Approved
by decision of the Management Board
JSC «NC «QazaqGaz»
Minutes #___ dated "___" _____ 2024.

BIODIVERSITY CONSERVATION PROGRAMME ON THE GROUP OF COMPANIES OF JSC «NC «QAZAQGAZ»

Astana 2024

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1. Purpose and area of application

1.1. This "Biodiversity Conservation Programme the group of companies of JSC "NC "QazaqGaz" (hereinafter - the Programme) is developed to assess the impact of the activities of JSC "NC "QazaqGaz" (hereinafter - the Company) and subsidiary, dependent legal entities (hereinafter - SACs) on biodiversity and establishes recommendations for the organization of a monitoring system for the activities of the Company and SACs in the field of biodiversity conservation.

1.2. The programme has been developed in accordance with the legislative requirements of the Republic of Kazakhstan and international methodologies and standards International Finance Corporation Performance Standard 6 (IFC), Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), International Union for Conservation of Nature and Natural Resources (IUCN), LIFE Certification Standards (LIFE), The Science Based Targets Network (SBTN) and Taskforce on Nature-related Financial Disclosures (TNFD).

1.3. The purpose of this Programme is to describe the processes of impact of the Company's and SDCs' activities on biological diversity, as well as to develop methods for collecting information on the state and level of pollution of ecosystem components in the area of impact of economic activity facilities

1.4. This Programme shall apply to all technological, business and social processes of the Company and SDCs.

1.6. This Programme is used as both an internal and public document confirming to stakeholders the existence of this programme in the Company and SDCs.

1.7 The Biodiversity Conservation Programme for the group of companies of NC "QazaqGaz" JSC, as well as amendments and additions to it are approved by the Management Board of the Company.

1.8. The programme applies to all structural subdivisions of the Company and SDCs.

2. Regulatory references

2.1 The following national standards and internal regulatory documents of the Company are referenced this Programme:

CDP	Carbon Disclosure Project Slimate Change C15 Biodiversity
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IUCN	International Union for Conservation of Nature and Natural Resources
LIFE	LIFE Certification Standard
SBTN	The Science Based Targets Network
TNFD	Taskforce on Nature-related Financial Disclosures
No. 400-VI ZRC of 2 January 2021	Environmental Code of the Republic of Kazakhstan
No. 477-II of 8 July 2003	Forest Code of the Republic of Kazakhstan
N 593 of 9 July 2004	Law of the Republic of Kazakhstan "On Protection, Reproduction and Use of Wildlife"
No. 1034 of 31 October 2006	Resolution of the Government of the Republic of Kazakhstan "On Approval of the Lists of Rare and Threatened Species of Plants and Animals"
No. 18-03-/106 of 16 February 2015	Order of the Minister of Agriculture of the Republic of Kazakhstan "On approval of the list of valuable animal species that are objects of hunting and fishing"
DP-01-23.	General requirements for the development, design and presentation of internal regulatory documents of NC QazaqGaz JSC

3. Terms and definitions

3.1 The terms and their respective definitions in this Programme shall be applied in accordance with Table 1.

Table 1: Terms and definitions

No. n/a	Terms and definitions	Term Description
1	**Anthropogenically transformed area**	An area that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activities have significantly altered the primary ecological functions of the area and species structure. The definition does not include habitat that has been transformed for the purpose of the project
2	**Associated objects**	Facilities that are not financed by the project and that would not have been constructed or expanded if the project had not been implemented, and without which the project would not be viable. Associated facilities may include roads, power plants or transmission lines for project needs, pipelines, utilities, warehouses and logistics terminals
3	**Biodiversity**	Diversity of life forms in all its manifestations, including intraspecific and interspecific diversity and diversity of ecosystems
4	**Subsidiary and dependent company (SDC)/enterprise**	QazaqGaz Exploration and Production LLP; JSC Intergas Central Asia; Asian Gas Pipeline LLP; Beineu-Shymkent Gas Pipeline LLP; KazTransGas Aimak JSC
5	**Exposure area**	Cumulative area of direct and indirect impact zones
6	**Area of indirect impact**	An area where there is an impact on environmental parameters that can lead to changes in biodiversity through a chain of interrelated abiotic and biotic influences.
7	**Area of direct impact**	Area of direct loss of biodiversity as a result of destruction of soil layer and deep transformation of abiotic components during exploration and extraction of mineral resources.
8	**Invasive species**	Objects of flora located outside their natural range, the spread and number of which pose a threat to the life or health of citizens, the conservation of biological diversity, as well as a threat of harm to certain sectors of the economy
9	**Society**	NC QazaqGaz JSC
10	**Key Bird Areas (KBAs)**	Areas that provide habitat for significant numbers of birds, rare, threatened and endangered species, bird communities characteristic of particular landscapes, significant breeding or migratory aggregations of landbirds or waterfowl and waterbirds
11	**Backbone transport**	JSC Intergas Central Asia; Asian Gas Pipeline LLP; Beineu-Shymkent Gas Pipeline LLP

12	**Habitat**	An area of land or water body occupied by part of a population of individuals of the same species or species and possessing the necessary ecological conditions for their survival and reproduction
13	**Production facilities**	A group of structures and buildings of the Company, which in their generality constitute an enterprise that has an impact on the components of the environment
14	**Exploration and production**	QazaqGaz Exploration and Production LLP
15	**Ramsar WBU**	A wide range of habitats including marshes, floodplains, rivers and lakes, coastal areas occupied by saltmarshes and mangroves, seagrass beds, coral reefs and marine areas no deeper than six metres at low tide, and anthropogenic sites including sewage lagoons and reservoirs listed by the Ramsar Regional Initiative for Central Asia.
16	**Gas sales**	KazTransGas Aimak JSC
17	**Region of presence**	The ecosystem in which the subsidiaries and affiliates are located
18	**Factors/impact factors**	All external factors affecting nature, biodiversity, anthropogenic assets, nature's contribution to people and quality of life
19	**Branch of subsidiaries and affiliates**	Regional division of SDCs, including trunk pipeline management and production branches
20	**Sensitive areas of biodiversity**	UNESCO World Heritage Sites. Specially protected natural areas. Key ornithological territories. Ramsar wetlands
21	**Ecosystem**	A set of co-existing organisms and conditions of their existence, which are in a regular interrelation with each other and form a system of interdependent biotic and abiotic phenomena and processes.

4. Abbreviations and notations

4.1 The abbreviations and designations used in this Programme are in accordance with Table 2.

Table 2. Abbreviations and notations

№ 3 n/a	Abbreviations and notations	Full name of the given designations and abbreviations
1	CDP	Carbon Disclosure Project (Carbon Disclosure Project)
2	IFC	International Finance Corporation (International Finance Corporation)
3	IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
4	IUCN/IUCN	International Union for Conservation of Nature and Natural Resources (International Union for Conservation of Nature and Natural Resources)
5	LIFE	LIFE Certification Standards (LIFE Certification Standards)
6	NDVI	Normalised difference vegetation index (Normalised difference vegetation index)
7	SiO2	Silicon dioxide (Silicon dioxide)
8	STBN	The Science Based Targets Network (The Science Based Targets Network)
9	TNFD	Taskforce on Nature-related Financial Disclosures (Taskforce on Nature-related Financial Disclosures)

10	AGDS	Automated gas distribution station
11	JSC	Joint Stock Company
12	ASBC	Kazakhstan Association for the Conservation of Biodiversity
13	BD	Biological diversity
14	WL	Wetlands
15	RC	Rotational camp
16	DBS	Departmental building standards
17	ARP	Along-the-route passage
18	HGRS	Head gas regulator station
19	GMS	Gas metering station
20	SNNP	State National Nature Park
21	GP	Gas collection point
22	GPU	Gas pumping unit
23	GDS	Gas distribution station
24	FL	Fuels and lubricants
25	SAC	Subsidiary and affiliated company
26	CM	Contaminants
27	SCV	Shut-off and control valves
28	CH	Critical habitats
29	SPS	Sewage pumping station
30	KOT	Key ornithological territories
31	CS	Compressor station
32	LPD	Linear Production Department
33	PL	Power lines
34	MG	Main gas pipeline
35	NIE	Negative impact on the environment
36	NC	National Company
37	EIA	Environmental Impact Assessment
38	SPNA	Specially protected natural areas
39	MPCM	Maximum permissible concentration maximum one-time concentration
40	MAD	Maximum allowable discharges
41	SMW	Scheduled maintenance work
42	SRV	Safety relief valve
43	PB	Production branch
44	UGS	Underground gas storage
45	RK	Republic of Kazakhstan
46	RMD	Repair and maintenance department
47	SPZ	Sanitary protection zone
48	EMS	Environmental management systems
49	MSW	Municipal solid waste
50	LLP	Limited Liability Partnership
51	FD	Fuel dispenser
52	GTM	Gas trunkline management
53	FS	Filter separator
54	CGTP	Central gas treatment plant
55	CRS	Closed-circuit regulator station
56	UNESCO	The United Nations Educational, Scientific and Cultural Organization (The United Nations Educational, Scientific and Cultural Organization)

5. Responsibility

5.1 The HSE shall be responsible for the development of this Programme.

5.2 The ISM SWAp shall be responsible for the management of this Programme in accordance with the requirements of documented procedure DP-02 "Document Management".

5.3 Control over the proper application of the Programme, timeliness, completeness, reliability and relevance of information provision is assigned to the heads of the Company's structural subdivisions and SDCs.

6. Requirements

6.1. Methodological approaches to impact assessment and main types of ecosystems in S&A activities

Analysis of the current impact of the group of companies of JSC "NC "QazaqGaz" on biodiversity is carried out in three areas of the Company's activities:

− Exploration and Production - is considered on the example of a subsidiary and affiliated company (hereinafter - S&A or enterprise): QazaqGaz Exploration and Production LLP.

− Backbone transportation - is considered on the example of three subsidiaries and affiliates: Intergas Central Asia JSC; Asian Gas Pipeline LLP; Beineu-Shymkent Gas Pipeline LLP.

− Gas sales - considered on the example of subsidiaries and affiliates: KazTransGas Aimak JSC.

Associated facilities are considered separately. Associated facilities are facilities that are not financed by the project, would not have been constructed or expanded if the project had not been implemented, and without which the project would not be viable. Associated facilities may include roads, power plants or transmission lines for the project, pipelines, utilities, warehouses and logistics terminals.

6.1.1 Methodological approaches to biodiversity impact assessment

The Company's activities in the field of biodiversity impact assessment, as well as in the field of conservation of fauna and flora objects and their habitats during economic activities are based on compliance with the requirements of national legislation, in particular:

− Code of the Republic of Kazakhstan from 2 January 2021 № 400-VI "Environmental Code of the Republic of Kazakhstan" (with amendments and additions as of 05.09.2023) ;[1]

− Forest Code of the Republic of Kazakhstan dated 8 July 2003 No. 477-II (with amendments and additions as of 01.05.2023) ;[2]

− Law of the Republic of Kazakhstan of 9 July 2004 "On Protection, Reproduction and Use of Wildlife" ;[3]

− Law of the Republic of Kazakhstan dated 7 July 2006 No. 175-III "On Specially Protected Natural Territories" (as amended as of 01.05.2023) ;[4]

− Resolution of the Government of the Republic of Kazakhstan dated 31 October 2006 No. 1034 "On Approval of the Lists of Rare and Endangered Species of Plants and Animals" ;[5]

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[1] http://zan.gov.kz/client/#!

[2] https://adilet.zan.kz/rus/docs/K030000477_

[3] http://zan.gov.kz/client/#!

[4] On specially protected natural territories (zan.gov.kz)

[5] https://adilet.zan.kz/rus/docs/P060001034_

− Order of the Minister of Agriculture of the Republic of Kazakhstan dated 16 February 2015 No. 18-03-/106 "On Approval of the List of Valuable Species of Animals that are Objects of Hunting and Fishing"[6] .

In addition to mandatory standards, the Company is guided by international standards in the field of biodiversity, in particular the Carbon Disclosure Project C15 Biodiversity[7] (hereinafter - CDP) non-financial information disclosure standard.

CDP's main biodiversity requirements:

− Identification of sensitive biodiversity areas, including United Nations Educational, Scientific and Cultural Organisation (hereinafter - UNESCO) World Heritage Sites, specially protected natural areas (hereinafter - SPNAs), key ornithological areas (hereinafter - KOTs), wetlands protected under the Ramsar Convention (hereinafter - Ramsar WBU)[8][9]

− Identify biodiversity indicators (impact, status, response).

The assessment of the current impact of the Company's business activities on biodiversity is based on the CDP methodological approach and the identification of sensitive biodiversity areas that are or may be affected by SACs (Figure 1).

Figure 1: Methodological approach used to assess impacts and identify biodiversity indicators

6 http://zan.gov.kz/client/#!

7 https://www.cdp.net/en/climate

8 https://www.acbk.kz/article/default/view?id=312.

9

IFC - International Finance Corporation Performance Standard 6 (International Finance Corporation Performance Standard 6) (hereinafter - IFC) .[10]

IPBES - Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (hereinafter referred to as IPBES) .[11]

IUCN - International Union for Conservation of Nature and Natural Resources (hereinafter IUCN) .[12]

LIFE - LIFE Certification Standards (hereinafter referred to as LIFE) .[13]

SBTN - The Science Based Targets Network (hereinafter referred to as SBTN) .[14]

TNFD - Taskforce on Nature-related Financial Disclosures ("TNFD") .[15]

The basic element of the first stage of the Company's biodiversity impact assessment is to identify the factors and sources of impacts of SDCs on biodiversity, determine the spatial and temporal extent of impacts, and establish cause-and-effect relationships between the impact factors and the state of biodiversity within the boundaries of these factors.

The Company's biodiversity **impact factors** are determined on the basis of:

- TNFD Recommendations;
- Current production processes of subsidiaries and affiliates.

When identifying impact factors, various aspects of the Company's economic activities related to the development and operation of gas fields and natural gas transportation are taken into account, when all components of the environment (atmospheric air, surface and underground water, relief, soil and vegetation cover, fauna) are subject to significant transformation. Such operations involve not only such basic resources as natural gas, but also associated resources of the territory - water, land, forests, pastures, resources of local construction materials (sand, peat), etc., into the sphere of technogenic impact of the Company. As a consequence, there is a decrease in the value of resources: soil and vegetation - as a result of littering, pollution of soil surface, destruction of vegetation cover, changes in the hydrological regime of bogs; water - due to changes in catchment areas, pollution with oil products, highly mineralised water, chemical reagents, domestic sewage; land - as a result of various types of disturbances and pollution; hunting and fishing - as a result of habitat destruction, trophic and migration links in biocenoses and associated poaching[16] (,) .[17]

The analysis identifies the Company's **direct and/or indirect** impacts on biodiversity. [18]

Direct impacts refer to impacts that result in the **direct** loss of biodiversity, such as the destruction and removal of living organisms or the destruction of their food resources.

Indirect impacts include biodiversity-damaging factors such as physical, chemical, biological and climatic impacts. The impacts of indirect factors can amplify or weaken the impacts of direct factors. [19,20] (,) .[21]

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[10] International Finance Corporation Guidelines: Performance Standards for Environmental and Social Sustainability. IFC, 2012.

[11] Brondízio, E. S. et al. (eds), IPBES, 2019: Global assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, IPBES secretariat, Bonn, Germany. 1144 pages. ISBN: 978-3-947851-20-1.

[12] IUCN Global Ecosystem Typology.

[13] LIFE-BR-CS-Standards_LIFE-3.2-English.pdf (institutolife.org).

[14] Science-Based-Targets-for-Nature-Initial-Guidance-for-Business.pdf (sciencebasedtargetsnetwork.org).

[15] The TNFD Nature-related Risk and Opportunity Management and Disclosure Framework. Additional Sector Guidance - Draft: Oil and Gas (March 2023): https://tnfd.global/wp-content/uploads/2023/07/23-2443-1-1.pdf?v=1690527822.

[16] Babak T. V. Influence of projected works during the construction of a gas pipeline on wildlife // Modern problems of nature management, hunting and fur farming. 2012. № 1. C. 36-37.

[17] Lavigina O. . Environmental aspects in the construction of linear objects // Izvestiya Vuzov. Investments. Construction. Real Estate. 2014. № 5 (10). C. 73-79.

[18] IFC. 2012. Environmental and Social Sustainability Performance Standards (Russian version), 63 p.

For each of the identified factors, the impact area where its influence is most clearly visible is determined. The total impact area of S&A is determined by overlaying the impact areas of all significant factors.

The definition of biodiversity impact zones of industrial facilities is based on the following international and national standards and methodologies outlining terminology and basic approaches:

- IFC;
- IPBES;
- Methodology for determining the size of the sanitary protection zone for oil and gas production, preparation and processing complexes ;[22]
- Sanitary Rules "Sanitary and Epidemiological Requirements for Sanitary Protection Zones of Production Facilities, which are the objects of impact on the habitat and human health"[23] .

The following impact areas can be identified for each SAC[24 ,25 ::]

- **Direct Impact Area** - an area where there has been direct loss of biodiversity as a result of destruction of the soil layer and deep transformation of abiotic components during exploration and extraction of mineral resources (not identified within this Project for the extractive SAC due to the point source nature of impacts from gas extraction wells);
- **Indirect impact zone** - an area where the environmental parameters are influenced, which can lead to changes in biodiversity through a chain of interrelated impacts of abiotic and biotic factors.

At the first stage of the assessment, in addition, information is collected and analysed on the biodiversity of the regions (areas) where SACs are present[26] based on the International Union for Conservation of Nature (hereinafter - IUCN) classification, as well as in the immediate area of direct or indirect impact. Special attention is paid to rare species and protected areas.

The second stage of the assessment identifies the specifics of the impact on biodiversity of the factors identified in the first stage within the boundaries of the areas where SACs operate.

The third stage of the assessment involves the selection of biodiversity targets for SDCs and the Company separately, as well as indicators of biodiversity status, based on the composition of previously identified significant impact factors, the specifics of biodiversity status and the response of biodiversity representatives to the impact of these factors.

The use of biodiversity status indicators is consistent with CDP C15.6 and is important for assessing the impacts of operations on biodiversity, including flora, fauna and habitats, as it allows aggregation of data from different activities and geographic regions. It also allows the Company and SDCs to track the achievement of biodiversity goals and targets and assess the success of the implementation of planned activities.

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[19] Brondízio, E. S. et al. (eds), IPBES, 2019: Global assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, IPBES secretariat, Bonn, Germany. 1144 pages. ISBN: 978-3-947851-20-1.

[20] International Finance Corporation Guidelines: Performance Standards for Environmental and Social Sustainability. IFC, 2012.

[21] GOST R 59782-2021 Environmental protection. Biological diversity. Recommendations for the formation and implementation by a commercial organisation of a programme for the conservation of biological diversity: national standard of the Russian Federation: approved and put into effect by Order of the Federal Agency for Technical Regulation and Metrology of 21 October 2021 № 1235-st.: date of introduction 01.04.2022.

[22] Methodology for determining the size of the sanitary protection zone for oil and gas production, preparation and processing complexes.

[23] On Approval of Sanitary Rules "Sanitary and Epidemiological Requirements for Sanitary Protection Zones of Facilities that are Objects of Influence on Habitat and Human Health".

[24] On Approval of Sanitary Rules "Sanitary and Epidemiological Requirements for Sanitary Protection Zones of Facilities that are Objects of Influence on Habitat and Human Health".

[25] Methodology for determining the size of the sanitary protection zone for oil and gas production, preparation and processing complexes.

[26] The region of presence refers to the ecosystem in which the S&A is located.

The fourth stage of the assessment involves the development of a monitoring system for biodiversity conservation, which is based on tracking changes that occur with the identified indicators.

6.1.2 Main types of ecosystems in S&A activities

The geography of SDCs' operations covers all natural and climatic zones of Kazakhstan - from forest steppes and steppes in the north of the Kostanay and West Kazakhstan regions to the foothills of large mountain ecosystems in the south of the country (Figure 2). Due to the wide distribution of the Company's production facilities in the territory of the Republic of Kazakhstan, an ecosystem approach was adopted as the basis for describing biodiversity.

As one of the tools for assessing impacts on biodiversity, a map-scheme of Kazakhstan's ecosystems in relation to the production facilities under consideration[27] of SACs was developed, based on the map of the Kazakhstan Association for the Conservation of Biodiversity (KACB)[28] and SACs' data on the locations of production facilities[29] (,)30(,)31(,) .32

Figure 2: Distribution of SDCs' production facilities on the map of ecosystems and KOT of the Republic of Kazakhstan[33]

[27] The objects of subsidiaries and affiliates include fields, compressor stations, gas distribution stations, automatic distribution stations, gas trunklines, shift camps, maintenance and operation departments, gas metering stations, and line production departments of gas trunklines.

[28] Official website of the Kazakhstan Association for the Conservation of Biodiversity: https://www.acbk.kz/article/default/view?id=109.

[29] Official website of the Company JSC "NC "QazaqGaz": https://qazaqgaz.kz/ru.

[30] The official website of the Company Intergas Central Asia LLP: https://intergas.kz/ru.

[31] The official website of the Company KazTransGasAymak JSC: http://www.ktga.kz/.

[32] The official website of the Company is Beineu-Shymkent Gas Pipeline LLP: https://bsgp.kz/ru_ru.

[33] Official website of the Kazakhstan Association for the Conservation of Biodiversity: https://www.acbk.kz/article/default/view?id=109.

The impact assessment analysed linear and fixed facilities of SACs. It was determined that large linear facilities, such as trunk gas pipelines (hereinafter - MG), in case of normal operation have minimal impact on biodiversity objects. Stationary production facilities have an impact on the air, soil and other components of the environment, so the greatest attention is paid to them. Such facilities include compressor stations (hereinafter - CS), shift camps (hereinafter - SC), repair and maintenance departments (hereinafter - REU), automated gas distribution stations (hereinafter - AGDS), gas metering stations (hereinafter - GMS) and line production departments of trunk pipelines (hereinafter - LPU MG).

Most of SDCs' production facilities are located in the desert zone, within which more than half of all production facilities are concentrated. The least affected ecosystems are steppes and forest-steppes. Most of the stationary facilities are located near settlements and anthropogenically disturbed areas, while the rest are adjacent to sensitive biodiversity areas.

Detailed statistics on the geographical distribution of SDCs' production facilities, including their geographical distribution in relation to ecosystems, settlements and proximity to areas of biodiversity value (PAs, KOTs, Ramsar WBU) are provided in Table 3 below.

Table 3: Statistics on the location of production facilities of subsidiaries and affiliates

№ n/a	Production facilities
1	62% of sites are located in anthropogenically transformed areas [34][35]
2	9% of sites affect protected areas or habitats of protected species of flora and fauna[36]
3	36% of properties are located near the KOT [9]
4	5% of facilities are located near Ramsar WBU [9]
5	55% of facilities are located in the territory of deserts and/or semi-deserts
6	19% of facilities are located in steppe and/or forest-steppe areas
7	

[34] An area that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activities have significantly altered the primary ecological functions of the area and species structure.

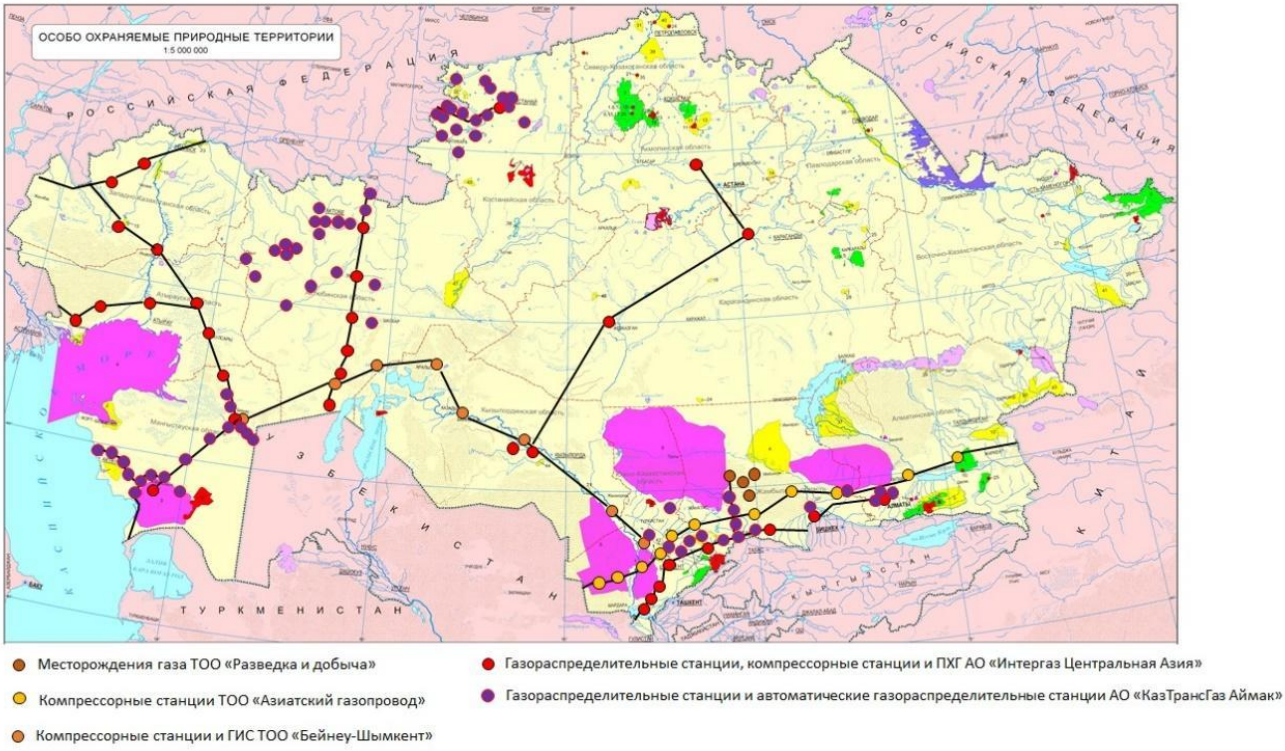
[35] An area that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activities have significantly altered the primary ecological functions of the area and species structure.

[36] The calculation was based on data from open sources (https://oopt.kz, https://www.keybiodiversityareas.org/sites/search, ASBC. About the Key Bird Areas Programme - IBA) and documents of the Company.

26% of sites are located near mountain ecosystems

To assess the impacts of the SACs on sensitive biodiversity areas, PAs, KOTs and Ramsar WBUs were identified that are in relative proximity to their production facilities (according to CDP, up to 70 kilometres away) (Figure 3, Table 4). The neighbourhood was determined based on the map of protected areas of the National Atlas of the Republic of Kazakhstan[37] and information from open sources[38] ,[39] ,[40](,)[41] . Given the nature of the impacts of the SACs, potential impacts are only possible in close proximity to the boundaries of sensitive biodiversity areas.

Figure 3: Distribution of subsidiaries and affiliates' production facilities in relation to PAs of the Republic of Kazakhstan



[37] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.

[38] Specially Protected Areas of the Republic of Kazakhstan: https://oopt.kz.

[39] ASBC. About the Key Bird Areas Programme - IBA.

[40] https://www.keybiodiversityareas.org/sites/search Key biodiversity areas. Map Search.

[41] On approval of lists of wetlands of international and republican importance.

Table 4: Description of ecosystems and sensitive biodiversity areas in relation to the location of SACs

Production facilities of the Company	**Location in relation to settlements**	**Natural area**	**Location near protected areas or critical habitats (up to 70 kilometres)**	**Location/crossing of SDCs' production facilities affecting Ramsar IAPs**	**Location/crossing of production facilities of SDCs affecting the KOT**
QazaqGaz Exploration and Production LLP					
Amangeldy field	165 km north of Taraz city	Deserts	Crosses the boundaries of the South Kazakhstan protected area	-	-
Zharkum field	215 km north of Taraz city	Deserts	-	-	-
Ayrakty deposit	135 km north of Taraz city	Deserts	-	-	-
JSC Intergas Central Asia					
Makatskoye LPU MG	150 km north-east of Atyrau, 2.3 km from Makat village	Semideserts	-	-	≈50 km from the Lower Emba River COT
Kulsarinskoye LPU MG	160 km east of Atyrau, 1 km north of Kulsary town	Semideserts	-	-	≈50 km from the Lower Emba River COT
Akkolskoye LPU MG	225 km west of Atyrau, 15 km north-west of the district centre of the village of Ganyushkino. Ganyushkino	Semideserts	-	-	Borders with KOT "Kazakhstan part of the Volga Delta. Zhambai"
Redutskoye LPU MG	25 kilometres north of Atyrau, 2.8 km north-west of Redut settlement	Semideserts	≈50 km from the state protected area in the northern part of the Caspian Sea	≈50 km from the Ramsar WBU "Ural River Delta with adjacent Caspian Sea coastline"	≈50 km from KOT "Ural Delta"
Tayman site	45 km south-east of Akkistau village	Semideserts	≈20 km from the border of the state protected area in the northern part of the Caspian Sea	-	-
Inderskoe LPU MG	2.9 km south-west of Inder	Semideserts	-	-	-

	settlement Inder				
Yeltai" AGDS	0.7 km west of the gas pipeline (858.5 km MG), 4 km from Yeltai village	Semideserts	-	-	-
Aktau UMG	Within the city of Zhanaozen	Deserts	Crosses the boundaries of the Kenderli-Kayasan State Protected Area	-	Borders with Kaunda Depression and Basgurly-Jazgurly Depression KOTs
Uralsk UMG	Within Uralsk city limits	Forest-steppes and steppes	In relative proximity to the Budara State Nature Reserve ≈10 km from Kirsanovsky State Nature Reserve	-	-
UMG Uralsk	Within the boundaries of the village. Dzhangala	Forest-steppes and steppes	≈5 km from Kirsanovsky State Nature Reserve		
Uralskoye LPU	18 km north-east of Uralsk city, near Dostyk and Makarovo settlements	Forest-steppes and steppes	-	-	-
Chizhinskoe LPU	110 km south-west of Uralsk, 2.5 km north-west of the village of Chizha-1, 3 km south of Amangeldy village	Forest-steppes and steppes	-	-	-
Dzhangalinskoye LPU	177 km south-west of Uralsk, 1 km from Dzhangala village	Forest-steppes and steppes	-	-	Bordering the Kushum Lakes COT
Aktobe UMG	Within Krasnooktyabrskoye, Shalkar districts	Steppes	-	-	Borders with KOT "Mugodzhary" (KS "Taldyk")
UMG "Kostanai"	Within the c. Boscol	Steppes	Crosses the boundaries of the Mikhailovsky State Nature Reserve	-	-
Karaganda UMG	Within Karaganda city limits	Steppes		-	-

Taraz LPU	Within Taraz city limits	Mountain ecosystems	In relative proximity (≈50 km) to the state nature reserve "Berikkara tract".	-	-
UMG Almaty	Within the boundaries of the village. Kaskelen	Mountain ecosystems	Crosses the boundaries of the Almaty State Nature Reserve; in relative proximity (≈10 km) to Ile-Alatau State National Nature Park	-	≈4 km from KOT "Big Almaty Gorge"
UMG Shymkent	Within Shymkent city limits	Deserts	In relative proximity (≈50 km) to Sairam-Ugam State National Nature Park	-	≈50 km from KOT "Tolebi" (Sairam-Ugam State National Nature Park)
Poltoratskoye LPU	700 m north-west of Zhibek Zholy village	Deserts and semi-deserts	Crosses the boundaries of the Sairam-Ugam State National Nature Park	-	Borders with the Chardara Reservoir KOT (Chinaz CS)
Akbulak LPU	10 km south-east of the district centre of Aksu village	Deserts and semi-deserts	In relative proximity (≈15 km) to Sairam-Ugam State National Nature Park	-	Borders the Shoshkakol Lakes COT
Beineu-Shymkent Gas Pipeline LLP					
Beineu COP and GIS	Within the boundaries of the village. Beineu	Deserts and semi-deserts	-	-	Borders with the KOT "Western Chink of the Ustyurt Plateau" and "North-Western Chink of the Ustyurt Plateau"
COP and Bozoi GIS	Within the boundaries of the village. Bozoi	Deserts and semi-deserts	-	-	-
Ustyurt CS	155 km east of Beineu village	Deserts and semi-deserts	-	-	-
Karaozek CS	40 km north-west of Kyzylorda city	Deserts and semi-deserts	In relative proximity (≈20 km) to Torangylsai State Nature Reserve	-	-

CS "Saksaulsk"	18 km south-west of Saksaulsk village	Deserts and semi-deserts	-	≈50 km from the Ramsar WBU "Small Aral Sea and Syrdarya River Delta"	≈50 km from KOT "Small Aral Sea"
Aksuat CS	2.5 km north of Aksuat village	Deserts and semi-deserts	-	≈50 km from the Ramsar WBU "Small Aral Sea and Syrdarya River Delta"	≈50 km from KOT "Small Aral Sea"
Shornak CS	25 kilometres west of Turkestan, 7 km west of Shornak village	Deserts and semi-deserts	In relative proximity (≈40 km) to the South Kazakhstan protected area	-	-
Akbulak GIS	20.3 km west of Shymkent city, 450 m from Akbulak village	Deserts and semi-deserts	In relative proximity (≈35 km) to Zadarya State Nature Reserve	-	Borders the Shoshkakol Lakes COT
Asian Gas Pipeline LLP					
KS-1	Within the boundaries of the village. Alimtau	Deserts	Crosses the borders of the Arys and Karaktau state natural zone	-	Within the boundaries of KOT "Arys and Karaktau protected area"
COP-2	500 m south-east of Kokbulak village	Mountain ecosystems	Crosses the protection zone of the Sairam-Ugam State National Nature Park ≈10 km from Boraldai State Nature Reserve ≈50 km from the state nature reserve "Berikkara tract"	-	-
KS-4	Within the limits of the village. Zhaksylyk	Mountain ecosystems	-	-	-
KC-5	Within Taraz city limits	Mountain ecosystems	≈20 km from Aksu-Zhabagli State Nature Reserve		
KC-6	Within the boundaries of the village of Shilibastau.	Mountain ecosystems	In relative proximity to the Zhusandala State Protected Area	-	-

	Shilibastau				
KC-7	Within the boundaries of the village. Masak	Mountain ecosystems	In relative proximity (≈10 km) to the Almaty State Nature Reserve ≈20–30 km from the State Nature Monument "Charyn Ash Forest Dacha"	-	≈20 km from KOT "Toraigyr Ridge"
KC-8	Within the boundaries of Sharyn village	Mountain ecosystems	≈20 km from Verkhnekokoksuisky State Nature Reserve ≈10–20 km from the state landscape nature monument "Singing Barkhan" ≈30–40 km from the state nature monument "Chinturgenskie spruce forests"		
SCS-1	Within the limits of the village. Baslandy	Deserts	In relative proximity (≈2 km) to the South Kazakhstan protected area	-	Bordered by the Arys and Karaktau protected area KOTT
SCS-2	1.5 km south-east of Akbulak village	Deserts	In relative proximity (≈35 km) to Zadarya State Nature Reserve	-	-
SCS-3	Within the boundaries of the village. Kurkureusu	Mountain ecosystems	-	-	-
SCS-4	Within the limits of the village. Zhaksylyk	Deserts and semi-deserts	-	-	-
SKS-5	4.2 km east of D. Kunayev settlement	Mountain ecosystems	-	-	-
SCS-6	5.8 km south-east of Shilibastau village	Mountain ecosystems	-	-	-

SKS-7	Within the boundaries of the village. Ornek	Mountain ecosystems	In relative proximity (≈10 km) to the Almaty State Nature Reserve	-	≈20 km from KOT "Toraigyr Ridge"
SKS-8	21 km west of Charyn village	Mountain ecosystems	In relative proximity (≈5 km) to the Charyn State National Nature Park	-	≈9 km from KOT "Altyn-Emel National Park", ≈10 km from KOT "Toraigyr Ridge"
KazTransGas Aimak JSC					
Aktobe production branch	-	Mountain ecosystems and steppes	-	-	-
Almaty production branch	-	Mountain ecosystems and deserts	-	-	-
Astana production branch		Steppes	-		
Atyrau production branch	-	Deserts	-	-	-
East Kazakhstan production branch	-	Mountain ecosystems	-	-	-
Zhambyl production branch	-	Mountain ecosystems and deserts	-	-	-
West Kazakhstan production branch	-	Semi-deserts and deserts	-	-	-
Kostanay production branch	-	Forest-steppes and steppes	-	-	-
Kyzylorda production branch	-	Deserts	-	-	-
Mangistau production branch	-	Deserts	-	-	-
Shymkent production	-	Mountain	-	-	-

branch		ecosystems and deserts			

6.2. Factors and areas of impact on biodiversity of current and planned economic activities of subsidiaries and affiliates

As part of the approach to identifying direct and indirect impacts on biodiversity (6.1.2.) and analysing the documentation submitted by subsidiaries and affiliates, it was concluded that current business operations do not have a direct impact on biodiversity, but there are indirect impacts, the factors of which were identified in the impact assessment.

According to the TNFD methodological approach, the following indirect impacts of the Company on biodiversity have been identified:

−land disturbance and withdrawal, including during remedial works;

−emissions of gaseous and solid pollutants into the atmosphere;

−methane leaks;

−water use (water abstraction and water disposal);

−pollution of soil cover (including pollution by fuel combustion products, oil products, heavy metals);

−physical exposure (thermal and electromagnetic radiation, noise, vibration and radiation exposure) / anxiety factor;

−disposal of solid industrial and domestic waste;

−associated facilities (including motorways, power lines, above-ground sections of plumes and gas pipelines);

−accidents;

−Invasive Species .[42]

Identification of biodiversity impact factors is the main element of the assessment, which is used to identify areas of direct and indirect impact, assess the temporal and spatial impacts of SAC on components of biogeocenoses and their intensity, and form a system of indicators of impact, status and response.

The boundary of the impact zone of each production facility within S&A is determined by the cumulative impact of the impact factors. For the facilities under consideration, the impact zone is allocated along the boundary of the indirect impact zone corresponding to the sanitary protection zone (hereinafter - SPZ). It includes territories that are not subject to deep redevelopment, but are subject to intensive impact from the production facility. The SPZ boundary is the minimum zone of the Company's impact. As a rule, most Russian and European companies allocate a zone of impact beyond the SPZ.

When determining the impact zone of production facilities, the norms of the legislation of the Republic of Kazakhstan[43] , regulating impact assessment and allocation of sanitary protection zones, are taken into account. For the gas industry, the most significant impact is on the atmospheric air, therefore, the main boundary of impact is carried out in accordance with the values of pollutant dispersion. According to the requirements of the legislation of the Republic of Kazakhstan[44] , the boundary of the SPZ of production facilities is conducted along the isoline corresponding to the level of 1 MPCmr for specific pollutants. At the same time, minimum SPZ sizes are established for production facilities depending on the hazard class. For gas industry enterprises this distance is 1,000 metres from the emission source. In the absence of data on exceedance of MACmR at the proposed distance, the area corresponding to the approved SPZ is recognised as the zone of impact.

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[42] Not analysed for the considered SDCs due to the lack of data.

[43] On Approval of Sanitary Rules "Sanitary and Epidemiological Requirements for Sanitary Protection Zones of Facilities that are Objects of Influence on Habitat and Human Health".

[44] Methodology for determining the size of the sanitary protection zone for oil and gas production, preparation and processing complexes.

One of the main activities of the Company is the development and operation of the main linear infrastructure consisting of onshore and underground gas pipelines of various capacities. The impact of underground gas pipelines on biodiversity during the operation of the facilities is not taken into account, as being buried to a depth of 1-2 metres, they cannot significantly affect the condition of soils and ecosystems of the territory. The impact of above-ground gas pipelines is taken into account, as it leads to habitat fragmentation and may negatively affect wildlife[45] (,) .[46]

When allocating the impact zone, it is necessary to take into account the presence of possible cumulative impacts on the study area from other existing or planned facilities. This makes it possible to assess the contribution of subsidiaries and affiliates to the overall environmental impact and adjust the area of responsibility[47] ,[48] (,) .[49]

Table 3 below provides a detailed justification of the impact areas for each SAC by factor.

[45] On Approval of Sanitary Rules "Sanitary and Epidemiological Requirements for Sanitary Protection Zones of Facilities that are Objects of Influence on Habitat and Human Health".

[46] Aktymbaev E. K. Project of the main gas pipeline "Beineu-Shymkent", explanatory note to the diploma project, 2019.

[47] Brondízio, E. S. et al. (eds), IPBES, 2019: Global assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, IPBES secretariat, Bonn, Germany. 1144 pages. ISBN: 978-3-947851-20-1.

[48] International Finance Corporation Guidelines: Performance Standards for Environmental and Social Sustainability. IFC, 2012.

[49] GOST R 59782-2021 Environmental protection. Biological diversity. Recommendations for the formation and implementation by a commercial organisation of a programme for the conservation of biological diversity: national standard of the Russian Federation: approved and put into effect by Order of the Federal Agency for Technical Regulation and Metrology of 21 October 2021 № 1235-st.: date of introduction 01.04.2022.

Table 5: Rationale for identifying areas of impact on biodiversity of current and planned activities of subsidiaries and affiliates

№	Factor	QazaqGaz Exploration and Production LLP	JSC Intergas Central Asia	Asian Gas Pipeline LLP	Beineu-Shymkent Gas Pipeline LLP	KazTransGas Aimak JSC
1	Total area of exposure	The total impact area is ≈74 km2 (≈56 km2 for the Amangeldy field; ≈9 km2 for each of the Zharkum and Ayrakty fields).				
	The total impact zone of SACs is assumed to be within the SPZ boundaries of each	The total area of impact is ≈439 km2 (the area of impact zones for 32 compressor stations – ≈85 km2, for 175 gas distribution stations – ≈50 km2, for three gas storage facilities – ≈304 km2). The total impact area of SACs is assumed to be within the SPZ of each facility (radius of SPZ for compressor stations – 700/1,000 m, for gas distribution stations – 300 m, for UGS – 1,000 m)	The total area of impact is ≈68 km2. Due to the similarity of the configuration and layout of the gas compressor stations, the areas of their SPZs will be ≈6.6 km2	The total area of impact is ≈86.7 km2. Due to the similarity of equipment and layout of gas compressor stations, the areas of their SPZs will be approximately equal and will amount to ≈6.8 km2. For the Bozoi compressor station the impact area is ≈21.2 km2	The total impact area of the sites for which data were obtained is ≈158.9 km2. According to "Sanitary and Epidemiological Requirements for Establishing Sanitary Protection Zone of Production Facilities"[51](,) the minimum size of SPZ should be taken from 50 to 99 m

[51] Order of the Minister of Health of the Republic of Kazakhstan dated 11 January 2022 No. KR DSM-2. Registered with the Ministry of Justice of the Republic of Kazakhstan on 11 January 2022, No. 26447.

of the fields (SPZ radius - 1,000 m from each source of industrial emissions into the atmosphere)[50]				

2

Land disturbance and withdrawal, contamination of soil cover

[50] The SPZ boundary of the Amangeldy field is presented in Annex 1a .

Areas of land disturbance and soil contamination are assumed to be equal to the SPZ, as this corresponds to the area of the most active anthropogenic transformation. During operation, the impact on environmental components from linear facilities is minimal[52] ,[53] ,[54](,)[55][56](,)[57](,)[58] .

Outfall loops are located within the SPZ of the enterprises and do not require an adjustment of the zone of influence[59] . According to the requirements of the legislation of the Republic of Kazakhstan, for gas pipelines of this class a sanitary gap of 75 m in rural areas and 100 m in populated areas is allocated. There is no legally established sanitary gap for unpopulated areas

3

Emissions of gaseous and solid pollutants into the atmosphere

The study of pollutant dispersion from emission sources did not reveal any exceedances of MPCmR at the SPZ boundary[60] ,[61] ,[62](,)[63](,)[64](,)[65](,)[66](,)[67] .

The boundary of the atmospheric air pollution area is established along	The pollutant dispersion study did not reveal any exceedances of MPCmR at the SPZ boundary[69] . The boundary of the atmospheric air pollution area is established along the boundary of the SPZ. The maximum size of SPZ for S&A is set for AGDS/GDS and is 300 m. For gas distribution networks, head gas regulator

[52] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity", 2022.

[53] Draft NPD of pollutant emissions into the atmosphere for Chizhinskoye LPU of Uralsk UMG of Intergas Central Asia JSC for 2022-2020. Volume III.

[54] Explanatory note to the report on implementation of the IEC programme at the facilities of Uralsk UMG of Intergas Central Asia JSC for the I-IV quarters of 2022.

[55] Explanatory note. Poltoratskoye LPU and Akbulakskoye LPU of UMG "Shymkent" for the I quarter of 2022.

[56] Reports on industrial environmental control at compressor stations of the main gas pipeline "Kazakhstan - China" of Asian Gas Pipeline LLP for 2022.

[57] Programmes of industrial environmental control for compressor stations of the main gas pipeline "Kazakhstan - China" of Asian Gas Pipeline LLP for 2021-2026.

[58] Project "Environmental Impact Assessment (EIA)" of production facilities of South Kazakhstan production branch of KazTransGas Aimak JSC.

[59] EP "Airakty Deposit Development Project", 2021.

[60] EIA "Development of wells No. 137, 138, 139, 140, 141 of Amangeldy field".

[61] Draft standards of permissible emissions of pollutants into the environment for the Amangeldy field.

[62] Report of industrial environmental control of QazaqGaz Exploration and Production LLP for the IV quarter of 2022.

[63] Explanatory note to the report on implementation of the IEC programme at the facilities of Uralsk UMG of Intergas Central Asia JSC for the I-IV quarters of 2022.

[64] Explanatory note. Poltoratskoye LPU and Akbulakskoye LPU of UMG "Shymkent" for the I quarter of 2022.

[65] Report on the research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity".

[66] Reports on industrial environmental control at compressor stations of the main gas pipeline "Kazakhstan - China" of Asian Gas Pipeline LLP for 2022.

[67] Construction of Beineu - Bozoi - Shymkent gas pipeline. Adjustment 2. Volume XIII. Environmental Impact Assessment. BSGP-BD (2)-E-EP-RE-0001-000-0. Book 1, Part 1, 2015.

the boundary of the SPZ with a radius of 1,000 m [68]	stations, gas distribution stations and cabinet regulator stations sanitary gaps are not established[70,71]

4

Methane leaks

Methane leaks occur as a result of gas venting through vent plugs and equipment plugs, as well as technical losses during maintenance work and through leaks in equipment, fittings and connections. However, emissions do not affect a specific area, but the atmosphere as a whole, and therefore the impact zone is not identified for this factor

5

Water use (water withdrawal and water disposal)

There are no natural surface water bodies at the existing facilities. There is no water intake for drinking and domestic needs. Water used for these purposes is imported to the enterprise from outside.

As these water bodies are at a significant depth and do not affect biodiversity status, no impact is considered under this factor. The final receptor of	Water supply to the main industrial sites located in the cities is provided through the city water supply networks on the basis of contracts. Wastewater is also discharged by agreement into the city sewerage collector. Based on the above, there are no impacts on the state of biodiversity[81]

[69] Draft standards of maximum permissible emissions (MPE) of pollutants into the atmospheric air for South Kazakhstan production branch of KazTransGas Aimak JSC.

[68] Methodology for determining the size of the sanitary protection zone for oil and gas production, preparation and processing complexes.

[70] Sanitary Rules "Sanitary and Epidemiological Requirements for Sanitary Protection Zones of Facilities that are the objects of impact on the habitat and human health" dated 11 January 2022 No. KR DSM-2.

[71] Draft standards of permissible emissions of pollutants into the atmospheric air from gas distribution networks of Karaganda city from AGDS - "Karaganda" MG "Sary-Arka".

[81] Project "Environmental Impact Assessment (EIA)" of production facilities of South Kazakhstan production branch of KazTransGas Aimak JSC.

domestic and technical wastewater is artificially created water bodies. Wastewater recipient objects are located within the SPZ. Adjustment of the boundaries of the total impact zone is not required. Water supply to the facilities is entirely from groundwater intake. Since groundwater used for water intake is at a considerable depth and is not used by representatives of fauna and flora, the impact zone for this factor is not allocated Domestic and industrial wastewater is discharged predominantly into evaporation ponds and therefore no adjustment of the boundaries of the total impact area is required[72] ,[73] ,74(,)75(,)76(,)77(,)78(,)79 , 80	

[72] EIA "Development of wells 137,138,139,140,141 of Amangeldy field".

[73] Report of industrial environmental control of QazaqGaz Exploration and Production LLP for the IV quarter of 2022.

6

Physical Exposure and Anxiety Factors

All active sources of physical impact of SACs are concentrated within the SPZ and are localised[82 ,83 ,84(,)85(,)86(,)87(,)88(,)89(,)90(,)91(,)92 ,.]

The area of the SPZ is taken as the zone of impact of the factor

7

Disposal of solid industrial and domestic waste

No impact zone of waste disposal facilities is identified within the production sites, as long-term storage of generated domestic and industrial waste is not carried out by S&A[93 ,94(,)95(,)96(,)97(,)98(,)99(,)100(,)101(,)102(,)103(,)104]

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[74] Permit for emissions into the environment for facilities of I category. Shymkent Main Gas Pipelines Management Branch of Intergas Central Asia JSC.

[75] Draft MPD norms for Akbulak LPU of Shymkent UMG of Intergas Central Asia JSC for 2020-2024.

[76] IEC Programme at the facilities of II category of UMG "Shymkent" JSC "Intergas Central Asia" for 2022-2024.

[77] Explanatory note. Poltoratskoye LPU and Akbulakskoye LPU of UMG "Shymkent" for the I quarter of 2022.

[78] Reports on industrial environmental control at compressor stations of the main gas pipeline "Kazakhstan - China" LLP "Asian Gas Pipeline" for 2022 year.

[79] Programmes of industrial environmental control for compressor stations of the main gas pipeline "Kazakhstan - China" of Asian Gas Pipeline LLP for 2021-2026.

[80] Construction of Beineu - Bozoi - Shymkent gas pipeline. Adjustment 2. Volume XIII. Environmental Impact Assessment. BSGP-BD (2)-E-EP-RE-0001-000-0. Book 1, Part 1, 2015.

[82] EIA "Development of wells 137,138,139,140,141 of Amangeldy field".

[83] Report of industrial environmental control of QazaqGaz Exploration and Production LLP for the IV quarter of 2022.

[84] Report on the research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity".

[85] Report on the research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity".

[86] Report on the research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity".

[87] Reports on industrial environmental control at compressor stations of the main gas pipeline "Kazakhstan - China" of Asian Gas Pipeline LLP for 2022

[88] Reports on industrial environmental control at compressor stations of the main gas pipeline "Kazakhstan - China" of Asian Gas Pipeline LLP for 2022

[89] Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.

[90] Project "Environmental Impact Assessment (EIA) of production facilities of South Kazakhstan production branch of KazTransGas Aimak JSC".

[91] Protocol No. 2404 of the measurement of production factors, 2021.

[92] Report on the results of mandatory periodic certification of production facilities on labour conditions of UMG "Shymkent" JSC "Intergas Central Asia".

8

Associated objects

Motor roads and passages on the territory are provided taking into account traffic flows. There is no information on bird mortality due to collision and electrocution in contact with power lines. On this basis, the impact on biodiversity is recognised as insignificant and does not adjust the footprint of the plant impact area

9

Accidents

During the operation of the pipelines, technical losses of natural gas may occur due to leaks in the pipelines. However, during normal operation, the impact on biodiversity within the territory of the laid pipelines is minimal. Only during pipeline installation the soil is disturbed to a depth of up to 1.5-2 metres, which may result in disturbance of vegetation[105] ,106(,)107(,)108(,)109(,)110(,)111(,)112 (.).

[93] Waste management programme for Atyrau production branch of KazTransGas Aimak JSC.

[94] Waste Management Programme for KarPF JSC "KazTransGas Aimak" GDS of Karaganda city from AGDS "Karaganda" of MG "Sary-Arka".

[95]Conclusion № 01-0429/18 dated 30.10.2018 (positive) on the working project "Construction of compressor station "Saksaulsk" of the main gas pipeline "Beineu - Bozoi - Shymkent".

[96] Construction of Beineu - Bozoi - Shymkent gas pipeline. Adjustment 2. Volume XIII. Environmental Impact Assessment. BSGP-BD (2)-E-EP-RE-0001-000-0. Book 1, Part 1, 2015.

[97] Reports on industrial environmental control at compressor stations of the main gas pipeline "Kazakhstan - China" of Asian Gas Pipeline LLP for 2022

[98] Waste Management Programme (WMP) for the Gas Transportation Management Facilities (GTF) Almaty of the Kazakhstan-China gas trunkline of the Asian Gas Pipeline LLP for 2022-2031.

[99] Programmes of industrial environmental control for compressor stations of the main gas pipeline "Kazakhstan - China" of Asian Gas Pipeline LLP for 2021-2026.

[100] IEC Programme at the facilities of II category of UMG Atyrau UMG JSC Intergas Central Asia for 2022-2024.

[101] Waste Management Programme for Atyrau Akkol LPU of Atyrau UMG of Intergas Central Asia JSC for 2021-2030.

[102] IEC Programme at the facilities of II category of Uralsk UMGU of Intergas Central Asia JSC for 2022-2030.

[103] EIA "Development of wells 137,138,139,140,141 of Amangeldy field".

[104] Report of industrial environmental control of QazaqGaz Exploration and Production LLP for the IV quarter of 2022.

[105] Draft standards of permissible emissions of pollutants into the environment for the Amangeldy field.

The territory of the SPZ of each of the production facilities was taken as a high-risk area for emergencies related to the activities of SDCs, as it is the place where the largest number of accident-prone assets are concentrated

[106] Permit for emissions into the environment for facilities of I category. Shymkent Main Gas Pipelines Management Branch of Intergas Central Asia JSC.

[107] Permit for emissions into the environment for facilities of I category. Shymkent Main Gas Pipelines Management Branch of Intergas Central Asia JSC.

[108] Programmes of industrial environmental control for compressor stations of the main gas pipeline "Kazakhstan - China" of Asian Gas Pipeline LLP for 2021-2026.

[109] Plan of liquidation of accidents on the main gas pipeline "Beineu - Bozoi - Shymkent", section 621-901 km D1067mm of REU "Aksuat" of the Department of main gas pipelines "Kyzylorda" of JSC "Intergas Central Asia".

[110] Plan of liquidation of accidents on the main gas pipeline "Beyneu - Bozoy - Shymkent" REU "Shornak" of the Gas Trunkline Department "Shymkent" of JSC "Intergas Central Asia", section of the main gas pipeline "Beyneu - Bozoy - Shymkent" 1212,1-1393,5 km D1067mm.

[111] Plan of liquidation of accidents on the main gas pipeline "Beineu - Bozoy - Shymkent" on Akbulak LPU of GIS "Akbulak" of Gas Trunkline Department "Shymkent" of Intergas Central Asia JSC, section of the main gas pipeline "Beineu - Bozoy - Shymkent" 1393,4-1454,2 km D1067mm.

[112] Plan for elimination of accidents on distribution gas pipelines of Intergas Central Asia JSC, branch "Kyzylorda Main Gas Pipelines Management".

6.3. Analysis of the state of biodiversity at the regional level and in the impact zones of the Company's industrial facilities

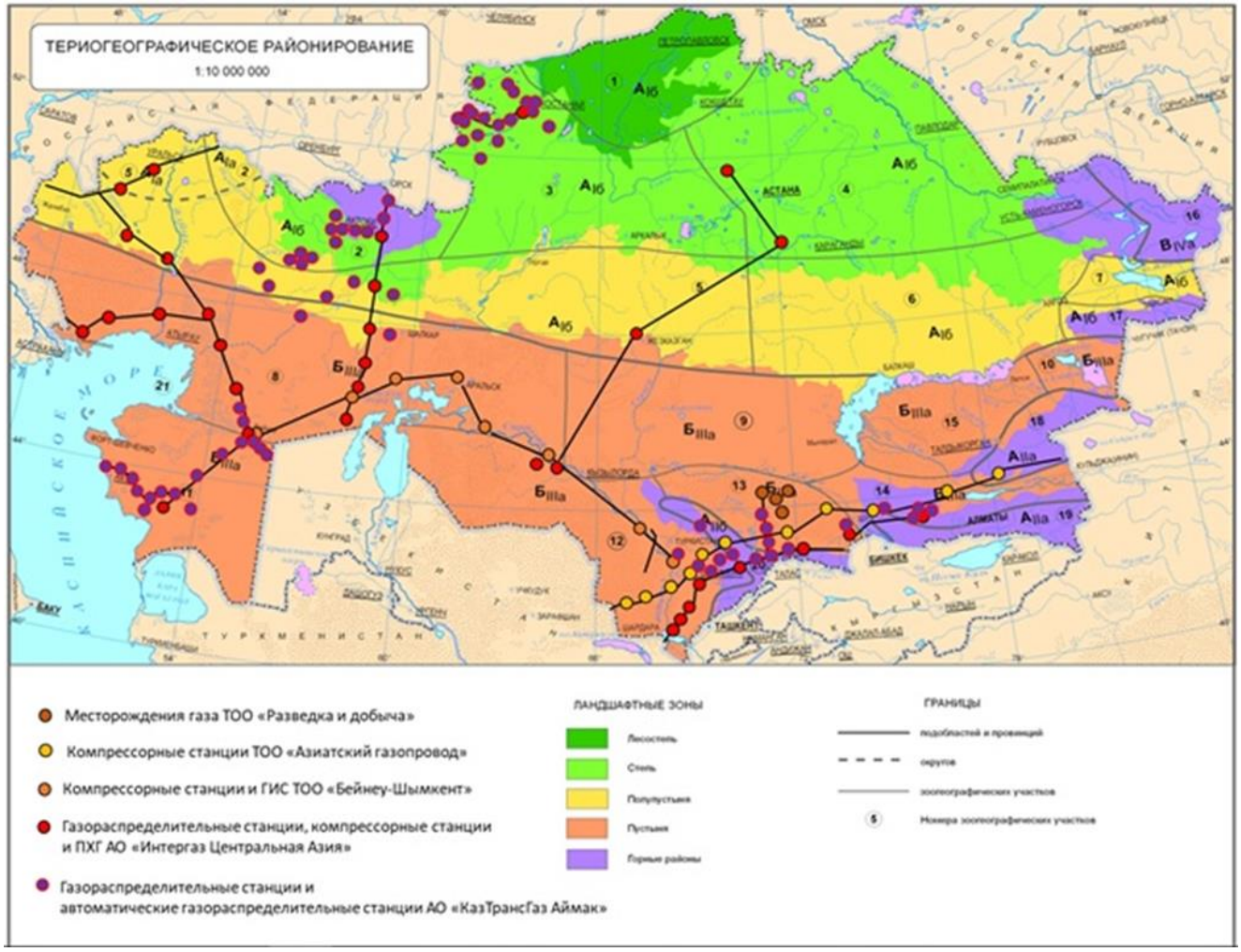
Biodiversity assessments are carried out both directly in the area affected by SDCs' production facilities and in the surrounding areas in the regions of operation. This approach allows us to identify baseline biodiversity parameters at local and regional scales and determine the intensity of the impact of SDCs' production facilities on biodiversity.

The background areas considered are:

− area natural objects within which the Company's point production facilities (gas fields) are located;

− natural zones, fully or partially covering the Company's linear facilities and related facilities.

Figure 4: Teriogeographical zoning and distribution of the Company's production facilities by natural zones of the Republic of Kazakhstan[113]



Since the Company's operations cover a large part of the territory of the Republic of Kazakhstan, and the production facilities, which carry out the impact, mostly have similar

[113] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c

characteristics, the description of the background biodiversity is proposed on the example of natural zones (Figure 4).

In accordance with CDP requirements, the main focus of the impact assessment is on the location and potential impact of the subsidiaries' production facilities on UNESCO World Heritage sites, protected areas, KOTs, Ramsar Sites and other areas of high biodiversity value. When describing impact zones, the possibility of the presence of rare and endemic animal and plant species was taken into account. Information on the conservation status of species was obtained from the Lists of Rare and Threatened Plant and Animal Species. Data from the Red Data Book (animals) were used for reference purposes.

To identify the current state of biodiversity, including within impact areas, data from open sources are used, including scientific publications and open databases, as well as (if available) research (field) materials provided by the Company. Primary research and biodiversity monitoring is required to clarify open source data and identify localised features in the regions where the Company's production facilities are located. Such a project has already been implemented in 2022 at some production facilities of Intergas Central Asia JSC, where primary biodiversity surveys have already been previously conducted[114] ,115(,)116(,)117(,)118(,)119(,)120(,)121(,) .122

6.3.1. Steppes and forest-steppes

6.3.1.1 Predominant biomes and landscape complexes, main water bodies that are habitats of rare, threatened and endangered fauna and flora in steppes and forest-steppes

Part of the main gas pipelines, compressor and gas distribution stations of Intergas Central Asia JSC and KazTransGas Aimak JSC are located in forest-steppe, steppe and dry-steppe zones within Akmola, Aktobe, Atyrau, West Kazakhstan, Karaganda, Kostanai and Ulytau regions.

According to the IUCN classification, the territories of the steppe and forest-steppe zones of Kazakhstan belong to the biome T4 "Savannas and Grasslands" and include functional groups of temperate forest communities (T4.4) and temperate semi-humid herbaceous communities (T4.5) .[123]

Within the forest-steppe, steppe and dry-steppe landscape zones on the plains of Kazakhstan, a regular change of six main sub-zones can be traced .[124]

The forest-steppe subzone with island birch-aspen forests and pine forests on typical and leached chernozems is located at the southern end of the West Siberian Lowland. The subzone's

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[114] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of the Zhanaozen CS of Aktau UMG, 2022.

[115] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" KS "Shalkar KS 12" and "Krasnooktyabrsk KS 14" UMG "Aktobe", 2022.

[116] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" GDS "Kaskelen" UMG "Almaty", 2022.

[117] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity" CS Akkol, CS Kulsary UMG Atyrau, 2022.

[118] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" REU "Nursultan" UMG "Karaganda", 2022.

[119] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" GDS Rudnyi, GDS v. Boskol UMG "Kostanay", 2022. Boskol UMG "Kostanay", 2022.

[120] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" UGS "Akir-Tobe" UMG "Taraz", 2022.

[121] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity" CS "Chizha" UMG Uralsk, 2022.

[122] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" Poltoratskoye UGS UMP "Shymkent", 2022.

[123] IUCN Global Ecosystem Typology.

[124] Chibilev A. A. Steppe Eurasia: regional review of natural diversity. Moscow: Orenburg: Institute of Steppe RAS; RGO, 2016. - 324 c.

zonal sagebrush-rich herbaceous steppes have been completely ploughed, with fragments of them preserved along forest edges.

The subzone of moderately arid steppe on ordinary chernozems covers the south of the West Siberian lowland and part of the Trans-Ural plateau. The zonal type of vegetation is now fully ploughed grass-grass-grass steppes in combination with grass-typchak and wormwood-typchak steppes. Fragments of zonal steppes are preserved only on lands not suitable for ploughing.

The subzone of arid steppe on southern chernozems is represented within the Podural Plateau, northern Mugodzhars, Zauralsky Plateau and Tobol-Ubaganskaya plain. The vegetation cover of the subzone is formed by mixed-grass-red-grass and lessing-grass steppes with a wide distribution of wormwood-typchak and breast-typchak associations along the watersheds. Like the previous subzone, the southern steppe subzone is completely ploughed. Individual virgin areas are preserved in the northern part of the East-Turgai plateau in the form of steppe wedges left untouched by the planning of rectangular fields.

The subzone of moderately dry steppe on dark chestnut soils extends over parts of the General Syrt, Podural and Trans-Ural plateau, Mugodzhar and lowlands of the Kazakh shallow **soils**. The natural vegetation cover of the subzone is formed by tepchak-lessingokovil groups with participation of tepchak-grudnitsa and tepchak-wormwood associations. Solonetz soils with solonets are widespread everywhere, and in relief depressions - halophytic complexes and solonchaks. The steppe areas of this subzone have not been ploughed and are included in the reserves and national parks of Kostanay, Akmola and Karaganda oblasts.

The subzone of dry steppe on chestnut soils is expressed on the Caspian lowland, Podural plateau, Turgai plateau, Turgai trough and Teniz depression. Zonal vegetation is represented by wormwood-typchak-sooty steppes. Farming in this subzone, even during the period of virgin lands development, was limited and temporary, so significant areas of former pastures were freely included in new and projected reserves and other protected areas of Kazakhstan.

The **subzone of desert steppe on light chestnut soils** covers the landscapes of the Caspian Lowland, the Podurals, Turgai and the Kazakh Shallow **Soil**. The vegetation cover of the subzone is dominated by wormwood-typchak groupings in combination with xerophytic semi-shrubs (wormwood, saltwort) and ephemerals. On soils of light mechanical composition wormwood-tyrsus and honeysuckle-typchak associations are widespread.

Within the steppe landscapes of the **Caspian Lowland** there are facilities operated by **UMG Uralsk of Intergas Central Asia JSC**: the Soyuz, Orenburg-Novopskov, Karachaganak-Uralsk and Central Asia-Centre gas trunklines with a total length of 2.87 thousand km. kilometres, 32 gas distribution stations for gas supply to consumers in the West Kazakhstan region, as well as the Uralsk CS, the Chizha CS and the Dzhangala CS[125] . Within this territory on relatively flat chalk watersheds communities of thyme guberlinskii, wormwood solankovidnaya and mordovnik ordinary are distinguished. On chalk slopes communities of Cretaceous hedgehog, Nanophyton hedgehog (Tasbiyurgun) and Kermeka large-flowered prevail. Rare and endemic species include Meyer's bedstraw, dyeing fern, fragrant leuca, and chalk junea. Abundantly fruiting thickets of Ephedra bicolor are common on eastern and southern slopes. On gentle slopes of non-southern exposures are characterised by patches of steppe cherry, low almond, spirea spiraea[126 ,127 (.)].

The territory of the **Ural Mountainous Country is** home to the Bukhara - Ural, Zhanazhol - Oktyabrsk - Aktobe, Zhanazhol - CS-13 and Kozhasai - CS-12 trunk pipelines, two compressor

[125] Intergas Central Asia.

[126] Chibilev A. A. Steppe Eurasia: regional review of natural diversity. Moscow: Orenburg: Institute of Steppe RAS; RGO, 2016. - 324 c.

[127] Report on the research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity".

stations (CS-14 Krasnooktyabrskoye and CS-13 Taldyk), as well as gas distribution stations operated by **UMG Aktobe of Intergas Central Asia JSC and KazTransGas Aimak JSC**[128] · The Ural mountainous country in the region of the Company's presence is represented by plateau-like high plains dissected by river valleys and the Mugodzhar Range, which pushes steppe landscapes to the south, up to the Ustyurt Plateau and the Aral deserts. Due to the low altitude of the main ridges, altitudinal zonality in the Mugodzhars is poorly expressed. The mountain-steppe zone prevails.

Deep gorges and places of groundwater inclination are occupied by birch and aspen stands with fragments of meadows. The background vegetation of the territory is represented by grass-grass, grass-grass, grass-hemlock, black sagebrush associations developed on chestnut and light-chestnut solonetz soils and solonets[129 ,130 (.).]

In the forest-steppe and steppe landscapes of the Tobol-Ubagan interfluve and the northern part of the Turgai plateau there is a gas pipeline "Kartaly - Rudny - Kostanay" (155.8 km) and gas distribution stations, which are operated by UMG "Kostanay" JSC "Intergas Central Asia" and JSC "KazTransGas Aimak"[131 (.).)]This territory is characterised by a combination of zonal steppe vegetation with sandy and aeolian massifs occupied by birch and pine forests. Specific geomorphological conditions contributed to the formation of shallow (from 3 to 15 m) aquifers with fresh water, which created conditions for the growth of uncharacteristic for the zone of birch and pine-birch forests with an undergrowth of steppe shrubs (steppe cherry, steppe tavolga, spikenard), as well as steppe cereals[132 ,133 (.).]

The plains between the forest massifs are occupied by grass-grass-grass steppes, where psammophyte communities dominate. Along with the usual representatives of steppes (Zalessky grasses, Tyrsa, tipchak, Russian mayflower, steppe sage), sand-steppe species are present in their composition (Ioann's grasses, Becker's fescue, tonknog blue, Marshall's wormwood, sand cumin, cachyme paniculata, etc.)[134(,)135 (.).]

In the dry-steppe and desert-steppe landscapes of the Tengiz Plain and Bayanaul-Karkarala region of the Kazakh Cretaceous Basin there is the Saryarka gas trunkline with a total length of 1.06 thousand km, as well as associated gas distribution stations, which are operated by UMG "Karaganda" JSC "Intergas Central Asia"[136(.)] The basis of vegetation on this territory is sod-grass steppes. On dark chestnut soils, typechanical-sooty steppes with the presence of xerophytic grasses dominate. Steppe solonts are formed on outcrops of kaolinite weathering crusts[137 ,138 .]

Landscape shape of Bayanaul-Karkarala region is formed by steppe shallow and lowland massifs. In the intermountain valleys and hollows oats-yrsi steppes are developed, in some places with the participation of red wattle (Erementau Mountains). The southern parts of the region are

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[128] Intergas Central Asia.

[129] Chibilev A. A. Steppe Eurasia: regional review of natural diversity. Moscow: Orenburg: Institute of Steppe RAS; RGO, 2016. - 324 c.

[130] Report on the research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity".

[131] Intergas Central Asia.

[132] Chibilev A. A. Steppe Eurasia: regional review of natural diversity. Moscow: Orenburg: Institute of Steppe RAS; RGO, 2016. - 324 c.

[133] Report on the research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity".

[134] Chibilev A. A. Steppe Eurasia: regional review of natural diversity. Moscow: Orenburg: Institute of Steppe RAS; RGO, 2016. - 324 c.

[135] Report on the research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity".

[136] Intergas Central Asia.

[137] Chibilev A. A. Steppe Eurasia: regional review of natural diversity. Moscow: Orenburg: Institute of Steppe RAS; RGO, 2016. - 324 c.

[138] Report on the research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity".

characterised by tipchak-yrsik-yrsik steppes. Almost everywhere there are steppe shrubs Karagana bushy and Spirea spirea. Most of the low-altitude landscapes of the subregion have a steppe appearance, but on the largest ones pine forests are formed[139]. Birch, birch-aspen, and less frequently black-alder forests appear along ravines and gullies, as well as at groundwater outlets. At altitudes of 600-800 m, grass-grass-grass (with predominance of desert oats) steppes are formed on mountainous rubbly chernozems, forming an altitudinal belt of chernozem steppes in the subzone of southern steppes with chestnut soils[140,141 (.)].

6.3.1.2 Objects of fauna and flora, including those included in the List of Rare and Endangered Species of Plants and Animals in Steppes and Forest Steppes

6.3.1.2.1 Vegetation of steppes and forest-steppes

Features of vegetation cover of the regions of Intergas Central Asia LLP presence belonging to the steppe zone are presented in the studies for Uralsk UMG, Aktobe UMG, Atyrau UMG and Kostanai UMG on the territories of West Kazakhstan, Aktobe Atyrau and Kostanai regions. Due to the large number of production facilities within the steppe zone, the description of biodiversity is divided by main pipeline directorates.

In the flora of the territory of UMG "Uralsk" (West-Kazakhstan region), annuals (including ephemerals), including 20 species, prevail. The total number of perennials (shrubs, bushes, shrubs, semi-shrubs, semi-shrubs, perennials, ephemeroids) is 19 species.

Vegetation is represented by sarsazan communities with biyurgun. The composition is dominated by ephemerals and annuals of the mareva family (saltwort, ebelek, swede). Species diversity and projective cover reflect changes in weather conditions by years[142].

This territory is characterised by the development of steppes dominated by tipchak with a significant admixture of various species of wattle occupying a subordinate position. In these steppes, the presence of mesophilic grasses is significantly reduced, but steppe shrubs - low bean, spirea spiraea St. John's wort and cityscape, caragana - are widespread, gravitating to low reliefs. Together with shrubs, a more northern species - pinnate sagebrush - can be found in depressions. In large depressions, wheatgrass, campfire and foxtail meadow groups are formed.

The basis of the flora of the region under consideration are steppe species (150 species; 47.7 per cent of the total number), among which there are turf grasses - tipchak and various sagebrush (hairy, Lessing's, pinnate, etc.). The second place is occupied by meadow species characteristic of forest belts, bottoms of ravines and gullies (87 species; 28% of the total number). The third place belongs to woody species, including white and black poplars, white and three-pointed willows. The other groups do not play a major role in the herbage, except for weeds[143,144].

Based on the report on research work on the impact of **UMG Aktobe** on biodiversity, it was revealed that the most frequent spring species of biodiversity in the surveyed areas were Tatar rhubarb, mortuke, sarsazan, climacoptera, Lerch's wormwood, biyurgun. Prickly-pear-leaved bedstraw,

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[139] Karamysheva Z. V., Rachkovskaya E. I. Botanical geography of the steppe part of Central Kazakhstan. I. Botanical geography of the steppe part of Central Kazakhstan. Л. Nauka, 1973. - 278 c.

[140] Chibilev A. A. Steppe Eurasia: regional review of natural diversity. Moscow: Orenburg: Institute of Steppe RAS; RGO, 2016. - 324 c.

[141] Report on the research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity".

[142] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of CS "Chizha" UMG Uralsk, 2022.

[143] Serebryakov I. G. Ecological and morphological classification of plant life forms, 1964.

[144] Botanical Geography of Kazakhstan and Central Asia / Edited by E. I. Rachkovskaya et al. - SPb., 2003. - 424 c.

bulbous bluegrass are also quite common. Other plants occur less frequently, taking various part in the composition of communities[145].

According to the scheme of botanical and geographical zoning, the region where UMG Aktobe operates[146] lies within the Zavolzhsko-Kazakhstan steppe province of the steppe zone of Kazakhstan and belongs to the strip of deserted steppes[147,148,149]. KS-14 Krasnooktyabrskoye is located in the Khromtau district of the Aktobe region, situated in the steppe zone of the Mugodzhar Mountains. Xerophytic shrubs, wormwood, saltwort and ephemerals grow in close proximity to the production facilities. Shrub thickets are found on the slopes of hillocks and ridges.

In the lower tiers of phytocenoses, the most characteristic and abundant among cereals are brittle wheatgrass or Yerkek, long-haired lentoostnik, forest rye and selin - on broken areas of sands. The whitish-blue background on levelled areas of gentle slopes and inter-sand plains is caused by the growth of wormwood. Other plants found in various plant communities of the sands include Eremurus inderskyi, spiny-leaved spurge, eastern camel's-foot, astragalus lisii, hornwort marsupial or ebelek, hyalea beautiful, cachimus paniculata, white-stemmed mordovnik, heliotrope and others.

The following associations are the most widespread in the yar formation in the desert steppe strip: tipchak-yar, white-pollen-yar, lerhean-pollen-yar, tipchak-lerhean-pollen-yar. There are also honeysuckle-yrsovaya, licorice-yrsovaya, yerkekovo-yrsovaya. The tipchak formation is characterised by variegated-typchak, lerhean-weed-typchak, tipchak-ketchak, etc. On the plain, white wormwood-isene, and on solonetz soils of loamy and sandy loam composition - leafless anabasis, low-flowered wormwood, prostrate twig, etc. are quite widespread.

Plant communities of the region of **UMG "Atyrau"** presence are most typical for semi-desert-steppe, desert and semi-desert natural zones. In the vegetation cover there is domination of sod-grasses, reduction of the role of grasses, strengthening of the role of semi-shrubs and shrubs (wormwood, twigs, tamarix), ephemerals and ephemeroids. Complexity of steppe types with desert types (with predominance of hairy wattle) is characteristic[150].

The vegetation of the region of **UMG "Kostanay"** presence is mainly represented by forest-steppe, steppe, desert and semi-desert zones. The steppe zone is represented by moderate forging steppes on chernozems and dry typical forging steppes on dark chestnut and chestnut soils, in the vegetation cover of which vegetation microcomplexes of wormwood-grass groupings with participation of desert ephemerals and halophytic semi-shrubs are represented. In the composition of herbaceous steppe vegetation there are endemic species of plants, such as short-fruited flax, Kazakh thyme and others.[151]

The existence of a variety of ecological conditions on the territory of the studied region provided the possibility of preservation of many relict species. Two categories of relicts are of botanical and geographical interest - Pliocene and Pleistocene relicts. The Pliocene relicts include mesophilic forest

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[145] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" KS-12 "Shalkar" and KS-14 "Krasnooktyabrskoye" UMG "Aktobe", 2022.

[146] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of CS "Chizha" UMG Uralsk, 2022.

[147] Flora of Kazakhstan. In 9 vol., Alma-Ata, 1956-1966.

[148] Aralbaev N. K. Phytochorions of Kazakhstan in the system of floristic zoning of the Holarctic // Botanical Research in Asian Russia : Proceedings of the XI Congress of RBO. Barnaul, 2003. - T. 1. - C. 320-321.

[149] Bykov B. A. 1975. Regional analysis of flora and botanical-geographical zoning of Kazakhstan // Problems of desert development. № 6. C. 3-15.

[150] Report on the research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of CS Akkol, CS Kulsary UMG Atyrau", 2022.

[151] Demchenko L.A. Vegetation cover of Kustanay region. Materials to the flora and vegetation of Kazakhstan // Tr. Institute of Botany of the Academy of Sciences of the Kazakh SSR. - Alma-Ata, 1961. 10. - C. 25-91.

plants, such as European hoofwort, Persicolist bellflower, May lily of the valley, small and round-leaved pear trees, as well as steppe mesophilic species of astragalus.

Among the Quaternary species, Pleistocene relicts include northern buttercup, bog cranberry, needle-leaved clove, hybrid clematis, spikenard, and Siberian mountain ash. The desert Turanian group of relicts can also be included here: hedgehog nanophyton, natron saltwort, sand hornwort, leafless saxaul (black)[152] (.).

The region of **UMG Karaganda**'s presence includes a variety of biotopes - dry steppes, uplands, forest plantations, agrocenoses. Due to the diversity of biotopes, the local flora includes both aquatic, aquatic and meadow species, as well as species typical of other landscape zones - forest-steppe, steppe, semi-desert and anthropogenic landscape.

According to the system of botanical and geographical zoning, the steppe part of the Central Kazakhstan shallow meadow[153] belongs to the Euroasian steppe region, the Trans-Volga Kazakhstan province, the Central Kazakhstan steppe subprovince, the Priishim district[154] (.).

The basis of grass cover is made up of dense turf grasses - red sagebrush, desert oats and tipchak (betege) with the participation of steppe sedges - squat and foot-shaped. Among herbs cold wormwood and tarragon, veronica, lapstick, lucerne, Russian mayflower, etc. are characteristic. Among tree and shrub species, silver elk, St. John's wort are characteristic. On rocky outcrops petrophytic variants of steppes are developed with participation of cold wormwood, mountain bush, Marshall's thyme, Siberian cornflower and Ledebur's toadflax. On upland areas petrophytic plants are included - Patrinia median, Valeriana tuberosa, etc. In the herbage of steppe cereals prevail sagebrush, tipchak, yarsa, from wormwoods - narrow-oblong wormwood, white wormwood, black wormwood, from saltworts - biurgun, kokpek, etc.[155]

On the edges of forests and forest belts there are richly variegated herb-red-cedar-oats steppes with silky wormwood, tarragon and Marshall's wormwood. The cereal basis, except for red wattle and oats, is made up of tipchak, steppe timothy, hairy wattle, ground reedgrass, combed honeysuckle, bromegrass and narrow-leaved bluegrass. Among representatives of herbs there are licorice Ural, strawberry, false veronica, plantain maxima, yarrow noble, medicinal haemochlebka, common carrot (Morrison's huckleberry), common laburnum, mouse pea, five-leaved clover[156] (.).

Xerophytic herbaceous-typchak-typchak-kovylky and typchak-kovylky dry steppes on dark chestnut solonetz soils with steppe solonets are represented by the complex of typchak-ovetsovo-kovylky, typchak-kovylky, Tipchak-ovetsovo-kovyly, Tipchak-grudnitsa and Tipchak-wormwood communities, which are characterised by such plants as Tipchak, red, hairy and sagebrush grasses, hairy sagebrush, saltwort, Camphorosma marseille. Saline meadow steppes and meadows on hydromorphic and semi-hydromorphic soils with vostrets, species of cuirass, tipchak, bromegrass, Ural licorice, Gmelina kermek and other halophytes are widespread along humidified hollows.

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[152] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on UMG Kostanai", 2022.

[153] Ishmuratova M. Y., Tleukenova S. U. On vascular plants of the flora of Central Kazakhstan // Bulletin of KarGU. Series "Biology. Medicine. Geography". - 2009. - № 4. - C. 9-20. 63 Kupriyanov A. N., Mikhailov V. G. New and rare plants of the early spring flora of Central Kazakhstan // Botanical materials of the herbarium of the Institute of Botany, Academy of Sciences of the Kazakh SSR. - 1987. - Issue. 15. - C. 11-12. 64 Baimukhambetova Zh. У. New location of birch forest in Central Kazakhstan // Botanical materials of the herbarium of the Institute of Botany of the Academy of Sciences of the Kazakh SSR. - 1987. - Vol. 15. - C. 13-15.

[154] Karamysheva Z.V., Rachkovskaya E. I. Map of vegetation of the steppe part of the Central-Kazakhstan melkosopochnik as a basis for botanical-geographical zoning // Geobotanical mapping, 1973.

[155] Tleukenova S.U., Ishmuratova M.Y. Analysis of the flora of the Karkaraly mountains // Vestnik of Kara State University. Series "Biology. Medicine. Geography". - 2010. - № 2. - C. 33-39.

[156] Karamysheva Z.V., Rachkovskaya E. I. Map of vegetation of the steppe part of the Central-Kazakhstan melkosopochnik as a basis for botanical-geographical zoning // Geobotanical mapping, 1973.

Among steppe complexes there are pine sparse forests and solitary pines, as well as small-leaved elm[157 (.).]

A general list of rare plant species is provided in Appendix 2 , Table 1 .

6.3.1.2.2 Animal life of steppes and forest-steppes

The most significant factors determining the current distribution and abundance of mammals in the Kazakh Shallow Soil, as well as the structure of large territorial groupings of these animals are latitudinal zonality and the impact of anthropogenic factors. Mixing and interpenetration of elements of different faunal complexes is a characteristic feature of the fauna of the region under consideration.

- The Kazakh steppe faunal grouping is represented by nine native forms: steppe pika, steppe mouse, big marmoset, little gopher, steppe pest, corsak, kulan, tarpan and saiga. The first three species are considered endemics of this landscape-climatic zone by all researchers who have specifically studied the fauna of steppes[158 ,159 ,160(.)]
- The Mongolian-Daurian steppe faunal grouping includes the red-cheeked gopher, Dzungarian and Barabinsk hamsters, and the light, or steppe, polecat. All of these species are now widely distributed in the Kazakh and Transbaikal-Mongolian steppes, with the exception of the steppe polecat, which inhabits the transholarctic range[161 .]

Mammals. The mammal fauna is represented by steppe and desert species. In the regions where SACs are present in the steppe zone, saiga migrations are potentially possible, belonging to two populations - the Ustirt saiga in the west and south-west, and the Betpakdala saiga in the south-east. The Betpakdala saiga population is protected in the Irgiz-Turgai Nature Reserve and the Turgai Nature Reserve. Rodents are important for steppe territories, among which the great and red-tailed gerbil predominate significantly.

According to literature data, the fauna of typical mammals of the study area includes 87 species belonging to six orders: insectivores - 9 species, man-eaters - 13, carnivores - 11, ungulates - 6, rodents - 43, hares - 5. The largest number of species is characterised by the rodent group, which is associated with the highest rate of evolution of this group in the arid zone[162 (.).]

On the steppe territory, according to the results of biodiversity surveys, there are about 60 species of mammals, including numerous species of rodents (squirrel-teleutka, marmot-baibak, Tolai and Rusak hares, pika, yellow, small and red-cheeked gopher, midday gerbil, comb gerbil, common marmot, grey and water rats, common shrew, field mouse), predators (wolves, foxes, manulas, badgers, weasels, ermine, polecats) and ungulates (saigas, gazelles, argali, wild pigs)[163(,)164(,)165(,)166 (.).]

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[157] Karamysheva Z.V., Rachkovskaya E. I. Map of vegetation of the steppe part of the Central-Kazakhstan melkosopochnik as a basis for botanical-geographical zoning // Geobotanical mapping, 1973.

[158] Afanasyev A. V. V., Bazhanov B. C., Korelov M. N., Sludsky A. A., Strautman E. I. Beasts of Kazakhstan. - Alma-Ata: Publishing House of the Academy of Sciences of the Kazakh SSR, 1953. - 536 c.

[159] Kucheruk V. V. Steppe faunistic complex of mammals in the fauna of Palaearctic // Geography of terrestrial animal population and methods of its study. M., 1959. C. 45-87.

[160] Animals of Kazakhstan in photos [Text]: photo album / - 2nd ed., rev. and supplement. - Alma-Ata: Nauka KazSSR, 1987. - 208 p., ill.; - 20 000 copies: (in per.): 300 tg.

[161] Yerzhanov N. T. The current state of biodiversity of mammals of the Kazakh Shallow Soil and factors determining it // Vestnik KarGU. 2001. № 3. C. 23.

[162] Yerzhanov N. T. The current state of biodiversity of mammals of the Kazakh Shallow Soil and factors determining it // Vestnik KarGU. 2001. № 3. C. 23.

[163] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity of GDS Rudnyi, GDS with. Boskol UMG "Kostanay", 2022.

Ornithofauna. The Siberian-Eastern African migration route of migratory birds passes through the territory of the Ural River delta and the adjacent Caspian Sea coast. A large number of rare and protected bird species, such as caraway, spoonbill, little white heron, Egyptian heron, sultana, etc., are concentrated here. Flamingos, dalmatian pelicans, black-headed puffins, whooper swans and the endangered piscule goose[167] (.) stop here during the migration period.
Steppe eagle, whooper swan, dalmatian pelican, and Savka[168] , and in the area of UMG Uralsk, steppe eagle and whooper swan[169] (.) Whooper swan was identified in several locations due to the presence of live individuals and the detection of feathers near habitats. Some birds were identified on the nest while incubating eggs. The Herring Gull was recorded on a tributary of the Chizhi River and in the vicinity of Mereke settlement, and the Steppe Eagle in the same area. The Curlew Pelican was seen in a single specimen on an overgrown stream near the settlement of Chizha-2[170] (.).
Individual species of avifauna found near the territories of UMG "Karaganda" are represented by ducks, geese, kobchik, cheglok, saker falcon, kite. In addition, there are muzzleloader eagles, owls, owls, owls, sparrows, magpies, crows, partridges, grouse, pheasants, chiggers, tits, woodpeckers[171 ,172] (.).

Amphibians and reptiles. Amphibians and reptiles are found in all natural zones of Kazakhstan, but their maximum diversity is characteristic of deserts and semi-deserts. Some of them can be found in steppe ecosystems. At the time of the surveys, four species of amphibians were recorded in the Uralsk UMG territory - lake frog, common and water urchin, and leaping lizard[173 ,174] (.).

Ichthyofauna. According to the studies carried out in 2007-2015. studies, the species composition of commercial ichthyofauna of rivers within the Kazakhstan sector of the Caspian Sea in summer and autumn is represented by 27 species: sturgeons - 4 species (Russian and Persian sturgeon, starred sturgeon, beluga), herring - 5 species (Black Sea-Caspian tulka, anchovy sprat, bigeye, Caspian and roundhead minnows, carp - 10 (roach, bream, white-eye, redfish, bluefin, gouster, chechon, carp, crucian carp, and zherekh), perch - 2 (pikeperch, perch), catfish - 1 (catfish), mullet - 2 (singil and ostronos). Low-value ichthyofauna was also encountered in research catches, represented by such families as bullhead (10 species), aterinae (1 species) and needlefish (1 species)[175] (.).

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[164] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" KS-12 "Shalkar" and KS-14 "Krasnooktyabrskoye" UMG "Aktobe", 2022.
[165] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of CS "Chizha" UMG Uralsk, 2022.
[166] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity of GDS Rudnyi, GDS with. Boskol UMG "Kostanay", 2022.
[167] Project "Construction of MG from Kashagan to Makat - North Caucasus MG with compressor station and infrastructure facilities of Kashagan GTF", Section "Environmental Impact Assessment", 2021.
[168] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" KS-12 "Shalkar" and KS-14 "Krasnooktyabrskoye" UMG "Aktobe", 2022.
[169] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" KS-12 "Shalkar" and KS-14 "Krasnooktyabrskoye" UMG "Aktobe", 2022.
[170] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of CS "Chizha" UMG Uralsk, 2022.
[171] Gavrilov E. I. Fauna and distribution of birds of Kazakhstan. - Almaty: Kainar, 1999. - 240 c.
[172] Birds of Kazakhstan and neighbouring territories. Bibliographic Index (1850-2000). Compiled by A. F. Kovshar and V. A. Kovshar. - Alma-Ata, Tethys, 2000. C. 1-300.
[173] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of CS "Chizha" UMG Uralsk, 2022.
[174] Report on the research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of CS Akkol, CS Kulsary UMG Atyrau", 2022.
[175] Project "Construction of MG from Kashagan to Makat - North Caucasus MG with compressor station and infrastructure facilities of Kashagan GTF". Section "Environmental Impact Assessment", 2021.

The ichthyofauna of the steppe zone of Karaganda oblast includes species living in the waters of the main water bodies of the oblast in controlled sites - the Nura River with its tributaries Sherubai-Nura and Sokur, Kara-Kengir, Samarkand and Kengir reservoirs. Within the framework of the research works conducted in the steppe zone of Karaganda oblast within the regions of SAC presence, the following fish species were found in lakes and rivers: crucian carp, redfin, carp, roach, bream, perch, pike.[176] (.).

A general list of rare animal species is provided in Appendix 2 , Table 2 .

6.3.1.3 Specially Protected Natural Territories (SPNTs), natural objects of international importance within the boundaries of the steppe and forest-steppe zone.

In the steppe and forest-steppe zones, the production facilities of SACs are located near three SPNAs of national importance (Table 6) .[177]

Table 6: List of protected areas within the desert and semi-desert zones located near the impact zone of SDCs' production facilities

№	Name of protected area	Nearby production facilities	Distance
1	Mikhailovsky State Nature Reserve (zoological)	GDS "KazTransGas Aimak" JSC	less than 5 km
2	Zhaltyrkulsky State Nature Reserve	Dzhangalinskoye LPU of Intergas Central Asia LLP	over 5 kilometres
3	Kirsanovsky State Nature Reserve (complex)	Intergas Central Asia LLP gas pipeline	over 10 kilometres

According to CDP requirements, the description of impacts on protected areas takes into account all protected areas located within 70 kilometres of the impact zones of the production facilities. A detailed description is provided for nature reserves, national parks and nature reserves located within 70 kilometres, and nature monuments within five kilometres. Nature reserves and protected areas are subject to detailed review if they are directly adjacent to or cross the impact zones of industrial facilities.

Mikhailovsky State Nature Reserve (zoological). The purpose of the reserve is to preserve hunting and commercial animal species of the region, primarily hog game[178] . The fauna of the reserve is characterised by species diversity, including species included in the List of Rare and Endangered Species of Plants and Animals. Mammals include the forest marten, birds - during migration - golden eagle, grave crane, grey crane, whooping crane, whooping crane, whooper swan, lesser swan, yellow heron, as well as the occasional nesting white-tailed eagle[179] (.).

Zhaltyrkul State Natural Reserve (zoological). The reserve was created to protect the system of freshwater steppe lakes and aquatic and near-water animals inhabiting them, including hog and wetland game[180] . It is home to such species of rare animals as white-tailed eagle, dalmatian pelican, spoonbill, whooper swan, whooper swan, caraway, piskulka goose, red-breasted goose, black-breasted geese, black-headed grouse, white-eyed duck, steppe eagle, peregrine falcon, Siberian crane, owl, wood marten, European mink[181] (.).

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[176] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of REU "Nursultan" UMG "Karaganda", 2022.

[177] List of specially protected natural territories of republican significance.

[178] Specially protected natural territories of the RK.

[179] Specially protected natural territories of the RK.

[180] Specially protected natural territories of the RK.

[181] Specially protected natural territories of the RK.

6.3.2 Deserts and semi-deserts

6.3.2.1 Predominant biomes and landscape complexes, main water bodies that are habitats of rare and endangered fauna and flora of deserts and semi-deserts

The largest number of the Company's production facilities are located within the desert zone. Beineu-Shymkent Gas Pipeline LLP is located entirely within the zone, as well as the Company's production assets related to QazaqGaz Exploration and Production LLP. In addition, part of the assets of Intergas Central Asia JSC, Asian Gas Pipeline LLP and KazTransGas Aimak JSC relating to Mangistau, Aktobe, Kyzylorda, Zhambyl and Turkestan regions are located within the zone.

According to the IUCN classification, the territories of the semi-desert zone of Kazakhstan belong to the biome of deserts and semi-deserts and include the functional groups of semi-desert steppes (T5.1) and cold deserts and semi-deserts (T5.4).

The regions of operations of S&A production facilities within the desert zone belong to the Iran-Turan sub-area of the Sahara-Gobi desert region and cover areas of the following provinces :[182]

- Northuran;
- Dzungaro-North Tianshan;
- Mountain-Mid-Asian.

The majority of S/As' production facilities are concentrated within the North Turan province, which includes two latitudinal sub-zones - northern and middle deserts.

The subzone of northern deserts with brown desert freezing soils extends along the border with the steppe zone and is located between 48° and 47° N. The largest areas are occupied by sagebrush deserts. The largest areas in the subzone are occupied by wormwood deserts. Lerchopolynnyky prevails on the Caspian lowland, grey polynyas on the Podural plateau, further to the east - sublessingian-polynyas and white-earth polynyas[183] . The regions of UMG activity located in Aktobe oblast belong to this subzone.

The deserts of Aktobe oblast adjacent to the production facilities of subsidiaries and affiliates are characterised by differences in the mechanical composition, chemistry and degree of soil salinity, causing increased diversity and spatial heterogeneity of vegetation cover. The vegetation of sands is represented mainly by white-earth-hemlock-teresken communities:

- with wormwood and brittle grass - on weakly fixed low hilly bumpy sands;
- sedge-white-soil-emergent sagebrush, ephedra and honeysuckle communities - on shallow hilly fixed sands;
- white-soil-white-emergent-teresken communities with honeysuckle, sedge and turmeric, as well as wormwood-psammophytic-shrub communities - on fixed hilly-ridgy sands.

White-earth wormwood communities with Itsygek (leafless anabasis) and keireuk (eastern saltwort) are formed on soils with light mechanical composition. Saline habitats are characterised by halophytic vegetation represented by sarsazan and annual saltwort communities. On sandy loam, white-earth sagebrush communities with the participation of perennial saltwort are developed, which can occur both on rubbly and clayey soils. Perennial solanaceous phytocenoses consisting of biurgunov, itsygekovo-sometimes white-earth-semi-wormwood-chernosaxaul and keireukovo-chernosaxaul communities are confined to clay soils[184] (.).

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[182] Botanical Geography of Kazakhstan and Central Asia (within the Desert Region) edited by Rachkovskaya E. I., Volkova E. A., Khramtsov V. N., 2003.

[183] Botanical Geography of Kazakhstan and Central Asia (within the Desert Region) edited by Rachkovskaya E. I., Volkova E. A., Khramtsov V. N., 2003.

[184] Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.

In the middle desert subzone of the North-Turan province, communities of three formations - white-earth sagebrush, biurgun and chernoboyalych - predominate. White-earth wormwood and biurgun communities predominate on the plains in the western part of the province, while black sagebrush communities dominate in the shallow sooty areas between the Aral Sea and Lake Balkhash, occurring to the west only locally - on the Ustyurt Plateau and in Mangyshlak[185] . The sub-zone includes the regions where subsidiaries' production facilities are present within the Kyzylorda, Zhezkazgan, Mangystau and Zhambyl (in the flat part) regions.

Biyurgunovy, kuyreukovy-polyny, sulphur-polyny-shrub-shrub-shrub-ephemeral and ephemeral-different-grass-saxaul groupings are widely spread in these territories. Sandy massifs are occupied by complexes of shrubby-wormwood, rank-shrubby, saxaul-ephemeral and ephemeral-grassy-saxaul associations. On the levees along large watercourses (the Syr Darya River and its tributaries), riparian forests consisting of elk, poplar, turanga, willow, etc. and replaced by reed, reed-grass and halophytic-grass meadows are spread in 1-Z km wide strips[186] on inter-channel depressions.

The neighbourhoods of production facilities of SACs in Mangystau Oblast are characterised by the development of combinations of biyurgun and miscellaneous wormwood communities on brown solonetz soils, where biyurgun, black wormwood, white earth wormwood and other wormwood species dominate. Ephemerals with annuals are also widespread - desert borage Turkestan, bulbous bluegrass, pierced-leaved clopovnik, Sophia descurrenia, marsupial hornwort. Sora vegetation is represented by sarsazan communities with participation of annual saltwort[187] .

Middle deserts of Zhambyl oblast develop on long-lasting frozen grey-brown soils. The largest areas fall on the following types of communities[188] :

- Chernoboyalychye communities on loamy-rubble soils in complex with biyurgun-tasbiyurgun communities on solonets;
- White saxaul and psammophyte-shrub communities on sands.

The main core of life forms of deserts of the region (Betpakdala and Moyinkum deserts) is formed by shrubs and semi-shrubs. The role of herbaceous forms - succulents and ephemerals - is less appreciable.

The central part of the Moyinkum desert (the area where the Company's gas fields are located) is characterised by hilly sands with the predominance of shrub vegetation (various species of zhuzgun and saxaul) on the slopes and tops of hillocks. A characteristic feature is the participation of black saxauls. Steep northern slopes of ridges are usually occupied by yerkek vegetation[189] .

Wormwood, ephemeral, teresken and yerkek vegetation with significant participation of weed grasses is spread along the slopes and inter-buggy depressions. The main vegetation types are wormwood-juzgunovy, wormwood-rangiferous, yerkekovo-white-emergent-wormwood, tereskenovo-white-emergent-wormwood, ephemeral-weed, white-emergent-wormwood-ebelekovo-rangiferous[190] (.).

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185 Botanical Geography of Kazakhstan and Central Asia (within the Desert Region) edited by Rachkovskaya E. I., Volkova E. A., Khramtsov V. N., 2003.

186 Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.

187 Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.

188 National Atlas of the Republic of Kazakhstan, 2006.

189 Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.

190 Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.

The depressions between sand hillocks are characterised by the development of churotes, where reed, reedgrass, reedgrass and ajrek meadows with a variety of grasses (mainly weeds) are found[191] (.).
The southern parts of Kyzylorda and Zhambyl oblasts belong to the **Dzungaro-North Tianshan province,** which is significantly affected by the mountainous territories bounding it from the south. The vegetation of this subprovince is characterised by the presence of two stages: true semi-shrubby and shrubby deserts with ephemeroids, with increasing altitude (approaching the mountains) being replaced by steppe deserts with cereals and ephemeroids. North Turanian Artemisia dominates (white-ground, semi-dry, and loessing), black boyalych[192] (.) is also characteristic.
Most of Turkestan Oblast is located in the **Mountain-Middle Asian Province**. Its vegetation cover is dominated by species-poor biyurgun, wormwood-biyurgun and wormwood-bolyalice groupings with some areas of sparse black saksaul thickets, as well as halophytic and weed-grass phytocenoses - kokpek, chernopolyne, sarsazan. In some areas ephemeroid-caratavian-pollen deserts are formed. Along the Syrdarya river channels and tributaries there are riparian sparse forests, floodplain poplar and willow forests, shrubs (chingil, tamarix), as well as reed and tuber reed meadows[193,194] (.).

6.3.2.2 Objects of fauna and flora, including those included in the List of Rare and Endangered Species of Plants and Animals in Deserts and Semideserts

6.3.2.2.1 Vegetation of deserts and semi-deserts

The key factors in the formation of desert vegetation cover are climatic conditions, topography (mainly micro-rainfall and mesorelief), soil conditions and depth to groundwater[195] .
In the composition of the herbaceous-shrub layer in the desert zone, various species of Artemisia, yerkek, biyurgun and tasbiyurgun predominate. The role of ephemerals and ephemeroids (bulbous bluegrass, various tulips, goose onion, eremurus, etc.) is significant in the composition of the layer. On saline areas perennial and annual solanaceous plants - Climacoptera, Petrosimonia, Halimocnemis, etc. dominate.[196,197]
Shrub vegetation is formed in conditions of hilly relief or in depressions with increased moisture (groundwater outlets, floodplains of watercourses). The species composition is dominated by saxauls (white and black), zhuzguns, sand acacia, tamarix and others.[198,199]
Along the river valleys, woody vegetation is preserved, represented by riparian forests of turanga, poplars and willows[200,201] .

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[191] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.
[192] Botanical Geography of Kazakhstan and Central Asia (within the Desert Region) edited by Rachkovskaya E. I., Volkova E. A., Khramtsov V. N., 2003.
[193] Botanical Geography of Kazakhstan and Central Asia (within the Desert Region) edited by Rachkovskaya E. I., Volkova E. A., Khramtsov V. N., 2003.
[194] Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.
[195] Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.
[196] Environmental Protection Section to the "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.
[197] Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.
[198] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.
[199] Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.
[200] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.

In the composition of the desert zone vegetation, a significant difference between the western and eastern parts can be traced. Among the dominants, there is a group of species that are phytocenotically active only in the western or eastern part of the province. Thus, Lerch's wormwood is widespread in the west, and Lissing's wormwood is widespread in the east.

Local distribution of a number of endemic desert formations in the region is also characteristic. Mugwort Gurgan is common in Mangyshlak, while in the northern Aral Sea region pentadolate mugwort is widespread on sands. Sporadically in the western part of the subprovince there are communities of Lehman's saxaulberry, and in the east - Balkhash saxaulberry[202] (.).

Rare, relict and endemic plant species may be found in the zone of impact of production facilities of SDCs. Along gas pipeline routes, at compressor stations and in the adjacent territories within the desert zone, the following endemic plant species may be encountered, subject to protection and included in the List of Rare and Threatened Plant Species of the Republic of Kazakhstan[203] .

- Shrenka tulip is a species with a shrinking range. Main habitats: steppes, steppe meadows, stony-rubble and clay slopes, mountain plumes. Stocks are decreasing as a result of ploughing and development of large areas of steppes and due to intensive collection by the population.
- Saltwort is a rare, narrowly endemic species. Known localities in the Northern Priaralie: Kuyandy Peninsula, Priaralie Karakum (north-east of Aralsk) and the right bank of the Syr Darya River with low abundance everywhere.
- Cretaceous mirena is an endangered, endemic species. It is found in isolated individuals on Cretaceous remnants of the Northern Ustyurt and the middle reaches of the Emba River.
- Artemisia citvara is a rare species with a shrinking range. Threatened with extinction, it can be found in the foothills of the Karatau Mountains and the Syr Darya River valley. It is used in medicine to obtain santonin.
- Berkara poplar is a rare, narrowly endemic, endangered species.
- Sisolist poplar (turanga) is found in solitary specimens and small groves from the lower reaches of the Syr Darya River to the Ili River in the north.
- The sad Zhuzgun is a narrowly endemic, rare species found in the Aral Karakums.

Also along the gas pipeline route and in the adjacent territory one can find such species of wild useful plants as Richter's hodgepodge, naked licorice (along the banks of the Syr Darya River), St John's wort, shepherd's purse, bitter wormwood, medicinal marshmallow, horsetail (in the south).

The following endemic species requiring special protection but not included in the List of Rare and Threatened Plant Species occur (Annex 2 , Table 3)[204] :

- prickly swan;
- petrosimonia rigidifolia;
- the climacoptera of the Kazakhs;

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[201] Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.

[202] Botanical Geography of Kazakhstan and Central Asia (within the Desert Region) edited by Rachkovskaya E. I., Volkova E. A., Khramtsov V. N., 2003.

[203] Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.

[204] Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.

- wormwood;
- wormwood aral.

On the territory of the enterprise "Exploration and Production QazaqGaz" LLP (Amangeldy field) the presence of four plant species belonging to the group of rare, relict and endemic, occurring in varying degrees of abundance and playing a different role in the vegetation cover was confirmed[205 ,206 (,) :207]

- Eminium lehmannii (Wunge) O. Kuntze (family - Araceae). Kuntze (family - Araceae). Perennial, has a flattened spherical poisonous tuber. Leaves are triangular-lanceolate. Flower-bearing stem up to 40 cm tall ends in a cob. Fruit is white, berry-shaped. The plant is poisonous. Propagated by seeds. Ephemeroid. Occurs in sandy deserts of Kazakhstan and Central Asia. Occurs in Moyinkum and Kyzylkum. Quite rare, as its roots are constantly dug up. Status: A rare species with a shrinking range.
- Ferula glaberrima Korov (family Apiaceae). Perennial plant with a height of about 50 cm. Stem is solitary, thin, leaves with triple-thickly dissected laminae. Inflorescences are umbrellas. Fruits are flat, ovoid, about 1 cm long. Inhabits sandy hillocks, inter-ridge depressions with single specimens in Moyinkum. Status: rare, narrowly endemic species.
- Soranthus meyeri Ledeb (Umbrella family Apiacea). A large perennial plant up to one metre high. The root is powerful, cylindrical, the stem is solitary, bluish, branching in the upper part. Leaves are broadly triangular in outline, triple-crossed, the upper leaves are simplified, sessile. Fruits are broadly oval. Propagated by seeds, fruiting in July. Inhabits sandy soils, dunes. Status: a rare species with low abundance.
- Chondrilla kusnczovii Nuin (family Asteraceae). Perennial plant up to one metre high. The stem is branched, not thickly pubescent. Lower stem leaves up to 0.5 cm long and 1 cm wide, string-shaped, less often entire-edged. The corms are flowering, the seeds about 7 mm long. Caoutchoukonos. Inhabits hilly and ridgy sands in Moyinkum, river gravels. Psammophyte. Status: rare, narrowly endemic species[208 .]

In the area of the Pridorozhnoye field project location, it is also possible to find the species of rare and endangered species listed in the List of Rare and Threatened Species of plants Shrenk's thistle flower (Spiraeanthus schrenkianus) and Stroganowia sagittata.

6.3.2.2.2 Animal life of deserts and semi-deserts

The animal world of desert and semi-desert territories corresponds to the zoogeographical section of desert zones and is represented by species that are adapted to living in hot territories in the absence of sufficient water and lead mainly nocturnal and crepuscular lifestyle.

Mammals. According to zoogeographic zoning, the territories under consideration are located in the Mediterranean sub-region of the Iranian-Turanian province of the Turan District. These are the Northern Aral-Caspian deserts with a characteristic composition of mammals, which closely border

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[205] Anabai deposit development project as of 01.07.2021. Contract No. 487295/2021/1. Book II. Section "Environmental Protection".

[206] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140,№ 141 at Amangeldy Field", Aktau, 2023.

[207] On Approval of the Lists of Rare and Threatened Species of Plants and Animals. Resolution of the Government of the Republic of Kazakhstan dated 31 October 2006№ 1034.

[208] Chondrilla kusnezovii Iljin // Plantarium. Plants and lichens of Russia and neighbouring countries: open online atlas and plant identifier. [Electronic resource].

the Betpakdala area. Characteristic representatives of the Northern Aral-Caspian deserts are the little gopher, fat-tailed marmoset, Severtsov's marmoset, noon gerbil, saiga.
The Betpakdala site is represented by the following typical species: Mongolian pika, selenia, little marmoset, red-tailed gerbil. Uniform for the given sites are sand hare, sand gopher, tarbaganchik, mimranchik, great gerbil, steppe polecat, korsak.
Some 43 species of mammals have been recorded, of which: three species belong to the insectivores, five to the man-eaters, nine to the carnivores (four from the dog family, four from the marten family, one from the cat family), three to the parnopods, 22 to the rodents (four from the squirrel family, one from the sonae (Selevinia) family, seven from the gopher family, five from the hamster family, four from the gerbil family, one from the mouse family) and one from the hare family[209].
Several species of leatherbacks are distributed among the representatives of the man-eaters. In the regions where SACs are present in the desert zone, the mustached noctuid, grey abalone and other species are found. The latter settle in cowsheds and houses. The white-bellied shrew is a rare and endangered species.
Rodents are the most numerous group of mammals[210,211,212(,)213(,)214]. Five species belong to the inhabitants of sandy deserts - psammophiles (most often found on sandy massifs, but can also live on rubbly soils). These are the fat-tailed gerbil, Severtsov's gerbil, noonday gerbil, Mongolian pika, and great gerbil. This group also includes the Selevinia, a rare endemic species found in the Betpak-Dala Desert. Six species are associated with human habitation (house mouse, bat), the rest are eurybionts, i.e. able to exist in different habitat types.
There are widespread commercial species - badger, wolf, steppe ferret, corsak, jackal, wild boar, tolai hare. These species belong to valuable commercial animals. They are monitored by hunting farms: their numbers and condition are determined, work is carried out on sanitary shooting of wolves, which affects the state of food chains of other animals[215,216(,)217(,)218(,)219 (.)].
Of the large mammals inhabiting the area, the saiga antelope is the background species. The distribution of the Betpakdala-Aryss group covers areas from the Aral Sea in the west to the eastern end of Lake Balkhash in the east, and from the Moyinkum and Kyzylkum deserts in the south to the virgin steppes in the north[220,221,222(,)223(,)224].

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[209] Construction of compressor station "Saksaulsk" of main gas pipeline "Beineu - Bozoi - Shymkent" with development of design and construction documentation. Section "Environmental Protection". Book 5. 052-01-18R-301.00-001-OOC.
[210] Construction of compressor station "Saksaulsk" of main gas pipeline "Beineu - Bozoi - Shymkent" with development of design and construction documentation. Section "Environmental Protection". Book 5. 052-01-18R-301.00-001-OOC.
[211] Working project "Construction of Karaozek Compressor Station". Section "Environmental Protection". Book 5. ICA-DD-E-OT-RE-1005.
[212] Project "Construction of compressor station "Aksuat" of main gas pipeline "Beineu - Bozoi - Shymkent" with development of design and construction documentation". Section "Environmental Protection". Book 5.
[213] Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC.
[214] Project "Construction of compressor station "Shornak" of main gas pipeline "Beineu - Bozoi - Shymkent" with development of design and construction documentation". Section "Environmental Protection". Book 5. 047-01-18R-303.00-001-OOC.
[215] Construction of compressor station "Saksaulsk" of main gas pipeline "Beineu - Bozoi - Shymkent" with development of design and construction documentation. Section "Environmental Protection". Book 5. 052-01-18R-301.00-001-OOC.
[216] Working project "Construction of Karaozek Compressor Station". Section "Environmental Protection". Book 5. ICA-DD-E-OT-RE-1005.
[217] Project "Construction of compressor station "Aksuat" of main gas pipeline "Beineu - Bozoi - Shymkent" with development of design and construction documentation". Section "Environmental Protection". Book 5.
[218] Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC.
[219] Project "Construction of compressor station "Shornak" of main gas pipeline "Beineu - Bozoi - Shymkent" with development of design and construction documentation". Section "Environmental Protection". Book 5. 047-01-18R-303.00-001-OOC.
[220] Construction of compressor station "Saksaulsk" of main gas pipeline "Beineu - Bozoi - Shymkent" with development of design and construction documentation. Section "Environmental Protection". Book 5. 052-01-18R-301.00-001-OOC.

The saiga is a migratory animal that migrates twice a year: north and north-west in spring and south and south-east in autumn. Spring migrations begin in March with the snow cover and end in June, when the animals reach summer habitat areas. Autumn migration begins in August with the first cold weather and precipitation and ends in December when saigas reach their wintering grounds.

According to the information presented in the atlas "Key natural territories of the Kazakhstan part of the Aral-Syrdarya basin ecological network"[225] , the fauna of the plain desert territory within the Aral-Syrdarya basin includes at least 350 vertebrate species.

Ornithofauna. According to the information of the Society[226 ,227 ,228(,)] the most dynamic group among the animal population is birds of the wetland complex (aquatic and near-water birds). This is vividly confirmed by the dynamics of avifauna under the conditions of the Aral Sea drying up and the restoration of water availability in the Small Aral. Of 34 bird species, 16 can be found on breeding grounds, of which eight were associated with coastal cenoses (pink and dalmatian pelicans, little white heron, spoonbill, grackle, marbled teal, etc.), which later began to occur on migration and migratory routes.

Waterfowl and waterfowl (45 species, or 49.4% of all birds) form the basis of the summer avifauna at borehole water bodies, in most cases represented by bachelor or vagrant individuals. There are 18-20 species of typical desert birds[229 ,230 (,)231 .]

About 50 bird species settle in terrestrial habitats[232 ,233 (,)234 ·] All large raptors live here (kite, golden eagle, barred eagle, steppe eagle, grave eagle, saker falcon, common kestrel, etc.), cranes (whooping crane and jack crane), waders ([aardwolf and] Caspian plover), grouse (black-throated grouse and Siberian spruce grouse).), cranes (Whooping Crane and Jack Crane), sandpipers (Whooping Crane and Caspian Golden Plover), grouse (Black-bellied and White-bellied Grouse, Saja), owls (House Owl and Eagle Owl), crayfishes (Titmouse, raptors, grey magpie, desert raven, warblers (grey murrelet, desert warbler and Eurasian warbler), barn owls (house owl and owl), bunting, etc.

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221 Working project "Construction of Karaozek Compressor Station". Section "Environmental Protection". Book 5. ICA-DD-E-OT-RE-1005.

222 Project "Construction of compressor station "Aksuat" of the main gas pipeline "Beineu - Bozoi - Shymkent" with development of design and construction documentation". Section "Environmental Protection". Book 5.

223 Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC.

224 Project "Construction of compressor station "Shornak" of main gas pipeline "Beineu - Bozoi - Shymkent" with development of design and construction documentation". Section "Environmental Protection". Book 5. 047-01-18R-303.00-001-OOC.

225 Bragina T. M., Geldiyeva G. V., Ogar N. P. Key natural territories of the Kazakhstan part of the Aral-Syrdarya basin ecological network / edited by T. M. Bragina, N. P. Ogar. Almaty: M&C Plus Publishing House, 2012. - 152 c. ISBN 978-601-06-1998-2.

226 Working project "Construction of Karaozek Compressor Station". Section "Environmental Protection". Book 5. ICA-BD-E-OT-RE-1005, 2016.

227 Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.

228 Construction of Beineu - Bozoi - Shymkent gas pipeline. Adjustment 2. Volume XIII. Environmental Impact Assessment. BSGP-BD (2)-E-EP-RE-0001-000-0. Book 1, Part 1, 2015.

229 Working project "Construction of Karaozek Compressor Station". Section "Environmental Protection". Book 5. ICA-BD-E-OT-RE-1005, 2016.

230 Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.

231 Construction of Beineu - Bozoi - Shymkent gas pipeline. Adjustment 2. Volume XIII. Environmental Impact Assessment. BSGP-BD (2)-E-EP-RE-0001-000-0. Book 1, Part 1, 2015.

232 Working project "Construction of Karaozek Compressor Station". Section "Environmental Protection". Book 5. ICA-BD-E-OT-RE-1005, 2016.

233 Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.

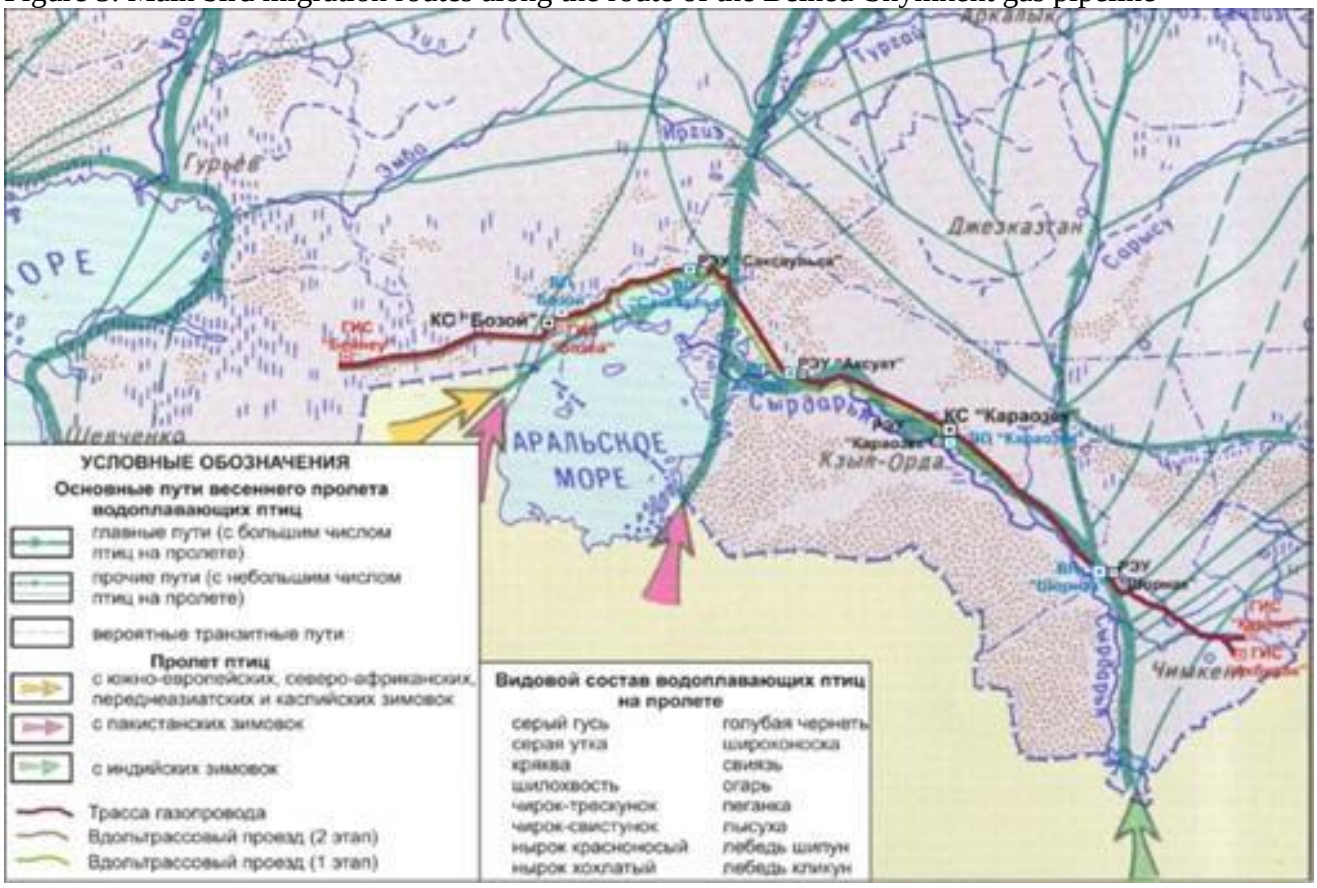
234 Construction of Beineu - Bozoi - Shymkent gas pipeline. Adjustment 2. Volume XIII. Environmental Impact Assessment. BSGP-BD (2)-E-EP-RE-0001-000-0. Book 1, Part 1, 2015.

A relatively small number of species are sedentary, i.e. they do not leave their breeding areas and inhabit them all year round. They form the basis of synanthropic bird species: blue dove, ringed and little turtledoves, owl, house owl, tufted lark, horned lark (rump), mayfly, magpie, grey and black crows, jackdaw, desert raven, long-eared owl, house and field sparrow, etc.[235]

According to literature data, up to 215 species of birds are found on the Aryskum depression plateau and adjacent territories, of which 96 species nest here, and the rest inhabit only during seasonal migrations, wintering or are migratory birds[236] (.).

Most of the breeding birds are migratory, i.e. after the breeding season they fly far outside their range to Uzbekistan, Turkmenistan, Africa, the Indian and Arabian Peninsulas. The record-breaker among the listed birds is the Village Swallow, wintering in Equatorial and South Africa (Figure 5).

Figure 5. Main bird migration routes along the route of the Beineu-Shymkent gas pipeline [237]



Amphibians and reptiles. Amphibians are the least represented. Only two species are found in the whole territory - the green toad and the lake frog[238] (.).

There are 20 species of reptiles in the study area: one species of turtle, five species of snakes and 14 species of lizards. Among snakes, one species, the water snake, is associated with water and inhabits stocked water bodies. The long-eared roundworm, striped and reticulated lizard, crested gecko and round-tailed duck are found in sandy areas. The Takyr Roundworm and Multicoloured Lizard are

[235] Gavrilov E. I. Fauna and distribution of birds of Kazakhstan. - Almaty: Kainar, 1999. - 240 c.

[236] Working project "Construction of Karaozek Compressor Station". Section "Environmental Protection". Book 5. ICA-DD-E-OT-RE-1005.

[237] Construction of Beineu - Bozoi - Shymkent gas pipeline. Adjustment 2. Volume XIII. Environmental Impact Assessment. BSGP-BD (2)-E-EP-RE-0001-000-0. Book 1, Part 1, 2015.

[238] Kuzmin S. L. Amphibians of the former USSR. - M.: Partnership of scientific editions of KMK, 1999. - 298 c.

associated with dense clay soils, while the other species occur in various combinations of desert terrain[239] (.).

The Aral-Caspian deserts are the most richly represented in terms of reptile fauna - 23 species, or 46.9% of the total fauna of Kazakhstan[240] · Depending on their habitat attachment, reptiles of the desert zone are divided into species adhering to strictly defined habitat conditions (stenobionts) and species able to exist in different types of deserts, sometimes differing sharply in environmental conditions. The richest in the number of reptile species are sandy desert ecosystems (seven species), followed by clay and stony-rubble deserts, and the poorest are salt marsh ecosystems. In terms of occurrence in deserts of different types, the most numerous reptile species are the steppe agama, the variegated lizard and the takyr roundworm. Many species are characteristic for all or almost all types of deserts, e.g. Central Asian tortoise, steppe agama, fast lizard, arrow snake, eastern boa constrictor, etc. The most abundant reptile species in different types of deserts are the steppe agama, variegated lizard and takyr roundhead.[241]

Ichthyofauna. Water bodies of the desert zone of Kazakhstan belong to the Aral-Caspian sub-area of the Eurosiberian province of the Palaearctic ichthyogeographic region. It is characterised by the presence of 13 endemic genera, including tullek, pekarin, goby-bellies and others. The background species are roach, pikeperch, and various gobies. The water bodies of the area are characterised by a high diversity of sturgeons. Such relict Pleistocene species, extinct in other areas, as the Syr Darya spoonbill, umbra (Evdosha), finches[242] (·) are preserved here.

The main water artery of the desert zone is the Syrdarya River, its tributaries and numerous lakes. The main gas pipelines, gas fields and gas distribution stations are located away from the Syrdarya River and do not have a negative impact on its ichthyofauna.

A general list of rare animal species is provided in Appendix 2 , Table 4 .

6.3.2.3 Specially Protected Natural Territories (SPNTs), natural objects of international importance within the boundaries of the desert and semi-desert zone

Desert and semi-desert zones occupy significant areas of the territory of the Republic of Kazakhstan and are characterised by a high diversity of landscapes, flora and fauna species. They are the habitat of many rare, relict and endemic species, which increases the importance of their conservation.

The following is a list of PAs located less than 70 kilometres from the boundaries of the impact zone of SDCs' production facilities (Table 7).

Table 7. List of PAs within the desert and semi-desert zones located near the impact zone of SDCs' production facilities

№	Name of protected area	Nearby production facilities	Distance
1	**South Kazakhstan State Protected Area**	Amangeldy field "QazaqGaz Exploration and Production" LLP	Crosses the zone of impact of production facilities
2	**State protected area in the northern part of the Caspian Sea**	CS "Tayman" LLP Intergas Central Asia	Less than 50 km

[239] Working project "Construction of Karaozek Compressor Station". Section "Environmental Protection". Book 5. ICA-DD-E-OT-RE-1005.

[240] Project "Natural-scientific substantiation of reducing the territory of Kargali State Nature Reserve in Kyzylorda region".

[241] Kuzmin S. L. Amphibians of the former USSR. - M.: Partnership of scientific editions of KMK, 1999. - 298 c.

[242] Abrosimova N. A. et al. Geography of fish. - 2020.

3	**Zadarya State Nature Reserve**	Akbulak GIS of Beineu-Shymkent Gas Pipeline LLP	Less than 50 km
4	**Arys and Karaktau state protected area**	Compressor station No. 1, string "C" of Asian Gas Pipeline LLP Alimtau Compressor Station No. 1 of Asian Gas Pipeline LLP	Crosses the zone of impact of production facilities
5	**Kenderli-Kayasan State Protected Area**	Zhanaozen GDS Intergas Central Asia LLP	Less than 10 km (stationary source). Crosses the zone of influence of the pipeline

Detailed description, according to CDP requirements, is conducted for nature reserves, national parks and natural reserves located within 70 kilometres, and nature monuments within five kilometres of the boundaries of the impact zones of industrial facilities. Nature reserves and protected areas are subject to detailed review if they are immediately adjacent to or cross the impact zones of the production facilities.

Production facilities of SACs within the desert zone affect several state protected areas. Higher level protected areas are located at a considerable distance from the impact area.

Conducting economic activities, including mining of minerals, within the protected areas is allowed on the basis of the decision of the Government of the Republic of Kazakhstan upon the submission of the authorised body for the study of subsoil, agreed with the authorised body, taking into account the special environmental requirements established by the Environmental Code of the Republic of Kazakhstan[243] (.).

South Kazakhstan state protected area. Desert communities, which are habitats of rare and endemic species of plants and animals, are preserved on the territory of the reserve zone. 13 species of plants and 38 species of animals inhabiting this territory are included in the List of rare and endangered species of plants and animals[244] (.).

Arys and Karaktau State Protected Area. It is part of the southern section of the South Kazakhstan Protected Area and is recognised as a KOT. The main protected species is the red-breasted bustard. The area is important not only as a typical nesting site for the species, but also as a place of permanent concentration of migrating Great Bustard from more northern areas. Among other globally threatened species, the Steppe Kestrel, Imperial Eagle, Brown Pigeon and Black Vulture[245] (·) nest here.

Kenderli-Kayasan State Protected Area. It was created in order to preserve the habitat and natural reproduction of the red-breasted bustard and saker falcon. The flora of the protected zone includes six

[243] Law of the Republic of Kazakhstan dated 7 July 2006№ 175 "On Specially Protected Natural Territories".

[244] Specially protected areas of the Republic of Kazakhstan. South Kazakhstan state protected area.

[245] Sklyarenko S. L. Arysskaya and Karaktausskaya state protected area. Studies on key ornithological areas in Kazakhstan and Central Asia // Studies on key ornithological areas in Kazakhstan and Central Asia / ed. by S. L. Sklyarenko. L. Sklyarenko. - Almaty. - 129 c., 2006.

species of rare and endemic plant species. Six species of mammals, one species of reptiles and many species of birds are included in the List of Rare and Endangered Species of Plants and Animals. The most characteristic inhabitants of clay deserts are the jack, black-bellied murrelet, sadja, Asiatic and great-billed, grey skylark. On the territory of the protected area the only in Kazakhstan meeting of the Spanish stonechat[246] (·) was noted.

6.3.3 Mountain ecosystems

6.3.3.1 Predominant biomes and landscape complexes, main water bodies that are habitats of rare and endangered fauna and flora of mountain ecosystems

Part of the Company's main gas pipelines runs through the foothills and low-altitude areas of the Tien Shan mountainous country. The foothills of the Karatau Range, the Kyrgyz Alatau, the Aitau Range, the Chu-Ili Mountains, the Zailiyskiy Alatau, as well as the Ili River valley bounded by the Dzungarian Alatau, Boro-Khoro and Ketmen Ranges are affected. The gas pipeline routes cross the Karatau and Aitau ranges (Figure 6)[247 ,248 (,) .249]

Figure 6. Scheme of orography of the Tien Shan mountain country[250]

According to the IUCN classification, the mountains of Central Asia belong to the polar-alpine (cryogenic) biome, a group of temperate alpine meadows and shrubs. Plain foothills belong to the desert biome[251 ,252 .]

The soil and vegetation cover of the mountains is very diverse due to the altitudinal belt, which includes desert, steppe, forest, alpine-meadow and cryophyte communities that change with altitude. Cryophytic and alpine-meadow communities are formed in the upper parts of slopes and are represented mainly by low-growing grasses and shrub shrubs[253 .]

The forest belt is characteristic of the highest mountains of the eastern part of the mountainous country, where it occupies mid-mountainous areas. It is composed mainly of spruce forests and sparse grass-moss forests with the participation of deciduous species (aspen, maple)[254 .] In the west of

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246 Specially protected areas of the Republic of Kazakhstan. Kenderli-Kayasan state protected area.

247 Tien-Shan. The Big Russian Encyclopaedia 2004-2017.

248 Map of main gas pipelines of Intergas Central Asia LLP.

249 PEC reports of Asian Gas Pipeline LLP UMG Almaty, Taraz, Shymkent.

250 Tien-Shan. The Big Russian Encyclopaedia 2004-2017.

251 IUCN Global Ecosystem Typology.

252 UN. System of Environmental-Economic Accounting - Ecosystem Accounting (SEEA EA), 2021.

253 Dimeeva L. A., Usen K. Altitude-belt differentiation of the vegetation cover of the Kyrgyz Ridge within Kazakhstan // Problems of Botany of South Siberia and Mongolia. - 2015. - №. 14. - C. 185-189.

254 National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.

the mountain system (Karatau, Kirghiz Alatau ranges) a belt of juniper sparse forests is developed, which is characterised by a combination of shrub-juniper sparse forests with steppe areas[255] (.).)On mountain slopes and foothills, forests of fruit plants are formed - apple, apricot, walnut forests; in the west - pistachio forests and sparse forests with the participation of various species of hawthorn[256] (.).

In the middle and lower parts of the slopes steppe vegetation develops, including meadow, savannoid and desert steppes. The sub-belt of meadow steppes occupies the most elevated areas and is represented by richly variegated grass-grass-grass-typchak communities in combination with bushes and in some places with juniper sparse forests[257] . Savannoid vegetation type forms the middle steppe sub-belt and includes sparse forest, shrub, semi-shrub communities with ephemeral-ephemeroid cover, as well as grass ephemeral-ephemeroid communities derived from them. Species of fruit trees and shrubs (hawthorn, rosehip, cherry, blackberry, etc.) play a significant role in the composition of communities.[258] ,[259] . The sub-belt of deserted steppes is represented by ephemeroid-semi-shrubby-soddy-grass communities with the participation of shrubs, in some places in combination with petrophytic shrubby-sagebrush communities. Floodplain and gallery forests[260] (.) are formed in areas with increased moisture within the steppe belt.

Extensive areas on the slopes of the Karatau Ridge are occupied by phryganoid vegetation, which unites a suite of obligate petrophytes, the centre of speciation of which is confined to the mountains of Central, West and Asia Minor. Many species of this group are endemic to the region under consideration. The dominant species are communities of Artemisia karatauska on stony-rubble soils[261] ,[262] .

In the foothills and on the lower parts of slopes semi-desert and desert vegetation develops[263] . Desert and semi-desert tiers of foothills are represented by wormwood-saline vegetation with cereals, saxaul thickets and significant participation of ephemerals and ephemeroids on clayey borozems. There are areas of solonchaks. Reed thickets, meadow and halophytic vegetation, partly riparian forests of willow and shrubs on alluvial-meadow soils and solonchaks are formed in river valleys[264] ,[265] (.).

The production facilities of the main gas pipelines of Asian Gas Pipeline LLP and Intergas Central Asia JSC, whose activities affect mountainous areas, are located in the desert natural-climatic zone and foothill areas of Zhambyl and Almaty regions.

Grassy ephemeral-steppe vegetation dominates the landscape of the area of operations of SDCs' production facilities within the Almaty region. A significant part of the territory is allocated for

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[255] Dimeeva L. A., Usen K. Altitude-belt differentiation of the vegetation cover of the Kyrgyz Ridge within Kazakhstan // Problems of Botany of South Siberia and Mongolia. - 2015. - №. 14. - C. 185-189.

[256] Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.

[257] Dimeeva L. A., Usen K. Altitude-belt differentiation of the vegetation cover of the Kyrgyz Ridge within Kazakhstan // Problems of Botany of South Siberia and Mongolia. - 2015. - №. 14. - C. 185-189.

[258] Ionov R. N., Lebedeva L. P. Savannoids of Kyrgyzstan coarse-grass and hemiephemeroid-rich-grass formations: Bothriochloa ischaemum, Elytrigia trichophora, Hordeum bulbosum, Inula macrophylla of species of genera Ferulus and Prangos, 2004.

[259] Dimeeva L. A., Usen K. Altitude-belt differentiation of the vegetation cover of the Kyrgyz Ridge within Kazakhstan // Problems of Botany of South Siberia and Mongolia. - 2015. - №. 14. - C. 185-189.

[260] Dimeeva L. A., Usen K. Altitude-belt differentiation of the vegetation cover of the Kyrgyz Ridge within Kazakhstan // Problems of Botany of South Siberia and Mongolia. - 2015. - №. 14. - C. 185-189.

[261] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.

[262] Grechushkina N. A. Petrophytic vegetation and its classification, 2011.

[263] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.

[264] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.

[265] Dimeeva L. A., Usen K. Altitude-belt differentiation of the vegetation cover of the Kyrgyz Ridge within Kazakhstan // Problems of Botany of South Siberia and Mongolia. - 2015. - №. 14. - C. 185-189.

agricultural crops. Natural vegetation is subjected to intensive grazing - from mountain foothills to high-mountain steppes and mountain meadows of zhailau. In the lower part of the mountain profile (in the vicinity of Kaskelen village) ephemeroid and ephemeral vegetation prevails[266] . The impact zones of the Asian Gas Pipeline LLP are characterised by a complex of species of desert and desert communities: sagebrush, tipchak, biurgun, ephemerals, black saxaul, thickets of shrubby willows[267] (.).
In the territory of the lowland massif Kazygurt (Turkestan region), where one of the compressor stations of JSC "Intergas Central Asia" is located, ephemeral wormwood semi-desert communities prevail, which are replaced at an altitude of 1200-1400 m by lowland coarse-grained ephemeroid steppes on dark grey soils. In some areas in this zone there are deciduous fruit forests - various species of hawthorn, mountain ash, etc. Part of the territory is occupied by savannoid communities (forest belts)[268] .

6.3.3.2 Objects of fauna and flora, including those included in the List of Rare and Threatened Species of Plants and Animals in Mountain Ecosystems

6.3.3.2.1 Vegetation of mountain ecosystems

Due to the great diversity of conditions and significant terrain dissection, zones of high biodiversity are formed within mountainous areas. Mountain areas are hotspots of active speciation and often fulfil the functions of refugia - areas where animal and plant species experience periods of negative conditions leading to their extinction or reduction in numbers in other areas, which enriches their flora and fauna at the expense of relict and endemic species[269 ,270 .]
Each of the mountain belts is characterised by a specific set of species. Mountain forests and sparse woodlands of the Tien Shan consist mainly of Tien Shan spruce, which is endemic to this region, but may include admixture of Siberian fir and small-leaved species. The forests are park-like in character. On steep slopes of northern exposures and in the bottoms of gorges there are patches of dense mossy spruce forests with taiga elements in the herbaceous layer[271 ,272 .] Among large shrubs and second-growth trees under the canopy of spruce, mountain ash, willow and Tianshan birch are common. Honeysuckle, Albert's briar, barberry, cotoneaster, Semyonov's birch, raspberry can be found among small shrubs in the undergrowth. Shrubs are twined with herbaceous liana of Siberian prince[273] (.).
The dominant herbaceous plants in spruce forests are alpine strawberry, bark bush, cicerbita lazorea and Tianshan, short-legged pinnate, oakgrass bluegrass, white-flowered geranium. Sharp-leaved violet, strawberry, Siberian trischetinnyk, golden rose, Russian iris, codonopsis brittlebush, short-

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[266] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.
[267] Reports on industrial environmental control at compressor stations of the main gas pipeline "Kazakhstan - China" of Asian Gas Pipeline LLP for 2022.
[268] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of UGS "Poltoratskoye" UMG "Shymkent", 2022.
[269] Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.
[270] Dimeeva L. A., Usen K. Altitude-belt differentiation of the vegetation cover of the Kyrgyz Ridge within Kazakhstan // Problems of Botany of South Siberia and Mongolia. - 2015. - №. 14. - C. 185-189.
[271] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.
[272] Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.
[273] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.

spurred and small-flowered nedotroga are often found in herbaceous spruce forests. Male fern (shieldwort), brittle vesicle and common millipede[274] (·) are almost constantly present.

Juniper forests are formed by tree-like junipers and are confined to mountain massifs of Southern and South-Eastern Kazakhstan. Several juniper species take part in their composition, the most widespread of which on the Northern Tien Shan is Turkestan juniper. In the Western Tien-Shan junipers - Talas, hemispherical and Zaravshan junipers are widespread. At present junipers occupy insignificant areas, occurring mainly in inaccessible rocky places and represent low-growing sparse light-coloured forests[275] (·).

On the slopes and foothills of the Northern Tien Shan, especially the Zailiyskiy Alatau, there are apple (Sivers, Nedzvetsky, etc.) and apricot forests. Under their sparse cover develops a dense shrub layer of hawthorn, iris, barberry. The grass-shrub layer is characterised by large grasses and many species of large herbs[276] (·).

In the west of the mountainous country, walnut and pistachio forests are found. Walnut forests are composed of walnut. Apple, maple, alder, and at higher elevations juniper and Tianshan birch can also be found in the stand. Pistachio forests are found in small groves on the Karatau Ridge and in the Kyrgyz Alatau and resemble dry savannahs. Pistachio does not form dense plantations and can withstand prolonged severe drought. Drought-resistant shrubs are found together with pistachio . Ephemeroids and ephemerals[277] (·)[278] · play the main role in the grass cover·

Due to lower temperatures and higher precipitation than on the plains, meadow and mixed-grass-grass-grass steppes are formed in the mountains. Their distinctive feature is the appearance of mesophilous cereals and motley grasses in addition to sod-grasses[279] · Various species of wheatgrass and tipchak form the basis of the herbage. Desert sage, bristly bunium, naked catnip, common yarrow, common oregano, St. John's wort, etc. are among the herbs.[280]

Vegetation cover of savannoid steppes is represented by ephemeroid-different-grass-grass-grass-grass-grass and ephemeroid-grass-grass vegetation with significant participation of savannoids (hairy wheatgrass, lanceolate koster, cylindrical aegilops, long-haired lentoostnik, hare barley, etc.) forming microcenoses. Ephemeroid-different-grass-grass-ketchak-typchak steppe communities (tipchak, hairy grass-grass, hairy-leaved wheatgrass, Tianshan eremurus, etc.) are combined with thickets of shrubs (St. John's wort, pear-leaved turmeric) and prickly cushions (paniculata), rocks and screes. The increase in phytocenotic diversity within the sub-belt is associated with gallery forests stretching along mountain rivers. The basis of the tree layer is formed by Semyonov maple, various species of hawthorn (Korolkov's hawthorn, blood-red, Turkestan hawthorn) and white willow. Among shrubs, species of rosehip, blackberry, sea buckthorn are widespread. Creeping and hair-bearing wheatgrass, long-leaved mint, and palm-leaved pigweed are noted in the herb layer. Red-fruited cherry and

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274 Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.

275 Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.

276 Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.

277 Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.

278 Dimeeva L. A., Usen K. Altitude-belt differentiation of the vegetation cover of the Kyrgyz Ridge within Kazakhstan // Problems of Botany of South Siberia and Mongolia. - 2015. - №. 14. - C. 185-189.

279 Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.

280 Dimeeva L. A., Usen K. Altitude-belt differentiation of the vegetation cover of the Kyrgyz Ridge within Kazakhstan // Problems of Botany of South Siberia and Mongolia. - 2015. - №. 14. - C. 185-189.

Tianshan cherry are found on dry stony slopes with low abundance. Sivers apple tree and Regele pear[281] (,)[282] · occasionally occur.
The sub-belt of deserted steppes is represented by ephemeroid-semi-shrub-shrub-soddy-grass communities dominated by grasses (Sareptian, Lessing's, Caucasian), various wormwoods and cereals. Shrubs of spirea spirea, Tianshan cherry, various species of spikenard and curlew are also present. In places, petrophytic shrub-emergent communities with Artemisia rutolistica, Sitnikova, Ephedra medianum, etc. are developed. In spring ephemeral sinusia are abundant (Japanese campfire, unequal roofing flower) with participation of ephemeroids such as bulbous bluegrass, various species of goose onion, tulips (Albert's, Kolpakovsky, Kaufman's, etc.)[283] (.).
The vegetation of foothill deserts is significantly influenced by the vegetation of surrounding desert territories, the species composition of which is largely preserved in the foothills. The dominant role is played by semi-shrubby species of Artemisia, sod-grasses are always present in the composition of communities, which determines the steppe character of foothill deserts. Foothill deserts of the mountains of the south of Kazakhstan are characterised by sagebrush- wormwood communities with ephemeroids and ebelec-isene wormwood communities. The communities are often composed of sedges - thick-stalked and two-formed. The accompanying role is played by ephemeroid low herb savannoids (bulbous bluegrass, hare barley, aegilops cylindricum, etc.), which often become subdominants in plant communities under moderate anthropogenic load. The vegetation of the foothills is subject to strong anthropogenic transformation, mainly agricultural (arable land, pastures). Along ditches and irrigation canals there are thickets of hairgrass, southern reed and Ural licorice[284] ,[285] (.).

On hilly foothills in the region of Intergas Central Asia LLP presence in Almaty oblast, communities dominated by ephemeral and ephemeroid grasses such as Aegilops cylindricum and three-inch, lentoostnik, bulbous bluegrass, various species of genera Koster and unequal-flowered. Among the herbs common are Ziziphora thin, Turkestan borage, Queria spanish, Chardinia orientalis, Rhemeria ottogonia, Yarrow medicinal and Biberstein's yarrow and a number of other species[286] (.).
The basis of grass stand is formed by turf grasses - tipchak and grasses (hairy, Kyrgyz, Lessing's) with admixture of small sedges (two-formed, Turkestan). Among herbs there are wormwood (Lessing's, tarragon), Marshall's thyme, narrow-leaved pea, eastern and Asian lapwort, whole-leaved snakehead, Tatar ichiolirion, Hungarian catnip and others. Among shrubs, spirea St. John's wort and flat-topped rosehip are characteristic. Tree and shrub vegetation, including rare and protected species, is concentrated in the deep gorges of the rivers[287] (.).
As a result of the expedition survey, the following rare, endangered, endemic, and relict plants included in the List of Rare and Protected Species of Plants and Animals were identified in the foothill communities adjacent to the production facilities of subsidiaries and affiliates: Tianshan

[281] Dimeeva L. A., Usen K. Altitude-belt differentiation of the vegetation cover of the Kyrgyz Ridge within Kazakhstan // Problems of Botany of South Siberia and Mongolia. - 2015. - №. 14. - C. 185-189.
[282] Ionov R. N., Lebedeva L. P. Savannoids of Kyrgyzstan coarse-grass and hemiephemeroid-rich-grass formations: Bothriochloa ischaemum, Elytrigia trichophora, Hordeum bulbosum, Inula macrophylla of species of genera Ferulus and Prangos, 2004.
[283] Dimeeva L. A., Usen K. Altitude-belt differentiation of the vegetation cover of the Kyrgyz Ridge within Kazakhstan // Problems of Botany of South Siberia and Mongolia. - 2015. - №. 14. - C. 185-189.
[284] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.
[285] Dimeeva L. A., Usen K. Altitude-belt differentiation of the vegetation cover of the Kyrgyz Ridge within Kazakhstan // Problems of Botany of South Siberia and Mongolia. - 2015. - №. 14. - C. 185-189.
[286] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.
[287] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.

spruce, Siversa apple tree, common apricot, Vittok's rhubarb, golden adonis, Tianshan adonis, Falconer's liverwort, Alatau crocus, Kolpakovsky tulip and Alatau veronica .[288]
The vegetation of the foothill territories of Zhambyl oblast near the production facilities of Intergas Central Asia LLP is characterised by a unique floristic composition of relict and endemic species of shrubs - Kokand rose, red-fruited cherry, southern carcase, plum, Olga honeysuckle and others. Tall grasses - hedgehog, viviparous barley, hairy wheatgrass, Turkestan koster and mixed grasses dominate in the herbage. Hawthorn trees of Turkestan and Pontic hawthorn are found everywhere, singly and in groups. No rare and endangered species requiring protection have been identified in the flora of the Kazygurt Mountains (Annex 2 , Table 5)[289] .

6.3.3.2.2 Animal life of mountain ecosystems

The fauna of mountain territories is peculiar, which is conditioned by the geographical position, the direction of the ranges, their orientation in relation to the prevailing winds and absolute altitude.
The presence of forest belt in the Northern Tien-Shan determines the distribution of boreal (taiga) animal species - lynx, red deer, grouse, mossy owl, hawk owl, three-toed woodpecker, nutcracker, clover, pika, tits. The largest animal population is found in mountain deciduous forests, which provide animals with an abundant forage base[290] (.).
In the Western Tien Shan, which is characterised by less wooded areas, there are species of southern origin - Menzbira's marmot, long-tailed (red) marmot, long-tailed porcupine, long-tailed magpie, white-throated nightingale and others.
Some species are characterised by vertical migrations involving different mountain belts. Examples are the Tianshan brown bear and certain bird species (the most striking example is the red-bellied shrew). The Tianshan brown bear can be found in any mountain belt, from foothills to glaciers. In the Tien Shan it inhabits Zailiyskiy and Talas Alatau, but now it is found only in the Aksu-Dzhabagly (Turkestan and Zhambyl regions) and Almaty (in the Talgar Gorge near Almaty) reserves[291] (.).
The mountains of Almaty region are home to many animal species listed in the IUCN Red List and the List of Rare and Threatened Species of Plants and Animals of Kazakhstan. These are: snow leopard, Tianshan brown bear, stone marten, Bukhara deer, pink pelican, curly pelican, kumai, bearded pelican, karavaika, black-headed crested mantis, variegated round-headed mantis, steppe turtle, Danata toad, Iliya marinka, Balkhash perch, tree mantis, damalacantha vakka, steppe dybka, Jacobson's cicada, Ilias beetle, Semyonov's crassetail, large rootworm, turang green lacewing, stethorus pitting, steppe scolia, yellow-winged sphex, turang revolver, patrician sailfinch, Mongolian cicada, flame microsegris and many others[292] .
In the surveyed industrial zones there is an increase in the impact of anthropogenic factor on species composition: an increase in the number of aggressive weeds, changes in the composition of cenopopulations and species diversity. Impact of production facilities of JSC "Intergas Central Asia" on the state of vegetation cover was not revealed[293] .

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[288] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.
[289] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity of UGS "Poltoratskoye" UMG "Shymkent", 2022.
[290] Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.
[291] Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.
[292] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.
[293] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.

Mammals. In the belt of alpine meadows, the main mammalian inhabitants are Siberian ibex - tauteke, which are the main object of hunting of the snow leopard. Ermine and small rodents (voles, pika) can also be found here[294].

Species gravitating to the boreal forest belt include lynx, red deer, roe deer, wild boar (entering the alpine belt), common and grey (Altai) marmot. Widespread in the spruce forests of Ileyskiy Alatau is the teleutka squirrel, which was brought here from Altai in 1952. The animal population of mountain deciduous forests is dominated by small rodents, such as the Tianshan mouser, forest dormouse[295].

The fauna of mammals of steppe and deserted foothills is close to theriofauna of similar plain ecotopes and includes such widespread species as steppe marmot, gregarious vole, long-tailed gopher and others.[296] In the foothills of steppe and desert zones, ungulates such as kulans and gazelles are recorded[297]. At the same time, the fauna of the foothills includes species that gravitate specifically to these landscapes and are not found on the plains. These include the Menzbira marmot, long-tailed marmot, relict marmot, Gissar vole, argali, and others.[298]

Ornithofauna. In the zone of alpine meadows nest vultures, bearded vultures, Himalayan eagle (mountain turkey), alpine jackdaws. Among small birds, mountain finches, high-mountain curlews, mountain pipit, great lentil, etc. are common.[299]

In the spruce forests of the Tien Shan Mountains nest grouse, sarych or buzzard, pygmy owl, three-toed woodpecker, nutcracker, wood pecker, wood clover, Muscovy or black tit, black and stone blue thrushes, blue-headed shrike, yellow-headed kingfisher[300].

Nesting in the juniper belt are the juniper grosbeak, juniper lentil, red-backed shrike, curlew, nightingale, black-breasted redshank and painted tit[301].

In mountainous deciduous forests one can find - wood pigeon wigeon, barn owl, magpie, buntings, white-throated nightingale, pheasants, steppe turtledove, etc.[302]

Amphibians and reptiles. The reptile fauna of Kazakhstan is most abundant in the desert and semi-desert zones in the south of the country. In the mountains, representatives of this group gravitate to the lower parts of the slopes and foothills, which are close to the zonal communities of the plains. In the desert areas of the foothills, such species as round-headed lizard, reticulated and linear lizard, agama, steppe turtle, etc. can be found. In mountainous areas there are also endemic species[303]. For example, only in the mountain rivers of Zhetysu Alatau (Almaty region) one can now see the Semirechensky frog-tooth, which is included in the List of Rare and Endangered Species of Plants

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[294] Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.

[295] Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.

[296] Afanasyev A. V. Zoogeography of Kazakhstan (based on the distribution of mammals), 1960.

[297] Red Book of Kazakhstan.

[298] Afanasyev A. V. Zoogeography of Kazakhstan (based on the distribution of mammals), 1960.

[299] Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.

[300] Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.

[301] Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.

[302] Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.

[303] Gvozdetsky N.A., Nikolaev V.A. Kazakhstan. Sketch of nature, 1971.

and Animals. Amphibians are present in all natural zones of the country, including mountainous areas up to altitudes of more than 3,000 metres above sea level[304,305].

Ichthyofauna. The Balkhash-Alakol basin, to which the mountain rivers of Almaty oblast belong, is poor in ichthyofauna (12 species of fish, including two species of osman, three of minnow, three of gubacha, etc.). Some of them have a limited range in high-mountain streams. There are three endemic species here - perch, gubach and marinka, which has become very rare in recent decades (after the construction of the Kapshagai hydrosystem in 1971). Many mountain rivers are inhabited by silver trout, naked ottoman, for example, in the Charyn River, etc.[306]

A general list of rare and protected species is provided in Appendix 2 , Table 6 .

6.3.3.3. Specially Protected Natural Areas (SPNA), natural objects of international importance within the boundaries of the mountain ecosystems zone

Mountain territories have high indicators of biodiversity, which increases the importance of conservation of these territories. For this purpose, a number of PAs of different levels have been established within the Tien Shan mountain country[307,308,309(,)310].

The following is a list of PAs located less than 70 kilometres from the boundaries of the impact zone of SDCs' production facilities (Table 8).

Table 8: List of protected areas within the mountainous regions located near the impact zone of production facilities of subsidiaries and affiliates .

Name of protected area	Nearby production facilities	Distance
Western Tien-Shan World Natural Heritage Site (Aksu-Zhabagli Reserve, Karatau Reserve, Sairam-Ugam National Park)	Compressor station No. 2 "Kereit" of Asian Gas Pipeline LLP	The impact area crosses a protected area (Sairam-Ugam National Park)
World Natural Heritage Site Turanian Temperate Deserts (Altyn-Emel National Park)	Compressor station No. 8 of Asian Gas Pipeline LLP	9 kilometres
Aksu-Zhabagli State Nature Reserve	Compressor station No. 2, string "C" of Asian Gas Pipeline LLP	10-20 kilometres
Almaty State Nature Reserve	Compressor station No. 7 of Asian Gas Pipeline LLP	10-20 kilometres
Altyn-Emel State National Natural Park	Compressor station No. 8 of Asian Gas Pipeline LLP	9 kilometres

[304] Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.

[305] Red Book of Kazakhstan.

[306] Physical Geography of Kazakhstan / E. N. Vilesov, A. A. Naumenko, L. K. Veselova, B. J. Aubekerov; ed. by A. A. Naumenko: Textbook. - Almaty: Kazak University, 2009. - 362 c.

[307] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.

[308] On approval of the List of specially protected natural territories of republican significance.

[309] Specially protected territories of the Republic of Kazakhstan.

[310] UNESCO World Heritage Convention. Kazakhstan.

Ile-Alatau State National Nature Park	GDS Kaskelen Intergas Central Asia LLP	4 kilometres
Sairam-Ugam State National Nature Park	Compressor station No. 2 "Kereit" of Asian Gas Pipeline LLP	Crosses the zone of impact of production facilities
Charyn State National Nature Park	Compressor station No. 8 of Asian Gas Pipeline LLP	2.8 kilometres
Almaty State Nature Reserve (complex)	Compressor station No. 7 of Asian Gas Pipeline LLP	10 kilometres
Boraldai State Nature Reserve (complex)	Compressor station No. 2 "Kereit" of Asian Gas Pipeline LLP	10 kilometres
Verkhnekokoksuisky State Nature Reserve (zoological)	Compressor station No. 8 of Asian Gas Pipeline LLP	over 50 kilometres
State Nature Reserve "Berikkara tract" (complex)	Compressor station No. 2 "Kereit" of Asian Gas Pipeline LLP	40-50 kilometres
Singing Dunes State Nature Monument	Compressor station No. 8 of Asian Gas Pipeline LLP	10-20 kilometres
State Nature Monument "Charyn Ash Forest Dacha"	Compressor station No. 8 of Asian Gas Pipeline LLP	20-30 kilometres
State Nature Monument "Chinturgen spruce forests"	Compressor station No. 7 of Asian Gas Pipeline LLP	30-40 kilometres

The facilities of Intergas Central Asia LLP do not affect the existing PAs, although the gas pipeline routes pass close to them. The shortest distance (4 kilometres) is from the Kaskelen gas distribution station to the Ile-Alatau State National Nature Park.

Production facilities of Asian Gas Pipeline LLP are also located at a short distance from protected areas in a number of places. Compressor station No. 2 "Kereit" of "Asian Gas Pipeline" LLP is located within a kilometre protection zone of one of the clusters of the Sairam-Ugamsky National Park, and compressor station No. 8 is located 2.8 km from the border of the Charyn National Park[311] [312] [313](.).

Western Tien Shan World Natural Heritage Site[314] . The Western Tien-Shan World Natural Heritage Site is a part of the Tien-Shan mountain system, which is of world significance as it is the place of origin of a number of fruit tree species and is characterised by a great diversity of forest

[311] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.

[312] Specially protected territories of the Republic of Kazakhstan.

[313] Reports on industrial environmental control at compressor stations of the main gas pipeline "Kazakhstan-China" of Asian Gas Pipeline LLP for 2022.

[314] UNESCO World Heritage Convention. Western Tien-Shan.

types and unique flora. The site includes the Aksu-Zhabagli and Karatau Nature Reserves and the Sairam-Ugam National Park[315].

Aksu-Zhabagli State Nature Reserve[316]. Almost all landscape and vegetation types of the Western Tien Shan are represented on the territory of Aksu-Zhabagli reserve, as well as about 75% of species biodiversity of the whole Western Tien Shan[317]. More than 70 species of wild relatives of cultivated plants grow in the reserve, and more than 200 species are medicinal plants. The flora includes 57 rare species listed in the Red Books and Lists of rare and endangered species of plants and animals of Kazakhstan, Uzbekistan and Kyrgyzstan. 24 species and subspecies of vertebrates are included in the List of Rare and Endangered Species of Plants and Animals. Two bird species (corncrake and white-winged woodpecker) and three mammal species - snow leopard, endemic of the Western Tien Shan Menzbira marmot and the endemic subspecies of argali, which is currently endangered, have been included in the IUCN Red List.

Sairam-Ugam State National Nature Park[318],[319]. The main purpose of the national park is to preserve in a natural form the landscapes of the Western Tien Shan, to preserve natural complexes and unique ecological, scientific, historical, cultural and recreational values[320]. The species composition of the park's vegetation is unique. More than 60 species of plants and 10 species of animals are included in the List of Rare and Endangered Species of Plants and Animals. The peculiarity of the national park is the distribution of many species of wild relatives of cultivated plants - apple, pear, plum, grape, walnut, onion and tulip[321].

World Natural Heritage site Turanian Temperate Deserts[322]. The site comprises 14 constituent parts located in the arid temperate belt of Central Asia between the Caspian Sea and the Turan Mountains, and affects the territories of several countries. The area represents a significant diversity of desert ecosystems[323]. The site includes the Altyn-Emel State National Nature Park in the Ili River valley and the Barsakelmes State Reserve, located on a former Aral Sea island.

Increased anthropogenic impact may lead to loss of species diversity of desert communities.

Altyn-Emel State National Natural Park. The purpose of the national park is to preserve the unique ecosystems of the Ili intermountain basin and their biodiversity, protect geomorphological and palaeontological sites, historical and cultural monuments. On the territory of the national park, 25 species of plants and more than 40 species of animals, included in the List of Rare and Threatened Species of Plants and Animals[324] (.) are registered.

Almaty State Nature Reserve[325]. The reserve was established to preserve the biodiversity of the Tien Shan mountain system. There are a total of 970 plant species in the reserve, many of which are endemic and are included in the List of Rare and Endangered Species of Plants and Animals[326]. The vertebrate fauna includes 222 species, including: fish - three species, amphibians - one, reptiles - five, birds - 177, mammals - 41. Seven species of mammals and a significant part of bird species nesting

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315 UNESCO World Heritage Convention. Western Tien-Shan.

316 Specially protected areas of the Republic of Kazakhstan. Aksu-Zhabagli State Nature Reserve.

317 Kazakhstan National Committee of the UNESCO Man and the Biosphere (MAB) Programme. Aksu-Zhabagly Biosphere Reserve.

318 Specially protected areas of the Republic of Kazakhstan. Sairam-Ugamsky State National Natural Park.

319 Sairam-Ugam State National Nature Park.

320 Sairam-Ugam State National Nature Park.

321 Specially protected areas of the Republic of Kazakhstan. Sairam-Ugamsky State National Natural Park.

322 UNESCO World Heritage Convention. Cold Winter Deserts of Turan.

323 UNESCO World Heritage Convention. Cold Winter Deserts of Turan.

324 Specially protected areas of the Republic of Kazakhstan. Altyn-Emel State National Natural Park.

325 Specially protected areas of the Republic of Kazakhstan. Almaty State Nature Reserve.

326 Almaty State Nature Reserve.

in the Reserve are included in the List of Rare and Threatened Species of Plants and Animals[327] . There are species included in the Red List of the International Union for Conservation of Nature and Natural Resources (IUCN): steppe kestrel, corncrake, siskin, black vulture[328] (.).

Ile-Alatau State National Natural Park[329] .The purpose of the national park is to preserve unique forest ecosystems dominated by the relict Shrenka spruce and red-listed deciduous species - Sivers apple and wild apricot, as well as glaciers, lakes and mountain rivers that provide water to the city of Almaty and many other settlements. There are 35 species of flowering and two species of moss-like plants from the List of Rare and Endangered Species of Plants and Animals in the national park. Another six species of flowering plants are found within the protection zone. Of the animals inhabiting the territory of the park, six species of mammals and 16 species of birds are on the List of Rare and Threatened Species of Plants and Animals, four species of birds are on the IUCN Red List[330] (.).

Charyn State National Nature Park. The Charyn State National Nature Park was organised to preserve and restore the unique natural complexes of the Almaty region, which have special ecological, historical, scientific, aesthetic and recreational value. The main objects of protection are unique geological formations (Charyn Canyon, Temrlik Canyon, etc.), habitats and calving grounds of gazelle and tek, protection of relict ash forest in canyons, saxaulniki, as well as rare species of flora and fauna. On the territory of the national park, 26 endemic plant species have been registered, 28 animal species inhabiting the territory of the park are included in the List of Rare and Threatened Species of Plants and Animals[331] (.).

6.4. Characterisation of current and potential impacts of subsidiaries and affiliates' operations on biodiversity

6.4.1 Exploration and Production

On the basis of project documentation of "Exploration and Production QazaqGaz"LLP[332] ,[333] ,[334](,)[335](,)[336](,) current and planned economic activities were analysed factors of impact on biodiversity in the context of the enterprise (Table 9).

Analysis of S&A documents, incl[uding Environmental Contro]l Programmes[337] ,[338] ,[339] (,) Draft em[is]s[ion standards (standards o]f [pe]rmissible emis[sions) of pollu]tants into th[e atmosphere][340] ,[341] (,) Waste Management Programmes[342] (,) Protocols of

[327] Almaty State Nature Reserve.

[328] Specially protected areas of the Republic of Kazakhstan. Almaty State Nature Reserve.

[329] Specially protected areas of the Republic of Kazakhstan. Ile-Alatau State National Natural Park.

[330] Ile-Alatau Ultyyq parki.

[331] Specially protected areas of the Republic of Kazakhstan. Charyn State National Nature Park.

[332] Draft standards of permissible emissions of pollutants into the environment for the Amangeldy field.

[333] Report of industrial environmental control of QazaqGaz Exploration and Production LLP for the IV quarter of 2022.

[334] On Approval of Sanitary Rules "Sanitary and Epidemiological Requirements for Sanitary Protection Zones of Facilities that are Objects of Influence on Habitat and Human Health".

[335] EIA "Development of wells No. 137, 138, 139, 140, 141 of Amangeldy field".

[336] Airakty field development project. Report under Contract No. 555708/2021/1. Book II. Section "Environmental Protection".

[337] Report of industrial environmental control of Amangeldy Gas LLP for I-IV quarters of 2022.

[338] Report of industrial environmental control of "Exploration and Production QazaqGaz" LLP for the second half of 2022.

[339] Production Environmental Control Programme (PEC) for 2022-2023 for the Barkhannaya-Sultankuduk exploration area of Amangeldy Gas LLP.

[340] Draft standards of permissible emissions of pollutants into the environment for the Amangeldy field of Exploration and Production QazaqGaz LLP (correction), 2023.

[341] Draft emission standards (standards of permissible emissions) of pollutants into the atmosphere for the Ayrakty field of Amangeldy Gas LLP for 2022-2029. Part 1 - inventory of sources of emissions of harmful substances into the atmosphere.

dosimetric control[343] ,[344] (.) Protocols of soil and soil analysis tests (,) (,) (,) Sanitary and Epidemiological Conclusions and Emergency Response Plans (,) (,) (,) (,) and Emergency Response Plans)Test protocols for soil and ground analyses[345] ,[346] ,[347](,) Sanitary and epidemiological conclusions[348] and Emergency Response Plans[349] ,[350](,)[351](,)[352](,)made it possible to identify the individual manifestation of factors and their environmental aspects in the area of impact of production facilities of subsidiaries and affiliates.

Based on the analysis of the provided documentation and expertise, the significance of the factors of impact of the enterprise's production facilities on biodiversity was assessed. The assessment took into account:

- the scale of the impact (the area affected and the number of ecosystem components affected);
- intensity of exposure (magnitude of exposure in relation to its duration);
- the regularity/non-standardity of the process in which the impact occurs;
- exposure frequency.

[342] Production and consumption waste management programme for 2023-2028. QazaqGaz Exploration and Production LLP (adjustment), 2023.

[343] Dosimetric Control Protocol No. 44 "22" August 2022 g. (d.).

[344] Dosimetric Control Protocol No. 63 "28" October 2022 g. (d.).

[345] Soil and soil analysis test report No. 10 dated "17" May 2022.

[346] Soil and soil analysis test report No. 19 dated "24" August 2022.

[347] Soil and soil analysis test report No. 25 dated "04" November 2022.

[348] Sanitary and epidemiological conclusion № N.09.X.KZ48VBZ00031198 dated 19.11.2021.

[349] Emergency response plan for well workovers at Amangeldy Branch facilities, 2022.

[350] Emergency Response Plan for the production facilities of the Ayrakta field, 2022.

[351] Emergency Response Plan for Amangeldy field production facilities, 2022.

[352] Emergency Response Plan for Zharkum field production facilities, 2022.

Table 9: Factors of impact of SDCs' production facilities on biodiversity in desert and semi-desert areas

№	Biodiversity Impact Factor	Environmental aspects	Name of biodiversity site	Description of impact	Location in the area of exposure	Significance of the factor
1	Land disturbance and withdrawal during field operation, construction, well development and development of production facilities	Technogenic changes in landscapes Overexploitation of natural resources using the infrastructure of production facilities Withdrawal of land resources Destruction of soil and vegetation cover	1. Habitats of mammals (insectivores, rats, carnivores, ungulates and rodents)[353], birds, amphibians and reptiles . 194 2. Desert vegetation communities with inclusion of semi-shrubs and shrubs and Artemisia, shrub, teresken, izene, rarely yerkek vegetation[354]. 3. Landscapes and soils: semi-fixed deeply dissected ridge and knobby sands of the Moyinkum Desert[355]. 4. Terrestrial animals: mammals (insectivores, rats, carnivores, ungulates and rodents)192 , amphibians and reptiles194	1. Physical destruction of plants. 2. habitat transformation	Areas of immediate location of wells and flare unit Areas of direct construction, placement of process equipment, well development, road network and stub laying	Significant (factor affects a large number of biodiversity sites with high intensity but low frequency)
2	Emissions of gaseous and solid pollutants	Emissions of nitrogen oxides, carbon monoxide,	1. Terrestrial animals: mammals (insectivores, rats, carnivores,	1. Damage to habitat, water and food sources	Within the SPZ (1,000 m radius	Significant (the factor consistently

[353] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.

[354] Anabai deposit development project as of 01.07.2021. Contract No. 487295/2021/1. Book II. Section "Environmental Protection".

[355] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.

№	Biodiversity Impact Factor	Environmental aspects	Name of biodiversity site	Description of impact	Location in the area of exposure	Significance of the factor
	into the atmosphere during operation of process equipment	sulphur dioxide during operation of boilers and reheating furnaces, hydrocarbons (except methane) during pumping of gas-condensate mixture into storage tanks and volatile organic compounds during methanol supply to plumes[356,357] Emissions of inorganic dust and soot from the operation of diesel generator sets, dusting of access roads and	ungulates and rodents), amphibians and reptiles[358,359]. 2. Desert vegetation communities with inclusion of semi-shrubs and shrubs and Artemisia, shrub, teresken, izene, rarely yerkek vegetation[360(.)]. 3. Landscapes and soils: semi-fixed deeply dissected ridged and knobbly sands of the Moyinkum Desert[361]	that plants and animals need to survive. 2. Appearance of acid rain as a result of accumulation of pollutants in the atmosphere	from the emission source), the approximate area of the Amangeldy deposit is 55.8 km2, the approximate area of the Zharkum deposit is 8 km2, the approximate area of the Ayrakty deposit is 7 km2	affects a large number of biodiversity sites)

[356] Draft standards of maximum permissible emissions of pollutants into the environment for the Amangeldy field of Exploration and Production QazaqGaz LLP (correction), 2023.
[357] Permit for emissions into the environment for facilities of I category for Ayrakty field of "Amangeldy Gas" LLP for 2022-2029.
[358] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.
[359] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.
[360] Anabai deposit development project as of 01.07.2021. Contract No. 487295/2021/1. Book II. Section "Environmental Protection".
[361] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.

№	Biodiversity Impact Factor	Environmental aspects	Name of biodiversity site	Description of impact	Location in the area of exposure	Significance of the factor
		operation of process equipment[362,363]				
3	Methane leaks during gas transfer and from vent plugs	Methane emissions[364,365] from natural gas pumping and from vent plugs	1. Terrestrial animals: mammals (insectivores, rats, carnivores, ungulates and rodents)[366], amphibians and reptiles[367]. 2. Desert vegetation communities with inclusion of semi-shrubs and shrubs and Artemisia, shrub, teresken, izeneva, rarely yerkek vegetation[368]	-	Atmosphere	Significant (the factor permanently and routinely affects a large number of biodiversity sites)

[362] Draft standards of maximum permissible emissions of pollutants into the environment for the Amangeldy field of Exploration and Production QazaqGaz LLP (correction), 2023.
[363] Permit for emissions into the environment for facilities of I category for Ayrakty field of "Amangeldy Gas" LLP for 2022-2029.
[364] Draft standards of permissible emissions of pollutants into the environment for the Amangeldy field of Exploration and Production QazaqGaz LLP (correction).
[365] Permit for emissions into the environment for facilities of I category for Ayrakty field of "Amangeldy Gas" LLP for 2022-2029.
[366] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.
[367] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.
[368] Anabai deposit development project as of 01.07.2021. Contract No. 487295/2021/1. Book II. Section "Environmental Protection".

№	Biodiversity Impact Factor	Environmental aspects	Name of biodiversity site	Description of impact	Location in the area of exposure	Significance of the factor
4	Use of water for technological and domestic needs	Water intake	According to the documentation, there are no surface water bodies in the impact zone of the production facilities. There is no water intake from surface water bodies on the territory of production facilities[369]	-	There is no water intake	Unsignificant (no impact on biodiversity, as water intake is carried out only from underground wells, and water disposal is carried out into artificial water bodies on the territory of SDCs' production facilities, created specifically for evaporation of wastewater).
		Wastewater disposal	Water is discharged to the evaporation pond at Amangeldy field [206]	-	Evaporation pond at the Amangeldy field	
5	Contamination of soil cover	Pollution of soil cover by fuel combustion products	1. landscapes and soils: semi-fixed deeply dissected deeply dissected ridged and knobby sands of the Moyinkum Desert[370]	1. Deterioration of physical, chemical characteristics of soils. 2. Damage to habitat, water and food sources	Within the SPZ	Significant (the factor contributes to accumulation of pollutants in soils, which will subsequently
		Pollution of soil cover with fuel and lubricants and oil products as a result of			Within the boundaries of production facilities	

[369] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.
[370] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.

№	Biodiversity Impact Factor	Environmental aspects	Name of biodiversity site	Description of impact	Location in the area of exposure	Significance of the factor
		spills		that plants and animals need to survive. 3. weakening of plants through ingestion of pollutants		affect other components of ecosystems, can affect in normal and abnormal modes)
6	Physical impact from the operation of motor vehicles, special machinery and stationary equipment, power lines and transformer substations	Noise exposure, vibration exposure, thermal radiation, electromagnetic radiation, radiation exposure	1. Habitats of mammals (insectivores, rats, carnivores, ungulates and rodents)[371], birds, amphibians and reptiles[372]. 2. Terrestrial animals: mammals (insectivores, rats, carnivores, ungulates and rodents), amphibians and reptiles[373,374]. 3. ornithofauna (more than 220 species in total, representing almost all existing bird families)[375,376]	1. Displacement of animal species sensitive to noise and human presence from the territory	Within the SPZ	Significant (the factor continuously affects a large number of biodiversity assets in a routine manner)

[371] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.
[372] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.
[373] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.
[374] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.
[375] Rare Birds and Animals of Kazakhstan, Alma-Ata, ed. "Galym", 1991.

№	Biodiversity Impact Factor	Environmental aspects	Name of biodiversity site	Description of impact	Location in the area of exposure	Significance of the factor
7	Disposal of solid industrial and domestic waste	Disposal of solid industrial (wiping material, including oily rags and scrap metal) and household waste (MSW)	There are no own waste disposal facilities, no impact is realised[377]	-	All household and industrial waste is removed by specialised organisations, no long-term disposal is carried out at production facilities	Insignificant (there is no impact of the factor, as the production facilities do not have their own waste disposal facilities)
8	Impact of associated objects	Impacts of outfall lines (plumes), interfield and trunk pipelines	1. Terrestrial animals: mammals (insectivores, rats, carnivores, ungulates and rodents), amphibians and reptiles[378,379]. 2. Ornithofauna (over 220 species in total, representing almost all existing bird families)[380,381]	1. Creating obstacles to migration and resettlement	- Outlet lines (loops) within the SPZ. - Ayrakty-Zharkum-Amangeldy interfield gas pipeline. - Access roads	Significant (permanently affects large areas and many biodiversity sites, routinely and non-routinely (in the case of throwaway lines).

[376] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.
[377] Environmental Protection Section to the working project "Wells No. 137, 138, 139, 140, 141 of Amangeldy field".
[378] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.
[379] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.
[380] Rare Birds and Animals of Kazakhstan, Alma-Ata, ed. "Galym", 1991.
[381] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.

№	Biodiversity Impact Factor	Environmental aspects	Name of biodiversity site	Description of impact	Location in the area of exposure	Significance of the factor
9	Emergencies	Well loop rupture, gas pipeline rupture, gas breakthrough through flange connection, gas condensate breakthrough, emergency fire at sites, leakage from storage tanks, wellhead fire	1. Habitats of mammals (insectivores, rats, carnivores, ungulates and rodents), birds, amphibians and reptiles[382,383]. 2. Landscapes and soils: semi-fixed deeply dissected ridged and knobby sands of the Moyinkum Desert[384]. 3. terrestrial animals: mammals (insectivores, rats, carnivores, ungulates and rodents), amphibians and reptiles[385,386]	1. Destruction of land cover, animal population as a result of fires. 2. Impeded nutrient absorption due to changes in salt balance. 3. weakening of plants through ingestion of pollutants	The zone of possible impact of emergency situations related to depressurisation of pipelines, apparatus and installed valves on the equipment includes the territory of the SPZ and the Airakty - Zharkum - Amangeldy gas pipeline right-of-way. Possible consequences of accidents: release of liquid and gaseous hydrocarbons into the atmosphere,	Significant (the factor affects a large number of biodiversity sites with high intensity in non-emergency situations)

[382] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.
[383] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.
[384] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.
[385] National Atlas of the Republic of Kazakhstan. - Vol. 3. Environment and ecology. 2 ed. - Almaty, 2010. - 520 c.
[386] Environmental Protection Section to "Addendum to the Group Technical Project for Drilling of Wells No. 139, No. 140, No. 141 at the Amangeldy Field", 2023.

№	Biodiversity Impact Factor	Environmental aspects	Name of biodiversity site	Description of impact	Location in the area of exposure	Significance of the factor
					formation of explosion and fire hazardous mixture	

6.4.2 Gas transportation and sales

The processes of gas transmission and distribution have some similarities, but gas distribution involves transporting smaller volumes of gas over limited distances through gas distribution systems. This process does not utilise compressor stations and operates high, medium and low pressure gas pipelines. Gas from a gas distribution station (GDS) or automated gas distribution station (AGDS) is sent to a lower pressure head gas distribution station (GDS). After that, the gas is directed to gas regulating stations (GDS) and wardrobe gas regulating stations (GDS). At GRPs and SHRPs, the gas pressure is reduced to the required level, which is then automatically maintained at the set point.
Due to the great similarity between the technologies and equipment used in gas transmission and distribution, it is not appropriate to analyse these two processes separately. Therefore, the analyses of the gas transmission and distribution companies have been combined in this section.
Biodiversity impacts from gas distribution were analysed for KazTransGas Aimak LLP. Biodiversity impacts from gas transmission were identified for Intergas Central Asia UMG JSC, Asian Gas Pipeline LLP and Beineu-Shymkent Gas Pipeline LLP in the process of analysing the Industrial Environmental Monitoring Reports[387] , IEC Programmes,[388] [389] [390] , IEC Programmes[391] [392] [393] , Waste Management Programmes[394] [395] [396] EIA[397] [398] Working Projects[399] , Emergency Response Plans[400] [401] Draft standards of permissible emissions of pollutants into the atmosphere[402] and other documents. The results of the analysis of impacts during mainline transport and distribution are presented in Table 8 .

[387] Report on industrial environmental control of the linear part of strings "A", "B", "C" (LC AO), running through the Almaty region of the main gas pipeline "Kazakhstan - China" LLP "Asian Gas Pipeline", I, II and III quarters of 2022.
[388] Report on industrial environmental control of the linear part of strings "A", "B", "C" (LC LO), running through Zhambyl region of the main gas pipeline "Kazakhstan - China" LLP "Asian Gas Pipeline", I, II and III quarters of 2022.
[389] Report on industrial environmental control of the linear part of strings "A", "B", "C", including Nalabai UZRG (PM TO), running through Turkestan region of the main gas pipeline "Kazakhstan - China" of Asian Gas Pipeline LLP, I and III quarters of 2022.
[390] Explanatory note to the report on monitoring of environmental impacts at the facilities of MG "Beineu - Bozoy - Shymkent" (BBS) in Aktobe region for the I quarter of 2022.
[391] Programme of industrial environmental control at the facilities of II category of GIS "Zhetysay" of UMG "Shymkent" JSC "Intergas Central Asia" for 2023-2027.
[392] Programme of industrial environmental control at category II facilities of Akbulak LPU of Shymkent UMG of Intergas Central Asia JSC for 2023-2027.
[393] Programme of industrial environmental control at the facilities of II category of Taraz UMG "Taraz" of Intergas Central Asia JSC for 2022-2024.
[394] Waste Management Programme for the facilities of UTG "Almaty" of MG "Kazakhstan - China" for 2022-2031. Asian Gas Pipeline LLP.
[395] Waste Management Programme for Beineu - Bozoi - Shymkent gas pipeline section in Mangistau region for 2022-2031. Beineu - Shymkent Gas Pipeline LLP.
[396] Waste Management Programme for Akkol Linear Production Department (LPU Akkol) of Atyrau UMG branch of Intergas Central Asia JSC for 2021-2030.
[397] Project "Construction of Beineu - Bozoi - Shymkent gas pipeline". III stage. Environmental Impact Assessment.
[398] Project "Construction of Beineu - Bozoi - Shymkent gas pipeline". Adjustment 2. Environmental Impact Assessment.
[399] Working project "Construction of Karaorzek Compressor Station". Section "Environmental Protection". Book 5.
[400] Plan for elimination of accidents on the main gas pipeline "Beineu - Bozoi - Shymkent" of Beineu LPU of Aktau UMG.
[401] Plan for elimination of accidents at the facilities of MG "Beineu - Bozoy - Shymkent" UMG "Aktobe".
[402] Draft standards of permissible emissions of pollutants into the atmosphere for the linear part of MG "Beyneu - Bozoy - Shymkent" located in Turkestan region (including AGDS "Shornak" and GIS "Akbulak") of "Gas Pipeline Beyneu - Shymkent" LLP.

Table 10. Impact factors of production facilities of gas transmission and marketing subsidiaries and affiliates on biodiversity

№	Biodiversity Impact Factor	Environmental aspects	Natural area and description of biodiversity			Description of impact	Location in the area of exposure	Significance of the factor
			Mountains[403]	**Deserts and semi-deserts**[404]	**Steppes, meadow steppes, dry-steppe zone, deserted steppes**[405]			
			Intergas Central Asia LLP (UMG Almaty, Shymkent, Taraz) Asian Gas Pipeline LLP (UMG in Almaty, Zhambyl, Turkestan regions) Beineu-Shymkent Gas Pipeline LLP (GIS, CS in Turkestan region) KazTransGas Aimak JSC (Turkestan production branch (PF), Shymkent PF, Zhambyl PF, Almaty PF, Zhetysu PF, East Kazakhstan PF)	Intergas Central Asia LLP (Taraz, Shymkent, Aktau UMGs) Asian Gas Pipeline LLP (UMG for Turkestan region) Beineu-Shymkent Gas Pipeline LLP (GIS, CS in Mangystau, Kyzylorda, Aktobe, Turkestan regions) KazTransGas Aimak JSC (Atyrau PF, Mangistau PF, Aktobe PF)	Intergas Central Asia LLP (UMG Atyrau, Uralsk, Kostanai, Aktobe, Karaganda) KazTransGas Aimak JSC (West Kazakhstan PF, Aktobe PF, Kostanay PF, Astana PF, Karaganda PF)			
1	Land disturbance and withdrawal	Technogenic changes in landscapes	1. Landscape complexes: foothills and lowland areas of Tien Shan mountain	1. Landscapes and soils: grey-brown soils, sandy loamy and sandy soils,	1. Landscapes and soils: ordinary chernozems, southern	1. Physical destruction of plants.	Within the boundaries of compressor	Insignificant (the factor

[403]. For a detailed description of the Mountain Natural Zone and its biodiversity, see Section IV.1 Mountain Ecosystems.

[404] For a detailed description of desert and semi-desert natural zones and their biodiversity, see Section IV.2 Deserts and Semideserts.

[405] For a detailed description of the steppe natural zone and its biodiversity see Section IV.3 Steppes and forest-steppes.

	during repair works on gas pipelines and operation of compressor and gas distribution stations	Overexploitation of natural resources using compressor station infrastructure facilities Withdrawal of land resources in the process of renovation Destruction of soil and vegetation cover	side, soils: grey soils and grey-brown soils, chestnut soils. 2. Habitats of mammals (carnivores, ungulates, rodents), amphibians and reptiles, birds. 3. Vegetation: communities dominated by ephemeral and ephemeroid grasses, grasses, herbage (based on turf grasses), tree and shrub vegetation in river gorges, including rare and endemic shrub species. 4. Terrestrial animals: mammals (carnivores, ungulates, rodents), amphibians and reptiles	brown solonetz soils. 2. Habitats of mammals (ungulates, rodents, insectivores, rats, carnivores), amphibians and reptiles, birds of wetland complex. 3. Vegetation: biyurgun, wormwood-biyurgun and wormwood-boyalych groups with separate areas of sparse black saksaul thickets (Turkestan oblast); sarzan communities with participation of annual saltwort (Mangystau oblast); white-soil-wormwood-teresken communities (Aktobe oblast); complexes of shrub-wormwood, rank-shrub, saxaul-ephemeral and ephemeral-grass-saxaul associations (Kyzylorda oblast). 4. Terrestrial animals: mammals (ungulates, rodents, insectivores, man-eaters, predators), amphibians and reptiles	chernozems, dark chestnut soils, chestnut soils, light chestnut soils. 2. Habitats of mammals (insectivores, man-eaters, rats, carnivores, parsnipedes, rodents and hares), amphibians and reptiles, birds (various species of migratory birds, endemics). 3. Vegetation: communities of sand-pollen and lerchopolyanniks, cereal communities, grasses, marevae, complex-flowered, etc. 4. Terrestrial animals: mammals (insectivores, rats, carnivores, carnivores, parsnipedes, rodents and hares), amphibians and reptiles	2. habitat transformation	stations, gas distribution stations and along gas pipelines during repair works	affects rarely and short-term small areas)

2	Emissions of gaseous and solid pollutants into the atmosphere as a result of hydrocarbon fuel combustion, gas venting and equipment operation	Emissions of nitrogen oxides, carbon monoxide, sulphur dioxide and volatile organic compounds from the operation of boiler houses and standby power plants (diesel generators) Emissions of inorganic dust and soot from boiler houses and standby power plants (diesel generators) Emissions of hydrogen sulphide, natural mercaptan	1. Habitats of mammals (carnivores, ungulates, rodents), amphibians and reptiles, birds. 2. Vegetation: communities dominated by ephemeral and ephemeroid grasses, grasses, herbage (based on turf grasses), tree and shrub vegetation in river gorges, including rare and endemic species of shrubs. 3. 3. terrestrial animals: mammals (carnivores, ungulates, rodents), amphibians and reptiles	1. Habitats of mammals (ungulates, rodents, insectivores, rats, carnivores), amphibians and reptiles, birds of the wetland complex. 2. Vegetation: biyurgun, wormwood-biyurgun and wormwood-boyalych groups with separate areas of sparse black saksaul thickets (Turkestan oblast); sarzan communities with participation of annual saltwort (Mangystau oblast); white-soil-wormwood-teresken communities (Aktobe oblast); complexes of shrub-wormwood, rank-shrub, saxaul-ephemeral and ephemeral-grass-saxaul associations (Kyzylorda oblast). 3. terrestrial animals: mammals (ungulates, rodents, insectivores, man-eaters, carnivores), amphibians and reptiles	1. Habitats of mammals (insectivores, rats, carnivores, carnivores, ungulates, rodents and hares), amphibians and reptiles, birds (various species of migratory birds, endemics). 2. Vegetation: communities of sandy-pollen and lerchopolyanniks, cereal communities, grasses, marevae, complex-flowered, etc. 3. Terrestrial animals: mammals (insectivores, rats, carnivores, pairs of ungulates, rodents and hares), amphibians and reptiles	1. Obstruction of photosynthesis due to dust particles settling on leaves. 2. weakening of plants by ingestion of airborne pollutants mixed with the air	SPZ of production facilities	Significant (the factor consistently affects a large number of biodiversity sites)

		mixtures and hydrocarbon mixtures from bleed plugs and equipment plugs, as well as from technical losses during repairs and loose fittings and connections						

3	Methane leaks due to gas venting, leaks due to loose equipment, repair works	Methane emissions from vent plugs and equipment plugs, as well as from technical losses during repairs and loose fittings and connections	1. Habitats of mammals (carnivores, ungulates, rodents), amphibians and reptiles, birds. 2. Vegetation: communities dominated by ephemeral and ephemeroid grasses, grasses, herbage (based on turf grasses), tree and shrub vegetation in river gorges, including rare and endemic species of shrubs. 3. 3. terrestrial animals: mammals (carnivores, ungulates, rodents), amphibians and reptiles	1. Habitats of mammals (ungulates, rodents, insectivores, rats, carnivores), amphibians and reptiles, birds of the wetland complex. 2. Vegetation: biyurgun, wormwood-biyurgun and wormwood-boyalych groups with separate areas of sparse black saksaul thickets (Turkestan oblast); sarzan communities with participation of annual saltwort (Mangystau oblast); white-soil-wormwood-teresken communities (Aktobe Oblast); complexes of shrub-wormwood, rank-shrub, saxaul-ephemeral and ephemeral-grass-saxaul associations (Kyzylorda Oblast). 3. terrestrial animals: mammals (ungulates, rodents, insectivores, man-eaters, carnivores), amphibians and reptiles	1. Habitats of mammals (insectivores, rats, carnivores, carnivores, ungulates, rodents and hares), amphibians and reptiles, birds (various species of migratory birds, endemics). 2. Vegetation: communities of sandy-pollen and lerchopolyanniks, cereal communities, grasses, marevae, complex-flowered, etc. 3. Terrestrial animals: mammals (insectivores, wolves, carnivores, carnivores, parnivores, rodents and hares), amphibians and reptiles	-	Atmosphere	Significant (the factor consistently affects a large number of biodiversity sites)

4	Water use in production and domestic needs	Water withdrawal from surface water bodies Water discharge to surface water bodies	According to the documentation, there are no surface water bodies in the impact zone of the production branches. Water intake from surface water bodies at industrial facilities is not carried out	According to the documentation, there are no surface water bodies in the impact zone of the production branches. Water intake from surface water bodies is not carried out at the production facilities	According to the documentation, there are no surface water bodies in the impact zone of the production branches. Water intake from surface water bodies is not carried out at the production facilities	-	There is no water abstraction from surface water sources. Water is discharged into evaporation ponds	Insignificant (there is no impact of the factor on biodiversity, as water intake is carried out only from underground wells, and water disposal - into artificial water bodies at production facilities, created specifically for evaporation of wastewater)
5	Contamination of soil cover	Pollution of soil cover with oil products during spills	1. landscape complexes: foothills and low-lying areas of the Tien Shan mountain side, soils: grey soils and grey-brown soils,	1. landscapes and soils: grey-brown soils, sandy loamy and sandy soils, brown solonetz soils	1. landscapes and soils: ordinary chernozems, southern chernozems, dark chestnut soils,	1. Damage to habitat, water and food sources that plants	Within the boundaries of production facilities	Significant (the factor contributes to the accumulati

		of fuels and lubricants, cleaning of pipelines and units Pollution of soil cover as a result of deposition of pollutants entering the atmosphere from compressor stations and gas distribution stations	chestnut soils		chestnut soils, light chestnut soils	and animals need to survive. 2. weakening of plants by ingestion of pollutants	 SPZ of production facilities	on of pollutants in soils that will subsequently affect other components of ecosystems)
6	Physical impact of CS and GDS equipment (compressors, diesel generators, pumps)	Noise exposure, vibration exposure, thermal radiation, electromagnetic radiation, radiation exposure	1. Habitats of mammals (carnivores, ungulates, rodents), amphibians and reptiles, birds. 2. Terrestrial animals: mammals (carnivores, ungulates, rodents), amphibians and reptiles. 3. ornithofauna (e.g. grouse, pygmy owl, hawk owl, three-toed woodpecker, nutcracker)	1. Habitats of mammals (ungulates, rodents, insectivores, rats, carnivores), amphibians and reptiles, birds of the wetland complex. 2. Terrestrial animals: mammals (ungulates, rodents, insectivores, man-eaters, man-eaters, carnivores), amphibians and reptiles. 3. 3. Ornithofauna: waterfowl and	1. Habitats of mammals (insectivores, man-eaters, rats, carnivores, ungulates, rodents and hares), amphibians and reptiles, birds (various species of migratory birds, endemics). 2. Terrestrial animals: mammals (insectivores, man-eaters, wolves,	1. Displacement of animal species sensitive to noise and human presence from the area. 2. Increased sensitivity to frost due to earlier start	SPZ of production facilities	Significant (the factor continuously affects a large number of biodiversity assets in a routine manner)

				waterbirds, as well as those living in terrestrial habitats: large raptors, cranes, sandpipers, grouse, owls, etc.	carnivores, ungulates, rodents and hares), amphibians and reptiles. 3. 3 Ornithofauna: various species of migratory birds and endemics	of vegetation/flowering caused by warming effect		
7	Disposal of solid industrial and domestic waste	Disposal of construction waste, contaminated containers, waste oil, filters, batteries, etc., and also municipal solid waste	There are no own waste disposal facilities, no impact is realised	There are no own waste disposal facilities, no impact is realised	There are no own waste disposal facilities, no impact is realised	-	Waste is not disposed of at production facilities	Insignificant (there is no impact of the factor, as the production facilities do not have their own conditions for waste disposal)

8	Impact of associated objects	Impacts of trunk pipelines and gas pipelines	1. Landscape complexes: foothills and low-lying areas of the Tien Shan mountain side, soils: grey soils and grey-brown soils, chestnut soils. 2. Habitats of mammals (carnivores, ungulates, rodents), amphibians and reptiles, birds. 3. Terrestrial animals: mammals (carnivores, ungulates, rodents), amphibians and reptiles, birds. 3. terrestrial animals: mammals (carnivores, ungulates, rodents), amphibians and reptiles	1. Landscapes and soils: grey-brown soils, sandy loamy and sandy soils, brown solonetz soils. 2. Habitats of mammals (ungulates, rodents, insectivores, rats, carnivores), amphibians and reptiles, birds of the wetland complex. 3. terrestrial animals: mammals (ungulates, rodents, insectivores, man-eaters, rats, carnivores), amphibians and reptiles.	1. Landscapes and soils: ordinary chernozems, southern chernozems, dark chestnut soils, chestnut soils, light chestnut soils. 2. Habitats of mammals (insectivores, man-eaters, wolves, carnivores, ungulates, rodents and hares), amphibians and reptiles, birds (various species of migratory birds, endemics). 3. Terrestrial animals: mammals, amphibians and reptiles, birds (various species of migratory birds, endemics). 3. terrestrial animals: mammals (insectivores, wolves, carnivores, carnivores, ungulates, rodents and hares), amphibians and reptiles	1. Creating obstacles to migration and resettlement	Along gas pipelines	Significant (permanently affects large areas and many biodiversity sites, routinely and non-routinely (in the case of drop lines).

9	Emergencies	Gas pipeline rupture, gas breakthrough through a flange connection, malfunction of pressure regulating equipment, gas condensate breakthrough, emergency fire or explosion in sections, leakage from storage tanks	1. Landscape complexes: foothills and low-lying areas of the Tien Shan mountain side, soils: grey soils and grey-brown soils, chestnut soils. 2. Habitats of mammals (carnivores, ungulates, rodents), amphibians and reptiles, birds. 3. Vegetation: communities dominated by ephemeral and ephemeroid grasses, grasses, herbage (based on turf grasses), tree and shrub vegetation in river gorges, including rare and endemic shrub species. 4. Terrestrial animals: mammals (carnivores, ungulates, rodents), amphibians and reptiles. 5. Ornithofauna (e.g. grouse, pygmy owl, hawk owl, three-toed woodpecker, nutcracker)	1. Landscapes and soils: grey-brown soils, sandy loamy and sandy soils, brown solonetz soils. 2. Habitats of mammals (ungulates, rodents, insectivores, rats, carnivores), amphibians and reptiles, birds of wetland complex. 3. Vegetation: biyurgun, wormwood-biyurgun and wormwood-boyalych groups with separate areas of sparse black saksaul thickets (Turkestan oblast); sarzan communities with participation of annual saltwort (Mangystau oblast); white-	1. Landscapes and soils: ordinary chernozems, southern chernozems, dark chestnut soils, chestnut soils, light chestnut soils. 2. Habitats of mammals (insectivores, man-eaters, rats, carnivores, parsnipeds, rodents and hares), amphibians and reptiles, birds (various species of migratory birds, endemics). 3. Vegetation: communities of sand-pollen and lerchopolyanniks, cereal communities, grasses, marevae, complex-flowers, etc. 4. Terrestrial animals: mammals (insectivores, rats, carnivores, carnivores, ungulates, rodents and hares), amphibians and reptiles. 5. Ornithofauna: various species of migratory birds and endemics	1. Destruction of land cover, animal population as a result of fires. 2. Impeded nutrient absorption due to changes in salt balance. 3. weakening of plants through ingestion of pollutants	The zone of possible impact of emergency situations related to depressurisation of pipelines, apparatus and installed fittings on equipment includes the territory of the SPZ of compressor stations and gas distribution stations and gas pipeline right-of-way. Possible consequences of accidents: release of liquid and gaseous hydrocarbons into the atmosphere,	Significant (the factor affects a large number of biodiversity sites with high intensity in non-emergency situations)

				soil-wormwood-teresken communities (Aktobe oblast); complexes of shrub-wormwood, rank-shrub, saxaul-ephemeral and ephemeral-herbaceous-saxaul associations (Kyzylorda oblast). 4. Terrestrial animals: mammals (ungulates, rodents, insectivores, rats, carnivores), amphibians and reptiles. 5. Ornithofauna: waterfowl and waterbirds, as well as those living in terrestrial habitats: large raptors, cranes, sandpipers, grouse, owls, etc.			formation of explosion and fire hazardous mixture	

6.5. Biodiversity indicators for monitoring the performance of the Company's subsidiaries and affiliates

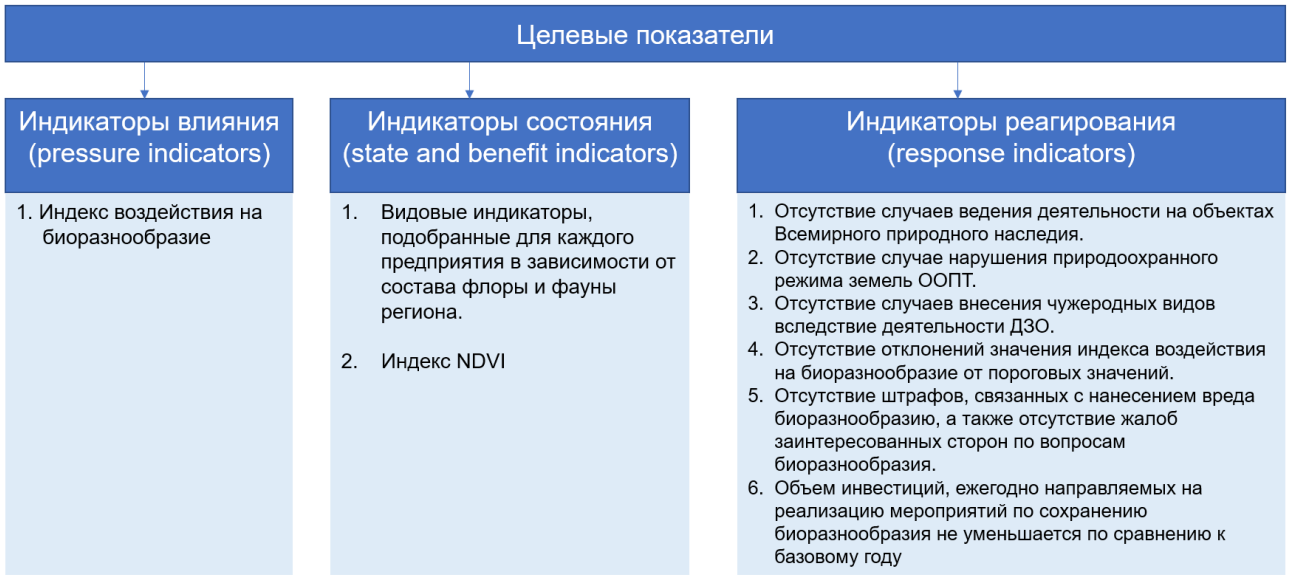
The following interrelated indicators are identified to assess the Company's and SACs' impact on biodiversity:

- Indicators of the impact of economic activities on biodiversity - reflect the types of impacts, main sources and factors that pose a threat to biodiversity and ecosystems. Within the framework of the work, the indicator is represented by a biodiversity impact index (hereinafter referred to as Impact Indicators).
- Biodiversity status indicators - reflect the state of ecosystems and biodiversity at the species and ecosystem levels (hereinafter - Status Indicators).
- Biodiversity Response Indicators - reflect the results of decision-making and implementation of measures aimed at preserving and improving the state of biodiversity and ecosystems. Response indicators can be applied to each SAC and the Company as a whole (hereinafter - Response Indicators).

Impact and condition indicators are allocated to each SDC and/or UMG management and are directly dependent on the natural conditions and the specifics of the operations of the production facilities.

The system of targets and indicators applied to the SDCs under consideration is presented in Figure 7.

Figure 7: Targets and indicators of biodiversity status of subsidiaries and affiliates



6.5.1 Biodiversity Impact Index

The Biodiversity Impact Index (BII) assesses the dynamics of biodiversity pressures of SACs (Table 11). It is based on a combination of approaches from international[406,407] environmental and biodiversity impact assessment methodologies.
The most significant impact factors are identified as components of the index for companies (Section VI), which can be revised if new significant factors are identified. The calculation formula is provided individually for each SAC in the sections below (Section1 "Biodiversity Impact Index").
The components on which the calculation is based are:

- atmospheric air (emissions of pollutants into the atmosphere, volume of methane leaks into the atmosphere);
- land use (area of reclaimed land);
- physical impact (noise, radiation).

The base year is 2021 and the value for 2021 is taken as the base value, but it is recommended to use the average value of the index components for the last 4-10 years, depending on the availability of data. When interpreting the assessment results, a 5% confidence interval has been established, which corresponds to the most commonly used 95% level of confidence in the obtained values[408].
Accordingly, the level of impact of SACs on biodiversity is considered unchanged if the value of the Biodiversity Impact Index is within the range of values from 0.95 to 1.05 (Table 9). The results of the calculation of the impact index of five SACs are presented in Annex 4 .

Table 11. Biodiversity Impact Index values

Index value	Impacts of S&A
<0,95	Decreases relative to the reference value
0,95-1,05	Does not change relative to the base value
>1,05	Increases relative to the base value

The calculation of the impact index for individual impact factors is capped at 2.00 to avoid grossly inflated biodiversity impact index values. For example, if an impact factor index value is calculated to be greater than 2.00, the index will be adopted at 2.00.
In addition, the presence of emergency situations at individual enterprises is taken into account (according to the documentation of subsidiaries and affiliates). In the formula for calculating the

406 SCIENCE-BASED TARGETS for NATURE (SBTN).
407 The LIFE Methodology for Business and Biodiversity.
408 Zar, Jerrold. (1999). Biostatistical analysis.

biodiversity impact index, emergency situations are taken into account in the form of a correction factor (Table 12).

Table 12. Distribution of the correction factor for the presence and level of emergency situation

Emergency level	Loss of species and ecosystem biodiversity	Correction factor
No emergencies	Species and ecosystems are not affected	1
Moderate impact	1) Most species persist without extinction - <10% (declining health). 2) Some changes in ecosystem connectivity, but basic ecosystem functions are maintained. 3) Moderate losses among rare and vulnerable species	1,4
Significant impact	1) Significant losses (with the possibility of extinction of some species - 10-30%) in species diversity. 2) Significant disruptions in ecosystem connectivity, which may lead to deterioration of ecosystem services. 3) Significant losses among rare and vulnerable species	1,7
Critical impact	1) Critical losses (with the possibility of complete extinction of many species - >30%) in species diversity. 2) Serious disruption of ecosystem processes, with the threat of disruption of ecosystem integrity. 3) High risk of extinction for many rare and vulnerable species	2

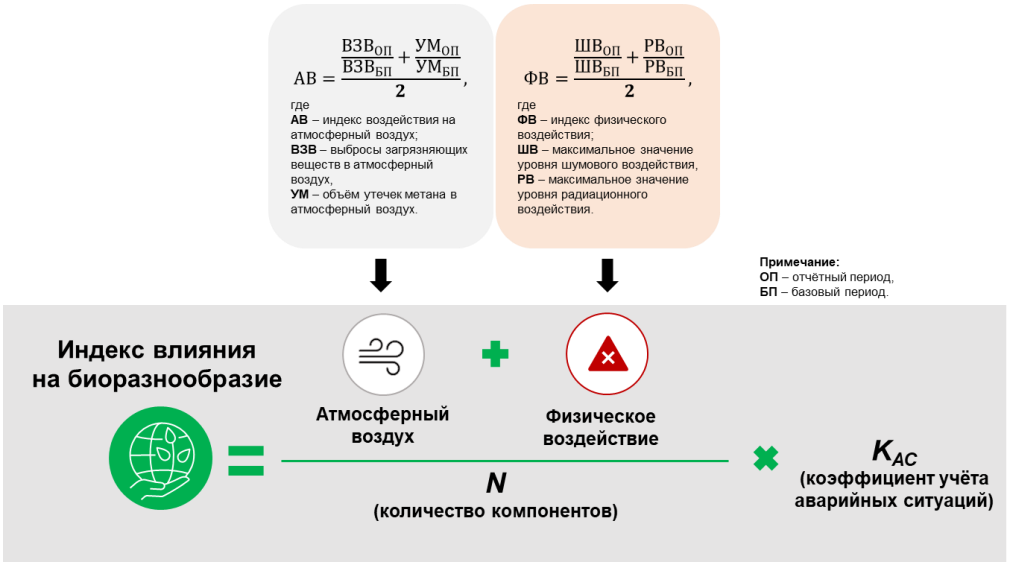
A correction factor of 0.8 is provided for trunk transport enterprises when calculating the coefficient for the "Land use" component. The introduction of the correction factor is due to the low significance of the impact of trunk transport on land resources.

6.5.1.1 Biodiversity Impact Index of QazaqGaz Exploration and Production LLP

The value of the biodiversity impact index for QazaqGaz Exploration and Production LLP for 2022 is 1.04, which indicates that there is no change in the company's impact on biodiversity for the reporting year compared to the base period. The index was calculated based on the data of subsidiaries and affiliates using the formula presented in the following table

Figure 8. Formula for calculating the impact index of QazaqGaz Exploration and Production LLP [409]

[409] The value is given without the Land Use component, as the data for this component were not provided by SDCs. Data for this component should be tracked for further calculation of the index.



Impact factors such as air pollutant emissions, methane leaks, noise and radiation exposure were included in the index calculation.

In the reporting year, emissions of pollutants into the atmospheric air at the enterprise increased. At the same time, the volume of methane leaks and radiation impact decreased. The level of noise impact remained unchanged compared to the baseline period. In 2022, there were no emergencies at the enterprise, therefore the coefficient of accounting for emergencies is equal to 1.

In order to provide a more complete picture of the impact of QazaqGaz Exploration and Production LLP's activities on biodiversity, it is recommended to continue monitoring in the future and take into account the following impact indicators when calculating the index:

- area of disturbed lands as of the end of the year;
- area of reclaimed land.

6.5.1.2 Biodiversity Impact Index of Intergas Central Asia JSC

The value of the biodiversity impact index for Intergas Central Asia JSC for 2022 is 0.56, which indicates a decrease in the company's impact on biodiversity in the reporting year compared to the baseline period. The index was calculated based on the data of subsidiaries and affiliates using the formula presented in Figure 9.

Figure 9. Formula for calculating the biodiversity impact index of Intergas Central Asia JSC

Impact factors such as air pollutant emissions, methane leakage and area of reclaimed land were included in the index calculation.

In the reporting year, pollutant emissions and the volume of methane leakage into the atmospheric air at the enterprise decreased. The area of reclaimed land increased significantly compared to the base period. In 2022, there were no emergencies at the enterprise, therefore the emergency accounting coefficient is equal to 1.

In order to provide a more complete picture of the impact of Intergas Central Asia JSC's activities on biodiversity, it is recommended to continue monitoring in the future and take into account the following impact indicators in the calculation of the index:

- area of disturbed lands as of the end of the year;
- level of noise and vibration impact (maximum values for the reporting period).

6.5.1.3 Biodiversity Impact Index of Asian Gas Pipeline LLP

The biodiversity impact index value for Asian Gas Pipeline LLP for 2022 has not been calculated due to the lack of data on impacts on environmental components, except for data on air pollutant emissions.

In the reporting year, emissions of pollutants into the atmospheric air at the enterprise decreased. No emergencies occurred at the enterprise in 2022.

In order to provide a more complete picture of the impact of Asian Gas Pipeline LLP's activities on biodiversity, it is recommended to continue monitoring in the future and take into account the following impact indicators when calculating the index:

- volume of methane leakage into the atmosphere;
- area of disturbed lands as of the end of the year;
- area of reclaimed land;

- level of noise and vibration impact (maximum values for the reporting period).

6.5.1.4 Biodiversity Impact Index of Beineu-Shymkent Gas Pipeline LLP

The value of the biodiversity impact index for Beineu-Shymkent Gas Pipeline LLP for 2022 is 1.01, which indicates no change in the company's impact on biodiversity for the reporting year compared to the baseline period. The index was calculated based on the data of subsidiaries and affiliates using the formula presented in Figure 10.

Figure 10. Formula for calculating the biodiversity impact index of Beineu-Shymkent Gas Pipeline LLP

Impact factors such as air pollutant emissions and the area of reclaimed land were included in the calculation of the index.

In the reporting year, emissions of pollutants into the atmospheric air at the enterprise decreased. The area of reclaimed land decreased significantly compared to the base period. In 2022, no emergencies occurred at the enterprise, therefore, the emergency accounting coefficient is equal to 1.

In order to provide a more complete picture of the impact of the Beineu-Shymkent pipeline LLP activities on biodiversity, it is recommended to continue monitoring in the future and take into account the following impact indicators when calculating the index:

- volume of methane leakage into the atmosphere;
- area of disturbed lands as of the end of the year;
- level of noise and vibration impact (maximum values for the reporting period).

6.5.1.5 Biodiversity Impact Index of KazTransGas Aimak JSC

The biodiversity impact index value for "KazTransGas Aimak" JSC for 2022 was not calculated due to the lack of data on impacts on environmental components, except for data on pollutant emissions and methane leakage into the atmosphere.

In the reporting year, emissions of pollutants into the atmospheric air at the enterprise increased. The volume of methane leakage into the atmosphere remained unchanged compared to the baseline period. No emergencies occurred at the enterprise in 2022.

In order to provide a more complete picture of the impact of KazTransGas Aimak JSC activities on biodiversity, it is recommended to continue monitoring in the future and take into account the following impact indicators when calculating the index:

- area of disturbed lands as of the end of the year;
- area of reclaimed land;
- level of noise and vibration impact (maximum values for the reporting period).

6.5.2 Biodiversity status indicators

In accordance with CDP requirements, a list of biodiversity status indicators has been developed to assess the impact on biodiversity from enterprises. It includes the Normalised Difference Vegetation Index (NDVI) and plant and animal species inhabiting the regions where S/As operate and possessing one or more of the following attributes:

- species included in the List of Rare and Threatened Species of Plants and Animals of the Republic of Kazakhstan[410] ,[411] (;)
- rare, endemic and relict species;
- species of important economic importance (sources of food and medicinal raw materials, honeydrops, pest regulators, etc.);
- species that are relatives of cultivated plants and have additional value as a source of genetic diversity;
- Background species responding to environmental changes resulting from anthropogenic activities.

The indicators are set at the UMG level for all production facilities of subsidiaries and affiliates located within the same natural zone. To identify the presence of species in the area under consideration, biodiversity monitoring reports of Intergas Central Asia LLP[412] ,[413]

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[410] On Approval of the Lists of Rare and Threatened Species of Plants and Animals. Resolution of the Government of the Republic of Kazakhstan dated 31 October 2006№ 1034.

[411] Red Book of the Republic of Kazakhstan. T. 1 Animals, ch. 1 Vertebrates, 2010.

[412] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of the Zhanaozen CS of Aktau UMG, 2022.

[413] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" KS-12 "Shalkar" and KS-14 "Krasnooktyabrskoye" UMG "Aktobe", 2022.

,414(,)415(,)416(,)417(,)418(,)419(,)420 , as well as a number of open sources421 ,422 . A species is recognised as present in the area of influence of a SFM if it is reflected in the biodiversity monitoring report of the relevant SFM. Indicators identified for individual UMGs of Intergas Central Asia LLP are extrapolated to the production facilities of other subsidiaries and affiliates located in the same region.

A total of 18 plant species, nine bird species, two reptile species and one mammal species are proposed as indicators. The large number of vegetation indicators is due to the significant number of production facilities within each FMU. An increase in the number of indicators increases the probability of their detection within the impact zones of production facilities. The predominance of birds in the wildlife indicators is due to the location of a significant number of production facilities in the vicinity of KOT. Due to the fact that a significant proportion of production facilities are located in the vicinity of KOTs, emphasis is placed on bird fauna when identifying status indicators. The list of indicators of the state of flora is presented in Tables 13 , ,1523 , of fauna - in Tables 14 ,, 1624 , grouped by natural zones.

The presence of species in the UMG impact area is labelled with the following designations:

- "Present" - presence is confirmed by SAC documentation (biodiversity monitoring reports, EIAs, etc.);
- "Probably present" - the probability of species presence in the area under consideration is established according to open sources or by analogy with UMG of Intergas Central Asia LLP, located in the same natural zones and having data of monitoring surveys.

6.5.2.1 Indicators of the state of biodiversity of steppes and forest-steppes

The following UMGs and production branches of the Company are fully or partially located within the steppe zone:

414 Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" GDS "Kaskelen" UMG "Almaty", 2022.

415 Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity" CS Akkol, CS Kulsary UMG Atyrau, 2022.

416 Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" REU "Nursultan" UMG "Karaganda", 2022.

417 Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" GDS Rudnyi, GDS v. Boskol UMG "Kostanay", 2022. Boskol UMG "Kostanay", 2022.

418 Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" UGS "Akir-Tobe" UMG "Taraz", 2022.

419 Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity" CS "Chizha" UMG Uralsk, 2022.

420 Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" UGS "Poltoratskoye" UMG "Shymkent", 2022.

421 Fungi.su - site about mushrooms of Kazakhstan.

422 Plantarium. Online plant identifier. Plants and lichens of Russia and neighbouring countries: an open online atlas and plant identifier.

- Atyrau, Uralsk, Kostanai, Aktobe, Karaganda UMGs of Intergas Central Asia LLP;
- Atyrau, Astana, Aktobe, Kostanay, Karaganda and Zhezkazgan production branches of KazTransGas Aimak JSC.

The composition of indicators is proposed on the basis of Intergas Central Asia LLP reports for Atyrau, Uralsk, Kostanai, Aktobe and Karaganda UMGs.

Table 13. Indicators of the state of vegetation of steppes and forest-steppes

1. Caspian onion[423],[424]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Atyrau UMG; KazTransGas Aimak JSC: Atyrau production branch	Present Probably present
Tracking indicators	Number of plants in the affected area	
Rationale for selection	Endemic species. The presence of the species in the UMG impact area was confirmed	
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere.	

[423] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" CS "Akkol", CS "Kulsary" UMG "Atyrau", 2022.

[424] Photo source: Natalia Beshko. Flowering plant. Uzbekistan, Bukhara oblast, western part of Kyzylkum desert, fine-bumpy consolidated sands. 23.04.2022. (Plantarium. Plant Identifier online - Allium caspium (Pall.) M. Bieb. (family Alliaceae) Caspian onion).

	Emergencies
Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)

2. Sogdian Tulip[425,426]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Atyrau UMG; KazTransGas Aimak JSC: Atyrau production branch	Present Probably present
Tracking indicators	Number of plants in the affected area	
Rationale for selection	Endemic species. The presence of the species in the UMG impact area was confirmed	
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere.	

[425] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" CS "Akkol", CS "Kulsary" UMG "Atyrau", 2022.

[426] Photo source: Central Asian tortoise (Testudo horsfieldii (Agrionemys horsfieldii). Neighbourhood of Baikonur city, Kyzylorda oblast, Kazakhstan.

	Emergencies
Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)

3. Schrenk's Tulip (fragrant)[427] ,[428]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Uralsk UMG; KazTransGas Aimak JSC: Astana and Karaganda production branches	Present Probably present
Tracking indicators	Number of plants in the affected area	
Rationale for selection	The species is included in the List of Rare and Threatened Species of Plants and Animals of the Republic of Kazakhstan and is subject to protection and monitoring.	

[427] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity" CS "Chizha" UMG Uralsk, 2022.

[428] Photo source: Ilya Mikheev. Flowering plants. Rostov region, Salsky district, vicinity of Talniki settlement, Salskaya steppe, steppe slope of south-eastern exposure. 16.04.2022 (Plantarium. Plant Identifier Online - Tulipa suaveolens Roth (family Liliaceae) Tulipa suaveolens Roth (family Liliaceae).

	The presence of the species in the UMG impact area was confirmed
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Emergencies
Exposure mechanism	Deterioration of the vital state of plants, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)

4. Peach-leaved bellflower ,[429][430]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: UMG Kostanai; KazTransGas Aimak JSC: Kostanay production branch	Present Probably present
Tracking indicators	Projective coverage of plants in the affected area	
Rationale for selection	On the territory of the Republic of Kazakhstan the species is preserved as a Pliocene relict, gravitating to meadow and forest communities. The presence of the species in the UMG impact area was confirmed	

[429] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" GDS Rudnyi, GDS v. Boskol UMG "Kostanay", 2022. Boskol UMG "Kostanai", 2022.

[430] Photo source: Julia Rayskaya. Upper part of a flowering plant. Tomsk region, Tomsk, Akademgorodok, in culture. 24.06.2022 (Plantarium. Plant identifier online - Campanula persicifolia L. (family Campanulaceae) Bell peach-leaved).

Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Emergencies.
Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)

5. Clematis hybridis[431][432]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: UMG Kostanai; KazTransGas Aimak JSC: Kostanay production branch	Present Probably present
Tracking indicators	Projective coverage of plants in the affected area	
Rationale for selection	On the territory of the Republic of Kazakhstan the species is preserved as a Pleistocene relict gravitating to petrophytic steppe and forest communities. The presence of the species in the UMG impact area was confirmed	

[431] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" GDS Rudnyi, GDS v. Boskol UMG "Kostanay", 2022. Boskol UMG "Kostanai", 2022.

[432] Photo source: Pavel Gorbunov. Flowering plant. Kazakhstan, Karaganda region, 6 km south-west of Ulytau village. Ulytau; Ulytau mountains, south-western slope, 760 m, granite. 20.06.2010 (Plantarium. Plant Identifier online - CAizopsis hybrida (L.) Grulich (family Crassulaceae) Hybrida hybrida, Ochitok hybrida).

Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Emergencies
Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)

Table 14. Indicators of the state of fauna steppes and forest-steppes

1. Steppe Eagle[433],[434] (,)[435]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Aktau UMG, Karaganda UMG; KazTransGas Aimak JSC: Kyzylorda, Mangystau, Zhezkazgan, Karaganda production branches	Present Probably present

[433] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of the Zhanaozen CS of Aktau UMG, 2022.
[434] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" REU "Nursultan" UMG "Karaganda", 2022.
[435] Photo source: Fungi.su - site about mushrooms of Kazakhstan. Steppe eagle (Aquila nipalensis (Hodgson,1833).

		Probably present
Tracking indicators	The occurrence of individuals of the species or traces of its presence in the affected area	
Rationale for selection	The species is included in the List of Rare and Threatened Species of Plants and Animals. The presence of the species in the UMG impact area was confirmed	
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Physical impact of CS and GDS equipment. Emergencies	
Exposure mechanism	Displacement of a species from the area of exposure as a result of disturbance. Depletion of forage base under the influence of atmospheric air pollution. Bird mortality, loss of nests, eggs and chicks as a result of emergencies	

2. Whooper Swan[436] ,[437] ,438(,)[439]	

[436] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity" CS "Chizha" UMG Uralsk, 2022.
[437] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" GDS Rudnyi, GDS v. Boskol UMG "Kostanay", 2022. Boskol UMG "Kostanay", 2022.
[438] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" KS-12 "Shalkar" and KS-14 "Krasnooktyabrskoye" UMG "Aktobe", 2022.
[439] Photo source: Fungi.su - site about fungi of Kazakhstan. Whooper swan (Cygnus cygnus (Linnaeus, 1758).

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Uralsk UMG, Aktobe UMG, Kostanai UMG; KazTransGas Aimak JSC: Aktobe and Kostanay production branches	Present Probably present Probably present
Tracking indicators	The occurrence of individuals of the species or traces of its presence in the affected area	
Rationale for selection	The species is included in the List of Rare and Threatened Species of Plants and Animals. The presence of the species in the UMG impact area was confirmed	
Exposure factor	Physical impact of CS and GDS equipment. Emergencies	
Exposure mechanism	Displacement of a species from the area of exposure as a result of disturbance. Bird mortality, loss of nests, eggs and chicks as a result of emergencies	

3. Strepeth[440,441]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Karaganda UMG; KazTransGas Aimak JSC: Karaganda Production Branch	Present Probably present
Tracking indicators	Occurrence of individuals of the species in the affected area	
Rationale for selection	The species is included in the List of Rare and Threatened Species of Plants and Animals. The presence of the species in the UMG impact area was confirmed	
Exposure factor	Physical impact of CS and GDS equipment. Emergencies	
Exposure mechanism	Displacement of a species from the area of exposure as a result of disturbance. Bird mortality, loss of nests, eggs and chicks as a result of emergencies	

[440] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" REU "Nursultan" UMG "Karaganda", 2022.

[441] Photo source: Fungi.su - site about mushrooms of Kazakhstan. Strepet (Otis tetrax) o. Sorbulak. Almaty region. Kazakhstan [09.05.2012].

4. Whooping crane[442] ,[443]	

Branches of subsidiaries and affiliates	KazTransGas Aimak JSC: Astana production branch	Probably present
Tracking indicators	The occurrence of individuals of the species or traces of its presence in the affected area	
Rationale for selection	The species is included in the List of Rare and Threatened Species of Plants and Animals. The species is likely to be present in the area of UMG impact	
Exposure factor	Physical impact of CS and GDS equipment. Emergencies	
Exposure mechanism	Displacement of a species from the area of exposure as a result of disturbance. Bird mortality, loss of nests, eggs and chicks as a result of emergencies	

442 Red Book of the Republic of Kazakhstan. T. 1 Animals, ch. 1 Vertebrates, 2010.

443 Photo : Fungi.su - site about mushrooms of Kazakhstan. Red-crowned crane (Anthropoides virgo) Kanshengel village, Almaty region, TRS. [22.06.2013]source.

5. Steppe turtle[444],[445]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Atyrau UMG; KazTransGas Aimak JSC: Atyrau production branch	Present Probably present
Tracking indicators	Species occurrence in the affected area during the period of species activity (spring, autumn)	
Rationale for selection	The species is characterised by lower mobility than mammals and avifauna and therefore the disappearance or reduction of the species in the affected area would be an indication of a significant impact of disturbance. Species entry into the UMG impact zone confirmed	
Exposure factor	Physical impact of CS and GDS equipment. Emergencies	
Exposure mechanism	Displacement of a species from the area of exposure as a result of disturbance. Deterioration of the quality of the forage base (vegetation) as a result of air pollution. Loss of animals and their offspring as a result of emergency situations	

[444] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity" CS Akkol, CS Kulsary UMG Atyrau, 2022.

[445] Photo source: Central Asian tortoise (Testudo horsfieldii (Agrionemys horsfieldii). Neighbourhood of Baikonur city, Kyzylorda oblast, Kazakhstan.

6. European bog turtle[446 ,447]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Uralsk UMG	Present
Tracking indicators	Species occurrence in the affected area during the period of species activity (spring, autumn)	
Rationale for selection	The area under consideration is on the eastern border of the species' range. The species is characterised by lower mobility than mammals and avifauna and therefore the disappearance or reduction of the species in the affected area would be an indication of a significant impact of disturbance. Species entry into the UMG impact zone confirmed	
Exposure factor	Physical impact of CS and GDS equipment.	

[446] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity" CS "Chizha" UMG Uralsk, 2022.
[447] Photo source: George Chernilevsky. European bog turtle in Vinnitsa region, Ukraine.

	Emergencies
Exposure mechanism	Displacement of a species from the area of exposure as a result of disturbance. Deterioration of the quality of the forage base (vegetation) as a result of air pollution. Loss of animals and their offspring as a result of emergency situations

6.5.2.2 Desert and semi-desert biodiversity status indicators

Exploration and production facilities, UMG and production branches of subsidiaries and affiliates are fully or partially located within the desert zone:

- gas development area of QazaqGaz Exploration and Production LLP;
- Taraz, Shymkent, Aktau UMGs of Intergas Central Asia LLP;
- UMG for Turkestan region of Asian Gas Pipeline LLP;
- GIS, CS for Mangystau, Kyzylorda, Turkestan regions of Beineu-Shymkent Gas Pipeline LLP;
- Kyzylorda and Mangystau production branches of KazTransGas Aimak JSC.

The composition of indicators is proposed on the basis of reports of Intergas Central Asia LLP for Taraz, Shymkent and Aktau UMGs. As one of the indicators of the state of fauna of deserts and semi-deserts for subdivisions located in Kyzylorda, Mangystau and Zhezkazgan regions, the steppe eagle is proposed, the range of which covers the territories of steppes and deserts (Table 14) .

Table 15. Indicators of the state of flora deserts and semi-deserts

1. Lemann's Eminium[448]	

[448] Photo source: Natalia Beshko. Flowering plant. Uzbekistan, Surkhandarya region, Kattakum sands. 06.03.2020. (Plantarium. Plant identifier online. *Eminium lehmannii* (Bunge) O.Kuntze.).

Branches of subsidiaries and affiliates	QazaqGaz Exploration and Production LLP	Present
Tracking indicators	Number of plants in the affected area	
Rationale for selection	The species is included in the List of Rare and Threatened Species of Plants and Animals of the Republic of Kazakhstan and is subject to protection and monitoring. The presence of the species in the area of impact of the enterprise has been confirmed. The species is easily identified in the field	
Exposure factor	Atmospheric air pollution. Land disturbance and soil degradation. Emergencies	
Exposure mechanism	In land disturbance: reduction in abundance through direct destruction of plants and their habitats. With increasing air pollution: deterioration of physiological properties of the plant (chlorosis, necrosis, etc.). In fires caused by emergency situations: destruction of plants and their habitats	

2. Borschova Tulip[449] [450]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Taraz UMG; Asian Gas Pipeline LLP: UMG for Turkestan region; Beineu-Shymkent Gas Pipeline LLP: GIS, CS in Mangystau, Kyzylorda, Turkestan regions; KazTransGas Aimak JSC: Kyzylorda Production Branch	Present Probably present Probably present Probably present
Tracking indicators	Number of plants in the affected area	
Rationale for selection	The species is included in the List of rare and endangered species of plants and animals of the Republic of Kazakhstan and is subject to protection and	

[449] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" UGS "Akir-Tobe" UMG "Taraz", 2022.
[450] Photo source: RSU "Barsakelmes State Reserve". Borszczow's tulip (Tulipa borszczowii).

	monitoring; endemic. The presence of the species in the UMG impact area was confirmed
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Emergencies
Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)

3. Greig's Tulip[451],[452]	

Branches of subsidiaries and affiliates	KazTransGas Aimak JSC: Kyzylorda Production Branch	Probably present
Tracking indicators	Number of plants in the affected area	
Rationale for selection	Endemic species. Included in the List of Rare and Threatened Species of Plants and Animals of the Republic of Kazakhstan and subject to protection and monitoring.	

[451] Fungi.su - site about mushrooms of Kazakhstan. Tulip of Greig, (Tulipa greigii).

[452] Photo source: Vladimir Epiktetov. Tulip of Greig, (Tulipa greigii Regel). Flowering plant. Kazakhstan, Almaty region, Kurdai pass, rubbly slope, 20.04.2006 (Fungi.su - site about mushrooms of Kazakhstan. Tulipa greigii (Tulipa greigii).

	The presence of the species in the UMG impact area was confirmed
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Emergencies
Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)

4. White Earth Wormwood[453] ,454 (,)455	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Taraz UMG, Aktobe UMG; Asian Gas Pipeline LLP: UMG for Turkestan region;	Present Probably present

[453] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" UGS "Akir-Tobe" UMG "Taraz", 2022.

[454] Dyusebayeva M. A. et al. Phytochemical study of *Artemisia terrae-albae* // Scientific Journal "Reports of the National Academy of Sciences of the Republic of Kazakhstan". - 2021. - №. 4. - C. 122-128.

[455] Photo source: Vladimir Kolbintsev. Vegetative plant with last year's generative shoots. Kazakhstan, Syrdarya Karatau, Central Karatau, foothills of the Kelinshektau Mountains in the area of the Arpa-Ozen brook, slope of a variegated sopka. 7 May 2019 (Plantarium. Plant Determinator Online - Artemisia terrae-albae Krasch (family Asteraceae). Artemisia terrae-albae Krasch (family Asteraceae).

	Beineu-Shymkent Gas Pipeline LLP: GIS, CS in Mangystau, Kyzylorda, Aktobe, Turkestan regions	Probably present
Tracking indicators	Projective coverage of plants in the affected area	
Rationale for selection	The species is one of the dominants of the herb and shrub layer. It is valuable as a source of medicinal raw materials. Deterioration of its condition and reduction of projective cover will indicate a significant deterioration of the environment. The presence of the species in the UMG impact area was confirmed	
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Emergencies	
Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)	

5. Eremurus indera[456] ,[457]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Taraz UMG; Asian Gas Pipeline LLP: UMG for Turkestan region; Beineu-Shymkent Gas Pipeline LLP: GIS, CS in Mangystau, Kyzylorda, Turkestan oblasts	Present Probably present Probably present
Tracking indicators	Projective coverage of plants in the affected area	
Rationale for selection	Ephemeroid, endemic of Turanian deserts[458] . Used as an early mellifer, food plant and source of medicinal raw materials , .[459][460] The presence of the species in the UMG impact area was confirmed	
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere.	

[456] Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas Central Asia" on the state of biodiversity" UGS "Akir-Tobe" UMG "Taraz", 2022.

[457] Photo source: Vladimir Kolbintsev. Flowering plant with bare roots. South Kazakhstan, Zhambyl region, vicinity of Akyrtobe village; southern part of Moyinkum sands, semi-fixed sands, weathering zone. 12 May 2021 (Plantarium. Plant Identifier Online - Eremurus inderiensis (Steven) Regel (family Asphodelaceae) Eremurus inderiensis).

[458] Fungi.su - site about mushrooms of Kazakhstan. *Eremurus inderiensis (Eremurus inderiensis (Steven) Regel, Ammolirion inderiense (M. Bieb). Regel ex A. P. Khokhr, Ammoliririon inderiense Bunge ex Regel).*

[459] Red Book of Russia. Plants. Eremurus inderiensis (Eremurus inderiensis).

[460] Local historian of the Orenburg region. Eremurus inderiensis (Eremurus inderiensis).

	Emergencies
Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)

Table 16. Indicators of fauna condition deserts and semi-deserts

1. White-bellied Grouse[461] ,[462] (,)[463]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Taraz UMG, Shymkent UMG; Asian Gas Pipeline LLP: UMG for Zhambyl region, UMG for Turkestan region; Beineu-Shymkent Gas Pipeline LLP: GIS, CS in Mangystau, Kyzylorda, Turkestan regions; KazTransGas Aimak JSC: Shymkent Production Branch	Present Probably present Probably present Probably present
Tracking indicators	Occurrence of individuals of the species in the affected area	
Rationale for selection	The species is included in the List of rare and endangered species of plants and animals of the Republic of Kazakhstan.	

[461] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of UGS "Poltoratskoye" UMG "Shymkent", 2022.

[462] Red Book of the Republic of Kazakhstan. T. 1 Animals, ch. 1 Vertebrates, 2010.

[463] Photo source: Birds of Russia and neighbouring regions. White-bellied Grouse (*Pterocles alchata*).

	The presence of the species in the UMG impact area was confirmed
Exposure factor	Physical impact of CS and GDS equipment. Emergencies
Exposure mechanism	Displacement of a species from the area of exposure as a result of disturbance. Bird mortality, loss of nests, eggs and chicks as a result of emergencies

2. Snakehead[464] [465]	

Branches of subsidiaries and affiliates	KazTransGas Aimak JSC: Kyzylorda Production Branch	Probably present
Tracking indicators	The occurrence of individuals of the species or traces of its presence in the affected area	
Rationale for selection	The species is included in the List of rare and endangered species of plants and animals of the Republic of Kazakhstan. The species is likely to be present in the area of UMG impact	

[464] Red Book of the Republic of Kazakhstan. T. 1 Animals, ch. 1 Vertebrates, 2010.

[465] Photo source: Birds of Europe. Snake-eater.

Exposure factor	Physical impact of CS and GDS equipment. Emergencies
Exposure mechanism	Displacement of a species from the area of exposure as a result of disturbance. Bird mortality, loss of nests, eggs and chicks as a result of emergencies

3. Baloban[466],[467]	

Branches of subsidiaries and affiliates	KazTransGas Aimak JSC: Kyzylorda Production Branch	Probably present
Tracking indicators	The occurrence of individuals of the species or traces of its presence in the affected area	
Rationale for selection	The species is included in the List of rare and endangered species of plants and animals of the Republic of Kazakhstan. The species is likely to be present in the area of UMG impact	
Exposure factor	Physical impact of CS and GDS equipment. Emergencies	

[466] Red Book of the Republic of Kazakhstan. T. 1 Animals, ch. 1 Vertebrates, 2010.

[467] Photo source: RedBook. Description of animals from the Red Book: description of saker falcon from the Red Book.

Exposure mechanism	Displacement of a species from the area of exposure as a result of disturbance. Bird mortality, loss of nests, eggs and chicks as a result of emergencies

4. Crested Lark[468] ,[469] (,)[470]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Aktau UMG; Beineu-Shymkent Gas Pipeline LLP: GIS, CS for Mangystau region; KazTransGas Aimak JSC: Mangystau production branch	Present Probably present Probably present
Tracking indicators	Numbers of individuals of the species in the affected area	
Rationale for selection	The species is a mass species for the territories under consideration. Regulator of arthropods, including pests of agricultural plants and disease	

[468] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of the Zhanaozen CS of Aktau UMG, 2022.

[469] Fungi.su - site about fungi of Kazakhstan. Crested lark (Galerida cristata (Linnaeus, 1758).

[470] Photo source: Fungi.su - site about fungi of Kazakhstan. Crested lark (Galerida cristata (Linnaeus, 1758).

	vectors. In summer, the species feeds on mixed food (insects, seeds, etc.) and feeds its chicks on insects. The abundance of the species allows indirect estimation of the number of insects, among which there are species included in the List of Rare and Threatened Species of Plants and Animals. The presence of the species in the UMG impact area was confirmed
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Physical impact of CS and GDS equipment. Emergencies
Exposure mechanism	Reduced forage base as a result of air pollution. Displacement of a species from the area of exposure as a result of disturbance. Bird mortality, loss of nests, eggs and chicks as a result of emergencies

5. Jairan[471],[472]	

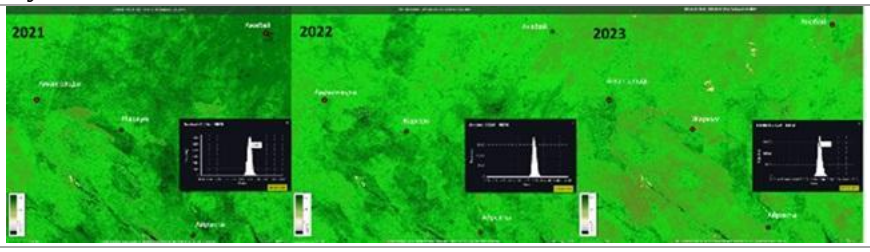
Branches of subsidiaries	Intergas Central Asia LLP: Aktau	Present

[471] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of the Zhanaozen CS of Aktau UMG, 2022.

[472] Photo source: Fungi.su - site about mushrooms of Kazakhstan. Jeyran (Gazella subgutturosa Güldenstädt, 1780).

and affiliates	UMG; Beineu-Shymkent Gas Pipeline LLP: GIS, CS for Mangystau region; KazTransGas Aimak JSC: Mangystau production branch	Probably present Probably present
Tracking indicators	The occurrence of individuals of the species or traces of its presence in the affected area	
Rationale for selection	The species is included in the List of Rare and Threatened Species of Plants and Animals. The species was confirmed to be entering the area of UMG impact (dead gazelle).	
Exposure factor	Physical impact of CS and GDS equipment. Emergencies	
Exposure mechanism	Displacement of a species from the area of exposure as a result of disturbance. Deterioration of the quality of the forage base (vegetation) as a result of air pollution. Mortality of adult animals and young animals as a result of emergency situations	

Table 17. Indicators of ecosystem health

1.State of vegetation using NDVI index	

Branches of subsidiaries and affiliates	QazaqGaz Exploration and Production LLP
Tracking indicators	NDVI index value
Rationale for selection	The index provides an overview of the overall vegetation condition and

	disturbed areas during the growing season. Including due to the availability of satellite imagery, it shows major changes in vegetation condition, such as fire due to accidents, etc.
Exposure factor	Emergencies. Indirect impact of pollutants on vegetation
Exposure mechanism	Fires and explosions. Spills of oil products and chemicals. Effects of pollutants on plant health

Explanation of the choice of NDVI index as an indicator of the state of desert ecosystems (for localised natural areas)

The NDVI index was chosen as an indicator of the state of ecosystems for localised natural areas contiguous to the impact zone of the SAC. For QazaqGaz Exploration and Production LLP, indicators reflecting the general state of ecosystems, namely desert ecosystems, within the impact zone and in adjacent territories are used. In this case NDVI index is proposed for this purpose, as the production sites of the enterprise are located in intact areas where vegetation cover has a short growing season. The index allows assessing the type and vital state of the vegetation cover of the study area. With the help of the index it is possible to identify the ratio of disturbed and undisturbed areas on the territory of the enterprise, which will allow to determine the degree of impact of its activities on local ecosystems[473] . The index complements species indicators of the state of biodiversity of deserts and semi-deserts.

Sentinel Hub images from 2021 to 2023 during the growing season, which for this area is defined as April to June, were used to correctly estimate the index. Ecosystem change can be assessed by analysing the NDVI index values during these time periods within the footprint of the production facilities. This potentially indicates the level of impact of the RoW on vegetation during the growing season within the specified areas. The NDVI index was estimated by factor analysis of the values and as a consequence an average value for the impact area was identified.

The study of remote sensing data has revealed that there are no significant differences between the SPZ territory and the surrounding natural communities (Figure 11 , Figure 13 , Figure 14 , Figure 15 , Figure 16). Localised degradation of vegetation cover is only observed around wells and linear structures (roads, outfall plumes) (Figure 11 , Figure 13 , Figure 14). The increase in degraded land from 2021 is due to the opening of new wells, linear structures and the growth of trampled areas around active fields.

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Table 18. Boundaries of values and average values of NDVI index during the growing season for the territory adjacent to the fields of "Exploration and Production QazaqGaz" LLP

Year	**Limits of values**	**Average NDVI index values**
2021	0,09-0,32	0,195
2022	0,1-0,3	0,175
2023	0,04-0,26	0,151

Рисунок 1. Change in vegetation condition at Amangeldy field from 2021 to 2023 using NDVI index

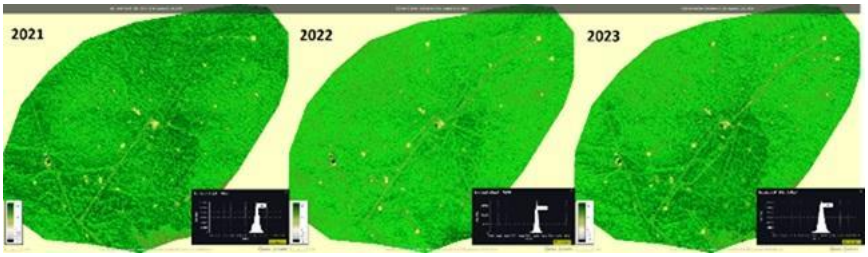


Table 19. Boundaries of values and average values of NDVI index during the growing season for the zone of impact of Amangeldy field

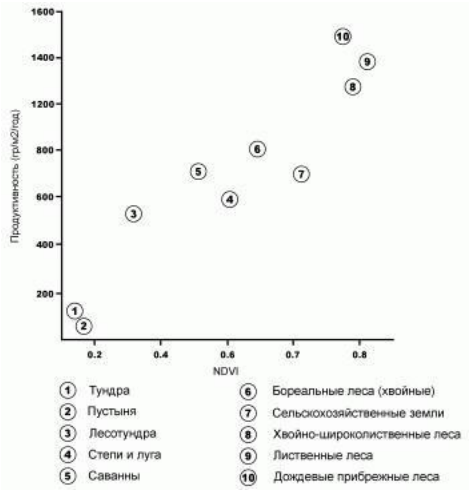
Year	**Limits of values**	**Average NDVI index values**
2021	0,03-0,31	0,18
2022	0,06-0,3	0,161
2023	0,04-0,29	0,164

The index values are decreasing every year, but the average value is within the range of indicators for desert areas (Figure 12).

The change of the index can be related to both possible impact of the enterprise and general climatic factors. Given the indirect impact of one of the factors (methane emissions), this may also be one of the reasons for the change in the index value. In order to make a reliable statement, it is necessary to monitor methane emissions and identify the share of emissions from all sources of methane emissions. It is not possible to do this at this stage of the work, but it will be taken into account when describing the general recommendations for organising the monitoring system (Section VI).

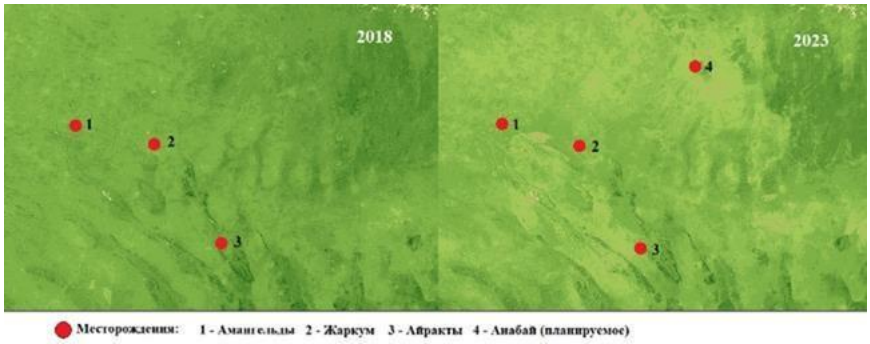
Figure 12. Correlation between NDVI and productivity for different ecosystem types[474]

[474] GIS-Lab. Theoretical basis for the use of NDVI index.



According to the theoretical basis for the use of NDVI index428 , it is possible to assess the productivity of vegetation cover during the vegetation period (most relevant for desert territories), as well as to assess the approximate state and actualise the zones of impact of production facilities of subsidiaries and affiliates on the state of vegetation.

Figure 13: Changes in the vegetation of the enterprise area from 2018 to 2023 using the NDVI index



In the territories of Zharkum and Ayrakty fields (Figure 14 , Figure 15) the limits of values decrease, but the maximum average values of the index fall on 2022.

Figure 14: Change in vegetation condition in the Zharkum field from 2021 to 2023 using the NDVI index

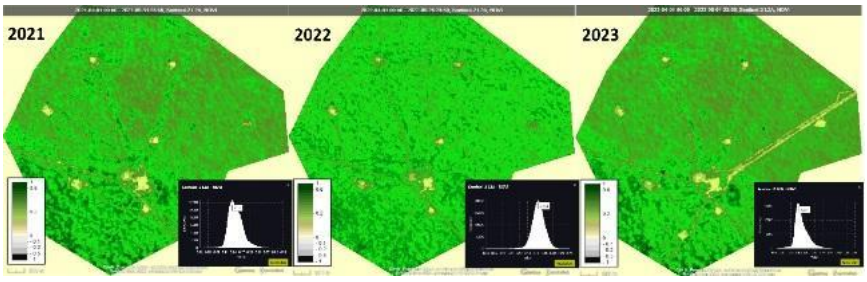


Table 20. Limits of values and average values of NDVI index during the growing season for the zone of Zharkum field impact

Year	**Limits of values**	**Average NDVI index values**
2021	0,03-0,28	0,14
2022	0,05-0,23	0,164
2023	0,04-0,27	0,135

Figure 15. Change in vegetation condition in the Ayrakty field from 2021 to 2023 using the NDVI index

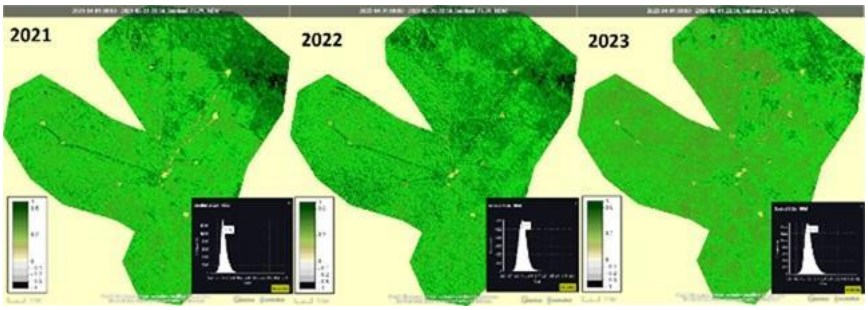


Table 21. Boundaries of values and average values of NDVI index during the growing season for the impact zone of Airakty deposit

Year	**Limits of values**	**Average NDVI index values**
2021	0,04-0,38	0,154
2022	0,05-0,36	0,17
2023	0,06-0,30	0,143

The change in the NDVI index at the Anabai field (Table 22) is most evident, given that the field's exploitation started in 2023. Prior to that, preparatory and construction works were carried out on the potential territory of the field.

Figure 16. Change in vegetation condition at the Anabai field from 2021 to 2023 using the NDVI index

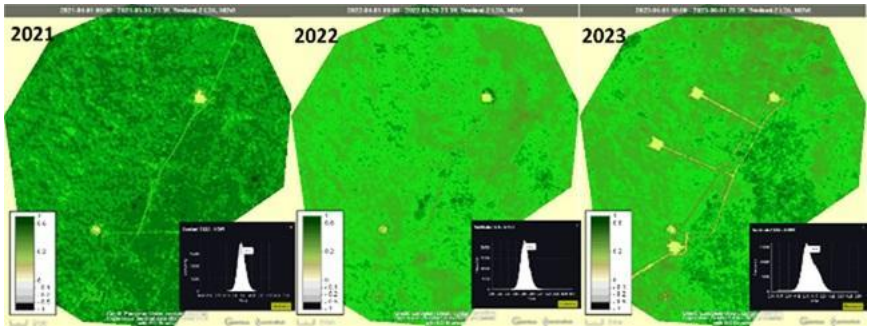


Table 22. Boundaries of values and average values of NDVI index during the growing season for the zone of impact of the Anabai deposit

Year	**Limits of values**	**Average NDVI index values**
2021	0,05-0,3	0,195
2022	0,05-0,24	0,152
2023	0,05-0,25	0,149

As the above values show, the area would naturally have a higher index value before 2022 than after construction is completed and the field is operational.

Based on the analysis of the NDVI index indicator, a gradual decrease in the index over time is noted. Since this index reflects changes in the vegetation condition during the vegetation period, it may be related to the impact of the enterprise on the study areas. This trend is observed most clearly in the example of the new Anabai field. The index values decrease before the start of construction, after the construction phase and as a result of further operation of the field. Nevertheless, it should be noted that changes in the index values can be related to general climatic processes.

Monitoring of vegetation condition using the NDVI index will allow monitoring of the impacts of the LDW on biodiversity and vegetation, in particular the vegetation condition indicators presented above.

6.5.2.3 Indicators of biodiversity status of mountain ecosystems

The following UMG and production branches of the Company are fully or partially located within the mining territories:

- UMG "Almaty", "Shymkent", "Taraz" of Intergas Central Asia LLP;
- UMG for Almaty, Zhambyl, Turkestan regions of Asian Gas Pipeline LLP;
- GIS, CS for Turkestan region of Beineu-Shymkent Gas Pipeline LLP;
- Almaty and Shymkent production branches of KazTransGas Aimak JSC.

The composition of indicators is proposed on the basis of Intergas Central Asia LLP reports for Almaty and Shymkent UMGs.

In addition to those presented below, the white-bellied murrelet, which inhabits desert terrain on both plains and gentle foothills (Table 16), has been proposed as an indicator of wildlife condition for SACs operating in foothill ecosystems located in Zhambyl and Turkestan oblasts.

Table 23. Indicators of the state of vegetation

1. Tulip of Kolpakowski[475] [476] [477]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: UMG Almaty; Asian Gas Pipeline LLP: UMG for Almaty region; KazTransGas Aimak JSC: Almaty production branch	Present Probably present Probably present
Tracking indicators	Number of plants in the affected area	
Rationale for selection	The species is included in the List of Rare and Threatened Species of Plants and Animals of the Republic of Kazakhstan and is subject to protection and monitoring. The species gravitates towards the foothills, where most of the production facilities managed by UMG are located. The presence of the species in the UMG impact area was confirmed	
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Physical impact of CS and GDS equipment. Emergencies	

[475] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.

[476] Fungi.su - site about mushrooms of Kazakhstan. Tulipa kolpakowskiana Regel (Tulipa kolpakowskiana Regel).

[477] Photo source: Tulipa kolpakowskiana Regel. Date: 09/02/2010 20:42. Added by: Naturalist.

Exposure mechanism	Deterioration of the vital state of plants, reduced resistance to diseases and pests as a result of air pollution. Increased risk of spring frost damage to flowers as a result of the calming effect leading to earlier flowering. Destruction of part of the population as a result of emergency situations (fires)

* hereinafter: "Present" - the species is noted in the documentation of enterprises (biodiversity monitoring reports, EIAs, etc.).

2. Apple tree Sievers[478] ,479 (,)480	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: UMG Almaty; Asian Gas Pipeline LLP: UMG for Almaty region; KazTransGas Aimak JSC: Almaty production branch	Present Probably present Probably present
Tracking indicators	The number of plants in the affected area. Plant yields	

[478] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.

[479] Fungi.su - site about mushrooms of Kazakhstan. Sivers apple tree (Malus sieversii).

[480] Photo source: Fungi.su - site about mushrooms of Kazakhstan. Sivers apple tree (Malus sieversii).

Rationale for selection	The species is included in the List of Rare and Threatened Species of Plants and Animals of the Republic of Kazakhstan and is subject to protection and monitoring. The species is the ancestor of the domestic apple tree and an important source of genetic diversity. The presence of the species in the UMG impact area was confirmed
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Physical impact of CS and GDS equipment. Emergencies
Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Increased risk of spring frost damage to flowers as a result of the calming effect leading to earlier flowering. Reduced tree yields due to flower blight or exposure to pollutants. Destruction of part of the population as a result of emergency situations (fires)

3. Rhubarb Wittrock[481,482]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: UMG Almaty; Asian Gas Pipeline LLP: UMG for Almaty region; KazTransGas Aimak JSC: Almaty production branch	Present Probably present Probably present
Tracking indicators	Number of plants in the affected area or projective cover in case of high abundance	
Rationale for selection	The species is included in the List of Rare and Threatened Species of Plants and Animals of the Republic of Kazakhstan and is subject to protection and monitoring. A food plant stressed by immoderate harvesting. The presence of the species in the UMG impact area was confirmed	
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere.	

[481] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.

[482] Photo source: Fungi.su - site about mushrooms of Kazakhstan. Wittrock's rhubarb (Rheum wittrockii Lundstr.).

	Emergencies
Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)

4. Saffron alatawa[483],[484]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: UMG Almaty; Asian Gas Pipeline LLP: UMG for Almaty region; KazTransGas Aimak JSC: Almaty	Present Probably present

[483] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.

[484] Photo source: Fungi.su - site about mushrooms of Kazakhstan. Saffron alatavicus, Saffron alatau, Saffron alatava, Crocus alatavicus, Crocus alatavicus (Crocus alatavicus Regel & Semenov(w)-Tjan-Schansky, V. P.).

	production branch	Probably present
Tracking indicators	Number of plants in the affected area	
Rationale for selection	The species is included in the List of Rare and Threatened Species of Plants and Animals of the Republic of Kazakhstan and is subject to protection and monitoring. The species gravitates towards the foothills, where most of the production facilities managed by UMG are located. The presence of the species in the UMG impact area was confirmed	
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Physical impact of CS and GDS equipment. Emergencies	
Exposure mechanism	Deterioration of the vital state of plants, reduced resistance to diseases and pests as a result of air pollution. Increased risk of spring frost damage to flowers as a result of the calming effect leading to earlier flowering. Destruction of part of the population as a result of emergency situations (fires)	

5. Podmarenika turkestansky[485,486]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Shymkent UMG, Taraz UMG; Asian Gas Pipeline LLP: UMG for Zhambyl region, UMG for Turkestan region	Present Probably present
Tracking indicators	Projective coverage of plants in the affected area	
Rationale for selection	The species is endemic to the mountainous Tien-Shan country, but it is rather massive, which increases the chances of its presence in the zone of impact of enterprises. The presence of the species in the UMG impact area was confirmed	
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Emergencies	

[485] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of UGS "Poltoratskoye" UMG "Shymkent", 2022.

[486] Photo source: Galina Chulanova © 2013; taxon identified by Georgy Lazkov. Flowering plant. Kyrgyzstan, Issyk-Kul region, Grigorievskoe gorge. 08.08.2011 (Plantarium. Plant Identifier online - Galium turkestanicum Pobed. (family Rubiaceae) Podmarennika turkestanskyi).

Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)

6. Kaufmann's Tulip[487],[488]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Shymkent UMG, Taraz UMG; Asian Gas Pipeline LLP: UMG for Zhambyl region, UMG for Turkestan region; KazTransGas Aimak JSC: Shymkent Production Branch	Probably present Probably present Probably present
Tracking indicators	Number of plants in the affected area	

[487] Fungi.su - site about mushrooms of Kazakhstan. Kaufmann's tulip, Kaufmann's tulip, Tulipa kaufmanniana Regel.

[488] Photo source: Fungi.su - site about mushrooms of Kazakhstan. Kaufmann's tulip, Kaufmann's tulip, Tulipa kaufmanniana Regel.

Rationale for selection	The species is included in the List of rare and endangered species of plants and animals of the Republic of Kazakhstan and is subject to protection and monitoring. The area of the species includes the territory of operations of the SACs under consideration. The species gravitates towards the foothills, where most of the production facilities managed by UMG are located
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Emergencies
Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)

7. Tulip Alberta[489,490]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Shymkent UMG, Taraz UMG; Asian Gas Pipeline LLP: UMG for Zhambyl region, UMG for Turkestan region; KazTransGas Aimak JSC: Shymkent	Probably present Probably present

[489] Fungi.su - site about mushrooms of Kazakhstan. Tulip Alberta (Tulipa alberti Regel).

[490] Photo source: Fungi.su - site about mushrooms of Kazakhstan. Tulip of Alberta (Tulipa alberti Regel).

	Production Branch	Probably present
Tracking indicators	Number of plants in the affected area	
Rationale for selection	The species is included in the List of Rare and Threatened Species of Plants and Animals of the Republic of Kazakhstan and is subject to protection and monitoring. The area of the species includes the territory of activity of the enterprises under consideration. The species gravitates towards the foothills, where most of the production facilities managed by UMG are located	
Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Emergencies	
Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)	

8. Artemisia citvara[491] [492] [493](,)[494]	

Branches of subsidiaries and affiliates	Shymkent production branch of KazTransGas Aimak JSC	Present
Tracking indicators	Projective coverage of plants in the affected area	
Rationale for selection	Endemic of Turkestan region. The species is included in the List of Rare and Threatened Species of Plants and Animals of the Republic of Kazakhstan and is subject to protection and monitoring. Source of medicinal raw materials. The presence of the species in the UMG impact area was confirmed	

[491] Environmental Impact Assessment of production facilities of South Kazakhstan production branch of KazTransGas Aimak JSC, 2008.

[492] FGBU Central Scientific Agricultural Library. Artemisia cina cina Berg.

[493] Karomatov I. D., Ruzieva I. G. Prospects for the use of the medicinal plant wormwood citvarnaya // Biology and Integrative Medicine. - 2018. - № 9. - C. 102-109.

[494] Photo source: Evgeny Davkaev. Plant in loess semi-desert. South Kazakhstan, right bank of the dry channel of the river Shayan, north of the intersection with the M-32 motorway. 24.06.2010 (Plantarium. Plant Identifier online - Artemisia cina Berg ex Poljakov (family Asteraceae) Wormwood citvarnia).

Exposure factor	Emissions of gaseous and solid pollutants into the atmosphere. Emergencies
Exposure mechanism	Deterioration of plant vitality, reduced resistance to diseases and pests as a result of air pollution. Destruction of part of the population as a result of emergency situations (fires)

Table 2 4. Indicators of the state of fauna

1. Asian kecklik[495],[496]	

Branches of subsidiaries and affiliates	Intergas Central Asia LLP: Almaty UMG, Shymkent UMG; Asian Gas Pipeline LLP: UMG for Almaty region, UMG for Turkestan region; KazTransGas Aimak JSC: Almaty and Shymkent production branches	Present Probably present Probably present
Tracking indicators	Occurrence of individuals of the species in the affected area	
Rationale for selection	The species is an important element of the food base for birds of prey living in the affected area, included in the List of Rare and Threatened Species of	

[495] Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the state of biodiversity of GDS "Kaskelen" of UMG "Almaty", 2022.

[496] Photo source: Fungi.su - site about mushrooms of Kazakhstan. Keklik, rock partridge (Alectoris chukar). Chu-Ili mountains. Kazakhstan [14.04.2011]. Date: 16/04/2012 16:05. Added: arfey.

	Plants and Animals of the Republic of Kazakhstan. The presence of the species in the UMG impact area was confirmed
Exposure factor	Physical impact of CS and GDS equipment. Emergencies
Exposure mechanism	Displacement of a species from the area of exposure as a result of disturbance. Bird mortality, loss of nests, eggs and chicks as a result of emergencies

6.5.3 Indicators of the Company's response to biodiversity status

Biodiversity response indicators are categorised as financial (related to the financial aspects of biodiversity management) and non-financial (i.e. not directly dependent on financial indicators).

Table 25. List of biodiversity response indicators

Financial performance	Non-financial indicators
No instances of activities in natural World Heritage sites. No cases of violation of the PA's environmental regime. No cases of introduction of alien species due to the activities of subsidiaries and affiliates. No deviations of biodiversity impact index values from threshold values	No biodiversity-related fines and complaints biodiversity stakeholders. The volume of investments annually allocated for the implementation of biodiversity conservation measures does not decrease relative to the base year

Response indicators make it possible to take into account cases of negative impacts of subsidiaries and affiliates on biodiversity and ecosystems, as well as to assess the amount of investment in the implementation of biodiversity conservation measures (Figure 17).

Figure 17. Relationship between the values of response indicator groups and the state of biodiversity and ecosystems

* Not taking into account the impact of other factors that directly or indirectly affect the state of biodiversity and ecosystems, the area of impact of which affects the area of impact of S&A.

No incidents of activities in natural World Heritage sites (Non-financial response indicators)

In accordance with the indicator, SDCs should exclude projects and activities related to activities at World Heritage sites. This indicator should be taken into account when planning production

activities at the stage of environmental impact assessment (EIA) and/or as part of the development of project documentation and comprehensive engineering and environmental surveys in order to exclude activities at World Heritage sites.

Since one of the lines of the Asian Gas Pipeline passes through the territory or border of the Altyn-Yemel National Park, which is part of the transboundary World Natural Heritage site "Turanian Temperate Deserts"[497] , and the "Beineu - Shymkent" gas pipeline branch passes in close proximity to the transboundary World Natural Heritage site "Western Tien-Shan", which includes the territories of Aksu-Zhabagli Nature Reserve and Sairam-Ugam National Park[498] , these SACs do not meet the criteria of the indicator.

Current compliance with the indicator criteria. As the above-mentioned PAs are not included in the list of World Natural Heritage sites, the SACs currently meet the indicator criteria.

No incidents of violation of PA conservation regime (Non-financial response indicators)

Violation of the protection regime of specially protected natural areas is a criminal offence under Article 342 of the Criminal Code of the Republic of Kazakhstan dated 3 July 2014 No. 226-V. The activities of SDCs affect mainly the territories of state protected areas, the protection regime of which allows for the conduct of the economic activity in question subject to approval by the authorised bodies. Failure to comply with the terms of an environmental permit entails a fine in accordance with Article 326 of the Code of Administrative Offences of the Republic of Kazakhstan No. 235-V dated 5 July 2014.

The highest category protected area affected by the activities of subsidiaries and affiliates is the Sairam-Ugam National Park, which is one of the sections of the UNESCO World Natural Heritage site "Western Tien-Shan"[499] ,[500] . Sections of gas pipelines of Intergas Central Asia JSC pass through the territory of the Syrdarya-Turkestan State Regional Natural Park. A section of the Bukhara-Ural gas trunkline is adjacent to the Mikhailovsky State Natural Zoological Reserve in Karabalyk district .[501]

Currently, gas production activities are affected by the South Kazakhstan State Natural Zone, on the border of which the Amangeldy field is located. In addition, the Pridorozhnoye gas field is planned to open in the central part of the zone in 2026.

The gas pipeline routes run through the following state protected areas :[502]

- Arys and Karatau;
- South Kazakhstan;
- Kenderly-Kayasanskaya.

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497 Cold Winter Deserts of Turan.

498 Western Tien-Shan.

499 National Atlas of the Republic of Kazakhstan, 2006.

500 National Atlas of the Republic of Kazakhstan, 2006.

501 INTEGRATED Annual Report of JSC "NC "QazaqGaz", 2022.

502 National Atlas of the Republic of Kazakhstan, 2006.

Compliance with the indicator criteria at present. A number of protected areas are currently affected by the activities of subsidiaries and affiliates (gas pipeline route through PAs, current and planned gas production), which may negatively affect the state of biodiversity and ecosystems of PAs.

No introduction of alien species due to the activities of SDCs (Non-financial response indicators)

The specifics of extraction, transportation and gas distribution activities do not involve cross-border transport of goods using water or land transport, which reduces the risk of infestations.

Compliance with indicator criteria at present. Currently, no invasive species have been identified by the CPs in natural communities. However, risks associated with the introduction of invasive species need to be monitored to meet the indicator criteria.

No deviations of the biodiversity impact index value from thresholds (Non-financial response indicators)

A biodiversity impact index is calculated for SACs according to the significant impact factors (Section VII .1).

Compliance with the indicator criteria at present. The biodiversity impact index values for Beineu-Shymkent Gas Pipeline LLP, equal to 1.01, and for QazaqGaz Exploration and Production LLP, equal to 1.04, for 2022 exceed the threshold value, which indicates an increase in the level of impact of S&A on biodiversity relative to 2021.

The index value for Intergas Central Asia JSC for 2022, equal to 0.56, does not exceed the threshold value, which indicates a decrease in the level of impact of subsidiaries and affiliates on biodiversity relative to 2021, which meets the indicator criterion.

Index values for KazTransGas Aimak JSC and Asian Gas Pipeline S&A in 2022 were not calculated.

See Section V.1 Biodiversity Impact Index for more details, calculation and analysis of the index values for SACs.

No biodiversity-related fines and stakeholder complaints on biodiversity issues (Financial Response Indicators)

For the period from 2018 to 2022, SDCs recorded six fines for excess emissions, as well as fines for late receipt of an environmental permit. All fines were paid on time .[503]

Compliance with the indicator criteria at present. There is currently no data on the penalties imposed on subsidiaries and affiliates related specifically to biodiversity impacts. However, in order to meet the indicator criteria, S/As need to strive for zero negative impacts on biodiversity and no complaints from stakeholders.

The volume of investments annually allocated for implementation of biodiversity conservation measures does not decrease relative to the base year (Financial Response Indicators)

The Company allocated 7% more than in 2021 and almost twice as much as in 2020 for the implementation of environmental protection measures in 2022. This amount paid for, among other things, research work on the impact of Intergas Central Asia JSC production facilities on the state of biodiversity.

[503] INTEGRATED Annual Report of JSC "NC "QazaqGaz", 2022.

In addition, in 2022, the Company has allocated funds for land remediation and abatement of contamination by biotechnological methods.

Other significant environmental expenditures are capital investments in environmental protection activities, payment for HBOC (negative environmental impact), compensation for damage caused by violation of environmental legislation, payment of fines for negative environmental impact .[504]

Current compliance with the indicator criteria. Currently, the volume of investments annually allocated to biodiversity conservation measures is increasing year by year, which meets the indicator criteria.

[504] INTEGRATED Annual Report of JSC "NC "QazaqGaz", 2022.

6.6. General recommendations for organising a system of monitoring of subsidiaries and affiliates' activities in the area of biodiversity conservation based on the selected indicators

The purpose of biodiversity monitoring conducted by subsidiaries and affiliates is to provide enterprises and all stakeholders with information on the condition and pollution of ecosystem components in the zone of impact of economic activity facilities, which is necessary for:

- prevention of negative impacts of economic activities on biodiversity and elimination of their consequences;
- implementation of activities on conservation, sustainable use and restoration of biodiversity.

The main objectives of corporate monitoring of the state of biodiversity include:

- monitoring of the state and changes in all components of the ecosystem in the zone of impact of production facilities that have a negative impact on fauna and flora and their habitat;
- analysing, evaluating the results of observations and planning environmental protection measures based on them;
- forecast of changes in the state of the main components of the ecosystem in the region of presence;
- development of proposals and measures to reduce and prevent negative impacts on biodiversity.

Monitoring of **biodiversity status indicators** requires initial field studies of the flora and fauna of the impact area. The study of vegetation is based on identification of the specifics of vegetation cover and flora, assessment of the dynamics of their development, including changes in floristic composition, structure and composition of plant communities and plant populations. The study of fauna is based on assessments of changes in the species composition of animals, changes in their numbers, etc.

Monitoring of biodiversity status indicators also includes assessment of the status and population dynamics of taxa in need of protection and listed on the List of Rare and Threatened Species of Plants and Animals. Initial surveys should be organised using a route method with the maximum possible coverage of existing communities and habitats in the area of impact.

Monitoring takes into account current vital signs of species indicators of biodiversity status (abundance, vital state, etc.). Since the purpose of monitoring is to identify long-term directional trends (changes in the boundaries of plant communities, species richness and composition of floras and faunas under the impact of anthropogenic load), the most optimal monitoring period is once every three years , .[505][506]

For QazaqGaz Exploration and Production LLP, an annual calculation of the NDVI index is also carried out using Sentinel Hub images, which allows assessing the type and vital state of the vegetation cover of

[505] Stishov M. S., Troitskaya N. I. Organisation of environmental monitoring in specially protected natural areas // Methodological recommendations. MOSCOW: WWF. - 2017.

[506] Nadokhovskaya G. A. A., Shepeleva L. F. Organisation of long-term local monitoring of vegetation cover of territories of gas and gas condensate fields of Western Siberia // Krylovia. Siberian Botanical Journal. - 2000. - T. 2. - № 1. - C. 123-128.

the study area. The index is used to identify the ratio of disturbed and undisturbed areas in the zone of impact of S&A.

Monitoring of **biodiversity response** indicators includes the collection of data for SACs at annual intervals.

Data for the calculation of the **biodiversity impact index is** collected on the basis of the Company's environmental documentation (forms 2TP-air, 2TP-water, 2TP-waste, 2TP-reclamation, IEC).

Activities within the framework of the monitoring system of subsidiaries and affiliates' activities in the field of biodiversity conservation The activities within the monitoring system of subsidiaries and affiliates in the field of biodiversity conservation with indication of responsible persons are presented in Table 24.

Table 26. Measures of the system for monitoring the activities of subsidiaries and affiliates in the area of biodiversity conservation

№	Monitoring activity	Description of the event		Purpose of the event	SUBSIDIARIES AND AFFILIATES	Responsible for implementation
1	Monitoring of biodiversity status indicators (once every three years)	For species whose presence in the area of impact of the FMU has been confirmed: Assessment of the status of indicator species within the boundaries of the impact zone of the enterprises' production facilities: for plant life: the number of plants in the affected area (or projective cover in the case of high abundance); plant yield (for fruit plants); for the animal kingdom: occurrence of individuals of the species (or traces of its presence) in the area of impact (for species whose presence in the area of impact is of short duration), the number of species permanently present in the area (for species whose long-term presence in the area of impact has been confirmed).	Plant world Kolpakowski's tulip Sivers apple tree Rhubarb Wittrock Saffron alatawa Podmarennika turkestanskyi Tulip Borschova White Earth Wormwood Eremurus indera Caspian onion Sogdian tulip Schrenk's tulip Peach-leaved bell Hybrid clematis Animal world	Controlling the impact of S&A on biological species	Intergas Central Asia LLP	Procurement of services from a contracting organisation

		Determination of critical habitat integrity (CHI) of indicator species: determination of the total area of each category of ITCMO; KVMO integrity assessment; displaying data on a cartographic basis. The report on monitoring of the state of biodiversity on the list of indicators should contain: Terms of Reference for biodiversity monitoring works, approved by the authorised person of the Contractor's organisation; schedule of field and desk research; information on actual values of biodiversity indicators included in the List; results of biodiversity status assessment on the list of indicators	Asian puffin Steppe eagle Crested lark Jeyran Steppe turtle European bog turtle Whooper swan Strepeth			
			Plant world Lemann's Eminium		Asian Gas Pipeline LLP	
			Plant world Artemisia citvara		KazTransGas Aimak JSC	
2		For biological species whose presence in the area of impact of SACs is not confirmed: identification of biological species in the area of impact of the production facilities of the enterprises; if these species are present, the measures described in item 1 of this Table shall be implemented	Plant world Kaufmann's tulip Tulip Alberta Animal world White-bellied murrelet		Intergas Central Asia LLP	
			Plant world		Asian Gas	

			Kolpakowski's tulip Sivers apple tree Rhubarb Wittrock Saffron alatawa Podmarennika turkestanskyi Kaufmann's tulip Tulip Alberta Tulip Borschova White Earth Wormwood Eremurus indera Animal world Asian puffin		Pipeline LLP	
			Plant world Tulip Borschova White Earth Wormwood Eremurus indera Animal world Steppe eagle Crested lark		Beineu-Shymkent Gas Pipeline LLP	

			Jeyran Whooper swan			
			Plant world Caspian onion Sogdian tulip Schrenk's tulip (fragrant) Peach-leaved bell Hybrid clematis Tulip Borschova Greig's Tulip Kolpakowski's tulip Sivers apple tree Rhubarb Wittrock Saffron alatawa Kaufmann's tulip Tulip Alberta Animal world Asian puffin Steppe eagle		KazTransGas Aimak JSC	

			Whooper swan Strepeth Whooping crane Steppe turtle White-bellied murrelet Snakehead Baloban Crested lark Jeyran			
3		calculation of NDVI index using Sentinel Hub images during the growing season for the SAC territory (April to June); analysing the index value and identifying the causes of vegetation degradation; identification of the dynamics of changes in the index values		Controlling the impact of S&A on vegetation in the area affected by industrial activities	QazaqGaz Exploration and Production LLP	As part of the EMS
4	Monitoring of biodiversity response indicators biodiversity	Capture data for further analyses of biodiversity response indicator values: number of cases of activities in World Natural Heritage sites; number of cases of violation of the environmental regime of protected areas; number of cases of introduction of alien species due to the activities of SDCs;		Control of actions taken by S/As within the framework of activities on biodiversity	Intergas Central Asia LLP Asian Gas Pipeline LLP	As part of the EMS

	(annually)	deviation of the biodiversity impact index value from the threshold values; number of fines related to damage to biodiversity, as well as the absence of stakeholder complaints on biodiversity issues; volume of investments annually allocated for the implementation of biodiversity conservation measures	and ecosystems conservation, including decision-making, as well as implementation of measures and their financing	Intergas Central Asia LLP Asian Gas Pipeline LLP Beineu-Shymkent Gas Pipeline LLP	
5	Calculation of biodiversity impact index (annually)	Collect data on the components included in the calculation of the index: atmospheric air (volume of pollutant emissions into the atmosphere, volume of methane leaks into the atmosphere); land use (area of disturbed lands as of the end of the year, area of reclaimed lands); physical impact (noise, radiation)	Controlling the impact of S&A in the area of impact on environmental components that have a habitat-forming function for biological species	QazaqGaz Exploration and Production LLP	As part of EMS based on environmental documentation
		Collect data on the components included in the calculation of the index: atmospheric air (volume of pollutant emissions into the atmosphere, volume of methane leaks into the atmosphere); water resources (water intake); land use (area of reclaimed land)		JSC Intergas Central Asia	
		Collect data on the components included in the calculation of the index: atmospheric air (volume of pollutant emissions into the atmosphere);		Beineu-Shymkent Gas Pipeline LLP	

		land use (area of reclaimed land)			
		Collect data on the components included in the calculation of the index: atmospheric air (volume of pollutant emissions into the atmosphere)		Asian Gas Pipeline S&A KazTransGas Aimak Subsidiary and affiliate	
6	Monitoring of invasive plant and animal species (once every three years)	Assessment of the impact of S&A activities on biodiversity based on monitoring data on invasive plant and animal species: the number of invasive plant species in the affected area (or projective cover in the case of high abundance); The occurrence of invasive species individuals (or traces of their presence) in the area of impact (for species whose presence in the area of impact is of short duration); Number of individuals of invasive species permanently present in the area (for species whose long-term presence in the area of impact has been confirmed)	Controlling the impact of S&A on biodiversity	Intergas Central Asia LLP Asian Gas Pipeline LLP Intergas Central Asia LLP Asian Gas Pipeline LLP Beineu-Shymkent Gas Pipeline LLP	Procurement of services from a contracting organisation

6.7. Key findings

The Company's production facilities are located in 13 out of 17 regions of the Republic of Kazakhstan, in all natural zones of the country - from forest-steppes and steppes to mountain ecosystems. In this regard, the biodiversity impact assessment was carried out at 2 levels:

- directly in the zone of impact of the enterprise (usually coincides with the SPZ);
- at the ecosystem level in order to get a full understanding of the Company's impacts on biodiversity and how to minimise them (steppe and forest-steppe, desert and semi-desert, mountain ecosystem).

Assessment of potential impact on biodiversity was carried out on the basis of impact factors and their influence in the context of three types of ecosystems - mountain, semi-desert and desert, steppe and forest-steppe, due to their landscape, geographical differences and representation of the Company's facilities in these zones. Further, depending on the location of subsidiaries and affiliates of JSC "NC "QazaqGaz" in different types of ecosystems, the key business areas of the Company's activities and the specifics of the factors of impact on biodiversity and their influence in the context of the areas were identified:

1. Upstream for which the key impacts on biodiversity are:
   - Disturbance and removal of land with subsequent destruction of land cover resulting in destruction of plant habitats (e.g. Lemann's Eminium, Schrenk's Tavolgocetum, etc.);
   - Physical impact (noise, radiation) resulting in the displacement of noise-sensitive animal species from the area of operation (e.g. White-bellied Murrelet, Crested Lark, etc.);
   - Contamination of soil cover with combustion products of fuel, fuels and lubricants and petroleum products, resulting in disruption of access to food and water sources for plants and animals, as well as their ingestion by plants and animals (e.g., Lemann's Eminium, etc.).
2. Mainline gas transmission and distribution*, for which the key impacts on biodiversity are:
   - Emissions of pollutants into the atmosphere resulting in impediment of photosynthesis process due to dust particles settling on plant leaves (e.g. Kolpakowski's Tulip, Sievers apple tree);
   - Physical impacts (noise, thermal radiation) resulting in displacement of noise-sensitive animal species from the area of operation (e.g. White-bellied Murrelet, Crested Lark, etc.) and increased sensitivity to frost caused by the warming effect of MG (e.g. Saffron alatava, Sivers Apple, etc.).

7. Records

7.1. There are no records in this documented Programme.

8. Revise, amend, store and distribute .

8.1. Revision, amendment, storage and distribution of this Programme shall be carried out in accordance with the requirements of documented procedure DP-02 "Document Management".

8.2 The "original" hard copy of this Programme shall be executed and kept in the IMS SWPPP of the Company.

8.3 A scanned version of this Programme shall be posted on the Company's and SDCs' internet portal.

Appendices I

Appendix 1.

General list of species included in the List of rare, threatened and endangered species of plants and animals that may be present in the area of operations of the Company's gas production enterprises

Table 1: General list of plant species of steppe and forest-steppe zones included in the List of rare, threatened and endangered plant and animal species that may be present in the area of operation of the Company's gas production facilities

№	Species name	Latin name	Category	Present in the area of exposure	Likelihood of being present in the affected area ,[507][508][509]
1	Schrenk's tulip	Tulipa shrenkii	II. Species in decline	+	Occurs as part of steppe and desert communities on limestone and chalk outcrops from lowlands to foothills. Uralsk UMG territory
2	Chalk mirena	Rubia cretacea	II. Species in decline		Slopes of chalk hills, in ravines

"+" - presence confirmed by in-situ studies or other documentation.

Table 2. General list of animal species of the steppe and forest-steppe zone included in the List of rare, threatened and endangered species of plants and animals that may be present in the area of operations of the Company's gas production enterprises

№	Species name	Latin name	Category	Present in the area of exposure	Probability of presence in the area of exposure
Ornithofauna					
1	Steppe eagle	Aquila rapax	V. Species recovering in abundance	+	Aktobe UMG territory. Uralsk UMG territory. Karaganda UMG

[507] Plantarium. Plant Identifier online.

[508] Fungi.su - site about mushrooms of Kazakhstan.

[509] KULYMBET K. et al. The current state of the cenopopulations of Adonis tianschanica (Adolf) Lipsch(Ranunculaceae) in Southeast Kazakhstan // Biodiversitas Journal of Biological Diversity. - 2023. - T. 24. - № 8.

					territory Deserts with flat o poorly criss-crossed relief character
2	Whooper swan	Cygnus cygnus	II. Species in decline	+	Aktobe UMG territory. Uralsk UMG territory. Large and deep lakes with well-developed emergent vegetation
3	Curly pelican	Pelecanus crispus	II. Species in decline	+	On the fly. Uralsk UMG territory
4	Savka	Oxyura leucocephala	I. Endangered species	+	On the fly. Uralsk UMG territory
5	Bustard dragonfly	Tetrax tetrax	II. Species in decline	+	On the fly. Karaganda UMG territory
5	Bustard/jack.	Chlamiydotis undulata	II. Species in decline	+	Open steppe plains
6	Red-breasted Goose	Rufibrenta ruficollis	II. Species in decline		On the span
7	loaf	Plegadis falcinellus	II. Species in decline		On the span
8	Kolpica	Platalea leucorodia	II. Species in decline		On the span
9	Lesser White Heron	Egretta garzetta	III. Rare species		Extensive reed willow thickets along lakes, channels seashores
10	Sultanka	Porphurio porphyrio	II. Species in decline		On the span
Mammals					
1	Dressing	Vormela	III. Rare species		Dry steppes

		peregusna				alternating with clay plains
2	Pallas	Felis manul	III. Rare species throughout its range			Steppes in areas where rodents are abundant

"+" - presence confirmed by in-situ studies or other documentation.

Table 3: General list of plant species of the desert and semi-desert zone, listed List of rare, threatened and endangered plant and animal species that may be present in the area of the Company's operations*

№	Species name	Latin name	Category	Present in the area of exposure	Probability of presence in the area of exposure
Vascular plants					
1	Schrenk's tulip	Tulipa schrenkii (Liliaceae)	II. Species in decline	+	Occurs as part of steppe and desert communities on limestone and chalk outcrops from lowlands to foothills
2	Chalk mirena	Rubia cretacea (Rubiaceae)	Endemic	+	Grows on the slopes of chalk hills, in ravines
3	Artemisia citvara	Artemisia cina (Asteraceae	Endemic	+	Grows in large masses along river valleys, in desert plains and foothill areas
4	Berkara poplar	Populus berkarensis (Salicaceae	Endemic		Syrdarya Karatau and Talas Alatau foothills
5	Sisol poplar (turanga)	Populus pruinosa (Salicaceae	III. Rare species		Grows on sands and gravels
6	Zhuzgun sad	Calligonum triste (Polygonaceae			

"+" - presence confirmed by in-situ studies or other documentation.

Table 4: General list of animal species of the desert and semi-desert zone included in the List of rare, threatened and endangered species of plants and animals that may be present in the area of the Company's operations*

№	Species name	Latin name	Category	Present in the area of exposure	Probability of presence in the area of exposure
Ornithofauna					

1	Gyrfalcon	Chettusia gregaria	I. Endangered species	+	Virgin dry dry clay wormwood, wormwood-tipchak steppes with sparse vegetation and solonchak shoulders
2	Black-bellied murrelet	Pterocles orientalis	II. Species in decline	+	Sandy deserts, isolated sand massifs
3	Curly pelican	Pelecanus crispus	II. Species in decline	+	Natural and artificial water bodies with islands, spillways and systems of small lakes, extensive deltas
4	Whooping crane	Anthropoides virgo	V. Species recovering in abundance	+	Typchak-sooty and sagebrush-grass dry steppes with sparse herbaceous cover, rubbly and clay semi-deserts, solonchaks
5	Strepeth	Otis tetrax	II. Species in decline	+	Foothill steppes overgrown with chyum
6	Yellow heron	Ardeola ralloides	II. Species in decline	+	Extensive reed thickets of lakes, channels, floodplains of rivers with an inclusion of trees
7	White-bellied murrelet	Pterocles alchata	III. Rare species	+	Bumpy scattered sands, also away from the sands on hard clay soils, densely overgrown with boyalichum
8	Long-tailed Eagle	Haliaeetus leucoryphus	I. Endangered species	+	Water bodies with reed bays, river floodplains with riparian and poplar-willow forests, mountain rivers and lakes with rocky banks and coastal tree and shrub thickets
Mammals					

1	Saiga	Saiga tatarica Linnaeus	I. Endangered species	Migration of the Betpak-Dalinsk-Aryss group is possible	Slopes with rich herbaceous cereal vegetation
Ichthyofauna					
1	Pike-eyed grouper	Aspiolucius esocinus	I. Endangered species		Muddy water areas of rivers and canals. Inhabits flat areas of rivers and irrigation canals, reservoirs of the Amu Darya and Syr Darya river basins, but does not descend to their lower reaches

"+" - presence confirmed by in-situ studies or other documentation.

Table 5: General list of plant species of mountain ecosystems included in the List of rare, threatened and endangered plant and animal species that may be present in the area of operations of the Company's gas production enterprises

№	Species name	Latin name	Category	Present in the area of exposure*	Likelihood of being present in the affected area [510][511][512]
1	Tianshan spruce	Picea schrenkiana	III. Rare species	+	Steep mountain slopes, gorges
2	Sivers apple tree	Malus sieversii	I. Endangered species	+	On drier sunny slopes of southern exposure, mainly near mountain streams
3	Common apricot	Armeniaca vulgaris	III. Rare species	+	On southern stony and rubbly slopes, screes and cliffs
4	Rhubarb Wittrock	Rheum wittrockii	III. Rare species	+	On grassy and forested mountain slopes
5	Adonis golden	Adonis chrysocyathus.	III. Rare species	+	Mountain slopes, alpine meadows.
6	Adonis of Tianshan	Adonis tianschanica	III. Rare species	+	Slopes of mountains and gorges
7	Falconer's liverwort	Hepatica falconeri		+	In mountain forests, on rocky mountain slopes on karst limestones
8	Saffron alatau	Crocus	III. Rare species	+	On the loess

[510] Plantarium. Plant Identifier online.

[511] Fungi.su - site about mushrooms of Kazakhstan.

[512] KULYMBET K. et al. The current state of the cenopopulations of Adonis tianschanica (Adolf) Lipsch (Ranunculaceae) in Southeast Kazakhstan // Biodiversitas Journal of Biological Diversity. - 2023. - T. 24. - № 8.

		alatavicus			foothills
9	Kolpakowski's tulip	Tulipa kolpakowskiana	Rare narrowly endemic species	+	On clay and rubbly slopes in the foothills
10	Veronica of Alatau	Veronica alatavica	III. Rare species	+	On meadows and rubbly slopes in the subalpine belt

* *Presence confirmed by in-situ surveys or other documentation.*

Table 6: General list of animal species of mountain ecosystems included in the List of rare, threatened and endangered species of plants and animals that may be present in the area of operations of the Company's gas production enterprises

№	Species name	Latin name	Category	Present in the area of exposure*	Probability of presence in the area of exposure
Ornithofauna					
1	Black stork	Ciconia nigra	III. Rare species		Rocky mountain gorges, plain and mountain forests
2	Whooper swan	Cygnus cygnus	II. Species with declining abundance		Large and deep lakes with well-developed emergent vegetation
3	White-eyed blackbird	Aythya nyroca	I. Globally threatened species with drastic population declines		Deep lakes with reed beds and rich aquatic vegetation. Winters in the Ili River basin, on the lake Sorbulak near Almaty.
4	Osprey	Pandion haliaetus	I. Endangered species		Fish-rich water bodies with clear water and forested shores
5	Snakehead	Circaetus gallicus	II. Species in decline		Dry foothills, desert mountains, sandy deserts. In the Western Tien Shan, Dzungarian Alatau penetrates into the zone of deciduous forests
6	Dwarf eagle	Hieraaetus pennatus	III. A rare, little-studied bird		Forests of different types - riparian, mountain deciduous, less often coniferous. For hunting it often flies to steppe foothills, open shores of lakes and flies into populated areas (Almaty)
7	Berkut	Aquila heliaca	III. Rare species in decline		A combination of areas with woody

					vegetation with open steppe or desert spaces is mandatory
8	white-tailed eagle	Haliaeetus albicilla	II. A rare bird with declining numbers		Forested shores of water bodies
9	Bearded Man	Gypaetus barbatus	III. Rare species with low but stable abundance		Rocky Mountains
10	Vulture	Neophron percnopterus	III. Rare species in decline		Rocky areas of low desert mountains or dry foothills of large ridges
11	Kumai	Gyps himalayensis	IV. Rare, poorly studied species		Highlands above the upper limit of the forest belt
12	Baloban	Falco cherrug	I. Endangered species		Low xerophytic foothills of large ridges, chinks, river canyons
13	Shaheen	Falco pelegrinoides	I. Endangered species		Nests in dry, desert mountains, river canyons, cliffs and chinks
14	Peregrine Falcon	Falco peregrinus	I. Endangered species		Diverse habitats
15	Grey crane	Grus grus	III. A species that has been declining sharply in recent years		Nesting in wetlands of the Chu River basin, the middle reaches of the Ili River and the Central Tien-Shan
16	Whooping crane	Anthropoides virgo	V. Species recovering in abundance		Steppe areas of slopes and foothills
17	Drofa	Otis tarda	I. Endangered species		Plain steppe and desert areas of the foothills
18	Strepeth	Otis tetrax	II. A recently endangered species. The species is now beginning to increase in abundance		Foothill steppes overgrown with chia, steppe meadows in lake basins and along river floodplains
19	Jack	Chlamydotis undulata	II. Endangered species in some parts of its range, but in Kazakhstan still retains significant abundance		Deserted foothills of the ridges
20	Sickleclaw	Ibidorhyncha struthersii	III. Rare stenobiont, easily threatened with extinction if its		Pebble valleys of mountain rivers at an altitude of 2000-3000

			habitat is converted		m above sea level. Obligatory condition - presence of pebble islands
21	Black-bellied murrelet	Pterocles orientalis	III. Species in decline		The deserts of the foothills
22	Saja	Syrrhaptes paradoxus	IV. A species that has been declining in recent years		Semi-desert and desert zones from the Volga River to North-East China
23	Brown pigeon	Columba eversmanni	III. Narrow-areal endemic species		Desert lowlands or desert river valleys with riparian areas
24	Owl	Bubo bubo	II. Species with rapidly declining numbers		Eurytopic species inhabiting desert, steppe and mountain-taiga landscapes
25	Bluebird	Myophonus caeruleus	V. A recovered but very mosaically distributed stenobiont species		Mountain gorges and canyons, gorges and waterfalls in the altitude range 1200-2700 metres above sea level.
26	Large lentils	Carpodacus rubicilla	IV. Rare, unstudied, sporadically distributed species		In autumn and winter it moves to the foothills, where it stays among tree and shrub vegetation - in river riparian areas, forest belts, gardens and parks.
Mammals					
1	Asian broad-eared	Barbastella leucomelas	IV. Unstudied species		In the foothill zone of Zailiyskiy Alatau
2	Broad-eared folding sponge	Tadarida teniotis	III. Rare species		Occurs at the junction of Talas Alatau and Karatau in caves of deserted foothills
3	Menzbira's groundhog	Marmota menzbieri	II. Species with sharply decreasing abundance		Meadow, steppe and deserted slopes - from lower tiers to alpine meadows
4	Indian porcupine	Hystrix indica	IV. Rare, poorly studied species		Gravitates to the rugged mesorelief of foothill and low-mountain areas (shrubs, fruit forests)
5	Red wolf	Cuon alpinus	I. Species that have disappeared from the country's wild		Rocky gorges, subalpine and alpine meadows, syrtes, steppe and forested

					areas of the mountains
6	Tien Shan brown bear	Ursus arctos isabellinus	III. The range and abundance of the species are declining		Mountain coniferous and deciduous forests, sparse forests, shrub thickets, subalpine and alpine meadows, cliffs, stony screes
7	Stone marten	Martes foina	III. Not a particularly rare species, but declining in some areas		Occurs from the foothills to the alpine belt in all biotopes
8	Dressing	Vormela peregusna	III. The range and abundance of the species are declining		From deserted foothills to mountain steppes (up to 3000 m a.s.l.)
9	Central Asian river otter	Lutra lutra seistanica	II. Dramatically declining species		Upper reaches of the Ili River and its tributaries
10	Pallas	Felis manul	III. Rare species throughout its range		Stony deserted mountains, high-mountainous cheeses and steppes in areas with rodent abundance
11	Central Asian, or Turkestan lynx	Lynx lynx isabellinus	III. A rare subspecies of lynx		Coniferous and deciduous forests, shrub thickets - mainly within the forest and subalpine belts, although these individuals are also found in the alpine belt, as well as in foothills
12	Snow leopard	Uncia cuncia	III. Range and abundance are declining, possible reclassification to Category II		Rocky areas predominantly in the subalpine and alpine belts of the mountains
13	Turkmen kulan	Equus hemionus onager	II. The kulan, as a species, is internationally classified as a globally declining animal species		Willingly enters foothills and low mountains
14	Riparian red deer	Cervus elaphus bactrianus	I. Disappearing species		In 1981, acclimatised in Karachingil hunting farm, along the left bank of the middle course of the

					Ili river
15	Jeyran	Gazella subgutturosa	III. Declining species		Deserted communities in the Iliya Basin. Occurs in low dry mountains
16	Tianshan mountain sheep	Ovis ammon karelini	II. Numbers are declining		Smoothed low-snow steppe mountain slopes in the band from 200 to 4000 m above sea level
17	Karatau mountain sheep	Ovis ammon nigrimontana	I. Endemic of Kazakhstan, narrow-areal subspecies, numbers of which are rapidly decreasing. Endangered		Strongly indented rocky gorges, overgrown with bushes, in north-western part of the Karatau Range
Amphibians					
1	Semirechensk frog-tooth	Ranodon sibiricus	II. Species with declining range and abundance		In the headwaters of small mountain rivers and streams in coniferous forests with Tianshan spruce and in juniper forests
2	Danatine toad	Bufo danatensis	IV. Unstudied species.		They occur in a wide range of altitudes from 200 to 3200 metres above sea level and inhabit a variety of habitats
3	Siberian frog	Rana amurensis	II. Species with declining range and abundance		Floodplains of plain and mountain rivers with quiet flow in the altitude range of 300-2600 m above sea level
Reptiles					
1	The variegated roundworm	Phrynocephalus versicolor	III. Species occurring in a limited area		Only in the Ili Valley: rubbly clay plains and consolidated sands with sparse shrub vegetation
2	Yellowbelly	Pseudopus apodus	III. Rare species occurring in a limited area		Among mesophyll vegetation in river valleys, banks of water bodies, on grassy slopes, mainly in the northern part of the country.
3	Eye lizard	Eremias multiocellata	III. Species occurring in a limited area		Fixed slopes of the Tien Shan mountains
4	Red-banded stripe	Coluber	III. Rare, poorly		Common among

		rhodorhachis	studied species occurring in a limited area		rocks with screes, along ravines, precipices, in bushes and bushes
Ichthyofauna					
1	Ship (Aral and Ili populations)	Acipenser nudiventris	I. Endangered populations		During the feeding period - in Lake Balkhash, Kapshagai reservoir. During migration, juveniles' migration and wintering - in rivers
2	Aral whisker	Barbus brachycephalus brachycephalus brachycephalus	II. The typical passerine form appears to have disappeared and the thuewater (resident) form is declining everywhere		Currently, it is found in the Syrdarya River and its lower tributaries
3	Turkestan mustache	Barbus capito conocephalus.	II. A subspecies rapidly decreasing its numbers in the territory of Kazakhstan		Syrdarya river basin up to the lower reaches, including the Shardara reservoir, as well as river basins flowing from the south-western slopes of the Karatau range (Arys, Bugun, etc.) and the Shu river basin.
4	Iliya marinka (Iliya population)	Schizothorax argentatus pseudaksaiensis	I. Endemic, endangered or possibly already extinct population		Balkhash Lake (western part), Ili River
5	Balkhash perch (Balkhash-Ili population)	Perca schrenki	II. Population numbers have declined dramatically		Water bodies of the Balkhash-Iliysk basin: lakes, plain river reaches, old rivers, reservoirs, ponds
6	Chatkal podkamenchik	Cottus jaxartensis	IV. Understudied species		The basins of the lower right tributaries of the Syrdarya River: Arys, Angren, Badam, Pskem, Chatkal, Chirchik rivers, as well as the upper reaches of the Ters River in the Talas River basin

"+" - presence confirmed by in-situ studies or other documentation.

Appendix 2.

Description of specially protected areas according to CDP criteria

Sensitive areas of biodiversity	**Region of Kazakhstan**	**Title**	**Distance from the plant to sensitive areas**	**Production facilities of the Company**	**Description of the organisation's activities with protected areas**	**Presence of negative impacts on biodiversity sites**	**Measures to reduce environmental impact**	**Description of negative impacts on biodiversity**
Forest-steppes and steppes								
State Nature Reserve	Kostanay region, Karabalyk district	Mikhailovsky State Nature Reserve (zoological)	Crosses the area of impact of the enterprise	Intergas Central Asia JSC (UMG Kostanai)	No	No	No	No
	West Kazakhstan region, Zhangalinskiy district	Zhaltyrkul State Nature Reserve (zoological)	≈5 km	JSC Intergas Central Asia (UMG Uralsk, CS Dzhangala)	No	No	No	No
	West Kazakhstan Oblast, Burlin, Zelenovsky and Terektinsky districts	Kirsanovsky State Nature Reserve (complex)	≈10 km	JSC Intergas Central Asia (UMG Uralsk)	No	No	No	No
Key bird area	West Kazakhstan region, Dzhangalinskiy district	Kushum Lakes	≈5 km	JSC Intergas Central Asia (Dzhangalinskoye LPU MG)	No	No	No	No
	Aktobe region, Mugalzhar district	Mugodzhary	≈5 km	JSC Intergas Central Asia (UMG Aktobe,	No	No	No	No

				CS Taldyk)				
Deserts and semi-deserts								
Protected area	Zhambyl Oblast, Sarysu and Shuisky districts; Kyzylorda oblast, Zhanakorgan district; Turkestan oblast, Arys, Suzak, Saryagash, Ordabasinsk districts	South Kazakhstan State Protected Area	≈40 km	QazaqGaz Exploration and Production LLP (Amangeldy field)	No	No	No	No
	Zhambyl Oblast, Sarysu and Shuisky districts; Kyzylorda oblast, Zhanakorgan district; Turkestan oblast, Arys, Suzak, Saryagash, Ordabasinsk districts	South Kazakhstan State Protected Area	Crosses the area of impact of the enterprise	Beineu-Shymkent Gas Pipeline LLP (Shornak CS)	No	No	No	No

	Zhambyl Oblast, Sarysu and Shuisky districts; Kyzylorda oblast, Zhanakorgan district; Turkestan oblast, Arys, Suzak, Saryagash, Ordabasinsk districts	South Kazakhstan State Protected Area	≈2 km	Asian Gas Pipeline LLP (SCS-1)	No	No	No	No
	Atyrau, Mangistau oblasts Water area of the northern part of the Caspian Sea with the deltas of the Ural and Kigach rivers	State protected area in the northern part of the Caspian Sea	≈50 km	JSC Intergas Central Asia (Redutskoye LPU MG, Tayman industrial site)	No	No	No	No
	Mangistau oblast, Karakiyanskiy district	Kenderli-Kayasan State Protected Area	≈10 km (stationary source). Crosses the area affected by the gas pipeline	JSC Intergas Central Asia (UMG Aktau)	No	No	No	No

National Natural Park	Turkestan region, Arys, Otrar, Shardara districts	Arys and Karaktau State Protected Area	Crosses the area of impact of the enterprise	Asian Gas Pipeline LLP (CS-1)	No	No	Industrial emissions, atmospheric air at the SPZ boundary, wastewater, groundwater are monitored as part of the IEC in the first quarter of 2022	Comparison of the obtained data on air measurements with the established MPC norms [6] did not reveal any exceedances at SPZ KS-1. Actual pollutant concentrations at all measurement points were significantly lower than MPC. The analysis of process parameters at the KS-1 facility for the first quarter of 2022 showed that the equipment operated in normal mode. No emergency situations occurred. The results of observations over the state of

								environmental components in the I quarter of 2022, according to the industrial environmental control programme of Asiatic Gas Pipeline LLP, showed that the Company's production activities do not have a significant impact on the natural environment
Key bird area	Turkestan oblast, Arys district	Zadarya State Nature Reserve	≈35 km	Beineu-Shymkent Gas Pipeline LLP (Akbulak GIS)	No	No	No	No
	Turkestan region, Arys district	Zadarya State Nature Reserve	≈35 km	Asian Gas Pipeline LLP (SCS-2)	No	No	No	No
	Atyrau region, Makat district	Lower reaches of the Emba River	≈50 km	JSC Intergas Central Asia (Makatskoye LPU MG)	No	No	No	No
	Atyrau region, Zhylyoi district	Lower reaches of the Emba River	≈50 km	JSC Intergas Central Asia (Kulsarinskoye LPU MG)	No	No	No	No

	Atyrau region, Kurmangazy district	Kazakhstan part of the Volga Delta. Zhambai	≈3 km	JSC Intergas Central Asia (Akkolskoye LPU MG)	No	No	No	No
	Atyrau oblast, Makhambet district, Atyrau city	Ural Delta	≈50 km	JSC Intergas Central Asia (Redutskoye LPU MG)	No	No	No	No
	Mangistau oblast, Karakiyanskiy district	Kaunda Depression	≈5 km	JSC Intergas Central Asia (UMG Aktau)	No	No	No	No
	Mangistau oblast, Karakiyanskiy district	Basgurly-Jazgurly Depression	≈5 km	JSC Intergas Central Asia (UMG Aktau)	No	No	No	No
	Turkestan region	Tolebi" (Sairam-Ugam State National Nature Park)	≈50 km	JSC Intergas Central Asia (UMG Shymkent)	No	No	No	No
	Akmola region, Arshalyn district	Chardara Reservoir"	≈5 km	JSC Intergas Central Asia (Poltoratskoye LPU, Chinaz CS)	No	No	No	No
	Turkestan oblast, Turkestan and Otrar districts	Shoshkakol Lakes	≈5 km	JSC Intergas Central Asia (Akbulak LPU)	No	No	No	No
	Turkestan oblast, Turkestan and Otrar districts	Shoshkakol Lakes	≈5 km	Beineu-Shymkent Gas Pipeline LLP (Akbulak GIS)	No	No	No	No
	Mangistau region, Mangistau and	Western Chink of the Ustyurt Plateau	≈5 km	Beineu-Shymkent Gas Pipeline LLP (Beineu CS and	No	No	No	No

	Beineu districts			GIS)				
	Mangistau oblast, Beineu district	North-west chink of the Ustyurt Plateau	≈5 km	Beineu-Shymkent Gas Pipeline LLP (Beineu CS and GIS)	No	No	No	No
	Kyzylorda oblast, Aralsk district	Small Aral Sea	≈50 km	Beineu-Shymkent Gas Pipeline LLP (Saksaulsk CS)	No	No	No	No
Ramsar-listed wetland	Turkestan region, Arys, Otrar, Shardara districts	Arys and Karaktau State Protected Area	≈2 km	Asian Gas Pipeline LLP (CS-1, SCS-1)	No	No	No	No
	Turkestan region, Arys, Otrar, Shardara districts	Arys and Karaktau State Protected Area	≈50 km	Beineu-Shymkent Gas Pipeline LLP (Aksuat CS)	No	No	No	No
	Atyrau oblast, Makhambet district, Atyrau city	The Ural River Delta with the adjacent Caspian Sea coastline	≈50 km	JSC Intergas Central Asia (Redutskoye LPU MG)	No	No	No	No
	Kyzylorda oblast, Aralsk district	Small Aral Sea and the Syrdarya River delta	≈50 km	Beineu-Shymkent Gas Pipeline LLP (Saksaulsk CS)	No	No	No	No
	Kyzylorda oblast, Aralsk district	Small Aral Sea and the Syrdarya River delta	≈50 km	Beineu-Shymkent Gas Pipeline LLP (Aksuat CS)	No	No	No	No
Mountain ecosystems								

World Heritage Site	Turkestan oblast, Tulkubas, Tolebi, Baidibek and Kazygurt districts Zhambyl oblast, Zhualin district	Western Tien-Shan (Aksu-Zhabagli Reserve, Karatau Reserve, Sairam-Ugam National Park)	≈50 km	JSC Intergas Central Asia (UMG Shymkent)	No	No	No	No
	Turkestan oblast, Tulkubas, Tolebi, Baidibek and Kazygurt districts Zhambyl oblast, Zhualin district	Western Tien-Shan (Aksu-Zhabagli Reserve, Karatau Reserve, Sairam-Ugam National Park)	The area of influence crosses the protection zone (Sairam-Ugam National Park)	JSC Intergas Central Asia (Poltoratskoye LPU MG)	No	No	No	No
	Turkestan oblast, Tulkubas, Tolebi, Baidibek and Kazygurt districts Zhambyl oblast, Zhualin district	Western Tien-Shan (Aksu-Zhabagli Reserve, Karatau Reserve, Sairam-Ugam National Park)	≈15 km	JSC Intergas Central Asia (Akbulak LPU)	No	No	No	No
	Turkestan oblast, Tulkubas, Tolebi, Baidibek and Kazygurt districts Zhambyl oblast, Zhualin district	Western Tien-Shan (Aksu-Zhabagli Reserve, Karatau Reserve, Sairam-Ugam National Park)	The area of influence crosses the protection zone (Sairam-Ugam National Park)	Asian Gas Pipeline LLP (CS-2)	No	No	No	No
State Nature Reserve	Zhetysus oblast, Kerbulak and Panfilov districts	Cold deserts of Turan (Altyn-Emel National Park)	≈9 km	Asian Gas Pipeline LLP (SCS-8)	No	No	No	No

	Turkestan oblast, Tulkubas, Tolebi and Baidibek districts Zhambyl oblast, Zhualin district	Aksu-Zhabagli	10-20 kilometres	Asian Gas Pipeline LLP (CS-5)	No	No	No	No
National Natural Park	Zhetysus oblast, Talgar and Enbekshikazakh districts	Almaty	10-20 kilometres	Intergas Central Asia JSC (UMG Almaty)	No	No	No	No
	Zhetysus oblast, Talgar and Enbekshikazakh districts	Almaty	≈10 km	Asian Gas Pipeline LLP (KS-7, SKS-7)	No	No	No	No
	Almaty region, Kerbulak and Panfilov districts	Altyn-Emel	≈9 km	Asian Gas Pipeline LLP (SCS-8)	No	No	No	No
	Almaty region, Karasai, Talgar and Enbekshikazakh districts	Ile-Alatau	≈4 km	Intergas Central Asia JSC (UMG Almaty)	No	No	No	No
	Turkestan province, Kazygurt, Tolebi and Tulkubas districts	Sairam-Ugam	≈50 km	JSC Intergas Central Asia (UMG Shymkent)	No	No	No	No
	Turkestan province, Kazygurt, Tolebi and Tulkubas	Sairam-Ugam	Crosses the area of impact of the enterprise	JSC Intergas Central Asia (Poltoratskoye LPU MG)	No	No	No	No

	districts							
	Turkestan Oblast, Kazygurt, Tolebi and Tulkubas districts	Sairam-Ugam	≈15 km	JSC Intergas Central Asia (Akbulak LPU)	No	No	No	No
	Turkestan province, Kazygurt, Tolebi and Tulkubas districts	Sairam-Ugam	Crosses the area of impact of the enterprise	Asian Gas Pipeline LLP (CS-2)	No	No	No	No
State Nature Reserve	Almaty oblast, Yenbekshikazakh , Raiymbek and Uygur districts	Charyn	≈3 km	Asian Gas Pipeline LLP (SCS-8)	No	No	No	No
	Almaty region, Rayimbek, Talgar and Enbekshikazakh districts	Almaty	≈10 km	Intergas Central Asia JSC (UMG Almaty)	No	No	No	No
	Almaty oblast, Rayimbek, Talgar and Enbekshikazakh districts	Almaty	≈10 km	Asian Gas Pipeline LLP (KS-7, SKS-7)	No	No	No	No
	Turkestan Oblast, Tyulkubas, Baidibek districts	Boraldaisky	≈10 km	Asian Gas Pipeline LLP (CS-2 "Kereit")	No	No	No	No
	Almaty region, Uygur district	Verkhnekokoksu ysky	≈50 km	Asian Gas Pipeline LLP (CS-	No	No	No	No

				8)				
Natural Monument	Zhambyl oblast, Zhualyn district	Berikkara tract	40-50 kilometres	Asian Gas Pipeline LLP (CS-2 "Kereit")	No	No	No	No
	Zhetysus oblast, Kerbulak district	Singing dunes	10-20 kilometres	Asian Gas Pipeline LLP (CS-8)	No	No	No	No
	Almaty region, Uygur district	Charyn ash forest dacha	20-30 kilometres	Asian Gas Pipeline LLP (CS-8)	No	No	No	No
Key bird area	Almaty region, Yenbekshikazakh district	Chinturgen spruce forests	30-40 kilometres	Asian Gas Pipeline LLP (CS-7)	No	No	No	No
	Almaty region, Karasaysky district	Big Almaty Gorge	≈4 km	Intergas Central Asia JSC (UMG Almaty)	No	No	No	No
	Almaty region, Yenbekshikazakh and Rayimbek districts	Toraigyr Ridge	≈20 km	Asian Gas Pipeline LLP (KS-7, SKS-7)	No	No	No	No
	Almaty region, Yenbekshikazakh and Rayimbek districts	Toraigyr Ridge	≈10 km	Asian Gas Pipeline LLP (SCS-8)	No	No	No	No
	Almaty region, Uygur district	Altyn-Emel National Park,	≈9 km	Asian Gas Pipeline LLP (SCS-8)	No	No	No	No

Appendix 3.
Calculation of biodiversity impact index

Table 1. Calculation of the impact index of QazaqGaz Exploration and Production LLP on biodiversity

№	Component name	Unit of measurement	2021 (Base year)	2022 (Reporting year)	Comments	Source of information
1	Component: Atmospheric air			1.11		
1.1	Emissions of pollutants into the atmosphere	tonne	49.01	63.78		JSC NC QAZAQGAZ (UR vault itself)
1.2	Volume of methane leakage to the atmosphere	tonne	1.56	1.42		JSC NC QAZAQGAZ (UR vault itself)
3	Component: Physical impact			0.97	The disturbance factor is one of the significant impact factors on wildlife	
3.1	Noise impact	dB	80	80		
3.2	Radiation exposure	μSv/hour	0.13	0.13		
Biodiversity Impact Index (pressure indicators)				1.04		

No accidents were recorded in 2022, according to the provided working documentation. In case of future emergencies, we propose to take into account the accident impact factor as a correction factor to the main formula of the biodiversity impact index:

Emergency level	Loss of species* and ecosystem biodiversity**	Correction factors	Source of information
No emergency situations	Species and ecosystems are not affected	1	

Moderate impact	1) Most species persist without extinction - <10% (declining health). 2) Some changes in ecosystem connectivity, but basic ecosystem functions are maintained. 3) Moderate losses among rare and vulnerable species	1.4	https://cyberleninka.ru/article/n/pozhary-kak-faktor-utraty-bioraznoobraziya-i-funktsiy-lesnyh-ekosistem https://www.cbd.int/doc/publications/cbd-sustain-en.pdf https://www.un.org/ru/documents/decl_conv/conventions/biodiv.shtml
Significant impact	1) Significant losses (with the possibility of extinction of some species - 10-30%) in species diversity. 2) Significant disruptions in ecosystem connectivity, which may lead to deterioration of ecosystem services. 3) Significant losses among rare and vulnerable species.	1.7	https://cyberleninka.ru/article/n/pozhary-kak-faktor-utraty-bioraznoobraziya-i-funktsiy-lesnyh-ekosistem https://www.cbd.int/doc/publications/cbd-sustain-en.pdf https://www.un.org/ru/documents/decl_conv/conventions/biodiv.shtml
Critical impact	1) Critical losses (with the possibility of complete extinction of many species - >30%) in species diversity. 2) Serious disruption of ecosystem processes with the threat of compromising ecosystem integrity. 3) High risk of extinction for many rare and vulnerable species.	2	https://cyberleninka.ru/article/n/pozhary-kak-faktor-utraty-bioraznoobraziya-i-funktsiy-lesnyh-ekosistem https://www.cbd.int/doc/publications/cbd-sustain-en.pdf https://www.un.org/ru/documents/decl_conv/conventions/biodiv.shtml
** Estimation of the exact number of species lost in each of the emergency severity levels requires specific data and research in the context of the specific situation. ** Losses of species and ecosystem biodiversity are assumed to occur in the area of the potential emergency.			

Table 2. Calculation of Intergas Central Asia JSC impact index on biodiversity

№	Component name	Unit of measurement	2021 (Base year)	2022 (Reporting year)	Comments	Source of information
1	Component:			0.81		

	Atmospheric air					
1.1	Emissions of pollutants into the atmosphere	tonne	77,863	63,046		JSC NC QAZAQGAZ (UR vault itself)
1.2	Volume of methane leakage to the atmosphere	tonne	71,906	58,935		JSC NC QAZAQGAZ (UR vault itself)
2	Component: Land use			0.30		
2.1	Area of reclaimed land	Ga	158	417.63		JSC NC QAZAQGAZ (UR vault itself)
Biodiversity Impact Index				0.56		

Correction factor for disturbed lands 0.8

The adjustment factor was introduced because the Land Use component is an insignificant factor for the transport sector, but it was taken into account in the calculation of the biodiversity impact index.

No accidents were recorded in 2022, according to the provided working documentation. In case of future emergencies, we propose to take into account the accident impact factor as a correction factor to the main formula of the biodiversity impact index:

Emergency level	**Loss of species* and ecosystem biodiversity****	**Correction factors**	**Source of information**
No emergency situations	Species and ecosystems are not affected	1	
Moderate impact	1) Most species persist without extinction - <10% (declining health). 2) Some changes in ecosystem connectivity, but basic ecosystem functions are maintained. 3) Moderate losses among rare and vulnerable species	1.4	https://cyberleninka.ru/article/n/pozhary-kak-faktor-utraty-bioraznoobraziya-i-funktsiy-lesnyh-ekosistem https://www.cbd.int/doc/publications/cbd-sustain-en.pdf https://www.un.org/ru/documents/decl_conv/conventions/biodiv.shtml
Significant impact	1) Significant losses (with the possibility of extinction of some species - 10-30%) in species diversity. 2) Significant disruptions in ecosystem connectivity, which may lead to deterioration of ecosystem services.	1.7	https://cyberleninka.ru/article/n/pozhary-kak-faktor-utraty-bioraznoobraziya-i-funktsiy-lesnyh-ekosistem https://www.cbd.int/doc/publications/cbd-sustain-en.pdf https://www.un.org/ru/documents/decl_conv/conventions/biodiv.shtml

	3) Significant losses among rare and vulnerable species.		
Critical impact	1) Critical losses (with the possibility of complete extinction of many species - >30%) in species diversity . 2) Serious disruption of ecosystem processes with the threat of compromising ecosystem integrity. 3) High risk of extinction for many rare and vulnerable species.	2	https://cyberleninka.ru/article/n/pozhary-kak-faktor-utraty-bioraznoobraziya-i-funktsiy-lesnyh-ekosistem https://www.cbd.int/doc/publications/cbd-sustain-en.pdf https://www.un.org/ru/documents/decl_conv/conventions/biodiv.shtml
* Estimating the exact number of species lost in each degree of emergency requires specific data and research in the context of the particular situation. ** Losses of species and ecosystem biodiversity are assumed to occur in the area of the potential emergency.			

Table 3: Calculation of the index of impact of Beineu-Shymkent Gas Pipeline LLP on biodiversity

№	Component name	Unit of measurement	2021 (Base year)	2022 (Reporting year)	Comments	Source of information
1	Component: Atmospheric air			0.42		
1.1	Emissions of pollutants into the atmosphere	tonne	3,597	1,500		JSC NC QAZAQGAZ (UR vault itself)

2	Component: Land use			1.60		
2.1	Area of reclaimed land	Ga	12.30	0.01		JSC NC QAZAQGAZ (UR vault itself)
Biodiversity Impact Index				1.01		

Correction factor for disturbed lands 0.8

The adjustment factor was introduced because the Land Use component is an insignificant factor for the transport sector, but it was taken into account in the calculation of the biodiversity impact index.

No accidents were recorded in 2022, according to the provided working documentation. In case of future emergencies, we propose to take into account the accident impact factor as a correction factor to the main formula of the biodiversity impact index:

Emergency level	**Loss of species* and ecosystem biodiversity****	**Correction factors**	**Source of information**
No emergency situations	Species and ecosystems are not affected	1	
Moderate impact	1) Most species persist without extinction - <10% (declining health). 2) Some changes in ecosystem connectivity, but basic ecosystem functions are maintained. 3) Moderate losses among rare and vulnerable species	1.4	https://cyberleninka.ru/article/n/pozhary-kak-faktor-utraty-bioraznoobraziya-i-funktsiy-lesnyh-ekosistem https://www.cbd.int/doc/publications/cbd-sustain-en.pdf https://www.un.org/ru/documents/decl_conv/conventions/biodiv.shtml
Significant impact	1) Significant losses (with the possibility of extinction of some species - 10-30%) in species diversity. 2) Significant disruptions in ecosystem connectivity, which may lead to deterioration of ecosystem services. 3) Significant losses among rare and vulnerable species	1.7	https://cyberleninka.ru/article/n/pozhary-kak-faktor-utraty-bioraznoobraziya-i-funktsiy-lesnyh-ekosistem https://www.cbd.int/doc/publications/cbd-sustain-en.pdf https://www.un.org/ru/documents/decl_conv/conventions/biodiv.shtml
Critical impact	1) Critical losses (with the possibility of complete extinction of many species - >30%) in species diversity. 2) Serious disruption of ecosystem processes with the threat of compromising ecosystem integrity. 3) High risk of extinction for many rare and vulnerable species	2	https://cyberleninka.ru/article/n/pozhary-kak-faktor-utraty-bioraznoobraziya-i-funktsiy-lesnyh-ekosistem https://www.cbd.int/doc/publications/cbd-sustain-en.pdf https://www.un.org/ru/documents/decl_conv/conventions/biodiv.shtml

* Estimating the exact number of species lost in each degree of emergency requires specific data and research in the context of the particular situation.
** Losses of species and ecosystem biodiversity are assumed to occur in the area of the potential emergency.

Table 4. Summary calculation of the biodiversity impact index

№	Enterprise	Biodiversity Impact Index value (2022)	Commentary
1	Exploration and production QazaqGaz	1.04	
2	Intergas Central Asia	0.56	
3	Asian Gas Pipeline	-	Only one component, Atmospheric Air, has been identified for the Asian Gas Pipeline S&A, as there are no other components for which data are recorded
4	Beineu-Shymkent gas pipeline	1.01	

5	KazTransGas Aimak	-	Only one component - "Atmospheric air" - is allocated for "KazTransGas Aimak" S&A, as there are no other components for which data are recorded

Appendix 4.

Calculation of quantitative data for the preparation of a report on the impact on biodiversity of production facilities of the Company's SDCs

Table 1. Geography of NC QazaqGaz JSC activities and biodiversity (qualitative information)

№	Facilities of NC QazaqGaz JSC[513]	Location in relation to settlements [514]	Location in relation to oblasts and cities of the republics ana scale[515]	Location in relation to water bodies[516]	Location in relation to mountainous areas	Location near specially protected natural areas or critical habitats (up to 70	Location/crossing of enterprise facilities affecting SPNA territories[518]	Location/crossing of SDCs' production facilities affecting Ramsar IAPs[519]	Location/crossing of SDCs' production facilities affecting the territories of key ornithological territories	Presence of undisturbed areas[521]	Natural area[522]

[513] 1. https://qazaqgaz.kz/ru/karta-prisutstviya-ao-nk-qazaqgaz-na-territorii-kazahstan

[514] 1. https://qazaqgaz.kz/ru/karta-prisutstviya-ao-nk-qazaqgaz-na-territorii-kazahstan

[515] 1. https://qazaqgaz.kz/ru/karta-prisutstviya-ao-nk-qazaqgaz-na-territorii-kazahstan

[516] 1. EIA "Development of wells No. 137, 138, 139, 140, 141 of Amangeldy field", EIA Airakty field development project, 2021.

2. Construction of the main gas pipeline "Beineu - Bozoi - Shymkent". Correction 2. Volume XIII. Environmental Impact Assessment. BSGP-BD (2) -E-EP-RE-0001-000-0. Book 1 Part 1, 2015.

3. Conclusion № 01-0429/18 dated 30.10.2018 (positive) on the working project "Construction of compressor station "Saksaulsk" of the main gas pipeline "Beineu - Bozoi - Shymkent"

4. Conclusion № 01-0428/18 dated 30.10.2018 (positive) on the working project "Construction of compressor station "Aksuat" of the main gas pipeline "Beineu - Bozoi - Shymkent"

5. Conclusion № 01-0427/18 dated 30.10.2018 (positive) on the working project "Construction of compressor station "Shornak" of the main gas pipeline "Beineu - Bozoi - Shymkent".

6. Working project "Construction of Karaozek Compressor Station". Section "Environmental Protection". Book 5. ICA-BD-E-OT-RE-1005, 2016.

7. Project "Construction of compressor station 1A of main gas pipeline "Beineu - Bozoi - Shymkent". Section "Environmental Protection". Book 5. 063-01-19R-304-3-00-001-OOC, 2019.

8. Project "Environmental Impact Assessment (EIA)" of production facilities of South Kazakhstan production branch of KazTransGas Aimak JSC.

9. PEC reports of Asian Gas Pipeline LLP I, II, III quarters of 2022.

10. IEC programmes of Intergas Central Asia LLP I, II, III, IV quarters 2022.

11. PEC of Production Branches of "KazTransGasAymak" JSC I, II, III, IV quarters of 2022.

12. Regional gasification schemes up to 2030 NC QazaqGaz JSC.

						kilometres)[517]			**(KOT) in the vicinity of the subdivision**[520]		
Total	**55**	**55**	**-**	**19**	**14**	**21**	**5**	**3**	**20**	**21**	**-**
QazaqGaz Exploration and Production LLP											
1	Amangeldy field	165 km north of Taraz city	Zhambyl region			South Kazakhstan protected area	+			+	Deserts
2	Zharkum field	215 km north of Taraz city	Zhambyl region							+	Deserts
3	Ayrakty deposit	135 km north of Taraz city	Zhambyl region							+	Deserts

[518] 1. https://www.keybiodiversityareas.org/ [GIS Data]
2. https://whc.unesco.org/en/list/ [List of protected areas]
3. https://oopt.kz
[519] 1. https://www.keybiodiversityareas.org/sites/search
[521] 1. https://naturemap.earth/
[522] 1. https://ingeo.kz/?page_id=2346 [National Atlas of the Republic of Kazakhstan]
[517] 1. https://www.keybiodiversityareas.org/ [GIS Data]
2. https://whc.unesco.org/en/list/ [List of protected areas]
3. https://oopt.kz
[520] 1. https://www.acbk.kz/article/default/view?id=12

JSC Intergas Central Asia											
4	Makatskoye LPU MG	150 km north-east of Atyrau city, 2.3 km from Makat settlement	Atyrau region						≈50 km from the Lower Emba River COT	+	Semiderts
5	Kulsarinskoye LPU MG	160 km east of Atyrau and 1 km north of Kulsary. Kulsary	Atyrau region						≈50 km from the Lower Emba River COT	+	Semiderts
6	Akkolskoye LPU MG	225 km west of the city of Atyrau and 15 km north-west of the district centre of Atyrau. district centre of Ganyushkino settlement. Ganyushkino	Atyrau region						Borders with KOT "Kazakhstan part of the Volga Delta. Zhambai"	+	Semiderts

7	Redutskoye LPU MG	25 km north of Atyrau city and 2.8 km north-west of Redut settlement	Atyrau region			State protected area in the northern part of the Caspian Sea		≈50 km from the Ramsar WBU "The Ural River Delta with the adjacent Caspian Sea coast"	≈50 km from KOT "Ural Delta"		Semiderts
8	Tayman site	45 km south-east of Akkistau village	Atyrau region			State protected area in the northern part of the Caspian Sea				+	Semiderts
9	Inderskoe LPU MG	2.9 km in south-west direction from the settlement. "Inder"	Atyrau region							+	Semiderts
10	Yeltai" AGDS	0.7 km west of the gas pipeline (858.5 km of MG) and 4 km from Yeltai settlement	Atyrau region							+	Semiderts

11	UMG Aktau	within the city of Zhanaozen	Mangistau region			Kenderli-Kayasan State Protected Area	+		Borders with Kaunda Depression and Basgurly-Jazgurly Depression KOTs		Deserts
12	UMG Uralsk	within the city of Uralsk	West Kazakhstan Oblast			Budarinsky State Nature Reserve Kirsanovsky State Nature Reserve					Forest-steppes and steppes
13	Uralskoye LPU	18 km north-east of Uralsk city, near Dostyk and Makarovo settlements	West Kazakhstan Oblast								Forest-steppes and steppes
14	Chizhinskoe LPU	110 km south-west of Uralsk city, 2.5 km north-west of Chizha-1, 3 km south of Amangeldy village.	West Kazakhstan Oblast							+	Forest-steppes and steppes

15	Dzhangalinskoye LPU	177 km south-west of Uralsk, 1 km from Dzhangala settlement	West Kazakhstan Oblast						Bordering the Kushum Lakes COT	+	Forest-steppes and steppes
16	UMG Aktobe	Within Krasnooktyabrskoye, Shalkar	Aktobe region						Borders with KOT "Mugodzhary" (KS Taldyk)		Steppes
17	UMG Kostanai	Within the c. Boscol	Kostanay region			Mikhailovsky State Nature Reserve	+				Steppes
18	UMG Karaganda	Within Karaganda city limits	Karaganda region								Steppes
19	Taraz LPU	Within Taraz city limits	Zhambyl region			"Berikkara tract" state nature reserve					Mountain ecosystems
20	UMG Almaty	Within the boundaries of the village. Kaskelen	Almaty region		Zailiyskiy Alatau foothills	Almaty State Nature Reserve, Ile-Alatau State National Nature Park			≈4 km from KOT "Big Almaty Gorge"		Mountain ecosystems

21	UMG Shymkent	Within Shymkent city limits	Turkestan region	p. Talas		Sairam-Ugam State National Nature Park			≈50 km from KOT "Tolebi" (Sairam–Ugam National Park)		Deserts
22	Poltoratskoye LPU	700 m north-west of the village. Zhibek Zholy	Turkestan region			Sairam-Ugam State National Nature Park			Bordering the Chardara Reservoir KOT (CS Chinaz)	+	Deserts and semi-deserts
23	Akbulak LPU	10 km south-east of district centre of Aksu village. Aksu	Turkestan region			Zhambyl State nature reserve	-		Borders the KOT "Shoshkakol Lakes"		Deserts and semi-deserts
Beineu-Shymkent Gas Pipeline LLP											
26	COP and GIS Beineu	Within the boundaries of the village. Beineu	Mangistau region						Borders with the KOT "Western Chink of the Ustyurt Plateau" and "North-Western Chink of the Ustyurt Plateau"		Deserts and semi-deserts
27	KC and Gis Bozoi	Within the boundaries of the	Kyzylorda region	30 kilometres North							Deserts and semi-

		village. Bozoi		of the Aral Sea							deserts
28	KC Ustyurt	155 km east of Beineu village	Kyzylorda region	25 east km from the site (temporary watercourse)						+	Deserts and semi-deserts
29	KC Karaozek	40 km north-west of Kyzylorda city	Kyzylorda region	The CW is located at a distance of 30 km from the Syrdarya river bed		Toryngylsai State Nature Reserve					Deserts and semi-deserts
30	CS Saksaulsk	18 km south-west of the village of Saksaulsk	Kyzylorda region					≈50 km from Ramsar WBU "Small Aral Sea and Syrdarya River delta"	≈50 km from KOT "Small Aral Sea"	+	Deserts and semi-deserts
31	KC Axuat	2.5 km north of Aksuat village	Kyzylorda region	3.5 km from the Syrdarya River				≈50 km from the Ramsar WBU "Small Aral Sea and Syrdarya River Delta"	≈50 km from KOT "Small Aral Sea"	+	Deserts and semi-deserts

32	KC Shornak	25 km west of Turkestan city, 7 km west of Shornak village	Kyzylorda region	Abay reservoir on the Aktobe River 25 km north of the site		South Kazakhstan protected area					Deserts and semi-deserts
33	GIS Akbulak	20.3 west of Shymkent city, 450 m from Akbulak village	Turkestan region			Zadarya State Nature Reserve			Borders the Shoshkakol Lakes COT	+	Deserts and semi-deserts
Asian Gas Pipeline LLP											
34	KS1	12 km north-east of Alimtau settlement	Turkestan region			Arys and Karaktau State Natural Zone	+		Within the boundaries of KOT "Arys and Karaktau protected area"	+	Deserts
35	KS2	500 m south-east of Kokbulak village	Turkestan region		Talas Alatau foothills					+	Mountain ecosystems
36	KS4	Within the boundaries of the village. Zhaksylyk	Zhambyl region		Talas Alatau foothills						Mountain ecosystems
37	KS6	Within the boundaries of the	Almaty region		Zailiyskiy Alatau foothills	Zhusandala State Protected					Mountain ecosyste

		village. Shilibastau				Area					ms
38	KS7	Within the boundaries of the c. Masak	Almaty region	500 m east of the Shildik River	Zailiyskiy Alatau foothills	Almaty State Nature Reserve			≈20 km from KOT "Toraigyr Ridge"		Mountain ecosystems
39	SCS1	Within the boundaries of the village. Baslandy	Turkestan region	13 km west of the Syrdarya River		South Kazakhstan protected area			Borders with the Arys and Karaktau protected area KOT "Arys and Karaktau protected area"		Deserts
40	SCS2	1.5 km south-southeast of Akbulak village	Turkestan region			Zadarya State Nature Reserve					Deserts
41	SCS3	Within the boundaries of the village. Kurkureusu	Zhambyl region	in the vicinity of the Teris River	Talas Alatau foothills						Mountain ecosystems
42	SCS4	Within the limits of the village. Zhaksylyk	Zhambyl region		Foothills of Talas Alatau						Deserts and semi-deserts
43	SCS5	4.2 km east of D. Kunayev	Zhambyl region		Foothills of the Kyrgyz					+	Mountain ecosyste

		settlement			Range						ms
44	SCS6	5.8 km south-east of Shilibastau village	Almaty region		Zailiyskiy Alatau foothills					+	Mountain ecosystems
45	SKS7	Within the c. Ornek	Almaty region	p. Kaskelen	Zailiyskiy Alatau foothills	Almaty State Nature Reserve			≈20 km from KOT "Toraigyr Ridge"		Mountain ecosystems
46	SCS8	21 km west of Charyn village	Almaty region Zhetysu region	Near the Charyn River	Foothills of the Ketmen Ridge. Ketmen	Charyn State National Nature Park			≈9 km from KOT "Altyn-Emel National Park"	+	Mountain ecosystems
KazTransGas Aimak JSC											
47	Aktobe production branch	The territories are located within the boundaries of settlements	Aktobe region	p. Elek							Steppes
48	Almaty production branch	The territories are located within the boundaries of	Almaty region r. Almaty	p. Kaskelen	Zailiyskiy Alatau foothills						Mountain ecosystems

		settlements									
49	Astana production branch	The territories are located within the boundaries of settlements	Akmola region г. Astana	p. Nura							Steppes
50	Atyrau production branch	The territories are located within the boundaries of settlements	Atyrau region								Deserts
51	East Kazakhstan production branch	The territories are located within the boundaries of settlements	East Kazakhstan Oblast								Mountain ecosystems
52	Zhambyl production branch	The territories are located within the boundaries of settlements	Zhambyl region	p. Talas	Talas Alatau foothills						Deserts

53	West Kazakhstan Production Branch	The territories are located within the boundaries of settlements	West Kazakhstan Oblast	p. Zhaiyk River (Ural River)							Semi-deserts and deserts
54	Kostanay production branch	The territories are located within the boundaries of settlements	Kostanay region	p. Tobyl							Forest-steppes and steppes
55	Kyzylorda production branch	The territories are located within the boundaries of settlements	Kyzylorda region	p. Syrdarya							Deserts
56	Mangistau production branch	The territories are located within the boundaries of settlements	Mangistau region								Deserts
57	Shymkent production branch	The territories are located	Turkestan region	p. Arys	Talas Alatau foothills						Mountain ecosyste

		within the boundaries of settlements	г. Shymkent								ms

Table 2. QazaqGaz NC JSC geography and biodiversity (calculation)

№	Indicator name	Number of facilities in the category (Table 1)	Total facilities	Value, %
1	Share of NC QazaqGaz JSC facilities in anthropogenically transformed territories	34	55	62%
2	Share of NC QazaqGaz JSC facilities in close proximity to major rivers and other water bodies	19		35%
3	Share of NC QazaqGaz JSC facilities in close proximity to mountain ecosystems	14		25%
4	Share of QazaqGaz JSC facilities near protected areas or critical habitats (up to 70 km)	21		38%
5	Share of QazaqGaz NC JSC facilities affecting protected areas or critical habitats of flora and fauna species	5		9%
6	Share of NC QazaqGaz JSC facilities near WBU (up to 70 km)	3		5%
7	Share of NC QazaqGaz JSC facilities near KOT (up to 70 km)	20		36%
8	Share of NC QazaqGaz JSC facilities in intact areas	21		38%
9	Share of NC QazaqGaz JSC facilities in natural areas	55		100%
10	Steppes and/or forest-steppes	10		19%
11	Deserts and/or semi-deserts	30		55%
12	Mountain ecosystems	14		26%

Table 3. Distribution of NC QazaqGaz JSC facilities by regions of the Republic of Kazakhstan

№	Name of area	Number of facilities in the region (Table 1)	Total facilities	Value, %
1	Abay region	0	55	0%
2	Akmola region	1		2%
3	Aktobe region	2		4%
4	Almaty region	6		11%
5	Atyrau region	8		15%
6	East Kazakhstan Oblast	1		2%
7	Zhambyl region	9		16%
8	Zhetysu region	1		2%
9	West Kazakhstan Oblast	5		9%
10	Karaganda region	1		2%
11	Kostanay region	2		4%
12	Kyzylorda region	7		13%
13	Mangistau region	3		5%
14	Pavlodar region	0		0%
15	North Kazakhstan region	0		0%
16	Turkestan region	9		16%
17	Ulytau region	0		0%
	Share of NC QazaqGaz JSC facilities in the regions of the Republic of Kazakhstan	55		100%
	Number of regions where NC QazaqGaz JSC facilities are located*	13		

* Not including cities of republican scale

Table 4: Calculation of quantitative data for preparation of the report on the impact on biodiversity of the facilities of JSC "NC QazaqGaz" enterprises

Name of subsection	**Quantitative data**	**Source of information**	**Calculation**	**Unit of measurement**	**Commentary**
Geography of operations	62% of NC QazaqGaz JSC facilities are located in anthropogenically transformed territories	1. https://naturemap.earth/	62%	%	see the "Geography of activities" tab

Geography of operations	35% of NC QazaqGaz JSC facilities are located in close proximity to major rivers and other water bodies	1. EIA "Development of wells #137,138,139,140,141 of Amangeldy field" EIA Airakty Field Development Project, 2021 2. Construction of Beineu-Bozoi-Shymkent Gas Pipeline. Adjustment 2. Volume XIII. Environmental Impact Assessment. BSGP-BD (2)-E-EP-RE-0001-000-0. Book 1 Part 1, 2015. 3. Conclusion № 01-0429/18 dated 30.10.2018 (positive) on the working project "Construction of compressor station "Saksaulsk" of the main gas pipeline "Beineu - Bozoi - Shymkent" 4. Conclusion № 01-0428/18 dated 30.10.2018 (positive) on the working project "Construction of compressor station "Aksuat" of the main gas pipeline "Beineu - Bozoi - Shymkent" 5. Conclusion № 01-0427/18 dated 30.10.2018 (positive) on the working project "Construction of compressor station "Shornak" of the main gas pipeline "Beineu - Bozoi - Shymkent" 6. Working Project "Construction of Karaozek Compressor Station" Section "Environmental Protection" Book 5 ICA-BD-E-OT-RE-1005, 2016 7. Project "Construction of compressor station "1 A" of the main gas pipeline "Beineu-Bozoi-Shymkent"" Section "Environmental Protection" Book 5 063-01-01-19R-304-3-00-00-001-OT-RE, 2019 8. Project "Environmental Impact Assessment (EIA)" of production facilities of South Kazakhstan production branch of "KazTransGas Aimak" JSC. 9. PEC reports of Asian Gas Pipeline LLP 1, 2, 3 quarter of 2022. 10. Programmes of IEC of Intergas Central Asia LLP 1, 2, 3, 4 quarter 2022. 11. IEC programmes of Production Branches of "KazTransGasAymak" JSC 1, 2, 3, 4 quarter 2022. 12. Regional gasification schemes up to 2030 NC QazaqGaz JSC	35%	%	see the "Geography of activities" tab
Geography of operations	25% of NC QazaqGaz JSC facilities are located in close proximity to mountain ecosystems	https://ingeo.kz/?page_id=2346 [National Atlas of the Republic of Kazakhstan]	25%	%	see the "Geography of activities" tab
Geography of operations	38% of NC QazaqGaz JSC facilities are located near protected areas or	1. https://www.keybiodiversityareas.org/ [GIS Data] 2. https://whc.unesco.org/en/list/ [List of protected areas] 3. https://oopt.kz	38%	%	see the "Geography of

	critical habitats (up to 70 km)				activities" tab
Geography of operations	9% of QazaqGaz's facilities affect protected areas or habitats of protected species of flora and fauna	1. https://www.keybiodiversityareas.org/ [GIS Data] 2. https://whc.unesco.org/en/list/ [List of protected areas] 3. https://oopt.kz	9%	%	see the "Geography of activities" tab
Geography of operations	20% of NC QazaqGaz JSC's facilities are located near the WBU	1. https://www.keybiodiversityareas.org/sites/search	5%	%	see the "Geography of activities" tab
Geography of operations	36% of NC QazaqGaz JSC's facilities are located near KOTs	1. https://www.acbk.kz/article/default/view?id=12	36%	%	see the "Geography of activities" tab
Geography of operations	38% of NC QazaqGaz JSC facilities are located in intact areas	1. https://ingeo.kz/?page_id=2346 [National Atlas of the Republic of Kazakhstan]	38%	%	see the "Geography of activities" tab
Geography of operations	19% of NC QazaqGaz JSC facilities are located in steppe and/or forest-steppe areas	1. https://ingeo.kz/?page_id=2346 [National Atlas of the Republic of Kazakhstan]	19%	%	see the "Geography of activities" tab
	55% of NC QazaqGaz JSC facilities are located on the territory of deserts and/or semi-deserts		55%		
	26% of NC QazaqGaz JSC facilities are located on the territory of mountain ecosystems		26%		

Appendix 5.

Impact Factors, Environmental Aspects, Natural Areas and Biodiversity Description

Table 1. Impact Factors, Environmental Aspects, Natural Areas and Biodiversity Descriptions for Exploration and Production Case Study

№	Biodiversity Impact Factor	Environmental aspects	Natural area and description of biodiversity	Description of impact	Status indicators at the UMG level	Presence in the territory of influence	Indicator response	Location in the area of impact	Significance of the factor
1	Land disturbance and withdrawal during field operation, construction, well development and enterprise development	Technogenic changes in landscapes	1. Habitats of mammals (insectivores, rats, carnivores, ungulates and rodents), birds, amphibians and reptiles 2. Desert vegetation communities with the inclusion of semi-shrubs and shrubs and wormwood, shrubs, teresken, izene, rarely yerkek vegetation yu 3. Landscapes	1. Physical destruction of plants 2. habitat transformation	1. Lemann's Eminium	1. Present.	1. Reduction in the number of plants or the entire population 2. Deterioration of the vital state of plants	Areas of immediate location of wells and flare unit	Significant (factor affects a large number of biodiversity sites with high intensity but low frequency)
		Over-exploitation of natural resources using the company's infrastructure facilities							
		Withdrawal of land resources						Areas of direct construction, placement of process equipment, well development, road network and stub laying	
		Destruction of soil and vegetation cover							

			and soils: semi-fixed deeply dissected deeply dissected ridged and hilly sands of the Moyinkum desert. 4. Terrestrial animals: mammals (insectivores, rats, carnivores, hoofed and rodents), amphibians and reptiles						
2	Emissions of gaseous and solid pollutants into the atmosphere during operation of process equipment	Emissions of nitrogen oxides, carbon monoxide, sulphur dioxide during operation of boiler plants and reheating furnaces, hydrocarbons (except methane) during pumping of gas condensate mixture into	1. Terrestrial animals: mammals (insectivores, rats, carnivores, ungulates and rodents), amphibians and reptiles. 2. Desert vegetation communities with inclusion of semi-shrubs and shrubs and	1. Damage to habitat, water and food sources that plants and animals need to survive. 2. Occurrence of acid rain as a result of accumulation of pollutants in the atmosphere.	1. Lemann's Eminium	1. Present.	1. Deterioration of the vital state of plants: appearance or increase in the number of floroses and necroses, dead leaves, branches 2. Increase in cases of damage by fungi,	Within the SPZ (1000 m radius from the emission source - approximate area for Amangeldy m. Amangeldy m. is 55.8 km2, approximate area for Zharkum m. is 8 km2, approximate area for Amangeldy m. Zharkum is 8 km2, approximate area for m.	Significant (the factor consistently affects a large number of biodiversity sites)

		storage tanks and volatile organic compounds during methanol supply to plumes	wormwood, shrub, teresken, izene, rarely yerkek vegetation 3. Landscapes and soils: semifixed deeply dissected deeply dissected ridged and knobbly sands of the Moyinkum desert				bacteria, insect pests as a result of reduced defence functions of plants 3. Death of plants, reduction of their number, projective coverage	Aiyrakty is 7 km2)	
		Emissions of inorganic dust and soot from the operation of diesel generator sets, dusting of access roads and operation of process equipment							
3	Methane leaks during gas pumping, from vent plugs	Methane emissions from natural gas pumping and venting plugs	1. Terrestrial animals: mammals (insectivores, rats, carnivores, ungulates and rodents), amphibians and reptiles 2. Desert vegetation					Atmosphere	Significant (the factor consistently affects a large number of biodiversity sites)

			communities with inclusion of semi-shrubs and shrubs and wormwood, shrub, teresken, izenev, rarely yerkek vegetation.						
4	Water utilisation	Water intake	According to the documentation, there are no surface water bodies on the territory of the enterprise impact. There is no water intake from surface water bodies on the territory of the enterprise.					There is no water intake	Insignificant (no impact on biodiversity, as water intake is carried out only from underground wells, and water disposal ¾ artificial water body on the territory of the enterprise, created specifically for evaporation of wastewater).
		Wastewater disposal	Water is discharged to the evaporation pond at Amangeldy m. Amangeldy.					Evaporation pond at m. Amangeldy.	

5	Contamination of soil cover	Pollution of soil cover by fuel combustion products, Pollution of soil cover with fuel and lubricants and oil products as a result of spills	1. Landscapes and soils: semi-fixed deeply dissected deeply dissected ridged and knobby sands of the Moyinkum Desert 2. Desert vegetation 3. Soil fauna	1. Damage to habitat, water and food sources that plants and animals need to survive. 2. weakening of plants by ingestion of pollutants	1. Lemann's Eminium	1. Present.	1. Deterioration of the vital state of plants: appearance or increase in the number of floroses and necroses, dead leaves, branches 2. Increased incidence of damage by fungi, bacteria, insect pests as a result of reduced defence functions of plants 3. Death of plants, reduction of their number, projective coverage	Within the sanitary protection zone Within the boundaries of the enterprise	Significant (the factor contributes to the accumulation of pollutants in soils, which will subsequently affect other components of ecosystems, can affect in normal and abnormal mode)

6	Physical impact from the operation of motor vehicles, special machinery and stationary equipment, power lines and transformer substations	Noise exposure, vibration exposure, thermal radiation, electromagnetic radiation, radiation exposure	1. Habitats of mammals (insectivores, rats, carnivores, ungulates and rodents), birds, amphibians and reptiles 2. Terrestrial animals: mammals (insectivores, man-eaters, rats, carnivores, ungulates and rodents), amphibians and reptiles 3. 3. ornithofauna (more than 220 species in total, representing almost all existing bird families)	1. Displacement of animal species sensitive to noise and human presence from the territory	1. white-bellied murrelet 2. tufted lark	1. Probably* present 2. Probably* present	1. Reduction or extinction of sensitive animal species	Within the sanitary protection zone	Significant (the factor constantly affects a large number of biodiversity assets in a routine manner)

7	Disposal of solid industrial and domestic waste	Disposal of solid industrial (wiping material, including oily rags and scrap metal) and household waste (MSW)	There are no own waste disposal facilities, no impact is realised.					All household and industrial waste is removed by specialised organisations, no long-term disposal is carried out on the territory of the enterprises.	Insignificant (there is no impact of the factor, as the enterprises do not have their own waste disposal facilities)
8	Impact of associated objects	Impacts of outfall lines (plumes), interfield and trunk pipelines	1. Terrestrial animals: mammals (insectivores, rats, carnivores, ungulates and rodents), amphibians and reptiles 2 Ornithofauna (over 220 species in total, representing almost all existing bird families)	1. Creating obstacles to migration and resettlement	1. white-bellied murrelet 2. tufted lark	1. Probably* present 2. Probably* present	1. Reduction or extinction of sensitive animal species	- Outlet lines (loops) within the sanitary protection zone - Ayrakty-Zharkum-Amangeldy interfield gas pipeline - Access roads	Significant (the factor permanently affects large areas and many biodiversity sites, routinely and non-routinely (in the case of throwaway lines))

9	Emergencies	Well loop rupture, gas pipeline rupture, gas breakthrough through flange connection, gas condensate breakthrough, emergency fire at sites, leakage from storage tanks, wellhead fire	1. Habitats of mammals (insectivores, rats, carnivores, ungulates and rodents), birds, amphibians and reptiles. 2. Landscapes and soils: semifixed deeply dissected ridges and hilly sands of the Moyinkum Desert. 3. terrestrial animals: mammals (insectivores, rats, carnivores, ungulates and rodents), amphibians and reptiles.	1. Destruction of soil and vegetation cover, animal population as a result of fires 2. Obstruction of nutrient uptake due to changes in salt balance 3. weakening of plants due to ingestion of pollutants	1. Lemann's Eminium 2. white-bellied murrelet 3. tufted lark	1. Present 2. Probably present 3. Probably present	1. extinction of individuals or populations of species 2. Impeded reproduction through the destruction of offspring, eggs, seeds 3. Deterioration of the vital state of organisms	The area of possible impact of emergency situations related to depressurisation of pipelines, apparatus and installed fittings on the equipment includes the territory of the SPZ and the Airakty-Zharkum-Amangeldy gas pipeline right-of-way. Possible consequences of accidents: release of liquid and gaseous hydrocarbons into the atmosphere, formation of explosion and fire hazardous mixture	Significant (the factor affects a large number of biodiversity sites with high intensity in non-emergency situations)

Sources:
Environmental Protection Section to "Addendum to Group Technical Project for Drilling of Wells #139, #140, #141 at Amangeldy Field" Aktau, 2023 .
Report on research work "Conducting research work on the impact of production facilities of JSC "Intergas

Central Asia" on biodiversity conditions" UGS "Akyr-Tobe" UMG "Taraz", 2022

Notation:	
	Not applicable
Present	The presence of the species in the area of influence is noted in the documentation of QazaqGas Exploration and Production LLP
Probably present	The presence of the species in the area of influence is assumed on the basis of public data and biodiversity monitoring materials of Intergas Central Asia LLP for adjacent territories, but field confirmation is required.

Table 2. Impact Factors, Environmental Aspects, Natural Areas and Biodiversity Descriptions for the Mainline Transport Case Study

№	**Biodiversity Impact Factor**	**Environmental aspects**	**Natural area and description of biodiversity**			**Description of impact**	**Status indicators**			**Indicator response**	**Location in the area of impact**	**Significance of the factor**
			Mountains	Desert and semi-desert	Steppes, meadow steppes, dry-steppe zone, deserted steppes		Mountains	Desert and semi-desert	Steppes and forest-steppes			

			Intergas Central Asia LLP (UMG Almaty, Shymkent, Taraz) Asian Gas Pipeline LLP (UMG in Almaty, Zhambyl and Turkestan regions)* Beineu-Shymkent Gas Pipeline LLP (UMG in Turkestan region)* KazTransGas Aimak JSC* (Turkestan PF, Shymkent PF, Zhambylsk	Intergas Central Asia LLP (UMG Taraz, Shymkent, Aktau) Asian Gas Pipeline LLP (UMG in Turkestan region)* Beineu-Shymkent Gas Pipeline LLP (UMG for Mangystau, Kyzylorda, Turkestan oblast)*	Intergas Central Asia LLP (UMG Atyrau, Uralsk, Kostanai, Aktobe, Karaganda) Beineu-Shymkent Gas Pipeline LLP (UMG in Aktobe region)* KazTransGas Aimak JSC (West Kazakhstan PF, Aktobe PF, Kostanai PF,		The indicator is defined for the level of individual UMGs	Presence in the territory of influence	The indicator is defined for the level of individual UMGs	Presence in the territory of influence	The indicator is defined for the level of individual UMGs	Presence in the territory of influence			

			PF, Almaty PF, Zhetysu PF, East Kazakhstan PF)	KazTransGas Aimak JSC (Atyrau PF, Mangistau PF, Aktobe PF)*	Astana PF, Karaganda PF)										
1	Land disturbance and withdrawal during repair works on gas pipelines and operation of compressor and gas distribution stations	Technogenic changes in landscapes Overexploitation of natural resources using compression station infrastructure compressor stations	1. Landscape complexes: foothills and low-lying areas of the Tien Shan mountain side, soils: grey soils and grey-brown soils, chestnut soils. 2. Habitats of mammals (carnivores,	1. Landscapes and soils: grey-brown soils, sandy loamy and sandy soils, brown solonetz soils. 2. Habitats of mammals	1. Landscapes and soils: ordinary chernozems, southern chernozems, dark chestnut soils, chestnut soils, light chestnut soils. 2. Places of habitats									Within the boundaries of compressor stations, gas distribution stations and along gas pipelines during repair works	Insignificant (the factor affects rarely and short-term, small areas)

		Withdrawal of land resources in the process of renovation	ungulates, rodents), amphibians and reptiles, birds. 3. Vegetation: communities dominated by ephemeral and ephemeroid grasses, mixed grasses, herbage (based on sod grasses), woody-shrub vegetation in river gorges; including rare and endemic species of shrubs.	(ungulates, rodents, insectivores, man-eaters, carnivores), amphibians and reptiles, birds of the wetland complex 3. Vegetation: biyurgun, wormwood-biyurgun and wormwood-boyalych groups with	of mammals (insectivores, man-eaters, man-eaters, carnivores, parsnipedes, rodents and hares), amphibians and reptiles, birds (various species of migratory birds, endemics). 3. Vegetation: communities of										
		Destruction of soil and vegetation cover														

			4. Terrestrial animals: mammals (carnivores, ungulates, rodents), amphibians and reptiles	separate areas of sparse black sarsaul thickets (Turkestan oblast); sarzan communities with participation of annual saltwort (Mangystau oblast); white-earth-wormwood-teresken communities (Aktobeinsk oblast); complexes of	sandy sagebrush and lerchopobalds, cereal communities, grasses, marevae, complex flowers, etc. 4. Terrestrial animals: mammals (insectivores, rats, carnivores, carnivores, ungulates, rodents and hares), amphibi										

				shrub-wormwood, rank-shrub, saxaul-ephemeral and ephemeral-grass-saxaul associations (Kyzylorda oblast); 4. Terrestrial animals: mammals (hoofed, , rodents, insectivores, man-eaters, carnivores),	ans, reptiles, etc. 4.											

				amphibians and reptiles											
2	Emissions of gaseous and solid pollutants into the atmosphere as a result of hydrocarbon fuel combustion, gas venting and equipment operation	Emissions of nitrogen oxides, carbon monoxide, sulphur dioxide and volatile organic compounds from the operation of boiler houses	1. Habitats of mammals (carnivores, ungulates, rodents), amphibians and reptiles, birds. 2. Vegetation: communities dominated by ephemeral and ephemeroid grasses,	1. Habitats of mammals (ungulates, rodents, insectivores, rats, carnivores), amphibians and reptiles, birds of the wetland comple	1. Habitats of mammals (insectivores, man-eaters, man-eaters, carnivores, parsnipedes, rodents and hares), amphibians and	1. Inhibition of photosynthesis through the deposition of dust particles on leaves 2. weakening of plants due to the ingestion of airborne	UMG Almaty (ICA)* 1.Kolpakovsky's tulip 2. Apple tree Sivers 3. Rhubarb Vittok 4. Saffron alatava. * similarly for UMG	1. Present 2. Present 3. Present 4. Present	UMG Taraz (ICA)* 1.Borschov's Tulip 2. White earth wormwood 3. Eremurus indera * similarly for UMG for Turkesta	1. Present 2. Present 3. Present	UMG Atyrau (ICA)* 1. Caspian onion 2. Sogdian tulip 3. Steppe turtle * similarly for Atyrau production branch	1. Present 2. Present	1. Deterioration of the vital state of plants: appearance or increase in the number of floroses and necroses, dead leaves in, branch	Sanitary protection zone of enterprises	Significant (the factor consistently affects a large number of biodiversity sites)

		and standby power plants (diesel generators)	grasses, herbage (based on sod grasses), woody-shrub vegetation in river gorges; including rare and endemic species of shrubs. 3. terrestrial animals: mammals (carnivores, ungulates, rodents), amphibians and reptiles.	x 2. Vegetation: biyurgun, wormwood-biyurgun and wormwood-boyalych groups with separate areas of sparse black saksaul thickets (Turkestan oblast); sarzan communities with participation of	reptiles, birds (various species of migratory birds, endemics). 2. Vegetation: communities of sandy sagebrush and lerchopolyanniks, cereal communities, grasses, marestail, complex-flowered, etc. 3. Terrestri	pollutants mixed with air	for Almaty region (AGP), Almaty production branch (KTGA)		n oblast (AGP) and UMG for Kyzylorda, Turkestan oblast (GBS)		(KTGA)		es 2. Increased incidence of damage by fungi, bacteria, insect pests as a result of reduced defence functions of plants 3. Death of plants, reduction of their number, projecti		
		Inorganic dust and soot emissions from boiler houses and standby power plants (diesel generators) operation									UMG Uralsk 1. shrenka tulip	1. Present			
											UMG Aktobe (ICA)* 1. whooper swan * similar for Aktobe Oblast UMG (GBS), Aklubinsk Production Branch	1. Present			

				annual saltwort (Mangystau oblast); white-soil-wormwood-tereskencommunities (Aktobe oblast); complexes of shrub-wormwood, rank-bush, saxaul-ephemeral and ephemeral-grass-	al animals: mammals (insectivores, man-eaters, rats, carnivores, pairs of ungulates, rodents and hares), amphibians and reptiles.					(KTGA)		ve coverage		
		Emissions of hydrogen sulphide, natural mercaptan mixtures and hydrocarbon mixtures from bleed plugs and equipment plugs,				UMG Shymkent (ICA)* 1. Podmarennika turkestanskyi 2.Albert's Tulip 3.Kaufman's Tulip Shymkent Production Branch (KTGA)	1. Present 2. Probably present 3. Probably present	UMG Aktau (ICA)* 1. Steppe eagle 2. Crested Lark * similarly for UMG for Myngystau oblast (GBS), Mangystau	1. Present 2. Present	UMG Kostanai (ICA)* 1. Peach-leaved bellflower 2. hybrid clematis * similarly for Kostanay production branch (KTGA)	1. Present 2. Present			

		as well as from technical losses during repairs and loose fittings and connections		saxaul associations (Kyzylorda oblast); 3. terrestrial animals: mammals (ungulates, rodents, insectivores, man-eaters, carnivores), amphibians and reptiles.			1. Artemisia citvara 2.Albert's Tulip 3.Tulip Kaufmaon * similar for UMG for Zhambyl, Turkestan oblast (AGP) and UMG for Turkestan oblast (GBS)	1. Present 2. Probably present 3. Verovaticallly present	production branch (KTGA).		UMG Karaganda (ICA)* 1. Steppe eagle 2. Streptet 3. Schrenk's tulpa * similarly for Karaganda Production Branch (KTGA)	1. Present 2. Present 3. Probably inherent present		
									Kyzylorda Production Branch (KTGA) 1.Borshchov's tulip 2.Greig'	1. Probably present 2. Probably present	Zhezkazgan production branch 1. Zmeyad 2. Steppe eagle	1. Probably present 2. Probably present		

									s Tulip		Astana Production Branch 1. Shrenka tulip 2. Crane-tern	1. Probably present 2. Probably present				
3	Methane leaks due to gas venting, leaks due to loose equipment, repair works	Methane emissions from vent plugs and equipment plugs, as well as from technical losses during repairs and loose fittings and connections	1. Habitats of mammals (carnivores, ungulates, rodents), amphibians and reptiles, birds. 2. Vegetation: communities dominated by ephemeral and ephemeroid grasses, mixed grasses,	1. Habitats of mammals (ungulates, rodents, insectivores, rats, carnivores), amphibians and reptiles, birds of the wetland complex 2.	1. Habitats of mammals (insectivores, man-eaters, rats, carnivores, ungulates, rodents and hares), amphibians and reptiles, birds (various									Atmosphere	Significant (the factor consistently affects a large number of biodiversity sites)

			herbage (based on sod grasses), tree and shrub vegetation in river gorges; including rare and endemic species of shrubs. 3. terrestrial animals: mammals (carnivores, ungulates, rodents), amphibians and reptiles.	Vegetation : biyurgun, wormwood-biyurgun and wormwood-boyalych groups with separate areas of sparse black sarsaul thickets (Turkestan oblast); sarzan communities with participation of annual saltwort (Mangy	species of migratory birds, endemics). 2. Vegetation: sandwort and lerchopolyne communities, cereal communities, grasses, marevae, complex flowers, etc. 3. terrestrial animals: mammals (insectivores, man-										

				stau oblast); white-earth-wormwood-teresken communities (Aktobe oblast); complexes of shrub-wormwood, rank-shrub, saxaul-ephemeral and ephemeral-grass-saxaul associations (Kyzyl Orda oblast); 3. terrestri	eaters, rats, carnivores, parnivores, rodents and hares different), amphibians and reptiles.											

				al animals: mammals (ungulates, rodents, insectivores, man-eaters, carnivores), amphibians and reptiles.											
4	Use of water for production and household needs	Water withdrawal from surface water bodies	According to the documentation, there are no surface water	According to the documentation, there are no	According to the documentation, there are no surface									There is no water withdrawal from surface water sources	Insignificant (there is no impact of the factor

		Water discharge to surface water bodies	objects in the territory of UMG impact. There is no water intake from surface water bodies on the territory of the enterprises	surface water bodies in the territory of UMG impact. There is no water intake from surface water bodies on the territory of the enterprises	water objects in the territory of UMG impact. There is no water intake from surface water bodies on the territory of the enterprises									Evaporation ponds on the territory of enterprises	on biodiversity, as water intake is carried out only from underground wells, and water disposal ¾ artificial water bodies on the territory of the enterprise, created specifically for evaporation of wastewater).

5	Contamination of soil cover	Pollution of soil cover with oil products during spills of fuels and lubricants, cleaning of pipelines and units	1. landscape complexes: foothills and low-lying areas of the Tien Shan mountain side, soils: grey soils and grey-brown soils, chestnut soils	1. landscapes and soils: grey-brown soils, sandy loamy and sandy soils, brown solonetz soils	1. landscapes and soils: ordinary chernozems, southern chernozems, dark chestnut soils, chestnut soils, light chestnut soils									Within the boundaries of the enterprises	Significant (the factor contributes to the accumulation of pollutants in soils that will subsequently affect other components of ecosystems)
		Pollution of soil cover as a result of deposition of pollutants entering the atmosphere from compressor												Sanitary protection zone of enterprises	

		stations and gas distribution stations													
6	Physical impact of CS and GDS equipment (compressors, diesel generators, pumps)	Noise exposure, vibration exposure, thermal radiation, electromagnetic radiation, radiation exposure	1. Habitats of mammals (carnivores, ungulates, rodents), amphibians and reptiles, birds. 2. Terrestrial animals: mammals (carnivores, ungulates, rodents), amphibians and reptiles. 3. ornithofauna (e.g. grouse, pygmy owl,	1. Habitats of mammals (ungulates, rodents, insectivores, rats, carnivores), amphibians and reptiles, birds of the wetland complex. 2. Terrestrial animals:	1. Habitats of mammals (insectivores, rats, carnivores, carnivores, ungulates, rodents and hares), amphibians and reptiles, birds (various species of migrator	1. Displacement of animal species sensitive to noise and human presence from the area 2. Increased sensitivity to frost due to earlier start of vegetation/flowering caused by	UMG Almaty (ICA)* 1. Asian puffin 2. Kolpakovsky tulip 3. alatavian saffron 4. Sivers apple tree * similarly for UMG for Almaty region (AGP),	1. Present 2. Present 3. Present 4. Present	UMG Taraz (ICA)* 1. white-bellied murrelet 2. Crested Lark * similar for UMG for Turkestan oblast (AGP) and UMG for Kyzylorda, Turkestan oblast (GBS).	1. Present 2. Present	UMG Uralsk (ICA) 1. European bog turtle 2. whooper swan	1. Present 2. Present	1. Reduction or extinction of sensitive animal species 2. Impeded population regeneration due to frost exposure during the flowering period	Sanitary protection zone of enterprises	Significant (the factor constantly affects a large number of biodiversity assets in a routine manner)

			hawk owl, three-toed woodpecker , pine nutcracker) .	mammals (ungulates, rodents, insectivores, man-eaters, rats, predators), amphibians and reptiles. 3. 3. ornithofauna: waterfowl and waterbirds, as well as those living in terrestrial habitats: large raptors, cranes,	y birds, endemics). 2. Terrestrial animals: mammals (insectivorous, man-eating, man-eating, predatory, carnivorous, ungulates, rodents and hares), amphibians and reptiles. 3. 3. ornithofauna: various	warming effect.	Almaty production branch (KTGA)		UMG Aktau (ICA)* 1. Steppe eagle 2. Jayrun 3. Crested Lark * similar for UMG for Myngystau oblast (Mangystau oblast), Mangystau production branch (KTGA) .	1. Present 2. Veroyatno present 3. Present	UMG Atyrau (ICA)* 1. Steppe turtle a * similar for Atyrau Production Branch (KTGA)	1. Present	3. Reduction of yields of fruit plants		
											UMG Aktobe (ICA), UMG Kostanai (ICA)* 1. whooper swan * similarly for Aktobe and Kostanai producti	1. Present			

				sandpipers, grouse, owls, etc.	species of migratory birds and endemics						on branch (KTGA)					
							UMG Shymkent (ICA) 1. White-bellied Grouse 2. Asian pintail * similarly for UMG for Zhambyl, Turkestan oblast (AGP) and UMG for Turkestan oblast (GBS).	1. Present 2. Present			UMG Karaganda (ICA)* 1. Steppe eagle 2. Streptet * similarly for Karaganda Production Branch (KTGA)	1. Present 2. Present			

							Shymkent Production Branch (KTGA) 1. Steppe eagle 2. White-bellied Grouse 3. Asian puffin	1. Possibly present 2. Possibly present	Kyzylorda Production Branch (KTGA) 1. Snakehead 2. Baloban	1. Probably present 2. Probably present	Zhezkazgan production branch 1. Zmeyad 2. Steppe eagle	1. Probably present 2. Probably present			
											Astana production branch 1. Whooping crane	1. Probably present			
7	Disposal of solid industrial and domestic waste	Disposal of construction waste, contaminated containers, waste oil, filters, batteries, etc., as well	There are no own waste disposal facilities, no impact is realised.	There are no own waste disposal facilities, no impact is realised	There are no own waste disposal facilities, no impact is realised.									Waste is not disposed of on the territory of enterprises	Insignificant (there is no impact of the factor, as the enterprises do not have their own waste

		as solid domestic waste													disposal facilities)
8	Impact of associated objects	Impacts of trunk pipelines	1. Landscape complexes: foothills and low-lying areas of the Tien Shan mountain side, soils: grey soils and grey-brown soils, chestnut soils. 2. Habitats of mammals (carnivores, ungulates, rodents), amphibians and reptiles, birds.	1. Landscapes and soils: grey-brown soils, sandy loamy and sandy soils, brown solonetz soils. 2. Habitats of mammals (ungulates, rodents, insectivores, rats,	1. Landscapes and soils: ordinary chernozems, southern chernozems, dark chestnut soils, chestnut soils, light chestnut soils. 2. Habitats of mammals (insect-eating, man-eating, man-										Significant (the factor permanently affects large areas and many biodiversity sites, routinely and non-routinely (in the case of throwaway lines))

			3. Terrestrial animals: mammals (carnivores, ungulates, rodents), amphibians and reptiles	carnivores), amphibians and reptiles, birds of the wetland complex. 3. terrestrial animals: mammals (ungulates, rodents, insectivores, rats, carnivores), amphibians and reptiles.	eating, predatory , parsnipeds, rodents and hares), amphibians and reptiles, birds (various species of migratory birds, endemics). 3. terrestrial animals: mammals (insectivores, man-eaters, man-eaters, carnivor										

					es, parnocopulates, rodents and hares different), amphibians and reptiles										
9	Emergencies	Gas pipeline rupture, gas breakthrough through a flange connection, gas condensate breakthrough, emergency fire	1. Landscape complexes: foothills and low-lying areas of the Tien Shan mountain side, soils: grey soils and grey-brown soils, chestnut soils.	1. Landscapes and soils: grey-brown soils, sandy loamy and sandy soils, brown solonetz soils. 2.	1. Landscapes and soils: ordinary chernozems, southern chernozems, dark chestnut soils, chestnut soils, light chestnut	1. Destruction of soil and vegetation cover, animal population as a result of fires 2. Impeded absorption of nutrients	UMG Almaty (ICA)* 1.Kolpakovsky's tulip 2. Apple tree Sivers 3. Rhubarb Vittok 4. Saffron alatava.	1. Present 2. Present 3. Present 4. Present	UMG Taraz* 1.Borschova tulip 2. White earth wormwood 3. Eremurus indera 4. White-bellied grouse	1. Present 2. Present 3. Present 4. Present 5. Present	UMG Atyrau (ICA) 1. Caspian onion 2. Sogdian tulip 3. Steppe turtle UMG Uralsk (ICA) 1.	1. Present 2. Present 1. Present	1. extinction of individuals or populations of species 2. Impeded reproduction through destruc	The area of possible impact of emergency situations related to depressurisation of pipelines, apparatus and installed valves at the	Significant (the factor affects a large number of biodiversity sites with high intensity in non-emerge

		in sections, leakage from storage tanks	2. Habitats of mammals (carnivores, ungulates, rodents), amphibians and reptiles, birds. 3. Vegetation: communities dominated by ephemeral and ephemeroid grasses, mixed grasses, herbage (based on sod grasses), tree and shrub vegetation in river gorges; including	Habitats of mammals (ungulates, rodents, insectivores, man-eaters, carnivores), amphibians and reptiles, birds of the wetland complex 3. Vegetation: biyurgun, wormwood-biyurgun and wormwood-	soils. 2. Places of habitats of mammals (insectivores, man-eaters, man-eaters, carnivores, parsnipedes, rodents and hares), amphibians and reptiles, birds (various species of migratory birds, endemics). 3.	due to changes in salt balance 3. weakening of plants due to ingestion of pollutants	* similarly for UMG for Almaty region (AGP), Almaty production branch (KTGA)		5. Crested Lark nok * similar for UMG for Turkestan oblast (AGP) and UMG for Kyzylorda, Turkestan oblast (GBS)		shrenka tulip		tion of offspring, eggs, seeds 3. Deterioration of the vital state of organisms	equipment includes the territory of the SPZ of compressor stations and gas distribution stations and gas pipeline right-of-way. Possible consequences of accidents: release of liquid and gaseous hydrocarbons into the atmosphere, formation of explosion and fire hazardous	ncy situations)
							UMG Shymkent (ICA)* 1. Podmarennika turkestanskyi 2.Albert's Tulip	1. Present 2. Probably present 3. Probably	UMG Aktau (ICA)* 1. Steppe eagle 2. Jayrun 3. Crested Lark	1. Present 2. Possibly present 3. Present	UMG Aktobe (ICA)* 1. whooper swan * similar for Aktobe	1. Present			

			rare and endemic species of shrubs. 4. Terrestrial animals: mammals (carnivores, ungulates, rodents), amphibians and reptiles. 5. 5. Ornithofauna (e.g. grouse, pygmy owl, hawk owl, three-toed woodpecker, nutcracker)	boyalyceous groupings with separate patches of sparse black sarsaul thickets (Turkestan oblast); sarzan communities with participation of annual saltwort (Mangystau oblast); white-earth-wormwood-teresken communities	Vegetation: communities of sandy sagebrush and lerchopolyanniks, cereal communities, grasses, marevae, complex flowers, etc. 4. Terrestrial animals: mammals (insectivores, man-eaters, man-eaters, carnivores, pair ungulate		3.Kaufman's Tulip * similar for UMG for Zhambyl, Turkestan oblast (AGP) and UMG for Turkestan oblast (GBS)	present	* similar for UMG for Myngystau oblast (Mangystau oblast), Mangystau production branch (KTGA).		Oblast UMG (GBS), Aklubinsk production branch (KTGA)			mixture	
											UMG Kostanai (ICA)* 1. Peach-leaved bellflower 2. hybrid clematis 3. whooper swan * similarly for Kostanai production branch (KTGA)	1. Present 2. Present 3. Present			

				(Aktobe oblast); complexes of shrub-wormwood, rank-shrub, saxaul-ephemeral and ephemeral-grass-saxaul associations (Kyzylorda oblast); 4. Terrestrial animals: mammals (ungulates, rodents, insectivores,	s, rodents and hares different), amphibians and reptiles. 5. Ornithofauna: various species of migratory birds and endemics		Shymkent production branch 1. Steppe eagle 2. White-bellied Grouse 3. Asian puffin	1. Probably present 2. Probably present 3. Probably present	Kyzylorda Production Branch (KTGA) 1. Snakehead 2. Baloban	1. Probably present 2. Probably present	UMG Karaganda (ICA) 1. Schrenk's Tulpa 2. Steppe eagle 3. Streptet	1. Probably present 2. Present 3. Present			
											Zhezkazgan production branch 1. Zmeyad 2. Steppe eagle	1. Probably present 2. Probably present			
											Astana Production Branch 1. tulpan Schrenk	1. Probably present 2. Proba			

				manniv ores, carnivor es), amphibi ans and reptiles. 5. Ornitho fauna: waterfo wl and waterbir ds, as well as those living in terrestri al habitats: large raptors, cranes, sandpip ers, grouse, owls, etc.							2. Red-crowned crane	bly tno, presen t			

* Indicator species for Asian Gas Pipeline LLP, Beineu-Shymkent Gas Pipeline LLP and KazTransGas Aimak JSC are allocated on the basis of monitoring data for the enterprises of Intergas Central Asia LLP located in the same natural zones.

Sources:

Lists of indicator species proposed by the Company

Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on Aktau UMG", 2022

Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on Aktobe UMG", 2022

Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on the Almaty UMG", 2022

Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on Atyrau UMG", 2022

Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on Karaganda UMG", 2022

Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on UMG Kostanai", 2022

Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on Taraz UMG", 2022

Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on Uralsk UMG", 2022

Report on research work "Conducting research work on the impact of production facilities of Intergas Central Asia JSC on Shymkent UMG", 2022

Fungi.su Site about mushrooms of Kazakhstan. Tulipa alberta, (Tulipa alberti Regel)
Fungi.su Site about mushrooms of Kazakhstan. Tulipa kaufmanniana Regel, (Tulipa kaufmanniana Regel)

Notation:

Not applicable

Present - The presence of the species in the area of influence is noted in the documentation of QazaqGas Exploration and Production LLP.

Likely to be present - Presence of the species in the area of influence is assumed based on publicly available data

Change registration sheet

Number modifications	Page numbers	Total number of sheets in the document	Numbers of sections to which the changes relate	Description of changes	Note on amendments		
					FULL NAME.	Signature	Date

Familiarisation sheet

№ n/a	Full name of the employee	Position	Date	Signature