

CONTEXT / SHORT DESCRIPTION:

In 2021, KPO continued its activities on implementation of the ‘green’ office principles. The implementation of the ‘green’ principles contributes to maintaining and improving environmental culture, raising awareness of employees of the importance of the environmental issues and conscious care for the environment.

Besides, the ‘green’ office concept motivates employees to participate in volunteer projects and development of eco-friendly behavior.

GOAL:

The targets of the ‘Green office 2021’ programme are:

- ▶ reducing the environmental footprint of the Company’s offices,
- ▶ promotion of environment related ideas, and
- ▶ increasing loyalty of employees to implementation of ‘green’ technologies and practices.

SOLUTIONS / ACTIONS:

In 2021, the target group for the pilot project ‘KPO Green office’ included Uralsk Kurmangazy office and Karachaganak Business Centre in Aksai. In these offices separate collection of plastic waste was put into practice followed by handover for recycling.

The project was launched by conduction of training and building a team of eco-volunteers. Over 200 KPO employees attended the eco-training in 2021, which included:

- ▶ Training modules of the ‘green’ office programme for eco-volunteers who, in their turn, shared the obtained knowledge with their colleagues.
- ▶ Eco-breaks for discussion of important issues on reduction of the ecological footprint in the offices and contribution of each employee into creation of eco-friendly office.
- ▶ Environmental seminars on ‘Management of material losses through waste management, or beneficial eco-friendly habits’ with Damir Karimov – motivational speaker, environmental and healthy lifestyle coach. As a result of the seminar, many of the employees expressed their wish to become eco-volunteers in their departments.

The following indicators were selected for monitoring environmental performance of the offices:

- ▶ Electricity consumption (kW);
- ▶ Cold water consumption (m³);
- ▶ Quantity of plastic waste generated (kg);
- ▶ Quantity of waste paper (kg);
- ▶ Quantity of used plastic tableware (pcs).

RESULTS:

In December 2021, KPO has won the Second Republican Contest ‘Green office 2021’ in the nomination for industrial companies.

The ‘Green office 2021’ contest was held upon an initiative of the Coalition for ‘green’ Economy and G-Global development with the support of the Ministry of Environment, Geology and Natural Resources of the Republic of Qazaqstan and the OSCE Programme office. Objectives of the contest are promotion of eco-friendly life style, “green” and low-carbon technologies, improvement of environmental behavior in life, extension of best practices and technology solutions, as well as assistance in arrangement of comfortable labour conditions for creating respect to the environment. Over 100 organizations took part in this contest.

In 2022, the ‘green’ office activities will be continued in other KPO offices.

Above all, the ‘Green office’ project is not only a popular social trend, but a need to reduce negative impact on the environment by people and organizations.

Why is it important to us?

Excessive and irrational water consumption may lead to impacts associated with the depletion of water resources and water shortage for industrial and economic needs, deterioration of aquatic ecosystems and water bodies becoming increasingly incapable of natural reproduction and purification.

The Company's target is to use water resources rationally in order to preserve them. KPO controls the use of clean water within the Company by undertaking a set of measures for conservation of water resources and maximum re-use of treated water, wherever possible. **GRI 102-15, 103-1 (3-3)**

WATER USE AND DISPOSAL **GRI 303-1**

Protection and rational use of water resources is a priority task faced both by the humanity and our Company. Water is the source of life and a valuable industrial raw material.

The results of our work to minimize the risks of the Company's production impact on the use of water resources are presented below.

Tab. 37. Targets in managing effluents **GRI 103-2 (3-3)**

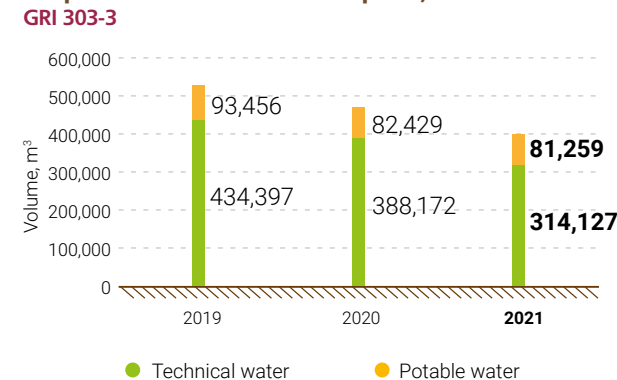


Our 2021 targets	Target achievement	Actions taken in 2021	Targets for 2022
Complete exploration activities under the Project for geological exploration works on the follow-up exploration of the site at the Industrial Wastewater Polygon № 2	Completed	All pre-exploration geological and hydrogeological works were carried out at the site of Polygon № 2, which allowed proving the reservoir capacity to accept increased volumes of industrial waste water. Main long-term solutions for injecting wastewater were presented to the Authorised body on environmental protection to which a conclusion requiring an environmental impact assessment was issued.	Carry out development of Annex № 3 to the industrial waste water injection project.

In 2021, the total KPO water consumption was 395,386 m³, of which technical water made up 314,127 m³, and potable water – 81,259 m³. **GRI 303-3, 303-5**

In 2021, the volume of water used by KPO for production needs was 16% lower than in 2020. The domestic needs' water consumption was lower too versus 2020. The reduction of water consumption was related to the drilling scope cut, better control over water losses during transportation, measures to optimize water consumption due to a decrease in the water level in holding pond № 1 at the Konchubai Gully, secondary use for technical needs of treated wastewater from storage ponds, rainwater and meltwater from lagoons and groundwater from wells.

Graph 23. KPO water consumption, 2019 – 2021 **GRI 303-3**



The main source of water supply for production needs in the Karachaganak field is the holding pond № 1 at the Konchubai Gully, while for household and domestic needs it is the Zharsuat water intake. The source of water supply for household, domestic and production needs of the Bolshoi Chagan OPS is the Serebryakovskiy water intake, while for the Atyrau Terminal is the Kigach water intake.

Konchubai Gully is not part of the list of fishery waters based on the WQO Administration Resolution dated 22.12.2014 (№ 325). The Konchubai Gully is not fed by groundwater; it collects water only during springtime by snow melting and rainfalls.

According to the Special Water Use Permit valid until 24.05.2025 for water intake from the Konchubai Gully for industrial needs, the KPO annual intake limit constitutes 741,432 m³. The Permit is issued by the RSE 'Zhayk-Caspian Basin Inspectorate for Water Resources Management and Conservation of Water Resources Committee of the RoQ Ministry of Environmental Protection, Geology & Natural Resources'. The holding pond № 1 at the Konchubai Gully is operated in line with the Operating Rules for ensuring optimum water use conditions, integrity of structures, environmental protection, and also as per the Process operating procedure for safe operation and maintenance of the holding pond's hydraulic structures.

In 2021, the combination of prolonged dry periods and little snow floods observed in the region has led to a critical decrease in the water level in holding pond

№ 1. In this regard, during 2021, KPO carried out a number of activities allowing optimization of technical water consumption and reuse of treated wastewater, rainwater, and melt water. Additionally, after conducting experimental filtration studies at wells, groundwater from wells was sent to operational facilities for reusing for technical needs. The Company has started and continues its research and development of framework of water consumption from alternative sources.

GRI 303-1

Water intake from other sources is ensured through contracts with water suppliers. **GRI 303-5**

In 2021, the potable water was used for domestic needs of the KPO facilities. By exception, at the Bolshoi Chagan Oil Pumping Station (OPS) the potable water has been supplied by the RSE 'KazVodKhoz' WQO Branch, due to absence of alternative sources of water supply, has been used to fill the fire water tanks for fire safety purposes.

Table 38 shows KPO water consumption breakdown by source.

Tab. 38. KPO water consumption in 2019 – 2021 broken down by source, m³ **GRI 303-3, 303-5**

№	Source	Facility	Water quality	2021	2020	2019
1	Zharsuat water intake facility (<i>domestic needs</i>)	KOGCF	groundwater, potable	79,852	80,957	91,851
2	Serebryakovskiy water intake facility	Bolshoi Chagan OPS	groundwater, potable	1,407	1,472	1,605
	<i>Domestic needs</i>			868	938	924
	<i>Production needs</i>			539	534	681
3	Konchubai Gully water intake facility (<i>production needs</i>)	KOGCF	surface water, technical	310,352	384,453	431,616
4	Kigach water intake facility	Atyrau Terminal	surface water, technical	3,775	3,719	2,781
	<i>Domestic needs</i>			808	759	777
	<i>Production needs</i>			2,967	2,960	2,004

Note: water consumption is metered using meters with measurements entered in the logbooks and further in the KPO water consumption metering database.

DISCHARGE OF TREATED WASTEWATER
GRI 302-2

KPO uses special man-made facilities for collecting treated domestic and industrial wastewater and storm runoffs. These facilities exclude a possibility of contaminants soaking into the soil and groundwater and allow collecting the treated wastewater for their re-use for technical needs, thereby reducing the fresh water intake. The types of wastewater collection facilities were shown in the [2018 Sustainability Report](#) (Tab. 40, p. 105).

Formation water produced with hydrocarbons and process wastewater are treated and injected into the deep-lying formations of the Karachaganak Field Subsurface Wastewater Disposal Polygons № 1 and № 2. Wastewater injection is the international practice of disposing wastewater that allows preventing the formation of salt-containing waste on the surface during the treatment. Owing to the reliable water shutoff and soil properties, which are perfect for the injection of wastewater, the migration of wastewater into upper aquifers is ruled out.

According to the RoQ legislation, the volume of discharged wastewater and amount of discharged contaminants are estimated and justified in the Company project documentation and regulated by special permits. Wastewater generated as a result of the KPO economic and operational activities is not discharged into the natural water bodies.

Table 39 shows the KPO discharge volumes in 2019–2021 by wastewater types and receiving facilities.

Comparing to 2020, the volume of wastewater discharged by Company in 2021 increased by 12.38%. Of that, in 2021 compared to 2020, the volume of

injected industrial wastewater increased by 12.35%. The increase in industrial wastewater was due to increase of produced water. The types of treated wastewater and contaminants were presented in the [2017 Sustainability Report](#) (p. 93).

In 2021, the discharge of contaminants amounted to 58,981 tonnes (which was 28.2% more compared to 2020 – 46,006 tonnes). Of them, 58,166 tonnes were discharged within the maximum permissible discharge (MPD) limits, while the excess discharge amounted to 815 tonnes.

Excessive discharge of contaminants was due to insignificant exceedance of the MPD limits in terms of hydrogen sulphide, chlorides and methanol content

in wastewater injected into Subsurface Waste Water Disposal Polygons № 1 and № 2. Excessive discharge of contaminants with domestic wastewater to the holding ponds was not observed, except for a slight excess in ammonium nitrogen, chlorides, and phosphates. As provided by the RoQ Tax Legislation, the Company effected necessary payments for the discharges of contaminants.

Overall, wastewater injection has no effect on the environmental components such as soil, flora and fauna, as wastewater is injected into effectively isolated deep horizons with high-mineralized groundwater that is not used for domestic and potable, balneological, and process needs, irrigation or livestock farming.

Tab. 39. Total discharge volume and contaminants by wastewater type and receiving facility, 2019–2021, m³ GRI 303-4

Receiving facility	Type of wastewater	2021		2020		2019	
		Discharge volumes, m ³	Amount of contaminants, tonnes	Discharge volumes, m ³	Amount of contaminants, tonnes	Discharge volumes, m ³	Amount of contaminants, tonnes
Holding ponds	Treated domestic wastewater	72,123	44.51	64,244	34.38	68,763	35.72
Subsurface Waste Water Disposal Polygons	Industrial wastewater, process and produced wastewater	780,755	58,935	694,893	45,970	628,819	39,645
Terrain of Bolshoi Chagan OPS and Atyrau Terminal OPS	Rainfall and snow melt wastewater	2,538	1,595	1,982	1.56	3,546	2.05
Total discharge		855,415	58,981	761,119	46,006	701,128	39,683

Note: the volume of water discharge is metered using meters with data entered in the logbooks and further in the KPO water consumption metering database. The amount of contaminants discharged is determined by calculation as the product of the actual concentration of the contaminant before the discharge and the actual volume discharged.

REUSE OF TREATED AND OTHER WASTEWATER **GRI 303-3 (2016)**

In order to reduce fresh water intake for such works and operations like drilling, drilling muds preparation, watering of planted trees, dust suppression on roads and constructed sites KPO uses treated domestic, production storm wastewater and storm runoffs. The wastewater is re-used at the Company facilities in line with the 2018–2022 Operating Procedure.

In 2021, treated waste water, rainfall and melted water, as well as groundwater from wells were also used for the technical needs of production facilities.

The volume of wastewater reused for technical needs by KPO in 2021 made up 11.3% of the technical water consumed from the Konchubai Gully. In 2021, the Company reused 35,061 m³ of treated wastewater for technical needs, mostly for dust suppression. Table 40 shows the activities that utilize treated wastewater and water.

Tab. 40. Reuse of treated wastewater and groundwater in 2019 – 2021, m³

	2021	2020	2019
The total volume of re-used treated wastewater, including:	35,061	18,313	38,545
Drilling operations and drilling mud preparation	5,317	3,482	30,117
Irrigation, hydro tests, and replenishing of fire tanks	8,465	335	1,088
Dust suppression	17,917	14,496	7,340
Technical needs of production facilities	3,362		

Note: the volume of reused water is measured indirectly in m³ (motor hours, tank truck volume, number of trips, pumping capacity, etc.) with the completion of a control ticket and data entered in the logbook.



Water samples intake in Karachaganak



INDUSTRIAL WASTEWATER MANAGEMENT GRI 303-2

Managing the produced and industrial effluent water is one of the main challenges faced by KPO in the Karachaganak Field.

KPO's wastewater management strategy consists of implementation of a portfolio of interconnected projects aimed at removal of production restrictions in terms of produced water handling as well as ensuring personnel safety, asset integrity and environmental compliance.

The Company took a decision to update the Project for wastewater injection into Polygons in order to increase the scope of injected water in Polygon 2 up to 1,100 thous.m³ from 2023 to 2037. The Project's Amendment No.3 will contain the planned increase of wastewater injection and activities targeting to expand the potential of injecting wells. Upon completion, development of the environmental impact assessment to Amendment No.3 followed by public hearings are scheduled.

In 2021, two planned projects were completed: workover of the second absorbing well for more effective utilization of wastewater and commission of a modified gas sweetening unit in order to automate a causterization process.

In 2022, refinement and implementation activities will continue including the upgrade of a caustic neutralisation unit. Also, it is expected that the 2022 turnaround will cover a replacement of induced gas flotation vessels and a tilted plate separator required for treating process effluents from oil. The vessels' replacement will ensure asset integrity and higher capacity of facilities and consequently provide better oil and water separation, which will positively affect the operation of the entire wastewater treatment system before disposal into deep horizons.

Tab. 41. Implemented industrial wastewater management projects in 2021 GRI 303-2

Project	Business driver	Note
Start-up of a modified gasoline demercaptanization unit	Safe operations	Implementation of the project allowed optimizing generation of the spent caustic soda, which further goes to a neutralization unit. By means of process automation the risks for personnel exposure to toxic agents.
Workover of the two water injection wells	Production maintenance	Workover of the two absorbing wells with application of proppant fracturing has led to a significant raise of wells acceptability of wastewater re-injection for increasing production.

WASTE MANAGEMENT

Waste handling in KPO is focused on reducing real and potential hazards of waste generated during the Company's production activities on people and the environment.

Our targets are to treat and recycle waste at our facilities, to cut down waste transfer to landfills, to

reduce negative impact from burials, as well as to explore and apply new methods and technologies.

The results of our work to minimize the risks of the Company's production waste impact on the environment are presented below in the table and further in the text.



Tab. 42. Targets in waste management GRI 103-2 (3-3)

Our 2021 targets	Target achievement	Actions taken in 2021	Targets for 2022
Ensure implementation of 10 activities scheduled for 2021 as per KPO's 2021–2023 Waste Management Programme	Completed	All activities scheduled for 2021 as per the Waste Management Programme were implemented throughout the year.	Ensure implementation of activities scheduled for 2022 as per the Waste Management Programmes both for Karachaganak Field and Bolshoi Chagan Ops and Atyrau OPS
Carry out pilot testing of clay drilling cuttings	Postponed	Due to the arisen organizational and financial challenges for pilot plant tests, these activities were not performed in 2021.	

KPO processes related to production, processing and transportation of raw materials, as well as the use of special equipment, materials and other required resources, inevitably involve generation of waste.

Measures taken by KPO to reduce the volume of generated waste, the Ventures' compliance with environmental safety rules during the accumulation, storage, and transportation, activities for segregation, reuse, recycling and reduction of

volume and hazardous properties of waste, as well as environmentally friendly burial – all these enable significant mitigation of the adverse impact on people and the environment. GRI 103-2 (3-3), 306-1

The KPO Waste Management Programme for 2021–2023 provides for indicators and measures for the gradual reduction of the accumulated and generated waste volumes and their hazardous properties.

Why is it important to us?

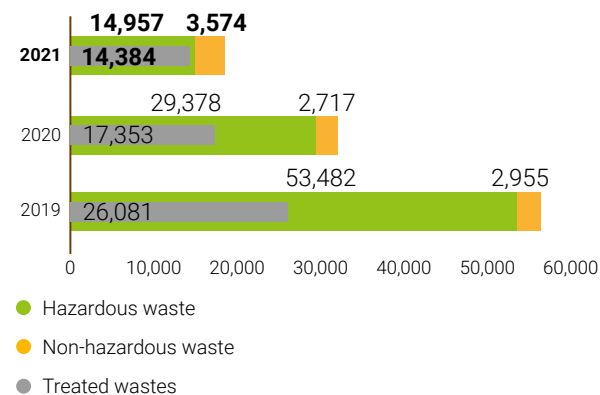
If handled unsafely, a hazardous production waste, its storage and disposal sites, may pose a threat to the environment and cause pollution of air, underground and surface waters, soils and vegetation, which may have a negative impact on the environment and the health of people.

Negative environmental impacts are prevented through compliance with the requirements of environmental legislation, i.e. burial and accumulation of waste on dedicated sites, avoidance of excessive burial and accumulation of waste, as well as timely removal of waste from the places of accumulation.

As per the monitoring work programme, KPO performs regular production environmental control (PEC) over the environmental conditions at the waste burial and accumulation sites in the field. In 2021, the monitoring did not reveal direct negative impact on the environmental components.

In the framework of the PEC, quantitative control is exercised over the movement of waste in order to account for the burial volumes, as well as the volumes and time of waste accumulation. GRI 306-1, 102-15, 103-1 (3-3)

Graph 24. Waste generated at KPO facilities in 2019–2021, tonnes GRI 306-3



Note. The domestic wastes are not accounted for in this calculation due to their insignificant quantity (below 6%) compared to the production waste. The domestic waste is described further in the text in the waste handling methods table.

”

The KPO Eco Centre comprises five waste treatment facilities, as well as a Landfill for its safe disposal.

“

In 2021 the volume of waste generated totalled

19,660
tonnes

The Company applies the following waste management methods:

- ▶ waste recovery to process stream;
- ▶ waste treatment at the Eco Centre facilities;
- ▶ waste burial at the Eco Centre facilities;
- ▶ waste handover to specialised contractor organizations for further processing, reuse or destruction. **OG-7**

WASTE TREATMENT AND BURIAL **GRI 306-2, 306-4, 306-5**

Treatment of the Company's production and consumption waste is carried out at the Eco Centre facilities or the waste management complex. The facility ensures cost-efficient and environmentally safe recycling and treatment of solid waste and fluids, and is considered to be an example of the best drilling waste management practice in the West Qazaqstan Oblast.

Drilling wastes are treated by means of technologies, which allow not only reducing their volume and hazard characteristics, but also recovering valuable components from them, and treating the waste for further reuse. Waste recycling back into production process exercised by the Company is the best possible way to re-use the generated waste.

In 2021, the volume of waste generated at KPO facilities totalled 19,660 tonnes. Compared with 2020, the amount of KPO waste in 2021 has decreased by 13,518 tonnes, which was mainly due to the reduction of the KOGCF drilling programme, and the shutdown of the Rotary Kiln Incinerator for repair. Graph 24 shows all types of waste generated in KPO.

According to the Unified republican form of the waste information reporting system, the total volume of waste generated in 2021 included both wastes generated and treated.

The KPO Eco Centre comprises five waste treatment facilities, as well as a Landfill for its safe disposal.

In 2021, KPO has completed all the activities scheduled in the 2021–2023 Waste Management Programme, including segregation, sorting, reuse, processing, reduction of volumes and hazardous properties, except for the treatment of solid waste in the Rotary-Kiln Incinerator due to the unscheduled long-term repairs of certain process parts of the unit. Handover of large-sized metal scrap as recyclable material to RSI Kapitalneftegaz has been postponed till 2022.

During 2021, the following activities were carried out at the Eco Centre:

Tab. 43. Eco Centre facilities and recycling activities

Eco Centre Units	Waste treatment activities in 2021
Thermo-mechanical cutting cleaning facility (TCC)	Owing to the separation of base oil and water from the treated oil-based drill cuttings, the quantity of KPO disposed waste was reduced by 13% from the initially generated volume. In 2021, 6,638 tonnes of waste were treated, 882 tonnes of base oil and water were separated, and 5,756 tonnes of waste treated at the TCC were disposed at the Solid Industrial Waste Landfill.
General Purpose Incinerator (GPI)	By incineration of waste at the GPI, the amount of waste was reduced by an average 89%. In 2021, 793 tonnes of waste were sent for incineration, following which 86 tonnes of ash were disposed at the Eco-Centre Solid industrial waste landfill.
Liquid Treatment Plant (LTP)	In 2021, 6,110 tonnes of liquid waste were treated. The process resulted in 4,287 tonnes of treated brines and muds, which were sent for re-use – preparation of drilling brines and muds.
Waste Segregation Unit (WSU)	In 2021, out of 1,128 tonnes of solid domestic waste, 790 tonnes were sent to General Purpose Incinerator for incineration, 180 tonnes, including waste paper, metal scrap, glass and plastic were sorted for handing over to the specialised organizations for treatment and reuse. 217 tonnes of solid domestic waste was handed over to specialised organizations for disposal at the Solid Domestic Waste Landfill. 129 tonnes of food waste was handed over to specialised organization for processing.
Solid Industrial Waste Landfill	16 cells of the Solid industrial Waste Landfill were capped and closed at the end of 2021.

In 2021, the Company continued extraction of wastes from the old Solid Waste and Spent Drilling Fluids Storage Site for further treatment at the Thermo-mechanical cutting cleaning facility and disposal at the Solid Industrial Waste Landfill. The waste is disposed at the Landfill in compliance with the RoQ environmental legislation.

In 2021, 4,308 tonnes (as compared to 1,220 tonnes in 2020) were sent for treatment from the Solid Waste and Spent Drilling Liquids Storage Site. The increase in the wastes treated at the TCC results from the decrease in the drilling waste and the capability to accept more waste from the Site for treatment. Processing of waste from the old Site is planned to continue in 2022. **GRI 306-4**

Drawing by Sergey Moroz, 14 years old, winner of the contest "Energy Saving By the Eyes of Children", nomination "Original idea"



The KPO waste is mainly produced during the wells' drilling and workover activities. Concurrently, the water or oil base of the drilling cuttings depends on the type of the drilling mud used for the well operations. The solid and liquid drilling waste generated in 2021 amounted to 6,647 tonnes (58% of the initially generated waste, i.e. waste volume before treatment). Due to COVID-19 restrictions in 2020 and 2021, the drilling operations were considerably declined.

The solid and liquid drilling waste generated in 2021 amounted to **6,647 tonnes**

Table 44 shows the waste handling methods used by the Company in 2021.

Tab. 44. KPO waste handling methods in 2021, tonnes GRI 306-3, 306-5

No.	Waste handling method	Generated hazardous waste	Generated non-hazardous waste	Domestic waste	TOTAL
1.	Waste balance at the beginning of 2021	341,416	3	0	341,419
2.	Generated during the reporting year	14,957	3,574	1,128	19,659
3.	Reused at the enterprise	4,740	0	0	4,740
4.	Treated at facilities	14,301	82	864	15,247
5.	Incinerated in the General Purpose Incinerator (without power generation)	3	0	790	793
6.	Disposed and buried at KPO waste disposal sites	12,322	0	0	12,322
7.	Handed over to specialised contractors	2,569	2,751	347	5,667
8.	Waste balance at the end of 2021	337,711	530	1	338,242

Note: the amount of waste is defined by weighing of each batch of waste at the Eco Centre weight scales prior to its transportation for treatment, segregation, removal, burial or other operations. Waste quantities are logged in the load supporting documents (control tickets, waste handover certificates) and further in the Company's waste accounting database.

Table No. 45 shows the main types of drilling waste broken down by handling methods. As table shows, only water-based mud and brines are subject to disposal at the Eco-Centre cells 35 A/B, and the water-based drill cuttings to be buried at the Landfill. Oil-based drilling cuttings are subject to burying after pre-treatment and extraction of the oil base. **GRI 306-5**

Tab. 45. Waste generated from well operations by handling methods, 2019 – 2021 OG-7

No.	Type of waste	Generated quantity, tonnes			Handling methods
		2021	2020	2019	
1.	Spent water-based drilling mud	382	4,125	427	Treatment at Liquid treatment plant (LTP)
		383	1,020	1,014	Disposal
2.	Water-based drilling cuttings	987	533	925	Burial
		0	0	182	Thermal treatment in the Rotary Kiln Incinerator (RKI)
3.	Spent oil-based drilling mud	432	818	2,676	Treatment at the Thermo-mechanical cutting cleaning facility (TCC) and Liquid treatment plant (LTP)
4.	Oil-based drilling cuttings	2,776	5,316	9,022	Treated at the TCC with extraction of oil base, water and followed by the burial of the solid part, thermal treatment in Rotary-Kiln Incinerator (RKI)
5.	Spent brines	1,438	1,932	4,866	Treatment at TCC and LTP, thermal treatment in RKI
		189	296	2,837	Disposal
6.	Oil cuttings	60	11	44	Thermal treatment in the RKI, treatment at TCC

Within the contract terms, the Company hands over part of the waste for recycling to specialised contractors, who make their own decision on further waste handling methods once the waste has been accepted from KPO, and report on its transfer to third parties on a quarterly basis. Depending on the type, specialised enterprises hand over the waste for treatment with subsequent production of consumer goods, demercurization, regeneration, thermal treatment, incineration, physical and chemical treatment, dismantling into component parts with further transfer to concerned enterprises as recyclables.

Based on the Article 351 of the RoQ Environmental Code that prohibits disposal of waste plastic, plastic, polyethylene and polyethylene terephthalate packaging, waste paper, cardboard, paper waste, glass cullet at the Landfills, the Company carries out sorting and segregation of such waste in rented buildings with engagement of contractors that lease office buildings to KPO. These types of waste are then handed over to specialized enterprises to be used as recyclables. **GRI 306-4**

Since 2011 till the end of 2021, for the whole period of the waste paper segregation, about 740 tonnes of the waste paper had been collected and handed over to local enterprises to produce consumer goods.

The segregation of spent batteries was arranged in all Company office premises. In 2021, 91 kg of batteries was collected. **GRI 306-4**

In 2021, **91 kg** of batteries collected

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Since 2011 till the end of 2021, for the whole period of the waste paper segregation, about 740 tonnes of the waste paper had been collected and handed over to local enterprises to produce consumer goods.

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CASE STUDY 4: GRI 102-44

TREATMENT OF FOOD WASTE IN ORDER TO OBTAIN BIOCOMPOST GRI 306-4-c-ii



CONTEXT / SHORT DESCRIPTION

As provided by the RoQ Environmental Law, effective since 2021, food waste is prohibited from burying at Landfills. Earlier, KPO incinerated food waste in General Purposes Incinerator (GPI) as part of the SDW, which has been ineffective method of waste management. During 2020–2021, the Company was searching for a waste treatment enterprise.

GOAL:

Introduce the most effective way of handling food waste generated at the catering facilities of the Karachaganak field in order to comply with the requirements of RoQ EcoCode.

SOLUTION / ACTIONS:

In 2020, a scope of work was compiled, the requirements for treating food waste identified, and a tender conducted. An important requirement to an enterprise in terms of a treatment method was biocomposting of food waste and obtaining a useful product – biocompost to be used in agriculture and forestry as organic fertilizer, which is used to remediate, preserve and improve soil fertility.

In 2021, KPO signed a contract with a food waste treatment enterprise. Over the June-December, 2021 period, the Company handed over 129 tonnes of food waste from its catering facilities for processing. The updates on the delivery of this contract will be presented in future Reports.

BIODIVERSITY

Karachaganak oil and gas condensate field (KOGCF) covers an area of more than 280 km². KPO shares the single territory with other users of natural resources, although it operates only on areas directly located under industrial facilities, pipelines and field roads.

Besides the KPO industrial facilities, there are other businesses deployed at the Karachaganak Field which are either engaged in processing of some part of the raw product produced by KPO (such as JSC “Condensate”) or provide maintenance services for the field and infrastructure facilities.

Besides KPO and third-party facilities, there are large areas of previously used agricultural land and land plots located on the Field. Until 1956 this area had been used for pastures and hayfields. After 1957, farmers started growing grain crops except the floodplains and slopes of Konchubai and Kalminovka gully, which remained as pastures. So far, the state reserve lands (SRL) prevail on the sanitary protection zone (SPZ) of KOGCF. However, some patches are being used for farms.

Thus, the above factors create certain difficulties in identifying and delineating responsibility for potential negative impacts and often limit KPO ability to take practical actions for restoration of environment and biodiversity. Nevertheless, in pursuit of minimizing the impact on biodiversity around the field area, since

2012 KPO has been developing and implementing a Biodiversity Action Plan (BAP).

The BAP is being developed in accordance with IPIECA/ OGP document titled “Instructions on development of BAP for oil and gas industry” and ESHIA 1.3.1.47 standard (document No. 1.3.1.47 HSE-IMS), according to which the operation’s potential impact on biodiversity and ecosystem services should be taken into consideration when developing oil and gas fields. Preparation of BAP includes identification of business risks associated with biodiversity and ecosystem services in order to mitigate and turn them into benefits where possible.

As part of BAP implementation, the data obtained during the monitoring at the end of 2021 suggest that:

1. There is no relation between the state of soil and vegetation cover and emissions of pollutants.
2. Many species of fauna adapt to physical factors that are of a continuing nature (continuous monotonous noise, traffic). For example, a settlement of beavers, gophers, bird colonies were observed in the immediate vicinity of central roads with heavy traffic near live facilities.
3. KPO’s main impact on natural ecosystems is a mechanical impact as a result of construction. The disturbed areas are either patchy or of linear pattern.

Why is it important to us?

As part of biodiversity assessment at the Karachaganak Field, KPO conducts a comprehensive assessment of risks and impacts. It is an indisputable fact that oil and gas field operation is associated with inevitable negative impacts on the environment around the production facilities and along the pipeline routes.

As part of the KPO Biodiversity Action Plan (BAP), KPO has been carrying out an assessment of the several main factors that affect the Karachaganak Field’s biodiversity:

1. Emissions of pollutants;
2. Physical impact (noise, light, vibration);
3. Cattle grazing at the Karachaganak Field area;
4. Mechanical impact (construction, pits, roads, etc.). **GRI 102-15, 103-1 (3-3)**



4. Moderate grazing of horses and cattle has been recorded in most of part the SPZ, which generally has a positive impact. However, grazing may also have negative consequences: intensive grazing can lead to a decrease in species diversity up to a complete destruction of natural soil and vegetation cover. Pastures are being increasingly overgrazed at

monitoring sites further away from the production facilities inside the SPZ.

In general, all Karachaganak operation activities in a regular mode are well within the acceptable risk range for biodiversity.

MONITORING OF BIODIVERSITY AT KOGCF GRI 304-2

Currently KPO is carrying out the approved scope of activities planned in BAP for 2021–2023. More information about the BAP is available on www.kpo.kz website in section [Sustainable](#)

[development/Environmental protection/Conservation of biodiversity/BAP](#).

The scope of work in 2021 included a comprehensive assessment of fauna dynamics at KOGCF area.



Table. 46. Targets in biodiversity conservation GRI 103-2 (3-3)

Our targets in 2021	Target achievement	Actions taken in 2021	Targets in 2022
Conduct the monitoring of fauna, including key and rare species	Complete	Field studies on fauna monitoring were conducted from May 22 to June 2 and from September 4 to September 14, 2021.	Conduct the monitoring of flora (vegetation), including key and rare species

FAUNA MONITORING IN 2021

Monitoring of fauna in the Karachaganak field was carried out during spring and autumn of 2021. Field studies were carried out on 17 walking routes and 5 observation sites using standard techniques for the live examination of vertebrates.

During the research 2 species of amphibians, 4 species of reptiles, 106 species of birds and 19 species of mammals were identified.

The results of fauna monitoring (amphibians, reptiles, birds and terrestrial vertebrates) conducted at the Karachaganak field in 2021 and the analysis of both the number and diversity of fauna species did not reveal any noticeable negative impact from the field facilities.

MONITOR KEY SPECIES

As part of biodiversity assessment, the KPO pays a considerable attention to the monitoring of rare plant and animal species. The priority of a particular species in matters of biodiversity conservation is determined by the priorities of international and local legislation, sensitivity and resistance to impacts and significance of possible negative impact of the company activities on the environment.

The main key species considered during the research period from 1990 to 2021 are shown on the website kpo.kz in the section [Sustainable development/Conservation of biodiversity/Significant species of flora and fauna registered at KOGCF area](#).

All these species are also found outside KOGCF area. It should be noted that presence, absence or number of these species within the field is not a direct indicator of environmental well-being of the area. The distribution of individual species may change due to reasons both local and global (climate change, desertification, etc.), which have nothing to do with KPO activities. At the same time, it is necessary to plan and organize production activities in a way not to cause any direct and indirect effects on the population of individual species, which are an important part of the biodiversity at KOGCF and adjacent areas.

In 2021 as part of monitoring of key species number, a thorough survey of abundance and habitats of river beaver (castor fiber) species was carried out.

In the spring of 2021 a decrease in the number of beaver settlements was recorded compared to previous periods.

Despite the reduction, a number of beavers in the spring period remains higher compared to the surrounding area of the region. When monitoring beavers in 2021, both in the spring and autumn periods, the water level in most reservoirs was extremely low, some ponds dried up, which affected the habitat conditions and number of beavers. The most likely relocation of beavers is to the vast reservoir on Berezovka river, most of which is not included in the research area.

KPO will continue to monitor the population of beavers living on the KOGCF area.

