

**Ministry of Ecology, Geology and Natural Resources
of the Republic of Kazakhstan**

**National report on the transition of the Republic of Kazakhstan to a
"Green Economy" for 2017 - 2019**

Nur-Sultan, 2020

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Introduction

The environmental policy of the Republic of Kazakhstan is built in accordance with the main strategic document - **"Kazakhstan-2050"**¹ **Strategy** - a new political course for the new Kazakhstan in a rapidly changing historical environment. In this message to the people of Kazakhstan, the First President of the Republic of Kazakhstan - Elbasy N. A. Nazarbayev noted: "It is fundamentally important for us to rethink our attitude to our natural resources. We must learn how to manage them correctly, accumulating income from their sale in the treasury, and most importantly, transforming our country's natural resources into sustainable economic growth as efficiently as possible".

The main goal of the "Kazakhstan-2050" Strategy is the creation by 2050 of a welfare society based on a strong state, a developed economy and opportunities for universal labor. An indicator of the achievement of this main goal is the entry by 2050 into the list of the 30 most developed countries in the world.

A new direction in the country's development was the transition to a "green economy", through the adoption in 2013 of the **Concept for the transition of the Republic of Kazakhstan to a "green economy"**² (hereinafter the Concept for the transition to a "green economy"). "Green economy" in this document is defined as an economy with a high level of quality of life of the population, careful and rational use of natural resources in the interests of present and future generations, in accordance with the country's international environmental obligations, including the Rio de Janeiro principles, Agenda 21, the Johannesburg Plan and the Millennium Declaration.

Measures for the transition to a "green economy", according to the Concept, are implemented in the following areas: sustainable use of water resources, development of sustainable and highly productive agriculture, energy saving and energy efficiency, development of the electric power industry, waste management system, reduction of air pollution and conservation and effective management of ecosystems.

The main priority tasks for the transition to a "green economy" identified by the Concept for the transition to a "green economy" are as follows:

- 1) increasing the efficiency of using resources (water, land, biological, etc.) and managing them;
- 2) modernization of the existing and construction of new infrastructure;
- 3) improving the well-being of the population and the quality of the environment through cost-effective ways to mitigate pressure on the environment;
- 4) improving national security, including water security.

Target indicators, norms and measures of the "green" economy are reflected in the legislative acts and program documents of our country, are guidelines for all levels of government and all sectors of civil society.

The action plan for the implementation of the Concept for the transition of the Republic of Kazakhstan to a "green economy" for 2013-2020 was approved by the Government of the Republic of Kazakhstan dated July 31, 2013 No. 750 (hereinafter - the Plan).

In 2018, the Strategic Development Plan of the Republic of Kazakhstan until 2025 (Presidential Decree No. 636 dated 15.02.2018) was adopted, which replaced the Strategic Development Plan until 2020.

"Green economy" and the environment are one of the seven policy areas of the new strategic plan. This direction includes the following tasks:

- fulfillment of obligations under the Paris Agreement;
- determination of funding sources, accounting for green finance and attracting investments;
- stimulating investment in green technologies;
- decarbonization of the economy; increasing the efficiency of use and protection of water resources;
- development of renewable energy sources and improvement of traditional energy sources;

1 MESSAGE OF THE PRESIDENT OF THE REPUBLIC OF KAZAKHSTAN - LEADER OF THE NATION N. A. NAZARBAYEV TO THE PEOPLE OF KAZAKHSTAN. "Kazakhstan-2050" STRATEGY

2 Concept for the transition of the Republic of Kazakhstan to a "green economy". Approved by the Decree of the President of the Republic of Kazakhstan dated May 30, 2013 No. 577.

- biodiversity conservation;
- development of a low-waste economy;
- waste management, which is fully consistent with the Concept for the transition to a "green economy".

The goal of the "Digital Kazakhstan" State Program (Government Decree No. 827 dated 12.12.2017) is the digitalization of key sectors of the economy. The action plan for its implementation provides for support in the creation of a unified state information system for monitoring the environment and natural resources. This State Program also provides for measures to introduce automated monitoring of fish resources, biodiversity, specially protected natural areas, water resources and water facilities, although they are not mentioned in its Action Plan. One of the priority areas of the program is the concept of "smart" cities, which, among other things, provides for the automation of heat supply systems, which is also fully consistent with the Concept for the transition to a "green economy". In addition, measures for the transition to a "green economy" are included in the strategic plans of all ministries responsible for the implementation of the Concept on the transition to a "green economy".

The Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan (hereinafter referred to as the Committee on Statistics) in accordance with the OECD methodology on green growth, developed and publishes indicators of a "green" economy on an annual basis on the www.stat.gov.kz Internet resource.

In 2018, experts from the United Nations Economic Commission for Europe (UNECE) completed the Third Environmental Performance Review for Kazakhstan (EPR). The recommendations of this Review are widely used in the preparation of this report in identifying problem areas of environmental protection and use of natural resources and in determining the planned directions for further activities.

In 2017, by the Decree of the President of the Republic of Kazakhstan dated January 31, No. 415, the "Main directions of state policy of the Republic of Kazakhstan in the field of official development assistance for 2017 - 2020" were adopted. The task of achieving the SDGs is set, and in 2018, under the leadership of the Deputy Prime Minister of the Republic of Kazakhstan, a Coordination Council was created to coordinate the implementation and monitoring of the SDGs and five interdepartmental working groups (Peace; People; Planet; Prosperity; Partnership), meeting once a quarter, which are responsible for the exchange of views and development of recommendations for achieving the relevant SDGs in Kazakhstan.

The voluntary national review of Kazakhstan on the achievement of the SDGs was published in 2019 on the UN website³.

Under the leadership of the Committee on Statistics, a draft national framework for SDG indicators was prepared. Work is underway to launch a national platform / page for reporting on the SDGs on the Committee website. However, the awareness of the SDGs among central government officials and at the subnational level is low.

In 2016, Kazakhstan joined the OECD⁴ Declaration on Green Growth and the Declaration on Reducing Lead Risks, in accordance with which signatory countries declare their efforts to implement green growth strategies, promote green investment and sustainable natural resource management; and domestic policy reform to eliminate environmentally harmful measures such as fossil fuel subsidies. The country seeks to actively participate in the work of the OECD Committee on Environmental Policy and its subsidiary bodies, share best practices and use the OECD guidelines to strengthen its own green growth policy.

This report was prepared by the International Green Technologies and Investment Projects Center NC JSC (IGTIPC) at the request of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan (MEGNR), in accordance with the Action Plan for the implementation of the Concept for the transition of the Republic of Kazakhstan to a "green economy" for 2013 - 2020,

3 https://sustainabledevelopment.un.org/content/documents/23453KAZAKHSTAN_VNR_Kazakhstan_web_site_2019.pdf

4 OECD. Declaration on Green Growth Adopted at the Meeting of the Council at Ministerial Level on 25 June 2009 [C/MIN(2009)5/ADD1/FINAL]

approved by the Decree of the Government of the Republic of Kazakhstan dated July 31, 2013 No. 750. In accordance with this plan, such reports should be prepared once every three years and the first report covered 2014-2016. This report covers 2017 - 2019, a significant addition compared to the first is the analysis of the problems of achieving the Sustainable Development Goals (SDGs), given for each direction of the Concept. When compiling the report, the materials of the Ministry of Energy of the Republic of Kazakhstan, the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan, the Ministry of Health of the Republic of Kazakhstan, the Ministry of Agriculture, the Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan, the Ministry of Internal Affairs of the Republic of Kazakhstan, the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan, akimats of regions, cities of republican significance and the capital, international and public organizations, the media and other published sources of information.

This report also presents an analysis of international experience in all areas being implemented, taking into account its possible use in the Republic of Kazakhstan.

The above plans for the future are closely linked to the existing strategic and program documents, including those adopted in 2017, 2018 and 2019, and the recommendations mainly follow from the analysis of international experience and reviews on Kazakhstan carried out by international organizations.

Extensive information and analytical materials of the national report are intended for central and local state bodies, deputies of all levels, the general population, public organizations and business and ensure transparency and openness of the activities of the Government of the Republic of Kazakhstan in the implementation of state, sectoral and regional programs and achievement of the target indicators of the Concept for the transition to a “green economy”.

For calculations and analysis, the following general indicators for Kazakhstan were used according to the data of the Committee on Statistics:

population (at the end of the year) in 2017 – 18,157.3 thou. people, in 2018 – 18,395.7 thou. people, in 2019 – 18,632.2 thous. people;

gross domestic product (GDP) by the production method in 2017 – 54,378.9 bln. tenge, in 2018 – 61,819.5 bln. tenge, in 2019 – 69,532.6 bln. tenge;

gross output of agricultural products (services) in 2017 – 4,070.9 bln. tenge, in 2018 – 4,474.1 bln. tenge, in 2019 – 5,151.2 bln. tenge;

the volume of industrial production (goods, services) in 2017 - 22,790.2 bln. tenge, in 2018 - 27,218.1 bln. tenge, in 2019 - 29,380.3 bln. tenge.

1. Implementation of measures and achievement of indicators of the transition of the Republic of Kazakhstan to a "green economy"

1.1. Sustainable use of water resources

Current situation and achievement of targets

The Concept for the Transition to a “green economy” notes that the threat of water scarcity and ineffective water management can become the main obstacle to sustainable economic growth and social development of Kazakhstan. The problems of the growing scarcity of water resources are supposed to be solved by increasing the efficiency of water use in agriculture, industry and housing and communal services, as well as through international measures to improve the reliability of the flow of transboundary rivers.

The total reserves of fresh water in Kazakhstan are estimated at 429 km³, including:

- 80 km³ - falls on glaciers;
- 190 km³ - concentrated in lakes;
- 101 km³ - river resources;
- 58 km³ - predicted reserves of groundwater.

The Committee for Water Resources of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan determines the average long-term flow of the rivers of the Republic of Kazakhstan in the amount of 90.0 km³. Of these, 50,8 km³ comes from neighboring states, 54.5 km³ is formed on the territory of Kazakhstan, 47.1 km³ flows into neighboring states (of which 3.70 are returnable resources), 15.5 km³ is lost for filtration and evaporation. However, these figures are not constant and change annually depending on the water content of the year and climatic changes. So, in recent years, there has been a slight increase in water content (compared to the average long-term values), which coincides with the climatic forecast of the possibility of a short-term increase in water content due to climate warming and accelerated melting of mountain glaciers.

In particular, according to the State Water Cadastre⁵, the total surface water resources in the Republic of Kazakhstan for 2018 amounted to 110.7 km³, which is characterized as an average water content, compared with the norm equal to 108.5 km³.

Additional sources of fresh water are groundwater, the reserves of which, approved for operation, amount to 15.4 km³, and the predicted resources of fresh groundwater reach 40.4 km³/year (of which 1.2 km³ is currently being extracted per year)⁶, desalinated sea waters and other sources. The main reserves of groundwater are located in the Balkhash-Alakol and Yertis basins (66% of the total reserves).

The inventory of groundwater reserves is carried out annually by compiling the state balance of groundwater reserves. For 2018, the state balance took into account 3544 fields with reserves of 42.6 mln. m³/day. For 2019, 3922 fields were taken into account with approved operational reserves in the amount of 42.9 mln. m³/day.

According to their intended purpose, the operational reserves are subdivided as follows: for household and drinking water supply - 15.4 mln. m³/day (35.9%); industrial and technical water supply - 2.2 mln. m³ / day (5.1%); irrigation of land - 18.9 mln. m³/day (44%) and complex use - 6.4 mln. m³ / day (14.9%).

Geographically, groundwater resources are unevenly distributed, which affects the availability of reserves in individual regions of the country: about 50% of resources are concentrated in the south of the country, 30% in the central, northern and eastern regions, and less than 20% in the west.

Groundwater resources (mln. m³/day) are provided: Almaty (16.7), East Kazakhstan (6.5), Zhambyl (4.7), Pavlodar (3.9), Karaganda (2.8), South-Kazakhstan (2.1), Aktobe (1.9), Kostanay (1.1), Kyzylorda (1.5) regions.

Limited by groundwater resources (mln. m³/day): North Kazakhstan (0.2), Atyrau (0.3), West Kazakhstan (0.3), Mangystau (0.4) and Akmolala (0.5) regions (table 1.1.1.).

Table 1.1.1. Provision of water basins

Basin name	Local water resources, km ³	Transboundary water resources, km ³	Groundwater, km ³	Other sources, km ³	Total, km ³
Aral-Syrdarya	3.4	14.6	0.2	3.2	21.4
Balkhash-Alakol	15.4	12.2	0.4	0.4	28.4
Yertis	25.9	7.8	0.2	0	33.9
Yessil	2.5	0.1	0.1	0	2.6
Zhaiyk-Kaspi	4.1	7.1	0.2	0.3	11.7
Nura-Sarysu	1.4		0.1		1.5
Tobyl-Torgay	1.6	0.3	0	0	1.9
Shu-Talas	1.6	2.6	0.1	0	4.3
Total for the RK	55.9	44.7	1.3	3.9	105.8

Source: State Water Cadastre

At present, the total groundwater withdrawal is 2.4 mln. m³/day (15.3% of the balance reserves) and the reserve for household and drinking needs includes reserves in the amount of 13.3 mln. m³/day.

⁵ State water cadastre. Surface and groundwater resources, their use and quality. 2018. Annual edition.

⁶ Concept of the draft Water Resources Management Program of Kazakhstan for 2020 - 2030.

The highest groundwater withdrawal (mln. m³/day) is in Almaty (1.1) and South Kazakhstan (0.3) regions, the lowest is in Atyrau (0.001).

The total volume of guaranteed water resources for use is 23.2 km³ per year⁷, excluding the water required for use for nature conservation purposes and ensuring mandatory flow to neighboring states.

The problem of water resources scarcity arises due to the uneven distribution of water in time and space, when up to 90% of surface runoff occurs in the spring months, and water resources are concentrated in the foothill and mountain regions of the east and south-east of the country. In dry years, the level of water supply is 60%, and in some regions (Central Kazakhstan) it is only 5-10%, while the scarcity falls mainly on irrigated agriculture. A particularly critical situation is developing in the basins of transboundary rivers: Syrdarya (scarcity - 1.2-3.5 km³), Ural (scarcity - up to 1.7 km³), Ili, Shu, Talas.

In case of unfavorable climatic and transboundary hydrological situations, in the future, a decrease in surface runoff in Kazakhstan by 11.4 km³ per year is predicted by 2040.

Information on the quality state of water resources is quarterly and annually published in newsletters on the state of the environment in the Republic of Kazakhstan, issued by Kazhydromet RSE.

The total withdrawal of fresh water in the Republic of Kazakhstan is constantly growing from 22.5 km³ in 2013 up to 25.3 km³ in 2017, 23.5 km³ in 2018, and 25.4 km³ in 2019. Losses during transportation are also growing from 2.5 km³ in 2013 to 3 km³ in 2017, 3.3 km³ in 2018, 3.2 km³ in 2019 (Table 1.1.2, Figure 1.1.1).

The main share of water use in 2019 is in agricultural production - 62.4% of the total water consumption in the country.

Table 1.1.2. Fresh water withdrawal⁸

Indicators	Unit	Years		
		2017	2018	2019
Surface water withdrawal *	mln.m ³	21,422	22,522	22,495.1
Groundwater withdrawal **	mln.m ³	1,032	1,020	1070,9
Freshwater withdrawal (total)	mln.m ³	22,454	23,542	23516
Freshwater withdrawal by households	mln.m ³	929	172	911
Freshwater withdrawal by agriculture, forestry and fisheries	mln.m ³	16,272	14,968	13178
of which used for agricultural irrigation	mln.m ³	713	11,974	10300
Freshwater withdrawal by the processing and electric power industry	mln.m ³	5,421	5,536	4,222.8
Freshwater withdrawal by other types of economic activity	mln.m ³	521	2,866	1,909.2
Water losses during transportation	mln.m ³	2,993	3,719	3,295

* Sea water is not included.

** Including mine and collector-drainage water.

Source: <https://stat.gov.kz>

The largest withdrawal of water from natural sources is noted in the Turkestan, Kyzylorda, Almaty and Pavlodar regions.

7 Concept of the draft Water Resources Management Program of Kazakhstan for 2020 - 2030.

8 NATIONAL REPORT ON THE STATE OF THE ENVIRONMENT AND ON THE USE OF NATURAL RESOURCES FOR 2018. Nur-Sultan. 2019.

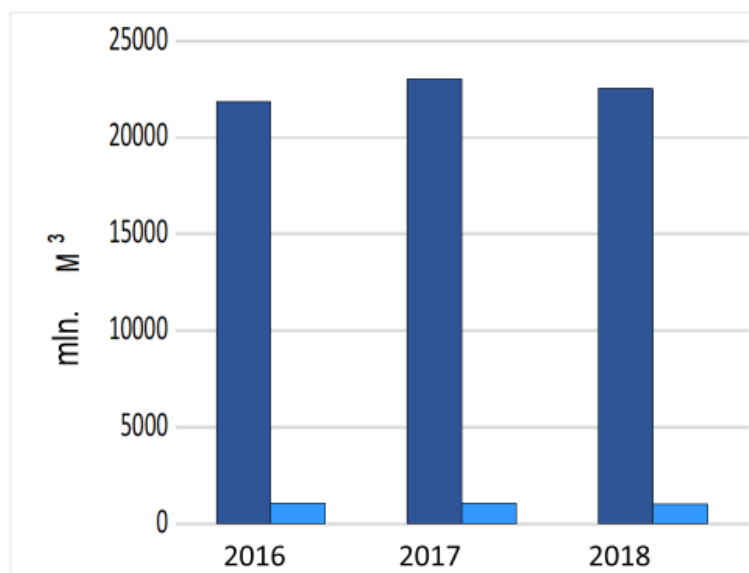


Figure 1.1.1. Water withdrawal from surface and underground sources for 2016 – 2018

Water withdrawal for agriculture in 2019 amounted to 15.8 km³, of which 12.1 km³ was used for the needs of regular irrigation, and the remaining 3.7 km³ was used for the needs of estuary irrigation, watering of hayfields and pastures. Moreover, from this volume of water withdrawal, losses, which are primarily associated with the low technical condition of irrigation systems, amount to 2.6 km³.

For guaranteed water supply to agriculture, measures are being taken to introduce modern methods of saving water resources, in particular, reconstruction and repair of 35 hydraulic structures (HS) or 18% of the total number of HS, which are in the republican ownership.

Water consumption in the industrial sector in 2019 amounted to 5.7 km³ or 22.4% of the total water withdrawal. The volume of non-returnable consumption is 1.36 km³ per year, or about a third of the total water withdrawal. The largest share in the water withdrawal belongs to the enterprises of heat power engineering, non-ferrous metallurgy, and the oil industry. At the same time, in many industries and enterprises, the consumption of fresh water per unit of production remains high. There is also a low level of use of reused (0.8 km³) and recycled water supply (8.8 km³).

For household and drinking needs 4-6% of the total water withdrawal is used annually. Of this volume, consumption in cities is 55%, in rural areas - 11%, and losses during transportation and delivery of water to consumers are about 17% of the total water withdrawal.

In 2019, water withdrawal for household and drinking needs amounted to 0.9 km³, losses during transportation amounted to 0.14 km³.

Large losses of water in communal water supply systems are due to high wear and tear of plumbing equipment, the use of outdated drinking water treatment technologies, a low level of sanitary appliances in houses, and an underdeveloped water supply network. At the same time, there is a tendency for a decrease in the specific water consumption per inhabitant, which is due to the introduction of apartment water meters.

In general, in the republic over the past 5 years, water losses during transportation from the point of water withdrawal to supply to consumers are on average 2.7 km³. At the same time, 80% of water losses are accounted for by agricultural consumers, about 5% - by industrial consumers and 5% - by utilities, while the remaining 10% are technological losses with other needs.

According to the Committee on Statistics, in 2018, enterprises of Kazakhstan supplied 2359.8 mln. m³ of water to the network, in 2019 - 2339.9 mln. m³, more than a quarter of the volume of water passed through treatment facilities. The volume of water supplied to consumers amounted to 1168.3 mln. m³ (2019 - 1160.9), of which 44.2% to the population (2019 - 46.2%). The total length of water

pipelines was 26.3 thousand km (2019 - 27.2); street water supply networks - 40.7 thou. km (2019 - 44.1); intra-quarter and intra-yard - 11.9 thousand km (2019 - 12.6).

41.2% (2019 - 40.1%) of all water supplied to the network were spent for the own needs of enterprises at the expense of enterprises operating in the field of electric power and manufacturing. Leakage water losses amounted to 217.8 mln. m³ (2019 - 241 mln. m³).

With an increase in population and a gradual economic recovery, the need for water will increase.

In the future, water supply to economic sectors will be 84% due to surface river waters, the rest - due to underground and mine, sea, lake and waste waters.

In order to manage the supply and demand for water while regulating the use and protection of water resources, long-term water use limits have been established, which in the republic total 28.3 km³ annually. These volumes of possible use of water resources are determined taking into account the prevention of degradation of water systems.

As measures of water saving, provisions on the regulation of water use have been introduced. The consolidated norms of water consumption for individual sectors of the economy have been developed, which are intended to solve the problems of planning the use of water resources in the context of the country. On the basis of consolidated water consumption norms, water users develop specific water consumption norms, on the basis of which they are issued a permit for the use of water resources.

The **volume of the issued limits** (standard discharges) of pollutants at the end of 2019, according to the Ministry of Ecology, Geology and Natural Resources, amounted to discharges of 2.0 million tons, with a plan of 2.8 million tons.

According to the Ministry of Ecology, Geology and Natural Resources, **actual discharges** of harmful substances amounted more than 1 million ton in 2017 and 2018, and 0.8 million ton in 2019. The largest discharges were made in the Karaganda, Kostanay and Almaty regions (Table 1.1.3).

Table 1.1.3. Limits and actual discharges of harmful substances

Names of regions	2017		2018		2019		thou. tons
	limit	actual	limit	actual	limit	actual	
Akmola	66	38	79	34	81.9	45.8	
Aktobe	91	19	48	20	39.03	18.02	
Almaty	360	155	340	172	340	172.2	
Atyrau	68	16	73	40	93.17	13.7	
East Kazakhstan	54	28	46	28	41.5	20.4	
Zhambyl	23	17	24	17	22.9	16.3	
West Kazakhstan	88	37	146	46	85.9	46.6	
Karaganda	1,043	458	429	428	454	302	
Kyzylorda	62	8	87	9	87.9	8.9	
Kostanay	365	122	545	105	355.1	136.1	
Mangystau	106	11	109	5	126	3	
Pavlodar	76	27	75	28	76	29.7	
North Kazakhstan	95	30	36	10	68	10	
South Kazakhstan	158	32	158	30			
Turkestan					143.2	18.2	
Nur-Sultan city	190	107	204	126	32.3	12.4	
Almaty city	0	0	1	0	0	0	
Shymkent city					6.9	2.9	
Total	2,845	1,104	2,396	1,097	2,053.9	856.4	

Source: Ministry of Ecology, Geology and Natural Resources

Based on the Strategy-2050, the Concept for the transition to a "green economy" sets **goals to ensure stable water supply** for the population (by 2020) and agriculture (by 2040), and by 2050, it is necessary to solve all problems with water resources.

At the basin level, the problem of water scarcity as a whole should be solved by 2025, and for each basin separately - by 2030. At the same time, the ecological component of water resources - the

stability of ecosystems, the development of fish farming, ecotourism and the preservation of unique natural resources - should not be infringed in favor of industrial development.

Achievement of these goals is presented in table 1.1.4.

Table 1.1.4. Achievement of target indicators for water supply and water disposal

Target indicators	2017	2018	2019	2020 (target)
Share of water users with permanent access to the central drinking water supply system:				
in cities	93.8	94.5	97.2	97.5
in rural areas	57.4	59.9	64.3 (86.4)	87.7*
Share of population covered by wastewater treatment:				
in cities	88.0	68.7	70.5	74.9
in rural areas	-	8.6	8.8	-

* Note: this indicator is calculated by population

Source: source Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan

The population is provided with quality drinking water, first of all, through access to centralized water supply.

At the end of 2018, 10.0 mln. people (out of 10.6 mln. people) or 94.5% of the urban population were provided with centralized water supply in urban areas.

Out of 6499 villages, 3892 villages or 59.9% of all villages are provided with water supply. At the same time, 6.5 mln. people or 84.4% of the population are provided for in these villages.

At the end of 2019, in the republic as a whole, the provision of centralized water supply in the UA was 97.2% (against the plan of 97%), in the RA - 64.3% (against the plan of 62%). Low indicators of the provision of the population of UA in Zhambyl (88.0%) and Pavlodar regions (93.1%); in RA in West Kazakhstan (50.1%), Zhambyl (56.0%), Kostanay (60.2%), and Pavlodar (74.6%) regions. 2263 RAs with a population of 1.1 mln. people are not provided with centralized water supply, of which 1117 villages with a population of less than 200 people (89 thou. people).

To accelerate the provision of the population with high-quality water supply services in villages with a population of less than 200 people, subject to migration and low socio-economic development potential, work is being carried out to install integrated block modules for drinking water purification.

Sewage treatment facilities are available in 58 out of 87 cities (including the city of Baikonur). The state of many treatment facilities is unsatisfactory, they have only mechanical cleaning.

In 2018, 573 sewerage facilities (2019 - 599) and 301 separate sewerage networks (2019 - 272) operated on the territory of the republic.

The length of the main collectors was 4.6 thou. km (2019 - 4.8). The street sewerage network stretches over a distance of 6.3 thou. km (2019 - 6.6).

The installed capacity of treatment facilities in 2018 amounted to 3828.4 thou. cubic meters per day (2019 - the productivity of mechanical treatment facilities was 1414.1 thou. cubic meters per day, biological treatment facilities (full cycle) - 2731.4 thou. cubic meters per day). 580.7 mln. cubic meters of wastewater were passed through the treatment plant, thus the share of treated wastewater in the total wastewater flow was 86.8% (2019 - 579.2, 84.5%). Including through the complete biological treatment, 532.9 mln. cubic meters were purified (2019 - 495.5), of which 5.7 mln. cubic meters with additional treatment (2019 - 124.7), normatively cleaned - 472.6 mln. cubic meters, insufficiently treated - 43.5 mln. cubic meters.

At the end of 2019, the coverage of the population with wastewater treatment in cities was 70.5%, in villages - 8.8%, and in 2018 this figure was in cities - 68.7%, in villages - 8.6%.

Since 2002, the **solution of water supply problems** in Kazakhstan has been consistently solved by implementing the following programs⁹:

1. the "Drinking Water" program was more aimed at restoring the existing water supply systems during the period of lack of financial support from the state (during the formation of independent Kazakhstan). At the same time, a large number of development directions were taken into account when developing the "Ak bulak" Program.

2. the "Ak bulak" program comprehensively covers all problematic issues of the drinking water supply sector. Measures to improve legislation, create conditions to increase the investment attractiveness of the sector, design, introduce a systematic approach have been completed to date. The effect from the implementation of these measures was supposed to be obtained during the implementation of the second stage of the Program.

3. the Regional Development until 2020 program provides for the development of regions in all sectors of the economy. In the field of water supply, a comprehensive policy for the development of this sector has been missed.

4. the state program for the development of infrastructure "Nurly Zhol" provides for the modernization (reconstruction and construction) of the infrastructure of housing and utilities infrastructure and systems of heat, water supply and sewerage. Indicators of direct results.

As part of the implementation of the State Program, as well as in order to reduce the burden on the budget, a mechanism of budgetary crediting and subsidies was provided. Budget loans are allocated to local executive bodies (LEBs) from the republican budget with further lending to natural monopoly holders (NMH). The main task of this mechanism is the return of allocated transfers. Budget lending conditions:

- the rate of remuneration for LEBs is 0.01% per annum;
- the rate of remuneration for NMHs is 0.02% per annum;
- loan term up to 20 years;
- financing currency - tenge;
- grace period - 1/3 of the loan term.

To ensure the stable operation of **hydraulic structures** that are in republican ownership, operational measures, current repairs, flood and water protection measures are carried out annually.

As of June 1, 2019, there were 1705 hydraulic structures (HS) in the republic, of which 516 HS were in the republican ownership, 962 HS were communally owned, 201 HS were private, 26 HS were ownerless. For all ownerless structures, local executive bodies are working to transfer them to state ownership.

The balance holder of the republican water facilities is the Kazvodkhoz RSE. On the balance sheet of the Kazvodkhoz RSE there are 87 reservoirs, 88 waterworks, 36 dams, 93 pumping stations, 24 head structures, 33 group water conduits, 4,348 canals and other water facilities.

At the same time, the overwhelming majority of water management structures were created during the Soviet period and at the moment they are both physically and morally worn out. The average wear of dams is 40%. The actual wear of the channels is 60% - 80%, as a result of which their efficiency has decreased to 0.45 - 0.62. The state of inter-farm and intra-farm canals, taken from communal to republican property, is also not satisfactory due to the fact that they have not been used at the proper level for a long time. Vertical drainage wells have wear up to 75%.

According to the Ministry of Internal Affairs of the Republic of Kazakhstan, 436 out of 1705 hydraulic structures require repair for safe operation.

As a result, there are unproductive losses in the delivery of water through canals, the efficiency of agro-reclamation measures on irrigated lands decreases, and the risk of dam breaks increases.

The Action Plan for the implementation of the State Program for the Development of the Agro-Industrial Complex of the Republic of Kazakhstan for 2017-2021 provides for the reconstruction of 41 emergency reservoirs, the main goal of which is to ensure the safe operation of water facilities.

9 Analytical report "Topical issues of providing high-quality drinking water to the settlements of the Republic of Kazakhstan". November 24, 2017.

Water supply to natural ecosystems. In addition to measures aimed at preventing a scarcity of water resources, in order to eliminate the processes of degradation and desertification in the lower reaches of the Shiderty River of Pavlodar region, fill and recharge the lake systems of the Kyzylorda region, improve the ecological state of the Tengiz-Korgalzhyn system of lakes in the Korgalzhyn state reserve of the Akmola region, improve the balance and the ecological state of the transboundary river Ilek in Aktobe region, improvement of cattle grazing, conservation of flora and fauna in the floodplain of the Shu river in the territories of Moyinkum, Sarysu districts of Zhambyl region and Sozak district of South Kazakhstan region, conservational releases in the amount of 1.431 km³ are annually carried out.

Along with this, the regulation of the water regime of reservoirs is carried out taking into account the necessary conservational releases. In particular, in the period from April 12 to May 11, 2018, an conservational release was carried out along the Yertis River in the amount of 6.0 km³, with a total floodplain area of 297.4 thou. hectares.

According to the ICWC, the actual supply to the Aral Sea along the Syrdarya River was 1.16 km³ at the end of 2019, according to RSE Kazhydromet, 1.95 km³ according to the Committee for Water Resources, 2.03 km³ was received along the Amu Darya River in the Aral Sea region and Aral according to the Centre of Hydrometeorological Service of the Republic of Uzbekistan (Uzhydromet), which was 97% of the plan¹⁰.

The unified information and analytical system for water resources management in the Republic of Kazakhstan (UIASWRM, Portal) was created to improve the water resources management system and increase the efficiency of water use. It is designed as an organizing link in a single information space, and is designed to improve the exchange and management of water management information.

A large number of participants in the process of using water resources, from the primary water user to the state level of management (Committee on Water Resources of the Ministry of Agriculture of the Republic of Kazakhstan), are united into a single information space by means of UIASWRM. The system was developed using GIS technologies.

UIASWRM is designed to collect, process, analyze, store, transfer and present data in order to systematically provide managers of different levels with information used in solving management problems, such as accounting for the state of water resources, monitoring their use, monitoring water resources and hydraulic structures, calculating water balances.

The system is designed as a single WEB-application, but divided into three blocks by organizing different access to system resources. Each block is intended for a specific circle of users:

- block of users of the Committee for Water Resources (CWR);
- block of users of basin inspections (BI);
- block of external users.

International cooperation in the field of water relations

Water relations between the Republic of Kazakhstan and the **People's Republic of China** are regulated by the Agreement between the Government of the Republic of Kazakhstan and the Government of the People's Republic of China on cooperation in the use and protection of transboundary rivers (12.09.2001, Astana). In the period 2015 - 2019 were held 9 meetings of the AHWG.

During the 15th meeting of the Joint Commission (November 15, 2017, Beijing), an Agreement was signed between the Government of the Republic of Kazakhstan and the Government of the People's Republic of China on the reconstruction of the Kazakh-Chinese joint water withdrawal facility on the Sumbe River.

Reconstruction of the Kazakh-Chinese joint water withdrawal facility on the Sumbe River was completed in 2018.

On April 17, 2019, on the territory of the Kazakhstani part of the withdrawal structure, a ceremony was held to complete the reconstruction of the Kazakh-Chinese joint withdrawal facility on the Sumbe River.

Meetings of the Working Group on Rapid Response to Emergencies and Prevention of Pollution of Transboundary Rivers of the Kazakh-Chinese Commission for Cooperation in the Field of Environmental Protection are held regularly.

In particular, during the period from 17 to 18 May 2019, the 8th meeting of the Working Group on Monitoring, Analysis and Assessment of Water Quality of Transboundary Rivers of the Kazakh-Chinese Commission on Cooperation in the Field of Environmental Protection was held in Beijing (PRC). During the meeting, the Parties agreed and approved the Work Plan of the Working Group for 2019-2020, and also signed the Minutes of the meeting.

In November 2019, the eighth meeting of the Commission was held in Nur-Sultan, during which the following issues were considered:

- conducting exercises to exchange information on emergency situations on transboundary rivers and check communication channels;
- forms of mutual support in the event of an environmental emergency on transboundary rivers;
- formation of a working mechanism for mutual notification of emergencies that have a transboundary impact on the environment between the border regions of the Republic of Kazakhstan and the People's Republic of China.

The use and protection of transboundary water bodies of the Republic of Kazakhstan and the **Russian Federation** is regulated by the Agreement "On the Joint Use and Protection of Transboundary Water Bodies" dated September 7, 2010 (instead of the Agreement dated August 27, 1992).

In order to implement the agreement, the Kazakh-Russian Commission for the joint use and protection of transboundary water bodies was established. Within its framework, 6 working groups have been created for the protection and use of water resources of transboundary river basins: Zhaiyk, Yertis, Yessil, Tobol, Kigach, Bolshoi (Karaozen) and Maly Uzeni (Saryozen). The meetings of the commission are held at least once, and the working groups are held 2 times a year, alternately in the territories of the parties.

On November 15-16, 2018, the first meeting of the Kazakh-Russian Commission for the Conservation of the Ecosystem of the Ural Transboundary River Basin was held in Moscow (RF). This meeting was held as part of the implementation of the "Agreement between the Russian Federation and the Republic of Kazakhstan on the Preservation of the Ecosystem of the Ural River Basin" adopted on October 5, 2016 in Astana (now Nur-Sultan) during the Forum of Interregional and Cross-Border Cooperation.

On July 25-26, 2019, a seminar was held in Uralsk city to study international experience and prepare proposals for a joint institutional and economic mechanism for preserving the ecosystem of the Ural River Basin (Zhaiyk).

Water relations with the neighboring states of the Amudarya and Syrdarya river basins are regulated by the Agreement between the Republic of Kazakhstan, the Republic of Kyrgyzstan, the Republic of Uzbekistan, the Republic of Tajikistan and Turkmenistan "On Cooperation in the Field of Joint Management of the Use and Protection of Water Resources of Interstate Sources" dated February 18, 1992.

Interaction on regulation of water resources of the Syrdarya River basin by the basin countries is carried out within the framework of the ICWC activities. The mode of operation of reservoirs, volumes of electricity flows, energy supplies, according to this agreement, are approved by annual intergovernmental protocols.

On August 23, 2018, the Board of IFAS approved the Concept for the development of ASBP-4, which retained four key areas of ASBP-3, namely: integrated use of water resources; ecological; socio-economic; improvement of institutional and legal mechanisms. To develop ASBP-4, a Regional Working Group was formed from representatives of ministries and departments, as well as representatives of the ICSD and ICWC. As of December 2019, three meetings of the regional working group were held (May 16-17, 2018, July 30-31, 2019 and November 28, 2019 in Ashgabat).

Following the state visit of the President of the Republic of Kazakhstan K.K. Tokayev to the **Kyrgyz Republic** and the Fifth meeting of the Supreme Interstate Council of the Republic of Kazakhstan and the Kyrgyz Republic (November 27, 2019, Bishkek), the Parties were instructed to

create a joint Working Group to develop proposals for deepening bilateral cooperation on the use of water and energy resources of the Syrdarya River basin and other issues of water relations between the Republic of Kazakhstan and the Kyrgyz Republic.

In addition, water relations between the Republic of Kazakhstan and the Kyrgyz Republic are regulated on the basis of the Agreement between the Government of the Republic of Kazakhstan and the Government of the Kyrgyz Republic on the use of interstate water facilities on the Shu and Talas rivers dated January 21, 2000.

According to the Agreement, the Commission of the Republic of Kazakhstan and the Kyrgyz Republic on the use of interstate water facilities on the Chu and Talas rivers operates. For the period of 2006 - 2019 were held 26 meetings of the Commission.

In 2016, at the level of the Heads of State of Kazakhstan and **Uzbekistan**, agreements were reached on the rapprochement of the policy of cooperation, including in all areas of water relations between the Republic of Kazakhstan and the Republic of Uzbekistan. In September 2017, in the city of Tashkent (Uzbekistan), the parties signed a Roadmap on cooperation in the field of water relations between the Republic of Kazakhstan and the Republic of Uzbekistan. Also in 2017, the 2nd, 3rd and 4th meetings of the joint Working Group of the RK-RU on the development of proposals for deepening cooperation in all areas of water relations were held. In 2019, there were held 2 meetings of the Working Group. Following the meeting, the Parties approved a list of 28 surface water quality indicators for joint monitoring.

Since 2001, Kazakhstan has been a party to the EEC Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention). In order to implement the commitments made by Kazakhstan at the Seventh Session of the Meeting of the Parties to the Water Convention (Budapest, Hungary, November 2015) in October 2018 in Nur-Sultan, the regular Eighth Session of the Meeting of the Parties to the Water Convention was held. The event was held for the first time in Asia at the global level with the participation of representatives from Africa.

In accordance with the rules of procedure of the Meeting of the Parties and the decision of its Eighth Session, the chairmanship of the Bureau of the Water Convention was transferred to Kazakhstan and the Program of Work of the Water Convention for 2019-2021 was approved. Chairmanship of the Bureau of the Water Convention involves a number of commitments to help advance its principles at the global level, implement the global Strategy for the implementation of the Convention and implement its Program of Work 2019-2021.

Taking into account the above tasks related to the implementation of the chairmanship, a Working Group was created on the implementation of the chairmanship of the Republic of Kazakhstan in the Bureau of the Water Convention. The functions of the secretariat of this Working Party are entrusted to the International Water Assessment Center (IWAC). The activities related to the Working Group on an ongoing basis are covered on the official IWAC website.

Since 2013, Kazakhstan has been implementing the National Dialogue on Integrated Water Resources Management under the EU Water Initiative. The results of this work include preparation for the country's accession to the Protocol on Water and Health, including through the development of targets for water and health, as well as the preparation of a joint Kazakh-Russian assessment for the Ural River and Kigach River (creek of the Volga River).

In May 2019, on the basis of the XII Astana Economic Forum, a high-level panel session "Water as a factor of economic growth and security in Central Asia" was held on the creation of a water and energy consortium in Central Asia.

In June 2019, in the city of Nur-Sultan, representatives of state organizations responsible for water problems, scientific institutions, non-governmental and international organizations took part in a meeting of the Working Group on NDWP (National Dialogues on Water Policy) on cooperation of Kazakhstan in the field of transboundary groundwater, ensuring the safety of hydraulic structures in Kazakhstan and preventing accidental water pollution, as well as the possibility of creating a water and energy consortium in Central Asia.

Since the launch of the NDWP process in Kazakhstan, a number of projects have been successfully implemented with the support of the UNECE as subcomponents of the EU / UNDP /

UNECE joint project "Supporting Kazakhstan's Transition to a Green Economy Model" funded by the European Union.

In Kazakhstan, since 2017, the German Society for International Cooperation (GIZ), with the help of the Executive Directorate of IFAS in the Republic of Kazakhstan, has been promoting the organization of meetings of the Basin Council of the Aral-Syrdarya water management region, increasing the availability of clean drinking water in the most remote rural areas of the Aral Sea region, conducting targeted socio-economic assistance to the most vulnerable segments of the population. Today, the meetings of the Basin Council of the Aral-Syrdarya water management region have become indicative for other Basin Councils of Kazakhstan, in addition, this experience is already being adopted by representatives of the water industry of Uzbekistan.

In 2019, GIZ within the framework of the project "Transboundary Water Resources Management in Central Asia" (TWRMCA) together with the Executive Directorate of IFAS in the Republic of Kazakhstan, KazNII Fishery, RSE Kazgiprovodkhoz PK and Kyzylorda branch of RSE Kazvodkhoz, a large investment project is being implemented to design a fish protection device on the Kokaral dam of the North Aral Sea.

An important element of cooperation on transboundary waters is **joint monitoring** of the quantity and quality of transboundary water resources. Kazhydromet carries out hydrological monitoring on transboundary rivers: hydrological observations are carried out at 21 posts on the border with the Russian Federation, at 6 posts on the border with the People's Republic of China, at one post on the border with Uzbekistan and at nine posts on the border with Kyrgyzstan. The exchange of hydrological data between the countries has been organized.

However, it should be noted that the bilateral cooperation of Kazakhstan in the field of water resources does not cover transboundary groundwaters. Another specific issue is the lack of trilateral cooperation throughout the Yertis River basin (Irtysh).

Signing of four international Protocols to the Framework Convention for the Protection of the Marine Environment of the Caspian Sea (Tehran Convention) is a significant national contribution of all the Caspian states, including Kazakhstan:

- Protocol Concerning Regional Preparedness, Response and Cooperation in Combating Oil Pollution Incidents (Aktau Protocol);
- Protocol on the Protection of the Caspian Sea against Pollution from Land-based Sources (Moscow Protocol);
- Protocol on the Conservation of Biological Diversity of the Caspian Sea (Ashgabat Protocol);
- Protocol on Environmental Impact Assessment (Moscow Protocol).

The Aktau Protocol has been ratified by all the Caspian states and entered into force in 2017.

Also, Kazakhstan is working on the Agreement on cooperation in the field of hydrometeorology of the Caspian Sea, signed by Kazakhstan in 2014 and approved by the Resolution of the Government of the Republic of Kazakhstan dated July 16, 2015 No. 533.

International experience

In 2019, the United Nations World Water Report "Leaving No One Behind" was released¹¹. It shows once again that global water use has grown on average by about 1% per year since the 1980s as a result of the cumulative impact of factors such as population growth, socio-economic development and changing consumption patterns. It is expected that global water demand will continue to increase at about the same rate until 2050, leading to a 20-30% increase in water consumption over today's, mainly due to increased industrial and domestic needs. More than two billion people live in countries with high water stress, and over four billion face severe water stress for at least one month a year.

The 2020 edition of the World Report "Water and Climate Change" highlights the critical links between water and climate change in the context of the broader Sustainable Development Agenda. Drawing on examples from around the world, the Report describes both the challenges and opportunities posed by climate change and suggests potential responses - in terms of adaptation, mitigation and increased resilience - that can be taken by improving water management, reducing the

11 United Nations World Water Report 2019 Leaving No One Behind.

associated water risks and improve access to water supply and sanitation services for all in a sustainable manner¹².

Specifically, the report states that around the world every year, inadequate water supply and sanitation are the causes of:

- nearly 2 million preventable deaths;
- 123 million preventable life years with disabilities;
- the greatest impact on children under 5 years of age.

In the UNECE region, a significant proportion of the population in Eastern Europe, the Caucasus and Central Asia is in a particularly difficult situation.

On addressing water and sanitation issues, the report states that large-scale infrastructures and services to share resources and achieve economies of scale are appropriate to provide services to large user populations in densely populated urban areas, but on the other hand in smaller urban settlements and rural areas less costly are decentralized water supply and sanitation systems. In rural areas with low population densities, one of the main challenges is to bring the structures closer to human habitation. Thus, the basis for choosing a technological approach to the provision of services is the principle not so much of best practice as of maximum compliance with the tasks at hand, i.e., providing the population with water supply, sanitation and hygiene services.

UNECE experts note that despite some improvements in water supply, Kazakhstan has a number of problems in this area. In particular, the problem of operation and maintenance of new water supply facilities remains after their commissioning. Only facilities at the district level are provided with material and labor resources. In rural areas, the management and maintenance of water supply systems is carried out by rural akimats, which are not provided with the minimum funds necessary for the operation and maintenance of such facilities or their maintenance by specialists¹³.

Despite the progress made, the situation with water supply in rural areas is currently still much worse than in urban areas (in terms of technical condition and equipment, forms of management, availability of qualified specialists, etc.). There are no organized laboratories for regular monitoring of drinking water safety, with the exception of large cities. In many settlements, sanitary protection zones around sources of drinking water supply are not established and are not observed. There are not enough chlorinators and disinfectants installed at water intake facilities and water supply networks in rural areas. Another important aspect is the insufficient use of the potential of groundwater to provide the population (including the rural population) with drinking water.

Scaling up efforts and investment is critical for Kazakhstan to achieve its national goals in this area, as well as related commitments under Goal 6 of the 2030 Agenda for Sustainable Development.

Kazakhstan needs to continue to work to provide the population with safe drinking water and sanitation services, in particular by:

- (a) increasing attention to water supply and sanitation in rural areas;*
- (b) increasing investment and creating an enabling environment to attract investment in the water supply and sanitation sector.*

In 2017, the **OECD Review of Water Infrastructure Management** was released¹⁴. Due to the complexity of the construction and management of hydraulic and hydropower facilities, this review provides examples of successful risk sharing between the state and investors through public-private partnerships and other instruments of such cooperation, which is recommended for use in Central Asian countries.

In Kazakhstan, the main problems of the water sector are the problems of insufficient investment and unsatisfactory management at state utilities: the efficiency of financial resources

12 Water and Climate Change, Paris, UNESCO.

13 Third Environmental Performance Review of Kazakhstan. UNECE. 2018

14 MANAGEMENT OF MULTI-PURPOSE WATER INFRASTRUCTURE: AN OVERVIEW OF INTERNATIONAL EXPERIENCE - WORKING PAPER ON ECOLOGY # 115. Melisa Naughton (1), Nicole DeSantis (1) and Alexander Martusevich (2)

allocated by the state and investments attracted by the regions is faced with low tariffs that do not provide return on investments, non-transparency of the sector, and a lack of corporate governance.

The solution to these problems is the introduction of public-private partnerships (PPPs) in the housing and utilities infrastructure (HUI) sector. This task was set by the Head of State in the Address to the people of Kazakhstan on January 31, 2017 "The third modernization of Kazakhstan: global competitiveness".

The website of "Kaztsentr Housing and Utilities Infrastructure" JSC, a subordinate organization of the Ministry of Investment and Development of the Republic of Kazakhstan, contains information on topical issues of PPP in the housing and utilities infrastructure sector and organized the work of a call center on planning, preparation and implementation of PPP projects. As a result of the work carried out, a list of pilot PPP projects was formed, consisting of 39 projects, of which 15 projects in the water supply sector (5 projects on trust management). The most significant projects are the transfer of the water utilities of the cities of Kyzylorda and Aktobe to trust management. These projects will be implemented in cooperation with the EBRD.

Currently, the legislation of the Republic of Kazakhstan has created all the legal conditions for the development of PPP in this sector. Amendments were made to the Water Code of the Republic of Kazakhstan, and also by the resolution of the Government of the Republic of Kazakhstan approved the List of facilities that are not subject to transfer for the implementation of public-private partnerships, including concessions, in accordance with which it is allowed to transfer water facilities of special strategic importance to lease, trust and concession.

The attention of foreign scientists is increasingly being drawn to water desalination technologies, especially with the use of renewable energy sources. Thus, a joint group of scientists from the Massachusetts Institute of Technology and Shanghai Jiao Tong University has developed a highly efficient passive water desalination plant. The pilot plant, located on the roof of one of the MIT campuses, showed an output of 1.52 gallons per hour per square meter of illuminated surface (approximately 5.7 liters). Such systems can potentially serve autonomous coastal regions to provide an efficient and affordable water source. The quality of the water obtained, by the way, was higher than that required by sanitary standards. According to the researchers, in the future, the development will allow creating small water desalination plants worth up to 100 US dollars for daily drinking water service for a family of four¹⁵.

In 2019, WHO released its first comprehensive Sanitation and Health Guidelines. This Guidelines clearly demonstrates the need for action and recommends methodological tools and information resources to do so, and re-emphasizes the role of health authorities as key advocates of sanitation¹⁶. The Guidelines recognizes that safe sanitation systems are at the heart of WHO's mission, strategic priorities and the statutory objectives of ministries of health around the world. This Guidelines will be of great practical value to ministries, health authorities and practitioners. The Guidelines summarize the current evidence supporting the link between sanitation and health, provide evidence-based recommendations and provide general guidance for the adoption of international, national and local sanitation strategies and public health interventions.

Problems of achieving the SDGs

Solutions to water problems mainly relate to SDG target 3.9 and selected targets under Goal 6 of the 2030 Agenda for Sustainable Development (Table 1.1.5).

In the 2030 Agenda, water is a (often) unrecognized but important link for the achievement of various Sustainable Development Goals (SDGs). Therefore, the lack of measures to adapt to climate change not only jeopardizes the achievement of SDG 6 (Water), but also jeopardizes the implementation of most other SDGs. SDG 13 (Take urgent action to combat climate change and its impacts) includes specific targets and indicators, but there is no formal mechanism to link SDG 13 to the goals of the Paris Agreement, which leads to duplication of efforts¹⁷.

15 <https://3dnews.ru/1003417?from=related-grid-auto&from-source=1004693>

16 WHO. Guidelines on sanitation and health. 2019.

17 Water and Climate Change, Paris, UNESCO.

For target 3.9, statistical observations are carried out on indicators of morbidity associated with waterborne transmission (cholera, typhoid fever, acute intestinal infections). According to EPR-3 analysis, the frequency of waterborne intestinal infections is low in Kazakhstan. In 2010, 2012 and 2013, one outbreak of acute intestinal waterborne infection was recorded, and in 2011, one case of viral hepatitis A was registered. In 2017, 1.0% of cases of acute intestinal the source of infection was drinking water. The causal relationship between the chemical composition of water and the prevalence of diseases of the urinary system was confirmed in the North Kazakhstan, Pavlodar and South Kazakhstan regions. A significant increase in urolithiasis in Almaty and Nur-Sultan, along with other reasons, may be associated with high mineralization and hardness of drinking water¹⁸.

As part of Kazakhstan's preparation for joining the Protocol on Water and Health, the country has developed 30 targets, including indicators related to a reduction in the number of cases of waterborne diseases. Among the proposed indicators, indicators 5-9 are intended to measure the reduction in the incidence of cholera and typhoid fever (5), acute viral hepatitis (6), dysentery (7) and acute intestinal infections (8), as well as the reduction in the scale of outbreaks and cases of diseases associated with water (9).

In 2017, Kazakhstan took part in the first round of reporting under the Water Convention, presenting the National Report on the implementation of the Convention and SDG indicator 6.5.2. According to the information provided by Kazakhstan in 2017 as part of reporting in accordance with the Convention on the Protection and Use of Transboundary Watercourses and International Lakes and for the global indicator 6.5.2, in Kazakhstan, the share of the area of transboundary basins covered by existing agreements on water cooperation is 73%. All surface waters shared by Kazakhstan with other countries are covered by agreements on transboundary waters, but none of the 15 transboundary aquifers are covered by any agreement.

For SDG 6, Kazakhstan does not currently track a number of indicators similar to indicators 6.3.1, 6.4.2, 6.5.1, 6.6.1 and 6b.1. This is due to the lack of an approved methodology for such indicators. These indicators are considered extremely important for Kazakhstan.

There is sufficient information collected in Kazakhstan for targets 6.1 and 6.2, but EPR-3 recommends that Kazakhstan expand the collection of data related to water quality and conduct research on gender aspects of unequal access to water resources and sanitation. At the same time, EPR-3 expresses doubt that at the current level of investment it is possible to achieve the targets set in the Strategic Development Plan until 2025 (achieving by 2025 the provision of centralized water supply in cities at the level of 100% and in rural areas by level of 80%)¹⁹.

Table 1.1.5. Challenges in achieving the water-related SDGs

Goals and targets of the SDGs	International indicators	Indicator in Kazakhstan	Problems in achievement	The need to introduce indicators
SDG 3. Ensure healthy lives and promote well-being for all at all ages				
Target 3.9. By 2030 substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination	3.9.2 (Mortality rate attributed to unsafe water, sanitation, and lack of hygiene)	There are no direct indicators. Waterborne morbidity rates are monitored (cholera, typhoid fever, acute intestinal infections).	It is necessary to reduce the incidence of cholera and typhoid fever, acute viral hepatitis, dysentery and acute intestinal infections, as well as reduce the scale of outbreaks and cases of water-related diseases.	Deaths and illnesses from exposure to hazardous chemicals and pollution and poisoning of air, water and soil
SDG 6. Ensure availability and sustainable management of water and sanitation for all				
Target 6.1. By 2030, achieve universal and	6.1.1 Proportion of population using	Provision of centralized water	Increased funding is needed	-

18 Third Environmental Performance Review of Kazakhstan. UNECE. 2018

19 Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

equitable access to safe and affordable drinking water for all	safely managed drinking water services	supply in the Republic of Kazakhstan in cities and villages		
Target 6.2. By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	6.2.1 Proportion of population using safe, organized sanitation services, including handwashing facility with soap and water	Length of sewerage networks in urban and rural areas	Increased funding is needed	-
Target 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	6.3.1 Proportion of safely treated wastewater 6.3.2 Proportion of bodies of water with good ambient water quality	Amount of wastewater in cities and rural areas, including the amount of treated wastewater List of reservoirs with good water quality	Increased funding is needed	Share of reservoirs with good water quality in accordance with international criteria
Target 6.4. By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1 Change in water-use efficiency over time 6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	Dynamics of changes in water use efficiency by economic activity Freshwater withdrawal by industry	Monitoring is required	No
Target 6.5. By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	6.5.1 Degree of integrated water resources management (from 0 to 100) 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation	Basin management has already been introduced in Kazakhstan. Proportion of transboundary water basins covered by existing agreements on cooperation in the field of water use	No	No
Target 6.6. By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	6.6.1 Change in the extent of water-related ecosystems over time	Land area of the water fund	Monitoring is required	No
Target 6.a. By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, wastewater	6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	Data are monitored for Kazakhstan as a recipient and as a donor	Monitoring is required	No

treatment, recycling and reuse technologies				
Target 6.b. Support and strengthen the participation of local communities in improving water and sanitation management	6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	Basin councils operate throughout Kazakhstan with the involvement of citizens and public organizations	No	No

Plans for the future

According to many international experts, Kazakhstan still faces a number of problems of sustainable water use. According to the Switzerland Global report, the key challenges in water management in Kazakhstan are:

- the use of water resources in Kazakhstan has low efficiency in comparison with other countries, given that three times more water is used per dollar of GDP in comparison with Russia or the United States and six times more than in Australia;
- the current tariff system and approved tariffs, especially in agriculture, do not cover the required operating costs and depreciation charges;
- insufficient stimulation of water conservation in all sectors, especially in agriculture, where losses reach 66%;
- lack of investment in infrastructure, both in the construction of new facilities to ensure access to water, and in the maintenance of existing infrastructure;
- outdated water management infrastructure due to insufficient investment and lack of maintenance;
- lack of an informational database on water bodies (state water cadastre)²⁰.

The Strategic Development Plan of the Republic of Kazakhstan until 2025²¹ within the Priority under the Priority "Ensuring a basic quality of life in all regions" provides that in order to improve the quality of life of the population and create more equal conditions in each region, basic social services should be provided, including affordable quality education and health care, the safety of citizens is ensured, the availability of water is increased, as well as the quality of the environment. There is also a specific Initiative 5.15 "Ensuring access to drinking water". To provide the population with drinking water of appropriate quality and in full, as well as the required level of wastewater treatment, the construction of new water supply and sewerage facilities and the reconstruction of existing facilities will continue. The allocation of budget funds for these purposes will increase. As a result, by 2025, all cities will be provided with centralized water supply, and the level of centralized water supply in villages will be 80%.

Also, the Strategic Plan provides for Target 5. "Increasing the efficiency of use and protection of water resources" for the solution of which it is planned to establish cooperation on the joint selection and exchange of hydrological and hydrochemical information with the countries of Central Asia, China and Russia for the protection and rational use of water resources of transboundary rivers. The government will work to conclude bilateral and multilateral international legal documents with the aforementioned countries to provide water resources to the territory of the Republic of Kazakhstan in sufficient volume and appropriate quality.

However, while maintaining the current situation of water resources use in public utilities and agriculture, a moderate increase in efficiency in industry until 2040, water withdrawal is expected to grow up to 29.7 km³ per year, that is, the deficit of water resources may exceed 20%, and in dry years it can reach 40% from the need.

20 The World Bank. Green Economy: Realities and Prospects in Kazakhstan. 2018.

21 Strategic development plan of the Republic of Kazakhstan until 2025, approved by the Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636.

Starting from 2020, the improvement of water supply and sewerage systems is planned to be implemented within the framework of the State Program for Housing and Utilities Development "Nurly Zher" for 2020-2025. During this period, it is planned to build and reconstruct 7666 km of water pipelines.

As a result of the implementation of the State Program, out of 462 rural settlements, 105 rural settlements will be supplied with water (it will be a source of water supply) and water supply will be improved in 351 settlements and 6 cities.

By 2023, it is planned to bring the indicator "The share of the population provided with water supply services that meet sanitary standards" to 100% in cities and villages.

1.2. Development of sustainable and highly productive agriculture

Current situation and achievement of targets

The concept for the transition to a "green economy" sets ambitious goals for the agriculture of Kazakhstan until 2020 to achieve a 3-fold increase in labor productivity, increase wheat yield to 1.4 t / ha, and reduce water consumption for irrigation to 450 m³ / t.

Currently, the State Program for the Development of the Agro-Industrial Complex for 2017-2021 is being implemented, aimed at increasing the competitiveness of the agro-industrial sector, the widespread involvement of small and medium-sized farms in agricultural cooperation, the growth of agricultural exports and the efficient use of water and land resources²². In general, this program continues to implement the targets and achieve the indicators established by the Concept for the transition to a "green economy". This program provides for an increase in labor productivity in agriculture from 1.2 mln. tenge up to 3.7 mln. tenge per employee. It also has the following indicators:

1) reduction of irrigation water consumption per 1 ha of irrigated area by 20% compared to 2015 (decrease from 9180 m³ in 2015 to 7348 m³);

2) the volume of water in the systems of recycled and reverse water supply in industry:

- recycled from 0.69 km³ in 2015 up to 0.77 km³;

- reversed from 7.3 km³ in 2015 up to 7.62 km³.

To achieve the above indicators and rates, the following activities are planned:

- restoration of the irrigation infrastructure on an area of 610.0 thou. hectares of regularly irrigated land;

- restoration of the infrastructure of estuary irrigation lands on an area of 368 thou. hectares;

- reconstruction of the 41 emergency reservoir;

- restoration of the collector and drainage network (250 km) and vertical drainage wells (519 units);

- introduction of water-saving irrigation methods (drip, sprinkling) on an area of 260 thou. hectares.

The targets set by the Concept for the transition to a "green economy" and their achievement are shown in Table 1.2.1.

Table 1.2.1. Achievement of targets in 2013 – 2019

Description of the target	2017	2018	2019	2020 (target)
Labor productivity in agriculture (increase to the level of 2012 in % - 612.2 thou. tenge / person)	Increase by 2.83 times (1,735.9 thou. tenge)	Increase by 3.39 times (2,076.6 thou. tenge)	Increase by 4.03 times (2,466.0 thou. tenge)	Increase by 3 times
Wheat yield (t / ha)	1.24	1.23	1.01	1.4
Irrigation water consumption (m ³ /ha)		8,209		7,348

22 State program for the development of the agro-industrial complex of the Republic of Kazakhstan for 2017 - 2021, approved by the Decree of the President of the Republic of Kazakhstan dated February 14, 2017 No. 420.

According to the Ministry of Agriculture of the Republic of Kazakhstan²³ and the Committee on Statistics

At the same time, labor productivity in agriculture lags far behind other sectors of the economy, and the yield of main crops is not comparable with the indicators of developed countries (for example, the wheat yield in 2015 was 1.33 t / ha, while the world average was 3.75 t / ha)²⁴. In addition, agriculture is the most water-intensive sector, besides with the largest losses of water during its transportation and use. As a result, agriculture in Kazakhstan is unattractive for investment and has difficulties in financing, which further exacerbate the existing problems.

According to the Committee on Statistics, in 2017-2019, gross agricultural output was constantly growing in monetary terms by 11-17% per year (2016 – 3,684.4 bln. tenge, 2017 – 4,070.9 bln. tenge, in 2018 – 4,474.1 bln. tenge, 2019 – 5,151.2 bln. tenge). At the same time, the index of actual volume of agricultural production grew by 3-4%.

The basis of agriculture is crop production (55%), and animal husbandry plays a significant role (45%). Kazakhstan ranks second in the world after Australia in terms of arable land per capita (1.675 ha per person, while the world average is 0.194 ha per person) and is one of the largest exporters of grain and flour.

The **total area of agricultural land** increased by 11.4%, from 93.3 mln. hectares in 2010 to 104.1 mln. hectares in 2017, to 105.4 mln. hectares in 2018, and to 106.4 mln. hectares in 2019, mainly due to reserve lands, the area of which in 2018 amounted to 96.7 mln. hectares and, compared to 2010 (111.8 mln. hectares), decreased by 13.5%.

In 2017, the **arable land area** was 25.2 mln. hectares, compared to 2010 (24.2 mln. hectares) increased by 4.4%, and in 2018 it increased to 25.8 mln. hectares. Including the area of irrigated arable land amounted to 1.5 mln. hectares in 2017 and 1.6 mln. hectares in 2018.

The **area of pastures** in 2017 was 186.4 mln. hectares, which is 1.02% less than in 2010 (188.3 mln. hectares), and in 2018 it decreased to 186.2 mln. hectares, including watered pastures occupy 105.1 mln. hectares.

In the second half of 2019, the Ministry of Agriculture, together with the Ministry of Digital Development, Innovation and Aerospace Industry of the Republic of Kazakhstan, created a geoportal on the basis of NC Kazakhstan Gharysh Sapary JSC. Based on the analysis of Earth remote sensing data:

- revealed unused arable land in the Akmola region – 223,405.72 hectares, in the North Kazakhstan region – 269,753.5 hectares, in the Karaganda region – 214,168 hectares, in the East Kazakhstan region – 154,600.1 hectares, in the Zhambyl region – 53,946.83 ha, Almaty region – 67,889.92 ha;

- revealed unaccounted and vacant land on the territory of Akmola region – 123,274.9 hectares, North Kazakhstan region – 64,456.6 hectares, Karaganda region – 32,107.5 hectares, East Kazakhstan region – 66,336 hectares, in Zhambyl region – 29,404.6 hectares, Almaty region – 52,298.5 hectares.

Thus, the preliminary results of land use monitoring are presented on the zher.gharysh.kz geoservice. Validation and interpretation of the results will be completed at the end of 2020.

In addition, in 2019, the Committee for Land Management, as part of the implementation of state control over the observance of land legislation, returned to state property through the courts - 1.2 mln. hectares of unused land, of which 37 thou. hectares - arable land, 1.163 thou. hectares - pastures. On these lands, work is being carried out to redistribute them to new land users and to involve them in farming business.

Labor productivity in agriculture in comparison with 2012 increased in 2017 by 2.8 times, and in 2018 by 3.4 times, exceeding the planned indicator of 2020, in 2019 the excess was already 4 times (Table 1.2. 1).

Labor productivity in agriculture over the past five years has increased more than 4 times from the level of 2012. According to the Committee on Statistics for 2019, labor productivity in agriculture amounted to 2,466.0 thou. tenge.

23 Report on the implementation of the 2017 - 2021 State Program for the Development of the Agro-Industrial Complex of the Republic of Kazakhstan for 2018.

24 Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

In crop production, it is necessary to note the results of structural and technological diversification, if in 2013 the wheat-growing area was almost 60.8% (13.1 mln. hectares), then in 2018 these areas decreased to 51.8% (11.4 mln. ha). As part of diversification in 2018, the gross harvest of oilseeds amounted to 2.7 mln. tons. At the same time, for the first time in the production of flax, Kazakhstan took 1st place in the world, bringing its volume to 930 thou. tons (report of the Minister of the Ministry of Agriculture of the Republic of Kazakhstan, June 18, 2019, moa.gov.kz). From the harvested grain crop in the amount of 20.3 mln. tons (with a yield of 13.5 centners / ha), 11.7 mln. tons of grain were sent for export, including flour, which is 33% more than in 2017. This is a record export for the years of Kazakhstan's independence. The total export of Agro-Industrial Complex products in 2018 increased by 24.5%, including the export of processed products increased by 3.5%. which also contributed to the growth of labor productivity.

In 2019, the gross harvest of cereals (including rice) and legume crops in weight after processing decreased by 14% compared to the level of 2018 and amounted to 17,428.6 thou. tons. At the same time, the gross harvest of oilseeds decreased by 4.1% and amounted to 2,583.7 thou. tons, cotton increased by 0.2% and 344.4 thou. tons, potatoes - by 2.7% and 3,912.1 thou. tons.

In 2019, 15,255.3 tons of high-quality original and elite seeds of grain, oilseeds, forage crops were produced, including 14,504.1 tons of grain, 500 tons of soybeans, 225.2 tons of sunflower, 26 tons of feeding hay. New varieties of grain, oilseeds, fodder crops have been introduced on an area of 1,108.801 hectares, including grain 1,107.728 hectares, soybeans 871 hectares, sunflower 202 hectares, fodder 139 hectares, safflower 702 hectares.

According to the Committee on Statistics, the **wheat yield** increased from 7.9 centner/ha in 2012 to 12.4 centner/ha in 2017 and 12.3 centner/ha in 2018 (in general, grain crops - 13.5 centner/ha), however, the growth rate of this indicator is insufficient to achieve its planned values in 2020. The highest wheat yield was noted in 2018 in Zhamby and Almaty regions, the lowest in West Kazakhstan region (Table 1.2.2.).

2019 turned out to be extreme for certain regions of our country. So, following the results of the 2019 harvest, 17.4 mln. tons of grain were threshed, which is 2.9 mln. tons or 14.3% less than in 2018, including 11.5 mln. tons of wheat in 2019, which is 2.5 mln. tons less than in 2018²⁵. The main decrease occurred in the Kostanay and Akmola regions. According to the updated data of the Committee on Statistics, the wheat yield was 10.1 centners per hectare. The year turned out to be more productive for sugar beet (yield growth by 6.3%), cotton (by 1.3%), potatoes (by 2.8%), and open field vegetables (by 1.3%).

Table 1.2.2. Wheat yield in the regions of Kazakhstan

mln. tons			
Regions	2017	2018	2019
Republic of Kazakhstan	12.4	12.3	10.1
Akmola	10.9	11.1	9.2
Aktobe	12.7	11.0	8.2
Almaty	20.1	20.3	19.7
Atyrau	-	-	-
West Kazakhstan	16.2	7.7	10.8
Zhambyl	21.1	22.5	19.8
Karaganda	9.6	11.9	9.1
Kostanay	11.3	11.4	7.3
Kyzylorda	15.1	16.8	16.3
South Kazakhstan	16.4	-	-
Turkestan	-	14.9	19.9
Pavlodar	10.0	11.2	7.9
North Kazakhstan	16.7	15.4	14.2
East Kazakhstan	11.3	14.4	16.2

25 Report of the first vice-minister of agriculture Aydarbek Saparov at an expanded meeting at the board of the Ministry of Agriculture of the Republic of Kazakhstan. February 21, 2020

Nur-Sultan city	6.3	5.8	8.5
Almaty city	6.9	6.1	-
Shymkent city	-	8.6	13.4

Source: <http://stat.gov.kz>

Water consumption for irrigation in 2018 amounted to 8.209 m³ per hectare, which is slightly lower than the planned values of 8.223 m³ per 1 hectare (Table 1.2.1.). The solution to the problem of reducing the consumption of water and other resources is carried out through the introduction of water and resource-saving technologies on most of the farmland.

The total area of irrigated land in the Republic of Kazakhstan in 1991 was 2,379.5 thou. hectares, in 2000 – 2,228.3 thou. hectares, in 2017 – 2,181.0 thou. hectares, in 2018 – 2,203.1²⁶. Considering the dynamics of the areas of irrigated land for 1991 - 2017, there is a tendency to reduce the area of irrigated land to the greatest extent in Almaty, Atyrau, Zhambyl, Kyzylorda, Aktobe, East Kazakhstan, Pavlodar and North Kazakhstan regions. At the same time, there is an annual increase in irrigated land in the South Kazakhstan (now Turkestan) region.

The area of regularly irrigated water-supplied lands at the beginning of 2019 was 1.480 thou. hectares. The plan for the restoration of the irrigation infrastructure of irrigated lands for 2019 is 124 thou. hectares. Actual execution - 66 thou. hectares. At the end of 2019, the area of regularly irrigated water-supplied lands amounted to 1,546 thou. hectares, including those with water-saving technologies - 210.4 thou. hectares. In 2019, 12.3 bln. m³ of water was used for their irrigation. This is 67% of the country's total water consumption.

In 2019, the economic infrastructure was restored in Almaty region - 14.7 thou. hectares, East Kazakhstan region - 25.4 thou. hectares, Zhambyl region - 2.6 thou. hectares, Pavlodar region - 9.0 thou. hectares, Karaganda region - 1.5 thou. hectares, Turkestan region - 12.8 thou. hectares.

In 2017, the **OECD Water Infrastructure Management Review**²⁷ was released. Due to the complexity of the construction and management of hydraulic and hydropower facilities, this review provides examples of successful risk sharing between the state and investors through public-private partnerships and other instruments of such cooperation, which is recommended for use in Central Asian countries.

As of January 1, 2019, in agriculture of the Republic of Kazakhstan, the area covered by water-saving technologies amounted to 215.6 thou. hectares (of which drip irrigation - 93.64 thou. hectares, by sprinkling - 121.95 thou. hectares), this is 14.5% used irrigated land. It is planned to bring the area for the introduction of water-saving technologies to 260 thou. hectares by 2021.

According to the analysis carried out within the framework of the State Program for the Development of the Agro-Industrial Complex for 2017-2021, currently the cost of water used for irrigation is less than 1% of the cost of growing major crops (0.9% for wheat, 0.1% for cotton), which is significantly lower compared to other countries (4-13% for wheat, 2-10% for cotton in countries such as Australia, People's Republic of China, India, Israel, South Africa and the United States of America). In absolute terms, the current tariffs for water used for irrigation are among the lowest in the world: 2 to 10 times lower than in countries such as Australia, the People's Republic of China, Greece and the United Kingdom, and 20 times lower than in Israel. Taking into account the extremely low tariffs for water for the end user (the average tariff is 0.5 tenge/m³), they do not stimulate efficient water consumption at all.

In order to stimulate agricultural producers to introduce water-saving irrigation technology, by the order of the Deputy Prime Minister of the Republic of Kazakhstan - Minister of Agriculture of the Republic of Kazakhstan No. 48 dated February 1, 2017, compensation was introduced for 30% of the costs of agricultural producers for the purchase of systems and equipment for drip and sprinkler irrigation, put into operation from January 1, 2015. Currently, in accordance with the Order of the acting Minister of Agriculture of the Republic of Kazakhstan dated July 23, 2018 No. 317, such

26 SUMMARY ANALYTICAL REPORT ON THE STATE AND USE OF LANDS OF THE REPUBLIC OF KAZAKHSTAN FOR 2018. Ministry of Agriculture of the Republic of Kazakhstan. Land Administration Committee. 2019

27 MANAGEMENT OF MULTI-PURPOSE WATER INFRASTRUCTURE: AN OVERVIEW OF INTERNATIONAL EXPERIENCE - WORKING PAPER ON ECOLOGY # 115. Melisa Naughton (1), Nicole DeSantis (1) and Alexander Martusevich (2)

subsidies were increased to 50%. In addition, in accordance with the same order, subsidies of up to 80% are provided for the creation of infrastructure for irrigation of pastures and the provision of water to livestock farms (wells, bores), for the construction and expansion of a greenhouse complex - up to 25%, as well as for the production of agricultural products in greenhouses (Order of the Acting Minister of Agriculture No. 4-3 / 177 2015).

In order to fulfill the instructions of the Head of State to increase the area of irrigated land, the Kazvodkhoz RSE is restoring the irrigation infrastructure by attracting loans from international financial organizations.

The main causes of agricultural land degradation are **soil erosion and deflation**. Erosion occurs from improper land use, excessive grazing of livestock, improper agricultural practices, and destruction of grass and forest vegetation.

At the end of 2019, in Kazakhstan, wind erosion (deflated) affects 24,200.1 thou. hectares, or 11.3% of agricultural land. Those exposed to water erosion (washed away) from the total area of eroded lands occupy an area of 4,950.3 thou. hectares, or 2.3% of agricultural land ²⁸ (Table 1.2.3.).

Table 1.2.3. Dynamics of eroded lands

	2010	2015	2019
Land area subject to water erosion, thou. ha	4 988.9	4 950.0	4 950.3
The share of soils subject to water erosion in the total area of agricultural land, in percent	2.2	2.2	2.3
Land area subject to wind erosion, thou. hectares	25,493.1	24,168.1	24,200.1
The share of soils subject to wind erosion in the total area of agricultural land, in percent	11.5	10.9	11.3

Source: <http://stat.gov.kz>, for 2019 - Ministry of Agriculture of the Republic of Kazakhstan (land survey is carried out once every 5 years)

Wind erosion is especially active in the vast massifs of sands Kyzylkum, Muyunkum, Bolshiye and Malye Barsuki, Saryishikotrau, in regions located in the desert, semi-desert, as well as in the steppe zone on soils of light texture.

The main areas of agricultural land subject to wind erosion are located in the Almaty region - about 5 mln. hectares, Atyrau and Turkistan - 3.1 mln. hectares, Kyzylorda - 2.8 mln. hectares, Zhambyl and Aktope - more than 2.0 mln. hectares.

The largest share of eroded agricultural land (over 30% of their total area) is located in the Almaty, Atyrau and Turkistan regions. The smallest specific weight of eroded land (up to 5%) in the composition of agricultural land is registered in Akmola, Karaganda, Kostanay and North Kazakhstan regions.

In addition to the problems of erosion, there is a steady tendency to the deterioration of the quality of land; over 28 years of soil use, the average weighted humus content in arable land has decreased by 0.52%. The maximum decrease in humus is noted in the North Kazakhstan region - from 6.03% to 4.14%. The minimum decrease in the humus content - from 1.88% to 1.73% is observed on the bog soils of the Kyzylorda region.

Negative features of pasture lands are characterized by their degradation. In total, out of 180.6 mln. hectares of pastures, degraded to a medium and strong degree, there are 27.1 mln. hectares in the republic. The largest areas of degraded pastures are registered in Atyrau (4.1 mln. hectares), Aktope (3.9 mln. hectares), Almaty (3.0 mln. hectares), West Kazakhstan (2.5 mln. hectares), Kyzylorda (2.0 mln. hectares), Akmola (1.9 mln. hectares) regions.

The following measures are taken to prevent land degradation:

- formed a state territorial-zonal network, which consists of 1168 observation points for changes in the soil parameter;

28 SUMMARY ANALYTICAL REPORT ON THE STATE AND USE OF LANDS OF THE REPUBLIC OF KAZAKHSTAN FOR 2018. Ministry of Agriculture of the Republic of Kazakhstan. Land Administration Committee. 2019.

- soil surveys are carried out annually (surveys were carried out annually on an area of 2 mln. hectares, within the framework of the State Program of the agro-industrial complex since 2017 - 7 mln. hectares);

- electronic soil maps are produced, displaying the quality of farmland and recommendations for the effective use of land with open access to the population;

- based on the survey results, recommendations are developed for akimats on the rational use of land;

- in order to strengthen and improve the effectiveness of control, since 2018, the district akimats have been additionally empowered to control the use of agricultural lands.

Law of the Republic of Kazakhstan "On Pastures" 2017 is fundamentally new for Kazakhstan. The 2003 Land Code did not regulate pasture management in such detail. The use of pastures is free of charge (only land tax is paid). At the district level, local executive authorities develop and local representative bodies approve plans for pasture management and use. The involvement of pasture users is an important aspect of developing such plans. Pasture management plans for 2018 - 2019 already adopted in almost all regions. Development and reconstruction of pasture infrastructure facilities are in the competence of the regional executive bodies. Watering of pastures is a key measure for more efficient use of distant pastures. At the beginning of 2020, 106.2 mln. hectares (59%) out of 180.1 mln. hectares of pasture land were watered. To stimulate the development of pasture lands, investment subsidies have been introduced up to 80% of the cost of creating water supply infrastructure. In the period 2014 - 2019, there were built 5.978 wells for pasture irrigation, with a planned indicator of 3633 units. Due to measures of pasture watering, the load on pastures of nearby settlements has been reduced by 20%.

The 2017 Methodology for Measures to Combat Degradation and Desertification of Pastures (Order of the Acting Minister of Agriculture No. 185 of 2017) identifies indicators of degradation of pastures and contains lists of measures to restore degraded pastures and prevent degradation and desertification.

In 2018, the UNDP-GEF-Government of the Republic of Kazakhstan project "Increasing the sustainability of the system of specially protected areas in desert zones through the promotion of biodiversity-compatible livelihoods in and around protected areas" was completed. Within the framework of this project, 40 pilot projects were implemented in three project areas to introduce sustainable agricultural practices in arid areas, demonstrating improved agricultural practices and alternative activities in rural areas with the following results:

- 180 hectares of highly productive forage lands were created on pilot sites in 3 desert regions of the country, which demonstrate methods that can double the productivity of forage while reducing water consumption by 60%;

- on an area of more than 40 thou. hectares of degraded pastures, the practice of seasonal pasture rotation has been introduced, 6 Pasture Management Councils have been created, 8 watering points have been restored at 6 pasturings to provide water for more than 3,000 head of livestock, alternative energy sources (solar panels and wind turbines) have been installed, the living conditions of 60 farmers and their families have been improved in remote pastures. The level of knowledge of 250 farmers on sustainable pasture management was increased;

- together with the Akimat of Mangystau region in the Ustyurt area, work was carried out to water 8 pasture areas on an area of 10 thou. hectares and provided with water for 2,000 head of livestock;

- in the Kyzylorda region, on an area of 2 hectares, the practice of drip irrigation was demonstrated for irrigation of rice and vegetable and melon crops. Water saving when irrigating rice was 23 thou. m³/ha, when irrigating vegetable and melon crops - 2500 m³/ha;

- information about the implemented projects is systematized and published on the open information resource

http://www.kz.undp.org/content/kazakhstan/en/home/operations/projects/environment_and_energy.html

In the field of **organic agriculture**, in November 2015, the Law of the Republic of Kazakhstan "On the Production of Organic Products" was adopted. Many experts believe that today Kazakhstan has significant potential in the field of organic agriculture.

Several initiatives are being implemented throughout the country, mainly by local or regional NGOs, which are aimed at encouraging the production of organic agricultural products, which in the absence of national standards means the production of agricultural products without the use of mineral fertilizers, pesticides and veterinary drugs. In addition, these initiatives promote local food production and create local "eco" brands that promote healthy eating. Currently the most significant is the initiative led by the "G-Global" Coalition for Green Economy and Development (working as an NGO), which has introduced the "Green Food KZ" brand.

In matters of certification of organic products, UNDP has provided significant support to the Government of the Republic of Kazakhstan in the certification of Kazakhstani honey in China and its promotion to foreign markets. The United Nations Development Program in Kazakhstan, together with the Ministry of Agriculture, has developed a single brand logo for Kazakhstani organic products "Organic Food".

One of the factors that reduce soil fertility is the low application of **mineral and organic fertilizers**.

According to the Republican Scientific and Methodological Center of Agrochemical Service RSU of the Ministry of Agriculture of the Republic of Kazakhstan in 1986, 33.2 mln. tons of organic fertilizers were applied to the fields of the republic. Since 2000, the use of organic fertilizers has dropped significantly. Over the past five years (2015-2019), on average, about 770 thou. tons of organic fertilizers were applied.

The maximum use of mineral fertilizers was noted in 1986, when 1.0 mln. tons were applied in terms of the active ingredient (29 kg were applied per hectare). For the period 2015-2019, the volume of application of mineral fertilizers varies within the range of 86.5 - 162.6 thou. tons in the active substance, the largest volume of fertilization falls on 2017 - 162.6 thou. tons (Table 1.2.4)²⁹.

Table 1.2.4. Application of mineral and organic fertilizers

	Name of measures	Unit of measurement	Years		
			2017	2018	2019
Consumption of mineral fertilizers					
1	Sown area of agricultural crops	mln.ha	21.8	21.9	22.1
2	Consumption of nitrogen fertilizers	thou. tons N	108.6	81.0	54.5
3	Consumption of nitrogen fertilizers	kg / ha	5.0	3.7	2.5
4	Consumption of phosphate fertilizers	thou. tons P ₂ O ₅	50.3	38.3	29.4
5	Consumption of phosphate fertilizers	kg / ha	2.3	1.7	1.3
6	Consumption of phosphate fertilizers	thou. tons K ₂ O	3.7	1.3	1.7
7	Consumption of phosphate fertilizers	kg / ha	0.17	0.06	0.08
8	Total consumption of mineral fertilizers	thou. tons	162.6	120.9	86.5
9	Consumption of mineral fertilizers per area	kg / ha	7.4	5.5	3.9
10	Areas treated with mineral fertilizers	mln.ha	2.0	2.3	2.7
11	The share of areas treated with mineral fertilizers of the total sown area of agricultural crops	%	9.2	10.5	12.2
Consumption of organic fertilizers					
12	Consumption of organic fertilizers	thou. tons	1 375.9	633.0	619.5
13	Consumption of organic fertilizers per area	kg / ha	63.0	28.9	28.0
14	Areas treated with organic fertilizers	mln.ha	0.12	0.1	0.1
15	The share of areas treated with organic fertilizers of the total sown area of agricultural crops	%	0.5	0.5	0.4

Source: Ministry of Agriculture of the Republic of Kazakhstan

29 NATIONAL REPORT ON THE STATE OF THE ENVIRONMENT AND ON THE USE OF NATURAL RESOURCES FOR 2018. Nur-Sultan. 2019.

The main reasons for the low application of fertilizers are the low solvent demand of agricultural producers, the high cost of fertilizers, a narrow range of fertilizers produced in the republic, and the lack of infrastructure for the delivery and storage of fertilizers.

In order to ensure the availability of mineral fertilizers for agricultural producers, the state subsidizes their purchase.

According to the Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan, 13 domestic producers of mineral fertilizers are registered on the territory of the republic, and in general, they can provide the production of about 40% of the demand.

To improve financing of agriculture in 2017, the final rate on loans for spring field work was reduced to 6% per annum to end borrowers, while in 2016 it was 9%. This has been achieved by reducing the number of links in the credit supply chain.

In 2017-2018, in accordance with the Action Plan for the implementation of the State Program for the Development of the Agro-Industrial Complex of the Republic of Kazakhstan for 2017-2021, the following types of government subsidies were in force:

- subsidizing the increase in yield and quality of crop production;
- subsidizing the cost of setting up and growing (including restoration) of perennial plantings of fruit and berry crops and grapes (apple trees of the "Aport" variety);
- subsidizing the cost of mineral fertilizers (with the exception of organic);
- subsidizing the costs of purchasing pesticides, biological products (bioagents) for the fight against harmful, especially dangerous harmful organisms above the economic threshold of harm, quarantine objects and weeds, carried out at the expense of individuals and / or legal entities;
- subsidizing the cost the examination of the quality of cotton fiber, raw cotton;
- subsidizing support for seed production;
- lending to agro-industrial complex entities for carrying out spring field and harvesting works;
- subsidizing the cost of developing livestock breeding and increasing the productivity and quality of livestock products;
- subsidizing procurement organizations in the field of the agro-industrial complex of the amount of VAT paid to the budget, within the calculated VAT;
- subsidizing the costs of processing enterprises for the purchase of raw materials for the production of milk powder, butter and cheese.

To improve the level of knowledge and skills of farmers in agribusiness, the Ministry of Agriculture, within the framework of the state assignment, the Atameken National Chamber of Entrepreneurs conducts free-of-charge training scientific and practical seminars in peasant farms and consulting events.

In the centers for the dissemination of knowledge of the National Agrarian Research and Education Center NJSC and on the basis of advanced agricultural enterprises, about 1400 seminars were held with the participation of over 25 thou. listeners in all areas of the agro-industrial complex development, including the introduction of the principles of "green" agriculture. In 2019, about 300 seminars, 72 commercial seminars and courses, 54 Field Days and other events were held.

The topics of scientific and practical seminars are formed from the needs of agribusiness entities based on the results of a survey of potential recipients of services.

In addition, free online consulting and online advanced training services were launched for agribusiness entities through the farmers.kz information and analytical portal.

International experience

Today organic agriculture is practiced in 160 countries around the world. 84 countries have their own laws on organic farming, and dozens of countries are developing such laws. According to economists, if in 2018 the turnover in the field of organic agriculture was 85-90 bln. US dollars a year, then by 2020 this figure will reach 200-250 bln. US dollars.

The demand for food products manufactured with environmental standards is constantly growing. The European Union is the second largest home market in the world after the USA for bio products, and Germany is the largest market within the EU. In 2017, this branch of the German

economy recorded a new record - a turnover of over 10 bln. Euro. The federal government calls for the expansion of green agriculture.

By 2030, 20% of agricultural land in Germany should be cultivated using eco-technologies. This goal is part of the sustainability strategy of the Federal Republic of Germany. The coalition agreement also provides for the digitalization of agriculture, for example, to control the use of pest and disease control products, fertilizers, and medicines for livestock. Currently, according to the Union for the Sustainable Food Industry (BÖLW), there are about 30,000 biofarms. This is approximately every tenth company in Germany. However, in order to achieve this goal, we need to put another 30,000 or 40,000 farms on "ecological rails". This strategy began to be implemented in 2015. At that time, Germany had about 6% of ecologically cultivated farmland, significantly less than in several EU countries, and in 2018 the area grew up to 8.2%. 760,000 hectares are used in organic farming as pasture, and the ecological arable area is 560,000 hectares. The remaining area is fruit and vegetable crops and fruit plains.

The Strategy for the Future of Sustainable Agriculture in Germany³⁰ is based on five areas of action. They are key national areas for stronger organic farming growth. At the same time, they solve important problems of the eco-industry:

- make the legal framework promising and coherent,
- facilitate access to organic agriculture,
- take full advantage of the demand potential and continue to increase,
- improving the efficiency of ecological agricultural systems, as well as
- respect environmental services appropriately.

In Russia, according to RIA News, Roskachestvo, together with scientific and industry associations, has developed national standards for environmentally friendly agricultural products, the organization said. The first six of them were approved by Rosstandart in December 2019. The standards describe general requirements, terms and definitions of agricultural products and raw materials with improved environmental performance, as well as conformity assessment. In addition, the production, transportation, storage and requirements for mineral fertilizers are fixed.

Russian scientists believe that Russia can become a leader in organic agriculture for a variety of reasons. The Russian regions have relatively "clean" soils, a low level of pollution with toxicants. Pesticides are used 3-4 times less than in Europe. 42% of arable land in the last decades without mineral fertilizers - the plan for 2020 is 3.5 mln. tons of the required 23 mln. tons. Research of the Russian State Agrarian University - Moscow Agricultural Academy named after K.A. Timiryazev showed:

1. on an organic field there are 15-20% less small (dust-like particles), i.e. the soil is capable of better retaining moisture, it has more comfortable conditions for the roots of plants and microorganisms, less loss of the fertile soil layer due to winds, rains, melt water than in a field with a traditional farming system.

2. on an organic field, 1.5-2 times less waste rock from the underlying horizons. That is, intensive farming brings to the surface more bedrock with low fertility.

3. on the organic field, there are more fractions of particles that provide soil fertility, they are the basis of the soil-absorbing complex.

As for the quality of wheat, when grown using an organic farming system, the falling number decreases, which indicates a decrease in the amount of starch and a decrease in the activity of the enzyme glycoside hydrolase. At the same time, the content of crude protein increases significantly from 9.79% up to 15.7% and of special gluten proteins from 10.6% in traditional farming and up to 25.1% in organic farming. This leads to an improvement in the baking characteristics of the products obtained and an improvement in the quality of bread baked from wheat flour.³¹

30 https://www.bmel.de/DE/Landwirtschaft/Nachhaltige-Landnutzung/Oekolandbau/_Texte/VeroeffentlichungZukunftsstrategieOekologischerLandbau.html

31 https://soz.bio/rossiyskie-uchenye-dokazali-polzu-or/?utm_source=sendpulse&utm_medium=email&utm_campaign=novosti-soyuz-organicheskogo-z&fbclid=IwAR0Bqr3HwfQDYvjcpPSriTVmM_q4RdCZelOouYuBRM7G5Z5is8hM_5O23Cw

According to many international experts, the country has ideal conditions for the development of organic agriculture and the production of organic products due to the extremely low level of use of fertilizers and pesticides on the territory of Kazakhstan, but so far this potential has been used only to a small extent. The government has recognized organic agriculture as one of the most promising agricultural subsectors. *At the same time, the development of legislation in the field of organic production has not yet been completed, and by-laws concerning national production standards, certification and labeling are under development and approval by the Government*³².

The world community pays great attention to limiting the use of pesticides in agriculture. Especially the illegal trade in these dangerous substances. A special report of the United Nations Environment Program (UNEP) “Illicit trade in chemicals” is devoted to this topic. This report notes that pesticides are widely used in agriculture and households, and their impact on health, food safety and the environment affects almost everyone. Evidence suggests that the end users of illicit pesticides are unaware of the health risks associated with exposure to these chemicals. The overall scale of the illegal trade in chemicals remains unknown, but some estimates put it at around 1.3 bln. Euro. For example, the illegal trade in pesticides in India accounts for about 25% of the cost of pesticides used in the country³³.

The establishment of national reporting mechanisms, similar to the annual reporting requirements under the Basel Convention on the Generation of Hazardous Wastes, could help develop the baseline data analysts need to assess the severity of illegal trade within national jurisdictions. National legislation may provide for measures to ensure that used pesticide containers are not returned to the market in a new supply chain. This approach can also contribute to the development of a regulation according to which seized illegal pesticides are treated as waste for environmentally sound disposal.

Referring on the achievements of the International Year of Family Farming 2014, the United Nations has declared 2019 - 2028 as the Decade of Family Farming. Supporting smallholders and family farmers is one of four FAO regional priorities in Europe and Central Asia, to which FAO seeks to improve policy formulation, increase agricultural sustainability and expand rural livelihoods while reducing rural poverty.

FAO promotes overall, participatory and inclusive community development with individual support to smallholder farmers through grant schemes or support measures based on the specific needs and priorities of each community³⁴.

Small-scale producers and the rural poor in developing countries are particularly vulnerable to the effects of climate change. Climate change and its impact on smallholder incomes could increase the number of people living in extreme poverty to 122 million by 2030.

Intensive monoculture systems have spread throughout the world, reducing the resilience of agroecological systems and livelihoods. Therefore, one of the important measures in the field of adaptation is the conservation of the genetic resources of agricultural crops and wild plants.

Soil degradation is becoming a source of carbon dioxide emissions. Increasing soil carbon not only stabilizes soils by strengthening their buffer and storage functions for nutrients and soil water, but also reduces atmospheric carbon dioxide. This potential is enormous: by 2030, up to 200 mln. hectares of land could be restored³⁵.

Also, soil degradation is one of the most significant limiting factors in agriculture in Kazakhstan, which has an adverse effect mainly on the production of agricultural crops, leading to their low yields, but also on livestock production due to a decrease in the fodder base. At present (apart from the existing subsidies for fertilizers and the new instrument of pasture management plans) there is no systematic approach within which the coordination or management activities of state bodies aimed at promoting measures to preserve and restore soil fertility are absent. There is no guarantee of the stable provision of government-supported extension services to farmers³⁶.

32 Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

33 UNEP and GRID-Arendal (2020). The Illegal Trade in Chemicals

34 <http://www.fao.org/europe/news/detail-news/ru/c/1184939/>

35 FAO'S STRATEGY FOR CLIMATE CHANGE. Rome. 2017.

36 Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

More efficient farming practices are needed that minimize tillage, preserve organic matter and moisture in the soil, prevent soil erosion by wind and water, for example through the use of zero-till equipment and crop rotation; the elimination of fallow fields and the use of crop diversification will increase the efficiency of conservation agriculture. A variety of crops and root systems, flora and fauna controls soil erosion, increases biological activity and sequestration of soil carbon.

Problems of achieving the SDGs

Agriculture is directly related to SDG targets 2.3, 2.4, 2.5, 2.a and 5.a of the 2030 Agenda for Sustainable Development (table 1.2.5).

The parameters defined in the State Program for the Development of the Agro-Industrial Complex for 2017 - 2021 assume a significant increase in both productivity and income of farms and peasant farms by 2021, which is consistent with Goal 2 and Target 2.3. To monitor these targets, Kazakhstan has a statistical indicator similar to that of 2.3.1. However, indicator 2.3.2 is not monitored.

Target 2.4 is monitored in part by the indicator “Proportion of agricultural land using productive and sustainable agricultural practices”. However, the term “productive and sustainable agricultural practices” is not clearly defined, and Kazakhstan is moving towards more sustainable agricultural practices than traditional technologies and methods. In addition, the production of organic agricultural products is one of the priority activities in the field of sustainable agriculture, and its growth is expected in the coming years³⁷. Calculations of the total share of agricultural areas cultivated using conservation methods (no-till and minimal tillage) and organic production show that at present, approximately 12.3 mln. hectares (or 48%) of arable land are used some productive and sustainable agricultural technologies.

In the State Program for the Development of the Agro-Industrial Complex for the period 2017 - 2021 the expected impacts of climate change are not taken into account (with the exception of the situation with water resources coming from outside the country) and measures to mitigate these effects are not identified. Implementation of Target 2.4 of the 2030 Agenda for Sustainable Development requires the inclusion of targets and measures in the field of climate change in the relevant national strategic documents for the agricultural sector and ensuring their implementation through a clear division of responsibilities between departments.

There are no statistical indicators for target 2.5 in Kazakhstan. This work is carried out only at the level of scientific research. Detailed information on such works is available in the 6th National Report on Biodiversity Conservation.

Achievement of target 2.a is monitored according to the reports of the State Program for the Development of the Agro-Industrial Complex for the period 2017-2021. An increased focus on innovation for sustainable productivity growth is essential for Kazakhstan's achievement of the agriculture-related SDGs and is one of the policy principles advocated by the 2016 OECD Declaration on Better Policies to Achieve a Productive, Sustainable and Resilient Global Food System.

Agriculture indirectly affects Goal 5 and Target 5.a. Currently, the presence of women leaders in the agricultural sector in Kazakhstan is statistically monitored for both agricultural enterprises and peasant and farm households. In particular, the proportion of women among all agricultural workers remains quite stable and amounts to 44 - 46%, while in the period 2008 - 2016 it was women accounted for only 13% of farm managers and 20% of smallholder farm managers.

Table 1.2.5. Problems of achieving the SDGs related agriculture

Goals and targets of the SDGs	International indicators	Indicator in Kazakhstan	Problems in achievement	The need to introduce indicators
SDG 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture				

³⁷ Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

Target 2.3. By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	2.3.1 Volume of production per labour unit by classes of farming/pastoral/forestry enterprise size 2.3.2 Average income of small-scale food producers, by sex and indigenous status	Agricultural labor productivity		Average income of small-scale food producers, by sex and indigenous status
Target 2.4. By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	2.4.1 Proportion of agricultural land used by efficient and inexhaustible farming methods Proportion of agricultural area under productive and sustainable agriculture	Proportion of agricultural area used productive and sustainable agriculture The area of irrigated lands with the use of water-saving technologies (drip irrigation and sprinkling)	Adaptation measures to climate change are not provided.	Develop a Strategy for adaptation to climate change with appropriate indicators.
2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed	2.5.1 Number of plant and animal genetic resources for food and agriculture secured in either medium or long-term conservation facilities 2.5.2 Proportion of local breeds classified as being at risk, not-at-risk or at unknown level of risk of extinction	Not available	This work is carried out only at the level of scientific research.	Corresponding indicators needed
Target 2.a. Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries	2.a.1 The agriculture orientation index for government expenditures 2.a.2 Total official flows (official development assistance plus other official flows) to the agriculture sector	Share of expenditures on agriculture in the budget of the Republic of Kazakhstan Determined separately by the inflow of funds and donation of Kazakhstan	The indicator tends to decrease	No
Goal 5. Achieve gender equality and empower all women and girls				
Target 5.a. Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws	5.a.1 a) Proportion of total agricultural population with ownership or secure rights over agricultural land, by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure 5.a.2 Proportion of countries where the legal framework (including customary law)	Share of women granted agricultural land, by type of tenure the current land legislation, when providing a land plot, does not differentiate entities by gender,	No	No

	guarantees women's equal rights to land ownership and/or control	and does not limit rights of women		
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Plans for the future

In accordance with the Strategic Plan until 2025, the policy in the agro-industrial complex will be focused on increasing agricultural productivity, deepening the processing of agricultural products, ensuring the country's food security and increasing export-oriented environmentally friendly products. Over 5 years, it is planned to increase labor productivity and the volume of exports of processed products by 2.5 times compared to 2017.

Comprehensive support will be provided to all types of agricultural cooperatives, in particular, production, procurement and processing. To introduce modern technologies, a network of model farms will be created with the involvement of international specialists and training of local agricultural producers. Geographic information systems will find widespread use for the effective management of water and land resources and for combating desertification. In order to effectively transfer technologies and develop agricultural science, the interaction of domestic agricultural research institutes and universities with the international scientific community will be intensified, the main tasks will be the development of the breeding gene pool, increasing reproductive performance in crop production, the development of precision farming, as well as increasing resource efficiency. To provide the industry with qualified specialists, disseminate advanced knowledge and best practices in the agro-industrial complex, the role of agricultural universities will be reviewed and training programs in them will be updated. A promising direction for the development of the export potential of agricultural production will be the production of organic products, including their export to developed countries. The own certification system for the production of organic products will be introduced, and specialized laboratories for determining the quality of products will be developed.

In accordance with the instructions of the First President of the Republic of Kazakhstan - Elbasy Nazarbayev N.A. an increase in labor productivity in the agro-industrial complex over 5 years (2017 - 2022) and the export of processed agricultural products by at least 2.5 times to a greater extent will be provided due to the digitalization of the agro-industrial complex.

As part of the digitalization of the agro-industrial complex, at least 20 digital farms and 4,000 advanced farms will be created throughout the Republic, and 100% automation of processes and public services will be ensured. Digitalization will focus on the farmer and simplify his activities from start to marketing. In accordance with the State Program for the Agro-Industrial Complex, through measures, it is planned to increase GDP over 3 tln. tenge, in which the effect of digitalization of the agro-industrial complex will be 30% or about 1 tln. tenge.

Speaking at an expanded meeting of the Government of the Republic of Kazakhstan on July 15, 2019, the President of the Republic of Kazakhstan K.K. Tokayev noted that the inventory of agricultural land carried out by the Ministry of Agriculture revealed 16.5 mln. hectares of unused areas, and this is only part of the problem. "I instruct the Government to audit all agricultural lands and digitize the land cadastre information system. Land is the main factor of production. Without efficiency and transparency in this matter, we cannot develop the rural area. We understand that this is a difficult job. This requires coordinated interaction between the ministries of agriculture and digital development. It is important to complete this work by the end of next year. It is necessary to strengthen control over the effective use of agricultural land both normatively and in practice, and monitor rational land use³⁸.

1.3. Energy saving and energy efficiency improvement

Current situation and achievement of targets

38 Speech by the President of the Republic of Kazakhstan Tokayev K.K at an expanded meeting of the Government of the Republic of Kazakhstan on July 15, 2019.

In his messages to the people of Kazakhstan dated January 29, 2010 "New decade - new economic upturn - new opportunities for Kazakhstan" and dated January 17, 2014 "Kazakhstan's way-2050: Common goal, common interests, common future", the First President of the Republic of Kazakhstan - Elbasy Nazarbayev N.A. in the field of energy saving and energy efficiency, set a goal to reduce the energy intensity of the country's Gross Domestic Product for at least 25% by 2025 and at least 2 times by 2050.

The Concept on the transition of the Republic of Kazakhstan to a green economy pays special attention to reducing the GDP energy intensity for 25% by 2025 compared to 2008.

At the end of 2018, the energy intensity of the country's GDP was reduced by 27.3% of the 2008 level (1.36 in 2000 prices, at the end of 2017, the energy intensity of the country's GDP was reduced by 18% of the 2008 level (1.53 tonnes of oil equivalent (toe) per 1,000 US dollars), and by the end of 2018 - by 27.3% (0.40 tonnes of oil equivalent per 1,000 US dollars in 2010 prices versus 0.51 toe per 1,000 US dollars in 2010 prices) (Table 1.3.1, 1.3.2., Fig. 1.3.). The results of 2019 will be published in December 2020.

Table 1.3.1. Implementation of the Concept indicators

Indicator name	Target indicator	2017	2018	2019
Decrease in GDP energy intensity from the level of 2008 (1.87 toe per thou. US dollars)	25% by 2020 10% by 2015	18.2% (1.53 toe per thou. US dollars)	27.3% (1.36 toe per thou. US dollars)	(data will be generated in December 2020)

Source: <http://stat.gov.kz>

For reference: The indicator of GDP energy intensity is published by the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan in the Official statistics section - Statistics of energy and commodity markets - Dynamic tables - GDP energy intensity in the Republic of Kazakhstan.

According to the survey of the International Energy Agency, Kazakhstan ranks 119th out of 143 countries.

At the same time, the energy intensity of Kazakhstan's GDP in comparison with the world average is 2 times higher, with the OECD countries by 4 times, among the CIS countries we occupy the 5th place.

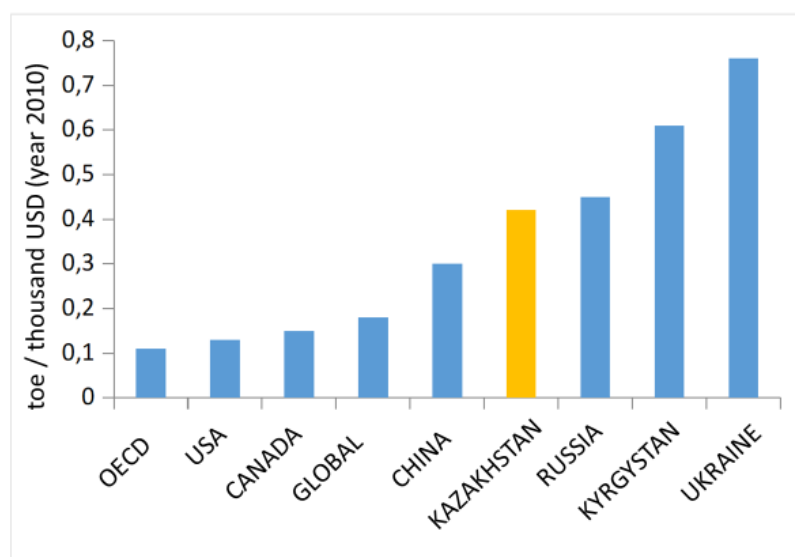


Figure: 1.3.1. Energy intensity of Kazakhstan's GDP in comparison with other countries, 2016, toe / thous. US dollars in 2010 prices.

Source: IEA Energy Outlook 2018

Table 1.3.2. Key energy indicators

Energy indicators	2017	2018
GDP energy intensity, toe per thou. US dollars in 2000 prices	1.53	1.36
GDP energy intensity, toe per thou. US dollars in 2010 prices	0.42	0.37
Total primary fuel and energy consumption, thou. toe	82,311	75,755
Total final consumption of fuel and energy, thou. toe	46,659	41,916

Source: <http://stat.gov.kz>

According to statistical data, the total fuel and energy resources amounted to 401,578.0 thou. tons of standard fuel (tsf) in 2017, 421,644.2 thou. tons of tsf in 2018, and in 2019 – 363,139.2 thou. tons of tsf. Fuel and energy resources (FER) of the republic in 2019 decreased by 13.9% compared to 2018 mainly due to a decrease in the export of fuel and energy resources.

The key energy-consuming sectors (over 98% of all consumption) are: energy supply, housing and communal services (buildings), industry and transport.

Industry leads among the sectors of the economy of Kazakhstan in terms of the consumption of primary energy resources; it accounts for 50.5% of the total energy consumption. Industrial energy use increased between 2008 and 2016 by 19.3%, from 16.8 mln. tons to 20.8 mln. tons.

The transport sector consumes 12-14% of the total energy. Although there are vehicles in Kazakhstan that run on electricity and natural gas, the main fuel used is gasoline. Poor quality motor fuels and obsolescence of the vehicle fleet contribute to low energy efficiency in the transport sector.

The residential sector is the third largest consumer of heat and electricity in the country after the energy and manufacturing sectors. As part of previously implemented UNDP-GEF projects, a selective energy audit of buildings of various years of construction was carried out, which showed that energy consumption in the residential sector of Kazakhstan is about 270 kW*h/m². This exceeds the level of consumption in Europe (100 - 120 kWh / m²), as well as in the Russian Federation (210 kWh / m²). The main reasons are: a cold climate, a high level of heat loss due to insufficient thermal insulation, lack of regulation of heat consumption depending on the actual weather, deterioration of the internal heat consumption systems of buildings, inadequate control of heating units, etc. About 75% of buildings in Kazakhstan were built between 1950 and 1990 and do not meet modern energy efficiency standards³⁹.

The most energy-intensive regions are the industrially developed Pavlodar and East Kazakhstan regions, the least - agricultural regions like Kostanay, Almaty, Zhambyl and Akmola regions, as well as the cities of Almaty and Nur-Sultan (Table 1.3.3.).

Table 1.3.3. Energy intensity of GRP in the Republic of Kazakhstan

	toe per thou. US dollars in 2000 prices		
	2017	2018	2019*
Republic of Kazakhstan	1.53	1.36	
Akmola	0.43	0.30	
Aktobe	3.69	2.98	
Almaty	0.15	0.08	
Atyrau	1.40	1.13	
East Kazakhstan	0.83	0.79	
Zhambyl	0.22	0.39	
West Kazakhstan	5.54	6.32	
Karagandy	2.84	2.40	
Kostanay	0.01	0.02	
Kyzylorda	5.96	5.42	
Mangystau	4.61	4.75	
Pavlodar	6.10	7.12	
North Kazakhstan	0.30	0.06	
South Kazakhstan	0.68	0.33	
Almaty city	0.12	0.09	
Nur-Sultan city	0.10	0.07	

Source: <http://stat.gov.kz>

39 Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

** Data will be generated in December 2020*

The electricity industry in Kazakhstan is predominantly coal-fired, as about 70% of electricity is generated at coal-fired power plants. At the same time, the share of CHPPs in the structure of electricity generation is 45%, and in heat production of heat energy in Kazakhstan, CHPPs account for more than 62%.

The specific fuel consumption at coal-fired CHPPs for electricity generation is always higher than at condensing power plants. At the same time, energy efficiency depends on the magnitude of the electrical load and on compliance with the parameters of the thermodynamic cycle, which are largely determined by the technical condition of the equipment. In terms of coal-fired CHPPs, their energy efficiency is largely determined by thermal loads, and to a lesser extent by the technical condition of equipment. As a result of a decrease in large heat consumers (since the 90s), the resulting decrease in heat loads often leads to the need for the CHPPs to operate in uneconomical modes. Data on the modernization of power plants are shown in Figure 1.3.3, where we can see that the share of equipment with wear over 75% has significantly decreased over 5 years.

Improving the energy efficiency of CHP plants refers not only to modernization issues, but also to planning the development of urban heat supply infrastructure to increase the load of CHP plants.

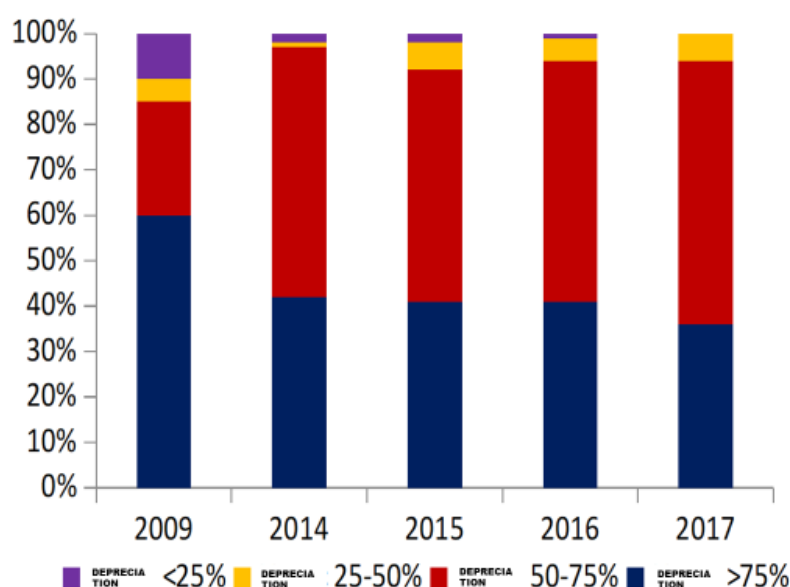


Figure: 1.3.3. Turbine equipment wear

Source: Kazenergy National Energy Report 2019

According to the Ministry of Education and Science of the Republic of Kazakhstan, in all secondary schools of the regions, the cities of Nur-Sultan, Almaty and Shymkent, work is underway to replace lighting devices with LED lamps. In accordance with modern requirements, during the construction of new schools in the design and estimate documentation, electric lighting is designed taking into account the installation of energy-saving LED lamps.

To improve the energy efficiency of public transport (separate lines, smart stops, electronic payment), separate lanes for public transport were introduced in the cities of Nur-Sultan and Almaty, a satellite monitoring system for the operation of urban and suburban routes, smart stops, and electronic toll systems were installed with a differentiated tariff, which allowed in Almaty to withdraw more than 800 million tenge from the shadow in one month.

In 16 regions of the country, there is a satellite dispatching system for public transport. During 2020-2021, it is planned to commission this system. With the help of this system, it is possible to solve a number of problems in the field of intercity and international passenger transportation.

In addition, since 2018, a program of preferential leasing for the purchase of domestically produced buses has been in effect, which made it possible to purchase 693 buses in 7 regions in 2018-2019.

Energy efficiency requirements are determined for various types of transport (road, air, rail, inland waterway, sea and urban electric transport) by order of the Minister for Investment and Development of the Republic of Kazakhstan dated March 31, 2015 No. 389 "On the establishment of requirements for energy efficiency of transport". In addition, in 2017, the Committee for Roads of the Ministry of Investment and Development approved the recommendations "Green principles of sustainable development of road and transport infrastructure" (R RK 218-137-2017). They define criteria and a scoring system for assessing road infrastructure facilities, roads, roadside service facilities and roadside hotels for environmental compliance and for assigning these facilities a compliance category (green, silver, gold or platinum).

In various regions of the country, there has been opened the **production of energy-saving building materials** as heat-insulating panels, pre-insulated pipes and pipes pre-insulated with polyurethane foam in galvanized and polyethylene sheaths (Akmola, North Kazakhstan and East Kazakhstan regions). Energy-saving engineering equipment such as heat exchangers, heat pumps (Akmola region and East Kazakhstan region) are produced. Also, foamed polyethylene is produced, which is considered one of the representatives of the four leaders in technical insulation all over the world (East Kazakhstan).

To date, 4 cement plants for the production of cement using energy-saving technology "dry method" have been commissioned: Mynaral Tas Company LLP, Standard Cement LLP, ACIG JSC, Kazakhcement LLP.

To implement the targets set by the Concept for the transition to a "green economy", the following measures have been taken:

1) formed a legislative framework based on the Law "On Energy Saving and Energy Efficiency";

2) chapter 17 of the Code of Administrative Offenses of the Republic of Kazakhstan establishes penalties for violations of legislative requirements in terms of energy saving and energy efficiency;

3) 16 regional energy saving plans are being implemented, as well as the Energy Saving Program of Samruk-Kazyna and its subsidiaries;

4) the State Energy Register (SER) has been created and is functioning as one of the key systemic mechanisms of the Law;

5) 18 educational centers for energy saving have been opened in order to train the necessary personnel and develop science in this direction. More than 500 specialists trained;

6) the "Institute for the Development of Electric Power Industry and Energy Saving" was created as a system operator, developing and coordinating all energy saving processes in the country;

7) 159 energy audit organizations are engaged in activities in the field of energy saving and energy efficiency on the energy efficiency market, more than 350 energy auditors have been certified;

8) the best practices of Germany and Japan are adopted within the framework of international cooperation, through the German Energy Agency and the Japan Energy Efficiency Center (102 specialists completed training courses in Japan), joint projects are being implemented with the WB, EBRD, UNDP, ADB;

9) Damu Entrepreneurship Development Fund JSC (Damu Fund) and the Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan, with the support of UNDP, has created an institutional framework for supporting energy saving and energy efficiency projects through financial incentives and support;

10) the International Green Technologies and Investment Projects Center (IGTIC) is engaged in the implementation of the best available technologies (BAT), which, among other things, include energy efficiency issues.

The State Energy Register (SER) includes 20,533 entities, of which: subjects of the quasi-public sector - 4,962, state institutions - 13,278, legal entities - 2,293.

The SER mechanism provides for enterprises that consume more than 1,500 tsf. per year, requirements for energy audits and the formation of a program of energy saving measures. The SER operator monitors the compliance with the legal requirements of the SER entities.

The total consumption of energy resources by the SER entities in 2018 amounted to 58 mln. tsf., or about 41% of the total national consumption of energy resources, of which: legal entities - 41%, institutions of the quasi-public sector - 37%, government institutions - 2%.

In the sectoral context, 30 mining enterprises account about 17.4% of consumption. The share of consumption by 41 SER entities providing transport services (stations, airports, bus fleets and other transportation) is 12.2%. At the same time, 32 manufacturing entities account only 3.4%.

In addition, the work is underway to digitize the SER - an automated information system for the SER has been created and launched. The number of SER entities that provided information through the AIS SER is more than 20,000.

In the implementation of the 59th step of the Plan of Nations "100 Steps to Implement Five Institutional Reforms", an Energy Efficiency Map was created, which includes 81 projects worth about 37.7 bln. tenge (24 projects of which - through the mechanisms of energy service contracts and public-private partnerships).

The mechanism of financial support in the form of subsidizing and guaranteeing energy saving projects has been tested (total amount - 3 mln. US dollars) in order to stimulate the implementation of energy service projects, together with the Damu Fund. In 2018, 90 projects were approved for the amount of 18.5 bln. tenge.

Active work is underway to attract investors to the field of energy saving. Together with the World Bank, the United Nations Development Program, the EBRD and the ADB, international projects totaling more than 50 million US dollars are being implemented.

1. Grant Agreement between Kazakhstan and the International Bank for Reconstruction and Development for the project "Improving Energy Efficiency in Kazakhstan" in the amount of 21.7 million US dollars. From 2015 - 2019 the project provides for the modernization of 97 state and social facilities (75 completed), as well as the development of laws and regulations and BAT and an information company.

2. In 2017, the implementation of the project with the United Nations Development Program "Promotion of energy efficient lighting in Kazakhstan" was completed, within the framework of which the lighting of 4 schools of the Akmola region, 3 schools of the East Kazakhstan region, entrances of apartment building in Lisakovsk, Satpayev, Uralsk, Aktau, Almaty, Nur-Sultan cities was modernized (3200 lamps were replaced). Within the framework of the project, the modernization of the street lighting system was carried out in 5 pilot regions (Aksu, Pavlodar, Aksuat, Arnasai, Petropavlovsk), where energy-efficient LED-based lighting equipment with elements of an automatic control system was installed. Modernization of lighting in 9 medical institutions of the country was carried out for the amount of more than 30 million tenge.

3. Since 2015, UNDP, with the financial support of the Global Environment Facility, has been implementing a joint project with the Government of the Republic of Kazakhstan "Sustainable Cities for Low-Carbon Development", within the framework of which technical and methodological support is provided to 15 selected pilot cities in the preparation and implementation of low-carbon (energy efficient) projects in systems their urban economy (heat consumption systems, lighting, water supply, sewerage, buildings, etc.).

4. The Kazakhstan program of the American Agency for International Development (USAID) to curb climate change in 2014-2017 implemented 24 pilot projects to develop energy management and monitoring systems (EMMS). Currently, USAID is providing assistance in launching energy service projects at 3 healthcare facilities in Karaganda, Pavlodar and East Kazakhstan regions through a public-private partnership mechanism.

5. In 2017, the implementation of a new project of the Government and UNDP for 3.5 mln. US dollars "Standards, certification and labeling of energy efficiency of electrical household appliances and equipment in Kazakhstan" was started. The goal of this project is to transform the domestic market for the use of energy efficient appliances and equipment, as well as to develop minimum and maximum energy efficiency standards. In 2018, a methodological guide was developed for conducting

express energy audits of electric motors and transformers for energy auditors, was conducted a sociological study "Consumer awareness of the benefits of energy-efficient equipment and devices". Out of 50 local testing laboratories, 6 laboratories were identified for further joint work on equipping / retrofitting with the necessary instruments.

International experience

Since the beginning of the 90s of the last century, the creation of energy efficiency centers has become popular in the world.

Such Centers rarely exist on a fully self-sustaining basis and are supported through national and international energy efficiency programs. The purpose of the Centers varies according to the level of development of the country.

In developing countries, the Centers are established within the framework of international programs of various financial institutions. The purpose of such projects is to raise awareness among politicians and the public about the benefits of energy saving to reduce the load on the network, to reduce environmental pollution and greenhouse gas emissions, as well as to increase the export potential of fuel and energy resources.

For example, the Oregon State University Energy Efficiency Center in the United States (OSU EEC), USA is a research and development center dedicated to promoting renewable energy and energy efficiency in the industrial, agricultural, commercial, institutional and residential sectors. OSU EEC is part of the Industry Assessment Center (IAC), established within a program of the US Department of Energy. The IAC program includes 26 centers located at universities throughout the country. OSU EEC was established in 1986 and has accumulated extensive experience in the field of energy efficiency in industry. The United States Department of Agriculture has provided 100,000 US dollars to the Center to conduct over 90 audits. In addition, the Center is the developer of a centralized energy efficiency guide. The aim of this project is to bring together a wealth of information on energy efficiency. The Guide is intended for open, public use.

Center for Energy Efficiency and Renewable Technologies (CEERT), USA. CEERT is a non-profit public organization founded in 1990. It's based in Sacramento, California state. The team of the Center, its affiliates and the Board of Directors include professional academics, lawyers, economists, policy experts, public advocates and green technology entrepreneurs. The center carries out technical work, policy development and implementation, and carries out advocacy campaigns that focus on key issues in the development of renewable energy sources. It actively cooperates with federal, regional and local energy agencies.

Michigan Energy Demonstration Centers, USA. A common feature of the Michigan Centers network is the status of independent non-profit, non-governmental organizations with a focus on local communities. The network is: a group of energy demonstration centers located throughout the state; organizations established to promote energy efficient and renewable energy sources; the centers educate the public through practical, interactive examples; Centers provide an opportunity for Michigan residents to be at the forefront of energy efficiency.

Modernization of coal generation

Recently, China has shown significant results in improving the energy efficiency of coal-fired power plants. The national average indicator of coal consumption in the electric power industry in 2015 was 315 g / kW * h, which is 55 g / kW * h less than in 2005.

Total PM, SO₂ and NO_x emissions from thermal power plants in 2014 were halved compared to 2006. Also, there was an exponential growth of power units operating on ultra-supercritical steam heating⁴⁰ technologies by 2014, it accounted for 100 out of 907 GW of China's total coal capacity. Today, according to S&P Global Platts, 19% of China's coal capacity operates on the basis of ultra-supercritical technology, 25% use supercritical technology, and 56% of coal plants operate on subcritical steam parameters.

40 For ease of understanding, the efficiency of the power generation process depends on the superheat temperature of the steam, and the higher the steam temperature, the higher the efficiency. Supercritical steam parameters are temperature 540 °C (efficiency 41%), and ultra-supercritical parameters 600-650 °C (efficiency 45-47%).

In 2014, China published an Action Plan for the Renovation and Reconstruction of Coal-Fired Power Plants for Energy Saving and Reducing Emissions, which sets technical standards for new and existing coal-fired power plants, effective in 2020 (from 2017 in East China and from 2018 - in central China). Emissions from coal-fired power plants should be approximately on par with gas generation. These are more stringent standards than those of the European Union and the United States (Table 1.3.4.).

It also stipulates that new pulverized coal units with a capacity of more than 600 MW should operate only using ultra-supercritical technology, and pulverized coal boilers and pulverized coal plants with a fluidized bed with a capacity of more than 300 MW should use only supercritical technologies.

Table 1.3.4. China's coal-fired power plant emission standards compared to US and EU.

Emissions	China (new)	USA	EU
Nitrogen oxides	100	135	200
Sulfur oxides	200	185	200
Particulate matter	30	19	20

In order to encourage the adoption of high-efficiency, low-emission technologies, the Chinese government has introduced special fixed tariffs since 2016 on electricity generated by low-emission plants.

The Center American Progress published a report on China's coal-fired generation in May 2017⁴¹. According to this report, the Chinese government is setting the following requirements: in 2020, all coal-fired power plants across the country must meet the following efficiency standards or shut down: 300 [gf/kWh] for all new plants and 310 [gf/kWh] for all existing plants.

Indicators of the 100 most efficient coal-fired power plants in China: from 271.56 [gf/ kWh] to 294.88 [gf/ kWh]. “Currently, none of the top 100 power plants in the United States will meet these efficiency standards,” the authors of the report note. The oldest of China's 100 most efficient coal-fired power plants was built in 2006. That is, China has the latest (and most modern) fleet of coal-fired power units. In the United States, only one coal-fired power plant in the top 100 operates on super-supercritical technology, there are 69 in the first 100 of such power plants in China.

At the same time, it should be understood that 68% of China's electricity is generated from coal, and during the period of rapid economic growth since the late 90s, generation grew mainly due to the construction of medium-power coal blocks at subcritical steam parameters. At the same time, the share of CHPP plants in China is not significant, the basis is made up of condensing power plants.

For Kazakhstan in the period of modernization of coal generation the most important will be the experience of China in terms of the introduction of coal-fired power units with ultra-supercritical steam parameters (Fig. 1.3.5.)

41 «Everything You Think You Know About Coal in China Is Wrong» Melanie Hart, Luke Bassett, and Blaine Johnson Posted on May 15, 2017

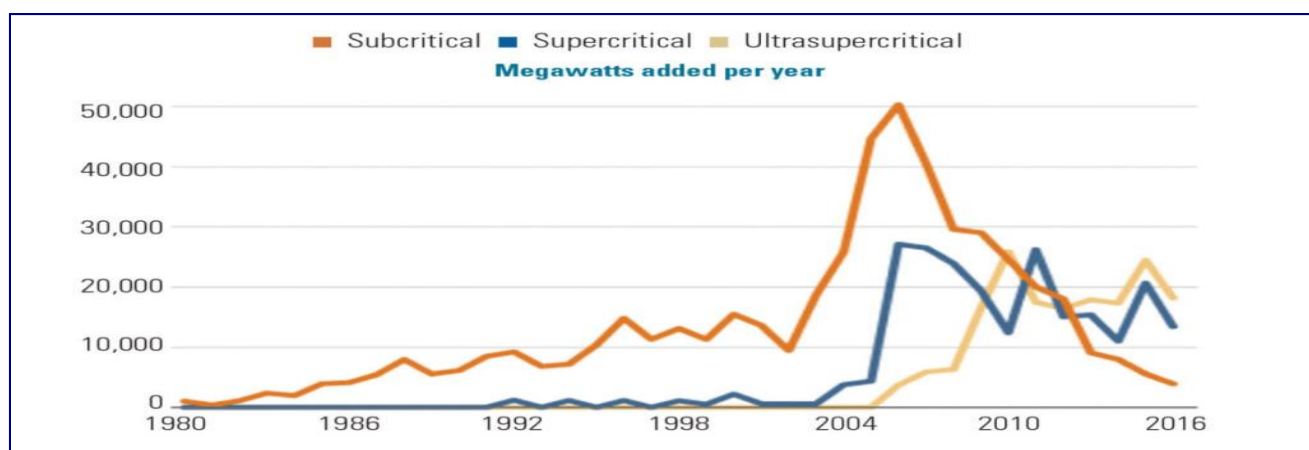


Figure: 1.3.5. The dynamics of the introduction of new technologies for coal combustion in China.

The gains in increasing high-efficiency capacity have been largely driven by China's gigantic investment in research and development (R&D). Five-year plans prioritized the development of advanced technologies - large-scale super-hypercritical and CFB-power units, as well as facilities with integrated gasification combined cycle (IGCC) and carbon capture.

UNECE experts note that the national strategic documents adopted in Kazakhstan indicate that coal will remain the main source of energy in the country in the medium and possibly long term. At the same time, the country stresses the importance of moving towards a more sustainable energy system. Clean coal technologies can make a significant contribution to improving sustainability.

Efficiency gains, flexible operating regimes to support renewable energy sources, and carbon capture and storage are key technologies to enable this transition. There is no strategic parity between these technologies and other low-emission technologies. Therefore, the Government of Kazakhstan, according to international experts' opinions, should⁴²:

continue research into more efficient and environmentally friendly uses of coal;

take measures to reduce emissions by increasing the efficiency of coal use, with gradual modernization and upgrading of the technological level of existing coal-fired power plants;

when developing national strategic documents aimed at achieving SDG 7, conduct a comprehensive study on the development of advanced technologies for the use of fossil fuels, taking into account their status, trends, economic analysis, impact on the environment and human health, and institutional and legal barriers ;

if clean coal-based power generation is economically viable and environmentally sound, develop and endorse relevant strategic documents to support the achievement of SDG 7, and ensure that these strategic documents incorporate appropriate legal frameworks and economic incentives, and take into account environmental and health impacts.

Problems of achieving the SDGs

Energy efficiency is directly related to SDG target 7.3 and SDG 7 (table 1.3.6).

In accordance with the Strategy "Kazakhstan-2050" and other strategic and program documents, Kazakhstan has set targets by 2020 to reduce energy intensity by 25% from the 2008 level, and by 2050 - by 50%. The solution to this problem is monitored by the statistical indicator "energy intensity, GDP". However, data are not yet available for indicator 7.b.1.

Indicator 12c.1 is not fully monitored in Kazakhstan. (The sum of fossil fuel subsidies per unit of GDP (production and consumption) and their share in total national spending on fossil fuels).

Table 1.3.6. Problems of achieving the SDGs related to energy efficiency

Goals and targets of the	International indicators	Indicator in	Problems in	The need to
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42 Third Environmental Performance Review of Kazakhstan. UNECE. 2018

SDGs		Kazakhstan	achievement	introduce indicators
SDG 7. Ensure access to affordable, reliable, sustainable and modern energy for all				
Target 7.3. By 2030, double the global rate of improvement in energy efficiency	7.3.1. Energy intensity measured in terms of primary energy and GDP	Energy intensity, GDP	No	No
Target 7.b. By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	7.b.1. Investments in energy efficiency as a percentage of GDP and the amount of foreign direct investment in financial transfer for infrastructure and technology to sustainable development services	No	No	Investments in energy efficiency as a percentage of GDP and the amount of foreign direct investment in financial transfer

Plans for the future

Clause 12 of the National Action Plan for the implementation of the Address of the Head of State to the people of Kazakhstan dated January 10, 2018 "New opportunities for development in the context of the fourth industrial revolution" stipulates the measure "Submission of proposals to improve the requirements for energy efficiency and energy saving of enterprises".

As part of the implementation of this measure, the Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan (MIID RK) analyzed the practical implementation of the Law of the Republic of Kazakhstan "On Energy Saving and Increasing Energy Efficiency", including for improving the requirements for energy efficiency and energy saving of enterprises. Based on the results of the analysis, a number of issues were identified that require tightening or, on the contrary, softening of regulation, for example, in relation to ensuring the quality of conclusions issued following the results of an energy audit, the formation and maintenance of the State Energy Register, regulation of energy audit activities, state control, etc.

In this regard, the improvement of the energy saving system is proposed in two directions - for the private and public sectors.

For private legal entities, measures are offered such as:

- partial elimination of strict regulations (for example, reducing the number of persons obliged to conduct an energy audit, reducing the amount of information provided);
- preventive control (in accordance with the law of the Republic of Kazakhstan "On Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan on Improving the Regulation of Entrepreneurial Activity");
- implementation of an energy manager on the staff (for large enterprises);
- transfer of control functions to the authorized body for the electric power industry (in relation to power plants);
- creation of incentive mechanisms (financial support, tax incentives).

In order to improve the regulation of the state and quasi-public sectors in the field of energy saving and energy efficiency, the following measures are proposed:

- full monitoring of energy consumption by subjects of the state and quasi-public sectors (expanding the coverage of the State Energy Register),
- taking measures of strict regulation of this area (strengthening the responsibility of managers, developing standards).

Based on the results of this work, the concept of the draft Law of the Republic of Kazakhstan "On Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan on Energy Saving and Energy Efficiency Improvement" was developed.

This Concept is aimed to improve the energy saving system and, by taking into account the international experience of the countries of near and far abroad, proposes appropriate amendments and additions to the legislation of the Republic of Kazakhstan, by taking into account the proposals of state and local executive bodies.

1.4. Electric power industry development

Current situation and achievement of targets

The Strategy "Kazakhstan-2050" and the Concept for the transition of the Republic of Kazakhstan to a "green economy" set ambitious goals to achieve the 3% share of **renewable energy sources** by 2020, 10% by 2030 and 50% by 2050 of total electricity production. Traditional energy sources also need to improve their efficiency.

Today the Unified Energy System (UES) of Kazakhstan is working steadily. The system reliability of the UES is fully ensured, the need of the economy and the population for electricity is satisfied.

Electricity production in Kazakhstan is carried out by 138 power plants (including RES) of various forms of ownership (most of them are private).

The total installed capacity of power plants (PP) in Kazakhstan as of January 1, 2019 is 21,901.9 MW, including by fuel type: coal-fired power plants - 13,236 MW; gas power plants – 5,699.7 MW; HEPPs (large) - 2,446.6 MW; RES (including small hydroelectric power plants) - 531 MW. The annual maximum load in Kazakhstan in 2018 was recorded on December 25, 2018 and amounted to 14,823 MW, with an available capacity of 18,895 MW. Over the past five years, the available capacity of power plants has increased by 2,470 MW, or 15% of the 2013 level, mainly due to the increase in the capacity of thermal power plants and renewable energy sources. At the same time, there is a capacity reserve of energy producing companies of about 4000 MW to the maximum load, or about 22 - 25%. This will ensure the required volumes of consumption until 2025.

According to statistics, in 2018, electricity generation amounted to 107.4 bln. kWh. or 116% over the same period in 2017 (103.1 bln. kWh), in 2019 - 106.5 bln. kWh, of which 11,097.0 mln. kWh due to renewable energy sources, including 9,993.7 mln. kWh of electricity produced by hydroelectric power plants, 707.1 mln. kWh - by wind power plants, 391.2 mln. kWh - by solar power plants. Electricity from biogas produced by biogas plants in 2019 amounted to 4,967.1 thou. kWh (5.0 mln. kWh)

The average age of equipment at power plants in Kazakhstan at the end of 2018 was 32 years. Over the previous five years, it has increased by 3 years. The capacity of the oldest equipment commissioned more than 70 years ago is 0.54% (118 MW) of the total installed capacity of power plants, and the capacity of power plants commissioned more than 30 years ago is 54.3% (11,892 MW).

The wear rate of electrical networks in Kazakhstan is about 60%. Losses of electrical energy in the main power grids (NPG RK) are from 5 to 7%, in the grids of regional power grid companies - about 12% and are practically optimal for networks of this class. In distribution networks of some regions of Kazakhstan, losses reach 20%, but they are associated with the high length of networks and low concentration of consumers⁴³ (Table 1.4.1.).

The Minister of Energy of the Republic of Kazakhstan noted at the collegium on February 25, 2020 that the length of ownerless networks had decreased from 2350 km in 2017 to 225 km in 2019 (by 2125 km). At the same time, as part of the work carried out by local executive bodies, new ownerless objects are identified, the final results on this problem will be achieved in 2023.

Thermal energy is supplied to the domestic market of the republic. In 2013, its production amounted to 94.7 mln. Gcal, in 2017 - 88.7 mln. Gcal, in 2019 - 90.0 mln. Gcal. Average depreciation of heating networks in the country is 63%. At the same time, about 40% or 9.6 thou. km have 100%

⁴³ State program of infrastructure development "Nurly Zhol" for 2015 - 2019. Resolution of the Government of the Republic of Kazakhstan dated July 30, 2018 No. 470.

wear. Heat energy losses in 2013 and 2017 amounted to 8.9 mln. Gcal and 8.3 mln. Gcal, respectively, that is, about 9% of the total heat energy resources ⁴⁴.

In 2019, according to the Committee on Statistics, the generation of heat energy amounted to 87.9 mln. Gcal, of which 52.2 mln. Gcal came from thermal power plants and 28.6 mln. Gcal - from boiler houses. In the republic in 2019, the number of heat supply sources was 2,457, the total length of heating networks was 11.4 thou. km, of which 28% needed to be replaced. Heat energy losses in 2019 amounted to 9027.6 thou. Gcal⁴⁵.

The Concept for the Development of the Fuel and Energy Complex until 2030 (2014 Resolution of the Government No. 724), adopted in 2014, covers the development of the coal, oil, gas and nuclear industries, as well as the electricity and heat power industry. It outlines the strategic priorities of the sector: energy security, development of the resource base and improvement of the environmental situation. The main tasks of the sector until 2030 include: modernization of existing and construction of new generating capacities; development of domestic markets and competition; modernization of industry and transport; introduction of modern technologies to improve energy efficiency and reduce adverse environmental impact; and the development of technologies and infrastructure for the use of alternative energy sources, including nuclear energy.

Since 2012, the total electricity consumption in Kazakhstan appears to have entered a new phase of stabilization - it is no longer growing at the relatively fast pace seen in 2000-2012 (4.4% per annum on average). In the future, electricity demand is expected to grow more modestly, averaging only about 1.1% per annum until 2040 (see Figure 1.4.1.)⁴⁶.

At the end of 2018, there were 67 operating renewable energy facilities in the Republic with a total capacity of 531 MW (HEPP - 200.25; WPP - 121.45; SPP - 209; biogas plant - 0.35) and electricity generation by renewable energy facilities amounted to 1.35 bln. kWh (115% by 2017). The share of RES in the total electricity production is 1.3% (Table 1.4.1.).

Table 1.4.1. Electricity production by renewable energy facilities in 2019

Indicators	Unit of measurement	2017	2018	2019
Installed capacity, including:	MW	409.35	570.35	1,050.1
wind power plants	MW	134.5	143.5	283.8
small hydroelectric power plants	MW	216.8	216.8	222.2
solar power plants	MW	57.7	209.7	541.7
bioelectric power plants	MW	0.35	0.35	2.42
Power generation, including:	mln. kWh	1,104.76	1,304.2	2,400.74
wind	mln. kWh	339.77	384	717.4
small hydroelectric power plants	mln. kWh	650.02	781.4	1,105.3
solar power plants	mln. kWh	114.28	138.8	563.14
bioelectric power plants	mln. kWh	0.69	0	14.9
The share of generated electricity by renewable energy sources in the total volume of electricity production	%	1.08	1.3	2.3

Source: data of the Ministry of Energy of the Republic of Kazakhstan

The following projects were commissioned in 2018:

- the project "SPP with a capacity of 2 MW in the area of Batyr village of Munaily district of Mangystau region" of the company Group Independent LLP;
- the project "Construction of Burnoe Solar-2 in Zhualy District of Zhambyl Region" with a capacity of 50 MW of the company Burnoe Solar-2 LLP;
- the project "Construction of "Sarybulak Wind Power Plant" in the area of Sarybulak village of Almaty region" with a capacity of 4.5 MW of the company VES Sarybulak LLP;

⁴⁴ Fuel and energy balance of the Republic of Kazakhstan for 2018.

⁴⁵ On the work of thermal power plants and boiler houses of the Republic of Kazakhstan for 2019.

⁴⁶ National Energy Report 2017. Kazenergy.

- the project "Construction of "Sarybulak 2 Wind Power Plant" in the area of Sarybulak village of Almaty region" with a capacity of 4.5 MW of the company VES Sarybulak-2 LLP;
- the project "Construction of a Solar Power Plant with a capacity of 100 MW in the city of Saran, Karaganda region" - SES Saran LLP.

The total volume of attracted investments for the above projects is more than 160 mln. US dollars.

In 2019, according to the Ministry of Energy, 2.4 bln. kWh of "green" energy was generated, with an increase of 77.8% compared to 2018. The share of renewable energy sources in the total electricity production is 2.3%. In 2019, 21 renewable energy facilities were commissioned.

At the end of 2019, 21 renewable energy facilities were commissioned with an installed capacity of 504.55 MW. For renewable energy projects, the total amount of attracted investments amounted to 613 mln. US dollars.

Thus, the total number of operating renewable energy facilities was 90 with a total capacity of 1050.1 MW (HEPP - 222.2; WPP - 283; 8 SPP - 541.7; biogas plant - 2.42). In 2020, it is planned to commission another 18 renewable energy facilities with a total capacity of 605.5 MW. Accordingly, the number of renewable energy facilities is planned to be increased to 108 (1,650 MW) in 2020.

According to statistics, by taking into account large hydroelectric power plants, electricity production from renewable energy sources in 2019 amounted to 11,097.0 mln. kWh, including 9,993.7 mln. kWh of electricity produced by hydroelectric power plants, 707.1 mln. kWh by wind power plants, 391.2 mln. kWh - solar power plants and 5.0 mln. kWh - biogas (table 1.4.2.). The electricity consumption by various industries is shown in Figure 1.4.1.

Table 1.4.2. Distribution of RES electricity generation by regions of the Republic of Kazakhstan for 2019.

	Total electricity production by RES	Electricity production by hydroelectric power plants	Electricity production by wind power plants	Electricity production by solar power plants	Electricity production using biogas	Share of RES in total electricity production in%
Republic of Kazakhstan	11,096,990.6	9,993,658.8	707,135.1	391,229.6	4,967.1	10.4
Akmola	230,796.6		230,776.4	20.2		21.4
Aktobe						
Almaty	2,465,857.3	2,385,809.3	36,136.0	43,912.0		65.9
Atyrau	206,628.0		206,628.0			3.4
West Kazakhstan						
Zhambyl	407,656.4	58,325.0	189,562.3	159,769.1		17.0
Karaganda	177,547.1	4,263.0		170,320.1	2,964.0	1.1
Kostanay						
Kyzylorda	3,054.2			3,054.2		0.2
Mangystau	39,727.5		36,682.1	3,045.4		0.8
Pavlodar	2,633.3		2,624.5	8.8		0.0
North Kazakhstan	21,549.8	16,827.0	4,722.8			0.6
Turkestan	505,020.2	495,565.6		9,454.6		96.6
East Kazakhstan	6,841,333.6	6,841,333.5		0.1		70.6
Nur-Sultan city	4.8		2.0	2.8		0.0
Almaty city	191,017.4	191,016.4	1.0			5.9
Shymkent city	4,164.4	519.0		1,642.3	2,003.1	0.6

Data is by taking into account the large hydroelectric power plants.

Source: <https://stat.gov.kz> Bulletin "Fuel and energy balance of the Republic of Kazakhstan"

The purchase and sale of electricity produced from renewable energy sources (RES) and supplied to the power grid of the Unified Energy System is carried out by the Financial Settlement Center of Renewable Energy LLP. The Center was established in accordance with the Law "On

Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan on Supporting the Use of Renewable Energy Sources" 2013.

The mechanism of fixed tariffs at the initial stage of RES development made it possible to quickly launch the RES market and implement the following types of RES: wind, solar, small hydropower (plants less than 35 MW) for the production of electric energy.

Since 2017, the selection for the implementation of RES projects has been carried out through an auction mechanism. This made it possible, on the one hand, to make the process of selecting projects and investors transparent and understandable, and, on the other hand, to rely on more efficient technologies and projects that minimize the impact on tariffs for end users from the commissioning of renewable energy facilities.

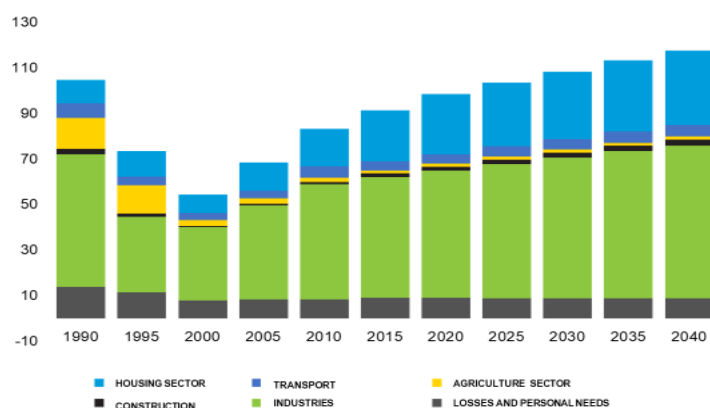


Fig. 1.4.1. Electricity consumption and losses in Kazakhstan.

Source: Kazenergy National Energy Report 2017

In order to implement the amendments and additions made in 2017 to the Law of the Republic of Kazakhstan "On Supporting the Use of Renewable Energy Sources" in 2018, the maximum auction prices and the auction schedule for 2018 with a total capacity of 1 GW were approved.

By taking into account the target indicators, the maximum allowable capacities for the zones of the Unified Electric Energy System (UES), the readiness of infrastructure, the need for electricity, as well as the potential of renewable energy sources, the corresponding Plan for the location of facilities for the use of renewable energy sources was developed and approved (on February 24, 2017 by order of the Minister of Energy No.68).

In order to reduce currency risks in the implementation of renewable energy projects, the Government of the Republic of Kazakhstan adopted Resolution No. 249 dated May 10, 2018 "On Amending the Resolution of the Government of the Republic of Kazakhstan dated March 27, 2014 No. 271" On Approving the Rules for Determining Fixed Tariffs and Limit Auction Prices".

In order to improve the investment climate and create favorable conditions for investors, on September 11, 2018, the order of the Minister of Energy of the Republic of Kazakhstan No. 360 was approved, within the framework of which the rules for organizing and holding auctions, the rules for centralized purchase and sale of renewable energy and the corresponding standard contracts were improved.

Auction international tenders 2018 - 2019 were held in electronic format for renewable energy projects with a total capacity of 1,205 MW. 138 companies from 12 countries took part in the auction: Kazakhstan, China, Russia, Turkey, Germany, France, Bulgaria, Italy, United Arab Emirates, Netherlands, Malaysia, Spain. Participants in the auction for the 1205 MW exposed were offered applications for the implementation of projects with an installed capacity of 3,893.52 MW, which exceeded demand by 3.2 times.

According to the BioPP, HEPP and WPP projects, the volume of demand exceeded the supply volume by about 2 times, the greatest interest among auction participants was in the implementation of SPP projects, for which the demand volume exceeded the supply volume by 7 times (with the SPP auction volume of 290 MW, the supply of participants was 2023.1 MW).

As a result of the auction, 30 companies signed contracts with a single purchaser of RES electricity (FSC) for 15 years for a total capacity of 804.3 MW and 12 companies at the stage of signing contracts with FSC for a total capacity of 162.89 MW.

In addition, it should be noted that there was a decrease in tariffs of wind power plants (WPP) electricity on average at the request of auction participants by 10.6%, small hydro electric power plants (HEPP) by 14.5%, solar power plants (SPP) by 36%. At the same time, the maximum reduction in tariffs for individual projects was 51% for SPPs, 23% for WPPs and HEPPs.

A measure to support RES in the form of a guaranteed purchase of RES electricity by a single purchaser of RES electricity - the Financial Settlement Center under a 15-year contract at an auction tariff, as well as annual tariff indexation, will allow the renewable energy sector to continue to develop, as well as to achieve the adopted specific target indicators for the development of RES, which provide for the achievement by 2020 of the share of renewable energy sources in the total volume of electricity production 3%, by 2030 already 10%. The target indicator is planned to achieve by 2020 through the implementation of projects of investors who have already signed contracts for the purchase of renewable energy.

In accordance with the Rules for the Organization and Conduct of Auction Bidding, which include qualification requirements for bidders, the official website of the Ministry of Energy of the Republic of Kazakhstan constantly publishes the auction bidding schedule.

The construction of the RES market is carried out through interaction with International financial institutions and organizations such as the European Bank for Reconstruction and Development (EBRD), the Asian Development Bank, the International Renewable Energy Agency IRENA, the World Bank, the United Nations Development Program, USAID, the American National Laboratory NREL, Eni, General Electric, Shell, etc.

The Ministry of Energy of the Republic of Kazakhstan, together with UNDP, at the end of 2017 developed an interactive solar atlas for the planning and implementation of solar energy in Kazakhstan. In 2018, the Atlas of Solar Resources of the Republic of Kazakhstan was transferred to the Financial Settlement Center of RE. Currently, free, open access to the Atlas is provided through the Internet site of FSC of RE LLP (rfc.kegoc.kz).

In addition to the active development of renewable energy sources, the further **development of the gas sector** is among the priority activities of the Ministry of Energy. The forecasts of international experts indicate that this issue is highly promising in the long term. The gradual replacement of coal with gas fuel allows to reduce not only the level of impact on the environment, but also to reduce greenhouse gas emissions.

Gasification of the country is being actively pursued, so according to the Ministry of Energy, at the end of 2018, the level of gasification of the population reached 49.68% (about 9 mln. people), and by 2020 it was planned to cross the 50% threshold in terms of gasification. In fact, the overall level of gasification of the country, according to the regional akimats, in 2019 amounted to 51.47% (9.5 mln. people) of the total population (Table 1.4.3).

Table 1.4.3. Gasification level by region

Total by regions	Total length of gas pipelines by region, km	Population of the region on 01.01.2020	The number of gasified population on 01.01.2020	Gasification level of the region (city) population, %	
				on 1.01.2019	on 1.01.2020
Republic of Kazakhstan	51,561	18,632,169	9,539,721	49.68	51.20
Akmola	0	736,682	0	0	0
Aktobe	6,720	881,728	792,472	88.5	89.9
Almaty	4,161	2,055,651	801,564	39.2	39.0
Atyrau	5,921	645,371	634,635	98.4	98.3
West Kazakhstan	7,614	656,974	627,300	95.5	95.5
Zhambyl	4,745	1,130,276	1,000,400	75.3	88.8
Karaganda	0	1,376,827	0	0	0
Kostanay	3,908	868,524	487,185	55.2	56.1
Kyzylorda	2,710	803,545	517,325	64.2	64.4

Mangystau	4,499	698,919	688,776	99.0	98.6
Pavlodar	0	752,252	0	0	0
North Kazakhstan	0	548,751	0	0	0
Turkestan	9,411	2,018,100	1,152,672	54.7	57.1
East Kazakhstan	224	1,369,635	16,362	0.7	1.2
Nur-Sultan city	0	1,136,008	0	0	0
Almaty city	5,309	1,916,782	1,869,197	98.2	97.5
Shymkent city	6,340	1,036,144	951,833	92.0	91.9

Source: data of the Ministry of Energy of the Republic of Kazakhstan

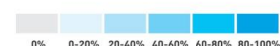
For gasification of the country from the republican budget in 2019 for the implementation of 88 projects, of which 16 are ongoing and 72 are new projects in Almaty, Aktobe, Zhambyl, West Kazakhstan, Mangystau, Kostanay, Kyzylorda, East Kazakhstan, Karaganda, Turkestan regions and The city of Nur-Sultan allocated 39.3 billion tenge. In total, in 2019, 36 projects were completed for the sum of 15.4 bln. tenge. In 2019, an additional 663.8 km of gas networks were built. The number of gas control points amounted to 1,380 units, the number of installed natural gas meters – 25,937 units. For projects completed in 2019, more than 100 thou. people were able to connect to gas.

The highest level of gasification of the population was achieved in the Mangystau, Atyrau regions and Almaty city (almost 100%). North Kazakhstan, Karaganda, Akmola, Pavlodar regions and the city of Nur-Sultan remain completely non-gasified (Table 1.4.3., Figure 1.4.2).

In 2017, natural gas resources were provided by 32.4% of our own production and 16.1% by gas imports from the CIS countries. There was a trend towards an increase in the share of natural gas in the total volume of natural resources (from 19.3% in 2012 to 26% in 2017). In 2017, 52.9 bcm of gas was produced, and in 2018 - 55.5 bcm. Domestic consumption of natural gas increased from 13.2 bcm in 2016 to 14.8 bcm in 2018 (an increase of 12%). The main task for the gas industry remains gasification of settlements and energy facilities.

In the course of the implementation by subsoil users of the Programs for the Development of **Sour Gas Processing**, the volume of flared associated gas during oil production in 2018 decreased by 30% in comparison with the last 2017 (1,043.5 mln. m³) and amounted to 731.5 mln. m³, with an increase in production oil from 86.2 mln. tons in 2017 to 90.36 mln. tons in 2018 and gas from 52.9 to 55.5 bcm, respectively. At the same time, the volume of utilized gas increased from 51.9 bcm to 54.7 bcm, i.e. by 2.8 bcm, which generally has a positive effect on the environmental situation in the country's regions and contributes to the rational use of gas resources.

Уровень газификации населения
Республики Казахстан на 01.01.2019 г.



п/п №	Наименование области	Уровень газификации населения области (города), %
1	Мангистауская	99,00
2	Атырауская	98,40
3	г. Алматы	98,20
4	ЗКО	95,50
5	г. Шымкент	92,00
6	Актюбинская	88,50
7	Кызылординская	64,20
8	Туркестанская	54,70
9	Жамбылская	75,30
10	Костанайская	55,20
11	Алматинская	39,20
12	ВКО	0,70
Всего по областям		49,68

Figure 1.4.2. Gasification level of the population of Kazakhstan

*

**The gasification level of
the population of Kazakhstan on 01/01/2019**

No.	Name of region	The gasification level of the region's (city's) population, %
1	Mangystau	99.00
2	Atyrau	98.40
3	Almaty city	98.20
4	West Kazakhstan	95.50
5	Shymkent city	92.00
6	Aktobe	88.50
7	Kyzylorda	64.20
8	Turkestan	54.70
9	Zhambyl	75.30
10	Kostanay	55.20
11	Almaty	39.20
12	East Kazakhstan	0.7
	Total	49.68

Uralsk		Kostanai	Petropavl	Pavlodar
Atyrau	Aktobe	Kyzylorda	Kokshetau	Semey
Aqtau		Turkistan	Astana	Oskemen
		Shymkent	Karaganda	Taldykorgan
			Taraz	Almaty

Electricity production in the country in 2019 amounted to 106.5 bln. kWh. or 99.3% by 2018. The share of gas-fired power plants in electricity generation in 2019 amounted to 19,309.8 bln. kWh or 20.2%.

In 2017 *, carbon dioxide emissions in the electric power industry increased by 6.9% from the level of 2012.

* *In accordance with the Decision of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) of June 2, 1995 (FCCC / CP / 1995/7 / Add.1), the data for this indicator are presented annually with a two-year shift back.*

International experience

A significant aspect of global trends in energy investment is the sharp increase in renewable energy capacity. In 2016, there was a record increase (by 150 GW per year, with the share of WPPs and SPPs being 87%) on a global scale, which exceeded the same indicator for all other energy sources, accounting for more than half of the total volume of commissioned new capacities, due to the strong political supporting the construction of solar photovoltaic installations and ground wind power plants and reducing capital costs, especially for solar power plants (Fig. 1.4.3)⁴⁷.

This trend was expected to continue. However, in 2018, investments in the field of renewable energy sources in the world decreased compared to 2017 by 11%, to 288.9 bln. US dollars, according to the report of the IRENA international global renewable energy support network (International Renewable Energy Agency). "Global investments in renewable energy and fuels in 2018 amounted to 288.9 bln. US dollars (340.9 bln. taking into account the construction of hydroelectric power plants with a capacity of more than 50 MW). This is 11% less than in the previous year (mainly due to a significant drop in investment in China)," the report says. At the same time, solar and wind energy received the most investments. Developing countries accounted for 53% of the total investment in renewable energy sources, with 32% attributable to China. Meanwhile, the share of traditional energy sources in the global energy balance increased by 0.2%⁴⁸.

47 <https://eenergy.media/2018/08/05/mirovye-trendy-investitsij-v-energetiku-natsionalnyj-energeticheskij-doklad-2017>

48 https://eenergy.media/2019/06/19/investitsii-v-vie-po-itogam-2018-goda-serezno-sokratilis/?fbclid=IwAR3TzdDFzp-R1ZXyXpJCFXm6Eujb_HKoX028DnotEiricv1SsilHcGtmTw8

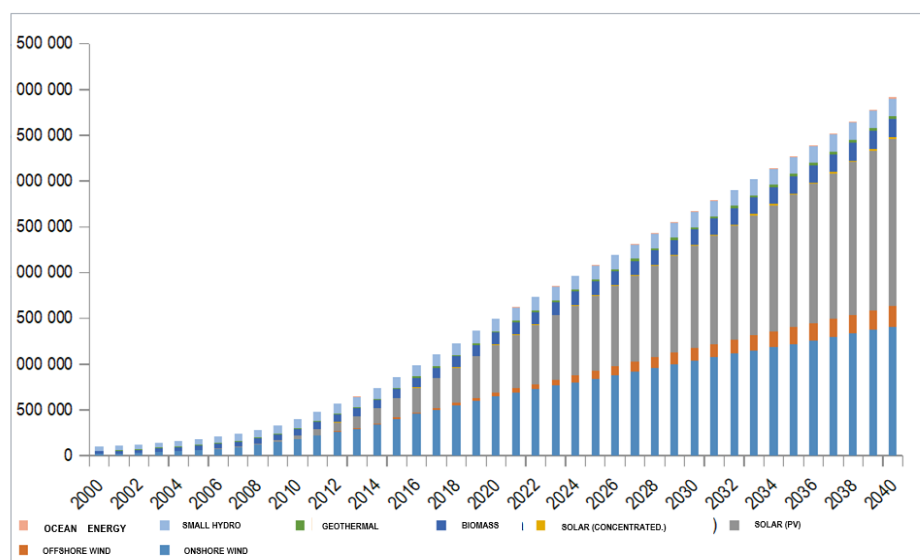


Figure: 1.4.3. Total installed capacity of renewable energy in the world by type of technology (2000 - 2040).

Source: Kazenergy National Energy Report 2017

According to IRENA, the global installed renewable energy capacity increased by 7.4% in 2019, in which 176 GW of new renewable power plants were commissioned. As a result, RES capacities increased to 2,537 GW at the end of the year. According to IRENA, the share of renewable energy sources in the installed capacity of the global electric power industry at the end of 2019 reached 34.7%⁴⁹. China leads the way in the use of solar energy, producing more than a third of the world's solar energy source. By the end of 2018, the PRC generated more than 175 GW of energy per year, and in 2019, more than 195 GW. 2/3 of all world solar module production was located in China. The share of solar energy in the total energy balance of the PRC by the end of 2018 was 3%, in 2019 this figure was already 4.5%. According to the plan of the 13th five-year plan from 2016 to 2020, China's share of renewable energy sources should be 15%, and coal should be reduced to 58%.

In many countries, and especially in developing countries in Asia, combating hazardous urban air pollution and striving to diversify energy supplies to improve energy security are equally important in increasing the use of low-carbon energy sources. This growth is partly due to the introduction of new capacities operating on natural gas. But while gas has significant advantages in terms of flexibility, reliability and, in some markets, prices, new investment in gas capacity lags behind investment in renewables. For example, in the United States in 2016, 63% of new capacities were solar and wind energy facilities, and gas accounted for 29% of the total.⁵⁰

At the end of 2019, a law on the development of microgeneration (471-FZ) was adopted in Russia. Thanks to this law, owners of micro-generating units in private houses will be able to connect them to the grid and sell surplus electricity at a weighted average wholesale price to sales companies.⁵¹

Finland has prepared a sustainable development program for our planet. Experts from the Finnish University of Technology Lappeenranta and the Energy Watch Group are confident that the planet can fully transfer its energy balance to renewable resources by 2050. We are talking about the generation of electricity and heat, transport and water desalination. Together, they drew up a 300-plus-page roadmap for this process, where they described in detail the possible consequences of such a step for humanity and specific regions. According to Finnish experts, the new energy system will be more

49 <https://renen.ru/ustanovlennaya-moshnost-vie-v-mire-prevysila-2500-gvt-po-itogam-2019-g-irena/?fbclid=IwAR2SIK5TMvWHXGUKesqvB0pOwZL-9kzCyT-cC2fNx-Q964XX7PMJGX9k68g>

50 NATIONAL ENERGY REPORT 2017. KAZENERGY.

51 <https://bellona.ru/2020/06/05/regulirovanie-vie-v-rossii-starye-printsiy-v-novye-vremena/>

economical and more efficient than the current one⁵². The following measures will help spur the energy transition:

- the introduction of green tariffs that guarantee a minimum price per unit of electricity. They will stimulate local and regional, private and public, small and medium-sized investments;
- tender procedures are recommended for grid projects above 40 MW. For projects below 40 MW, green tariffs should encourage distributed generation;
- tax incentives, direct subsidies and legal privileges for renewable energy technologies;
- introduction of taxes on carbon, methane and radiation;
- regulations and infrastructure planning that require improving the energy efficiency of buildings, lighting, electrical appliances, etc. ;
- cogeneration with full use of secondary heat;
- equalization of opportunities for energy supply;
- proportional increase in both private and public funding;
- regular financial support from local, regional and federal authorities;
- introduction of new innovative financing schemes;
- cooperative financing of projects with open and accessible tools for monitoring costs. For example, participatory budgeting.

New opportunities for the development of renewable energy sources appear with the development of energy storage systems. Thus, the Bloomberg New Energy Finance analytical company has updated its forecast for the development of energy storage systems. According to a new report, 1,095 GW of batteries will be installed worldwide by 2040. For comparison, today this figure is only 9 GW. This means that the industry is expected to grow 122 times. The US and China will be the leaders in terms of installation volume, followed by Germany and India. The exponential increase in energy storage will mean a revolution in renewable energy. The output of solar and wind installations is highly dependent on the time of day, but efficient batteries will allow to store energy and use it when need it. This will significantly increase the popularity of renewable energy sources.

The US is already witnessing a boom in household energy storage installations. In the first quarter of 2018, homeowners installed more lithium-ion storage facilities than in the previous three quarters combined - for 36 MWh.

However, it is possible that expensive and short-lived lithium-ion batteries will eventually be replaced by more innovative options, including zinc-based batteries, hydropower energy storage and hydrogen-based systems⁵³.

Institute for Energy Economics and Financial Analysis - IEEFA reported in its report that in 2018 15.4 GW of coal-fired power capacity will be decommissioned in the United States - 44 power units at 22 power plants in fourteen states. The closure of 36.7 GW of coal-fired power plants is planned in the US between 2018-2024. And this is just what has already been announced. There will probably be more. No new coal-fired power plants are being built in the United States. In 2017, coal consumption in the US power industry reached its lowest level since 1982⁵⁴.

In South Korea, it is planned to invest about 36.6 bln.US dollars in the field of renewable energy by 2020. In this regard, coal-fired power plants with a total installed capacity of about 3.3 GW, whose service life is 30 years and older, will be closed, Yonhap news agency reported. A total of 8.6 bln. US dollars will be invested to implement the proposed phase-out plan for ten aging coal-fired power plants by 2030. This plan will reduce the current share of coal generation in the country's energy balance by 28% - up to 26.2% by 2029⁵⁵.

A complete phase-out of coal-fired CHP plants in the UK is planned for 2025.

The EU aims for climate (carbon) neutrality by 2050. Hydrogen is a decarbonising agent in a number of sectors (chemical industry, steelmaking, transportation).

52 http://www.ng.ru/ng_energiya/2019-06-10/15_7595_finland.html?fbclid=IwAR3gCFw2K0I7N64vr8Phg4E66cUN-WeN20nr6FAyXXCuCY-_1nEUQuWngX8

53 <https://eenergy.media/2019/08/04/bloomberg-k-2040-godu-obem-sistem-hraneniya-energii-vyrastet-v-122-raza/?fbclid=IwAR09HE4ExLSeETvozg1Mo72MDNeG1UgrxrY8KJYPv4A3aynQcApdPYC6uWU>

54 <https://in-power.ru/news/ugol/20587-v-2018-godu-v-ssha-ozhidaetsja-rekordnoe-zakrytie-ugolnyh-elektrostantsii.html>

55 <http://greenergy.com.ua/novosti/yuzhnaya-koreya-perevodit-ugol-ny-e-e-lektrostantsii-na-biomassu/>

The turnover of the "hydrogen sector" can grow in just one decade until 2030 from 2 to 140 bln. Euro, and the potential for creating hydrogen jobs is estimated at 140 thou.

The EU today produces 9.8 million tonnes of hydrogen (global production: 74 million tonnes), of which only 4% is green hydrogen. Political action will be aimed at allowing green hydrogen to reach competitive price levels in a couple of years. This requires gigawatt-scale green hydrogen plants. It is necessary to quickly increase the volume of green hydrogen and reduce its cost to 1-2 Euro per kilogram "as quickly as possible".⁵⁶

According to the expectations of international experts⁵⁷ in Kazakhstan, the main changes in the energy sector will occur due to the development of renewable energy sources. However, at the current stage, a significant expansion of power generation based on renewable energy sources has resource and technological limitations. The development of renewable energy requires a significant level of government support over a long period of time. In this regard, the Government of Kazakhstan should:

when developing national strategic documents aimed at achieving SDG 7, conduct a comprehensive study on the development of technologies based on the use of renewable energy sources, taking into account their status, trends, economic analysis, as well as institutional and legislative barriers in the field of technologies for the use of renewable energy sources in country;

carefully design and implement a carbon trading system that could increase the competitiveness of renewable energy sources in comparison with fossil fuels;

develop a roadmap for the development of renewable energy sources as part of the revised Concept for the Development of the Electricity Sector until 2035 with a perspective for 2050.

Problems of achieving the SDGs

Kazakhstan is among the leaders in ensuring universal access to energy services in accordance with Sustainable Development Goal 7 (table 1.4.4). However, the country has yet to resolve issues related to aspects of ensuring uninterrupted energy supply and the use of clean fuels and technologies.

The quantitative assessment of the achievement of target 7.1 is carried out, first of all, using the indicator "Share of population with access to electricity". Since 2006, 100% of the urban population of Kazakhstan has access to electricity. However, rural electrification reached 100% in 2009, after which it declined slightly and fluctuated between 99% and 100% until it reached 100% again in 2014. Thus, universal access to energy services is practically guaranteed. The electrification rate in Kazakhstan has reached 100%, but in some rural areas the electricity supply system is unreliable. However, these statistics do not take into account detached peasants and farms, distant-pasture stations, etc., which are not provided with electricity at all or in the required amount. Often, the infrastructure of public power grids is in a state of disrepair and requires repair and restoration.

Achievement of this target is also assessed based on Indicator 7.1.2. According to the 2016 WHO report *Combustion Opportunities: Clean Household Energy for Health, Sustainable Development and Well-being of Women and Children*, 92% of Kazakhstan's population uses mostly clean fuels for cooking. At the same time, over 1,400,000 people in Kazakhstan use polluting fuels for cooking. In addition, Kazakhstan is one of the few countries in the WHO European Region where a small proportion of the population (5% or less) uses coal for cooking. In order to expand the use of clean fuels, Kazakhstan first and foremost needs to continue to make efforts to develop the country's gas infrastructure⁵⁸.

There is progress in achieving Target 7.2, but Kazakhstan needs to intensify its efforts to increase the share of renewable energy sources in order to meet global trends in progress in this area.

The solution of target 7.b is monitored by the national indicator "Investments in fixed assets in renewable energy sources (by forms of ownership)", but it is apparently not enough to fully assess the solution of this target. It is necessary to track investments in the development of the entire energy supply infrastructure.

56 https://renen.ru/vodorodnaya-strategiya-evropejskogo-soyuza-tezisy/?fbclid=IwAR1_iLJIVcy-nMHjnWyuHFIIsKhyDoqnxX8Rw2ynHprB5TEVCK1T5H_6cmQ

57 Third Environmental Performance Review of Kazakhstan. UNECE. 2018

58 Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

Table 1.4.4. Problems of achieving the SDGs related to energy supply

Goals and targets of the SDGs	International indicators	Indicator in Kazakhstan	Problems in achievement	The need to introduce indicators
SDG 7. Ensure access to affordable, reliable, sustainable and modern energy for all				
Target 7.1. By 2030, ensure universal access to affordable, reliable and modern energy services	7.1.1 Proportion of population with access to electricity 7.1.2 Proportion of population with primary reliance on clean fuels and technology	Proportion of population with access to electricity none	No	Proportion of population with primary reliance on clean fuels and technology
Target 7.2. By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption	Renewable and alternative energy share in total electricity generation	It is necessary to intensify efforts to increase the renewable and alternative energy share	No
Target 7.b. By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programs of support	7.b.1 Investments in energy efficiency as a proportion of GDP and the amount of foreign direct investment in financial transfer for infrastructure and technology to sustainable development services	No	No	No

Plans for the future

According to the forecast balance (table 1.4.5.), The consumption of electric power in 2025 is forecasted at the level of 18,260 MW (an increase of 3566 MW in relation to the fact of 2018). At the same time, even taking into account the required regulatory capacity reserve (in the amount of about 2000 MW), by 2025, an excess of capacity in the amount of 966 MW⁵⁹ is forecasted for the UES of Kazakhstan. In order to meet the demand for electric power, the forecast balance takes into account the commissioning of additional electric capacities at the existing plants in the amount of 3,567 MW and the construction of new plants, including renewable energy facilities, with a capacity of 1,296 MW.

Table 1.4.5. Forecast balance of electric power, MW.

Name	Forecast						
	2019	2020	2021	2022	2023	2024	2025
Need	17,094	18,205	18,523	18,809	19,237	19,656	20,262
Generation							
Existing plants, taking into account the disposal of capacities							
Available power	17,797	17,695	17,414	17,219	17,179	16,836	16,794
Deficiency (+), excess (-)	-332	879	1,473	2,076	2,540	3,298	3,942
Planned commissioning of capacities							
Available power	1,670	2,863	4,014	4,973	5,076	6,223	7,043
Total (existing and planned)							
Available power	19,467	20,558	21,428	22,193	22,255	23,060	23,838
Of these, unused power	1,145	1,764	2,130	2,603	2,627	2,634	2,641
Deficit (+), excess (-)	-1,229	-590	-775	-781	-391	-770	-934

59 Forecast balance approved by the Ministry of Energy (Order No. 10 dated January 14, 2019)

In the forecast balance, the values of unused capacity of power plants using RES and power plants of the oil and gas sector are separately indicated. These power plants participate in covering the loads of the UES of Kazakhstan in part:

- the capacity of power plants in the oil and gas sector (TCO, Kashagan, Karachaganak) is not taken into account due to the fact that these power plants work to self-balance their own consumers;*
- SPP capacity is not taken into account due to the fact that SPP does not participate in the evening maximum loads;*
- WPP capacity is taken into account in the amount of 20% of the available capacity;*
- the capacity of damless hydroelectric power plants operating along the watercourse is taken into account in the amount of 30% of the available capacity.*

Electricity consumption in 2026 is planned in the amount of 124.1 bln. kW*hour, and production - 128.5 bln. kW*hour, including at the existing plants - 98.9 bln. kW * hour, at the planned - 29, 6 bln. kW * hour, for renewable energy - 5.6 bln. kW * hour⁶⁰.

The strategic development plan of the Republic of Kazakhstan until 2025 determines that the policy for the development of the electric power industry will be aimed at ensuring a balanced and sustainable development of generation and transportation, as well as reducing the cost of electricity. The main directions will be the modernization and construction of priority energy facilities necessary to meet the needs of the domestic market and an acceptable level of tariffs for the industry in order to maintain the competitive advantage of Kazakhstani producers in the domestic and foreign markets.

To solve the problems of the electricity generation segment, it is planned to develop and implement a model of wholesale electricity and capacity markets (target model), which considers the functioning of electricity and capacity markets with competitive pricing. Improving the tariff regulation system will reduce the cost of electricity. The environmental friendliness and efficiency of power producers will increase.

Measures will be taken to further implementation of smart grids / and energy storage systems.

In order to improve energy efficiency and reduce energy losses, the introduction of intelligent energy management systems, energy saving technologies will be stimulated both among industry and among the population.

Renewable energy sources will be further developed. Under the section "Policy 6. "Green" economy and environmental protection", Objective 6. Development of renewable energy sources, improvement of traditional energy sources is set.

The legislation in the field of renewable energy will be improved in terms of the introduction of an auction mechanism for supporting renewable energy, which implies a flexible system of planning, administration and tariffication. Administrative barriers in the renewable energy market will be reduced.

It is planned to implement projects in the field of renewable energy sources provided for in the List of energy producing organizations using renewable energy sources. The possibility of annual approval of the maximum permissible capacity of RES facilities in the zones of the unified energy system of the Republic of Kazakhstan is being considered.

At the same time, the requirements for producers and consumers of traditional energy sources will be strengthened in terms of improving the efficiency and modernization of the technologies and production facilities used, reducing the burden on the environment and the health of citizens.

To this end, sufficient domestic and international finance will be mobilized and created financial services to support the necessary investments. New instruments for financing "green projects" (in particular, the issuance of "green" bonds) will be created on the basis of the AIFC (Initiative 2.8 "Development of Green Technologies").

1.5. Waste management system

Current situation and achievement of targets

The Concept for the transition of the Republic of Kazakhstan to a "green economy" provides for bringing the share of waste recycling to 40% by 2030, 50% - by 2050.

60 Appendix to the Order of the Minister of Energy of the Republic of Kazakhstan No. 15 dated January 15, 2020.

Industrial waste.

According to the State Cadastre of Production and Consumption Wastes for 2019, about 30.6 bln. tons of production and consumption waste have been accumulated in the country, of which about 100 mln. tons are solid household waste, and the rest is industrial waste.

Table 1.5.1 shows data on production waste generation for 2017-2019 excluding technogenic mineral formations and surface effusive and intrusive sedimentary rocks of different ages (overburden) according to the data of the Information and Analytical Center for Environmental Protection RSE of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan.

Table 1.5.1. Formation of industrial waste by hazard level, thou. tons

Industrial waste generation	2017	2018	2019
Total:	405,023.4	445,417.2	515,958.2
Including the danger:			
Hazardous waste	126,874.3	149,962.4	180,506.8
Non-hazardous waste	278,148.8	295,455.0	335,451.4
Radioactive waste	160.0	130.0	

Source: <https://stat.gov.kz>, Information and Analytical Center for Environmental Protection, State Cadastre of Production and Consumption Wastes

The main sources of the formation and accumulation of industrial waste are the mining, metallurgical, oil and gas production, heat and power industries. Industrial waste is represented by overburden, ore crushing and beneficiation tailings, metallurgical slags, ash and ash slag, oil production and oil refining waste (oil sludge, drill cuttings, acid sludge, gas condensates.). These types of waste are classified as main and large-scale industrial waste.

Also in the production activities of enterprises are formed: waste oils, filters, asbestos-containing products, ion-exchange resins, graphite waste, asphalt-resinous paraffin deposits, chemical waste, mercury-containing waste, worn tires and other types of waste.

About 30-35% of the generated industrial waste is hazardous, with the main one being in the mining industry and quarrying. According to the Committee on Statistics, in 2017 the total amount of **hazardous waste** generated was 126.9 mln. tons, in 2018 - 149.96 mln. tons, in 2019 - 180.5 mln. tons.

Industrial enterprises in Kazakhstan are making significant efforts to increase the recycling and reuse of industrial waste. The share of recycled and disposed **industrial waste** is increasing annually and amounted to 30.9% in 2017, 32.2% in 2018, and 34% in 2019 (Table 1.5.2) to their generation. The rest of the volume is located at tailings and landfills.

Table 1.5.2. Generation and disposal of industrial waste in 2019

Name of region, city	Formed	Recycled, of them:			
	Industrial waste, thou. tons	Industrial waste			
		Total	Used, thou. tons	Processed, thou. tons	%
Akmola	47,273.0	7,024.0	7,024.0	0	14.86
Aktobe	75,000.0	10,015.0	15.0	10000.0	13.35
Almaty	430.9	0	0	0	0.00
Atyrau	338.8	211.8	0	211.5	62.41
East Kazakhstan	56,174.2	41,876.0	41,846.9	29.1	74.55
Zhambyl	13,318.6	1,849.8	181,368.3	36.0	13.89
West Kazakhstan	174.3	54.8	19.800	35.0	31.45
Karaganda	221,115.5	95,202.0	95,200.300	1.7	43.06
Kostanay	240,000.0	59,600.0	5,800,000.0	1,600.0	24.83
Kyzylorda	116.0	26.1	26,100	0	22.50

Mangystau	620.1	271.8	51,780	220.0	43.83
Pavlodar	198,306.3	78,535.9	75,811.282	2,724.7	39.60
North Kazakhstan	1,400.0	278.7	169,837	108.8	19.91
Turkestan	12,212.0	8.7	84	0.272	0.07
Almaty city	999.6	44.9	0	44.9	4.5
Nur-Sultan city	1,575. 6	0	0	0	0.00
Shymkent city	22.8	19.6	19.5	0.124	86.03
Total	868,646.9	295,018.9	280,006.6	15,012.3	34.0

Source: <https://stat.gov.kz>

Recycling of production waste is developed in the industrial centers of the country. There are more than 260 enterprises in the regions for integrated waste management, processing of hazardous waste, including oily waste, metallurgical slags, tailings, etc.

During the processing, enterprises use various methods: physical and chemical, biological, thermal and pyrolysis. Depending on the composition of oily waste, a biological, thermal or physicochemical method of processing and disposal is used.

Ash and slag waste is mainly disposed of in ash dumps. In some regions of Kazakhstan, cinder blocks are made for the needs of the enterprise, they are used to prepare a filling mixture.

Some industrial enterprises, where slags are formed, are used to fill in mine voids and caving zones from mining operations and dispose of industrial waste in a landfill. Also, granulated blast-furnace slag is used in the construction and reconstruction of roads.

The level of reuse, recycling and disposal of mining waste is low (no more than 10%). Technogenic mineral formations are used in the amount of 2-3% of the annual input into the dumps. Thus, there are significant unrealized opportunities for the efficient use of almost all types of both accumulated and generated waste.

Radioactive waste

Kazakhstan has a nuclear industry that generates radioactive waste. The main operator of the industry is Kazatomprom, which is responsible for the extraction, processing of ore and the organization of the operation of the Ulba Metallurgical Plant OJSC, which produces uranium fuel pellets for nuclear reactors. Kazatomprom also provided the decommissioning of the BH-350 nuclear reactor located in Aktau. Research activities are carried out by the Institute of Nuclear Physics and the National Nuclear Center, which have three operating reactors and storage facilities for radioactive substances and waste. Five operating nuclear reactors are the main source of high and intermediate level radwaste.

Other users of ionizing radiation sources include hospitals, laboratories, industrial plants, and oil and steel companies. They use about 15,000 sources of radioactive radiation.

Radioactive waste is generated in various forms - from ore waste, wastewater and leaks, tailings, nuclear waste, spent fuel and other waste generated as a result of the operation and decommissioning of power and research reactors, to spent sealed sources and radioisotopes.

The main storage facility for radioactive waste "Baikal-1" is located at the former Semipalatinsk nuclear test site. It began to receive spent sources in a sealed enclosure in 1995 and is designed for 50 years of operation. As of the end of 2017, over 40,000 sources in a sealed enclosure with a total activity of $3 \cdot 10^{15}$ Bq were received for long-term storage in reinforced concrete modules.

The Koshkar-Ata tailing dump located in a natural drainless depression near the city of Aktau, Mangystau region, contains 115 mln. tons of toxic and radioactive waste. In its area of 77.18 km², the storage facility has no analogues in the world. The total area of the disposed waste is 66 km², the area of bare beaches at this time is about 50 km² and the process of decreasing the level of the water phase continues. Currently, the disposal of radioactive waste in the tailing dump is not carried out. Reclamation of the tailing dump is envisaged.

Medical waste

In 2017, 7,253 state healthcare organizations functioned in Kazakhstan, including 640 hospital organizations. The total bed capacity was 99,465 units, including 88,585 units - in the system of the Ministry of Health of the Republic of Kazakhstan.

Medical waste is generated in the process of providing medical services, performing medical procedures and as a result of servicing medical devices and equipment. These are dressings, including those containing microbes and viruses, various types of waste containing used therapeutic medicines, including those with radioactive elements such as H, 14C, 35P, 60Co, 90SSr, 137Cs and others.

According to estimates, in 2017, the volume of hazardous (infected) **medical waste** generated in Kazakhstan amounted to 78,000 tons, and the volume of non-hazardous (similar solid household waste) medical waste was generated at 122,000 tons. The total volume of medical waste generated in the republic in 2018 was 47,325 tons. These data indicate an improvement in the provision of information on medical waste, as in 2011 only 16,000 tonnes of non-hazardous and 8,500 tonnes of hazardous waste were reported.

The volume of medical waste generation according to the Informational Surveys based on the results of maintaining the State Cadastre of Production and Consumption Wastes for 2017, 2018 and 2019 is presented in table 1.5.3.

Table 1.5.3. The volume of medical waste generation in 2017-2019

Waste types	The volume of medical waste by years		
	2017	2018	2019
Class A waste, tons	847,657.32	30,920.23	121,799.60
Class B waste, tons	203,863.57	15,779.13	112,280
Class B waste, tons	3,698.20	558.89	11,300
Class Г waste:			
Devices, pcs.	127,589.00	114,465.00	24,085.00
Solid, kg	13,490.62.	10,480.467.	5,774.30
Liquid, l	1,292.46	2,606.10	150.00
Class Д waste (radioactive), tons	0	57.00	0.38

Hazardous medical waste must undergo thermal treatment, for which in 2011, 91 incinerators and more than 1,000 chamber furnaces designed to incinerate medical waste were activated. According to the data for 2017, 158 incineration and sterilization units for the disposal of medical waste and 69 sets of equipment adapted for the incineration of medical waste were equipped. Despite the fact that the number of medical waste disposal facilities has increased, it is still insufficient⁶¹.

Hospitals manage medical waste independently at the local level. A regional approach to medical waste management has not been implemented. As a result, the cost of medical waste management remains high, often reaching 2,000 per tonne US dollars. There is no collection of medical waste from individual households.

In 2017, new Rules for the management of medical waste were approved (Order of the Minister of Health No. 357 dated May 31, 2017, Sanitary Rules "Sanitary and Epidemiological Requirements for Healthcare Facilities"), which establish the procedure for the collection, disposal and storage of waste at healthcare facilities.

Historical waste and pollution

As a result of the liquidation, reorganization, privatization and bankruptcy of some industrial enterprises, large areas of disturbed land, waste accumulators, open pits, remained ownerless, posing a real threat to the country's environmental safety, their elimination and reclamation are required.

Objects of "historical pollution" are conventionally divided into 4 groups.

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The first is the objects that are in republican ownership. They are represented by former military training grounds, burial sites and accumulations of obsolete agricultural products (pesticides), etc. They also include man-made mineral objects stored on the territory of the country before May 31, 1992 (the date of the entry into force of the Code on Subsoil and Processing of Mineral Raw Materials).

The second group - objects that are in communal ownership. These are ash and slag dumps of small heating facilities of settlements (boiler houses), waste landfills, cattle burial grounds, remains from destroyed (abandoned) settlements and local industry facilities, oil contaminated territories from repair and technical stations (RTS and MTS) of former collective and state farms, etc. This also includes warehouses for agricultural chemicals and burial sites (burial grounds) of obsolete residues of agricultural products. High levels of contamination with obsolete pesticides are typical for almost all regions of Kazakhstan. Due to the fact that the inventory was not carried out, data on the number of old storage facilities, as well as on the amount of obsolete pesticides, are contradictory.

The third group is ownerless objects. These are the territories of former industrial enterprises and their landfills (warehouses, sludge and slag storage facilities, unidentified waste, etc.) left after the bankruptcy of enterprises.

It is not possible to establish the total amount of ownerless waste, since the inventory was not carried out. Historical waste is transferred by a court decision to the republican or municipal property as soon as it is identified.

As of the end of 2019, by a court decision, 17 objects located in Aktobe, Karaganda, Kostanay, Akmola, Mangystau and Pavlodar regions were transferred to republican ownership, including 5 of them were transferred from the communal to the republican one:

- in the Karaganda region, mercury-containing wastes were disposed (removed or sold for subsequent removal), Cesium-137 was buried in a long-term storage facility;
- in Kostanay region, 4 hectares in the village of Toguzak were cleared of obsolete pesticides;
- in the Mangystau region, were disposed 304,136 tons of oil sludge, located near the city of Zhanaozen;

The ownerless hazardous waste received into the republican ownership is managed by Zhasyl Damu JSC of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan.

The fourth group - objects located on the contract territory of subsoil users. These are self-flowing oil and hydrogeological wells, oil-contaminated areas of oil fields of past years of activity.

Persistent organic pollutants (POPs)

In terms of POPs waste reserves, the Republic of Kazakhstan ranks second among the countries of Eastern and Central Europe after the Russian Federation. There is no production of POPs in Kazakhstan.

The main groups of POP-containing wastes in the Republic of Kazakhstan are PCB-containing equipment (*PCB-containing transformers, capacitors*) and POP-containing pesticides. In 2003-2004 identified 114 PCB-filled transformers and more than 50 thou. PCB capacitors, more than 1.5 thou. tons of obsolete pesticides and 8 sites contaminated with PCBs and pesticides. Most of the pesticides were buried, the condensers were taken out of Kazakhstan for destruction. 5,946 capacitors and about 105 tons of obsolete pesticides remained.

In 2017, with the support of the UNDP / GEF project "Updating the National Implementation Plan, Integrating Persistent Organic Pollutant Management into the National Planning and Sustainable Management of Medical Waste in Kazakhstan", the National Implementation Plan for the Stockholm Convention (NIP 2014) was revised. As a result of the revision, unintentional POPs were included in the NIP.

In accordance with the NIP for 2017 - 2028 (Order of the Minister of Energy No. 312, 2017), the national priorities include:

- detailed inventory of POPs, including new POPs included in the list of the Stockholm Convention;
- development of a POPs monitoring system;
- creation of a unified POPs management system;

- improvement of legislation on the problem of chemical safety and creation of mechanisms for its implementation;
- increasing human resources in the field of POPs.

In 2017, the Ministry carried out work to determine the impact on the environment, inspected the integrity and tightness at two warehouses of the **Daryal-U facility**.

According to the results of the examination of the containers and the capacitors inside them, it follows that all 5,946 capacitors must be repackaged and transferred to storage of PCB-containing waste in special rooms after repackaging.

In samples of the flooring of warehouses, significant excess of the maximum permissible concentration of PCBs was revealed from 500 up to 95,000 times, in all 7 water samples the presence of PCBs was also revealed. Based on the foregoing, taking into account the proximity of PCB-containing waste to the Balkhash Lake, the pre-emergency state of the warehouses, the capacitors were repackaged and transported to an equipped warehouse for temporary storage in Stepnogorsk until the issue of their disposal was resolved.

In order to resolve the issue of destruction of POPs-containing and other hazardous wastes, the Ministry, together with UNIDO (United Nations Industrial Development Organization), is implementing the project "Coordinated management of the disposal of ozone-depleting substances and persistent organic pollutants". Within the framework of this project, it is planned to transfer a POPs destruction facility to Kazakhstan free of charge.

In addition, a Coordination Center for the exchange of information (POPs Center) will be created on the basis of Zhasyl Damu JSC.

Historical mercury pollution is found in Pavlodar and Karaganda regions.

In 2003, the Republic of Kazakhstan and the World Bank signed a Loan Agreement (Law of the Republic of Kazakhstan No. 556 dated May 26, 2004) for the implementation of a project to clean up the Nura River from mercury. The customer was the Committee for Water Resources of the Ministry of Agriculture. Within the framework of this project, 2.1 mln. tons of mercury-contaminated waste was buried at the Apan landfill located in the Bukhar-Zhyrau region near the city of Temirtau.

However, the mercury-contaminated collector on the territory of the TEMK JSC enterprise and the treatment facilities were not included in the main project to clean up the Nura River, since the project involved only cleaning the river itself. Thus, re-contamination of the Nura River with mercury from the collector of the TEMK JSC enterprise was observed.

According to the monitoring data of the Kazhydromet RSE, the maximum concentration of total mercury in the Nura River basin was 0.00011 mg / dm³, which is assessed as "high level of pollution".

TEMK JSC developed design estimates for the project "Construction of a plant for treatment and neutralization of industrial wastewater in the western industrial zone of Temirtau with a capacity of 10,000 m³/day". The implementation of the project began in 2019 as part of the budget program 082 "Implementation of activities in single-industry towns and regions within the framework of the Regional Development until 2020 program". For the implementation of the project, 350 mln. tenge has been allocated from the republican budget for 2019. The total cost of the project is 1.3 bln. tenge.

Since 2005, within the framework of the implementation of the program of mercury monitoring in the area of the Northern industrial zone of the Pavlodar city, events are annually carried out at the expense of the regional budget. The results of long-term mercury monitoring show the effectiveness of those demercurization activities previously carried out in 2002-2004. The impact of mercury on the environment is characterized as stable and sustainable. In 2017, the Akimat of Pavlodar region carried out work to adjust the mercury monitoring program with a deadline for 2019 - 2025. The Program provides for drilling work on the construction of new observation wells for monitoring mercury in groundwater in the amount of 41 pieces, the implementation of which is provided for 2019 (21.3 mln. tenge), as well as sampling in biological samples (fish, waterfowl, human hair). In 2019, design and estimate documentation was developed for "Construction of an cut-off curtain with a depth of 20 m from the western side of the road from the former pumping station No. 6 to the Balkyldak storage tank in the area of the Northern industrial zone of Pavlodar city".

Within the framework of the UNDP / GEF project "Updating the National Implementation Plan, Integration of Persistent Organic Pollutant Management into the National Planning and Sustainable

Management of Medical Waste in Kazakhstan", a draft National Plan for the reduction of the use and collection of mercury was prepared based on the preliminary inventory of mercury. It aims to implement the principles of the Minamata Convention on Mercury, contains information on past and current activities in Kazakhstan aimed at reducing mercury pollution, and describes the activities planned for the period 2017-2020. However, it has not yet been approved as a policy document.

To date, the following problems remain unresolved, where the main sources of pollution are "historical pollutants":

- complete rehabilitation of the territories of the military-industrial enterprises of the last century, such as the Semipalatinsk nuclear test site and Azgir, the territories of the military bases of the Northern Balkhash region, etc., which to this day are not safe for the population and the environment;

- removal of historical burials (burial grounds) of obsolete pesticides and other agrochemicals, with the reclamation of adjacent land plots;

- cleaning the Ilek River, contaminated with chromium and boron from the sludge storage of the Alga Chemical Plant named after S.M. Kirov. As long as there are problems with cleaning up the entire territory and surroundings of the former plant and its sludge storage facilities, the pollution of the river will only worsen, as indicated by the duration of the impact itself;

- rehabilitation of lead contaminated areas adjacent to the former Shymkent lead plant.

Solid household waste

4.5-5 mln. tons of **solid household waste (SHW)** are generated annually in Kazakhstan.

According to the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan, in 2019, 4.7 mln. tons of solid household waste were generated in the Republic of Kazakhstan.

In the field of waste management, there are the following achievements:

- the share of recycled and disposed solid household waste in 2019 amounted to 14.9% (Table 1.5.4.);

- waste collection and disposal services are provided to 72% of the country's population, in 2018 - 72%, and in 2017 - 68%;

- in the republic, out of 3,292 landfills and dumps operating in 2019, 18.26% met environmental requirements. In 2018, out of 3,520 landfills and dumps, 623 (17.7%) were legalized, and in 2017 out of 3,817 - 611 (16%).

Table 1.5.4. Volumes of solid household waste generation and processing by regions of the Republic of Kazakhstan for 2017-2019

Name of region, city	Volume of generated waste (thou. tons)			Share of processed and disposed solid household waste		
	for 2017	for 2018	for 2019	2017, %	2018, %	2019, %
Akmola	234,000	241,000	245,000	2.11	2.93	3.02
Aktobe	300,000	298,600	295,600	3.51	11.69	10
Almaty	629,000	628,681	624,283	24.77	27.55	23.28
Atyrau	72,458	207,798	191,720	44.33	1.69	10.44
East Kazakhstan	180,365	183,550	164,680	3.17	4.84	3.28
Zhambyl	74,959	95,691	80,935	3.47	3.11	8.53
West Kazakhstan	105,000	108,111	107,000	2.17	5.28	8.6
Karaganda	654,640	651,300	660,000	13.96	16.39	17.42
Kostanay	435,000	250,000	216,700	0.93	9.65	10.3
Kyzylorda	148,000	147,000	122,000	8.13	7.42	10.78
Mangystau	190,100	182,323	188,285	6.49	1.42	33.8
Pavlodar	426,581	117,336	648,000	0.23	0.12	15
North Kazakhstan	182,500	66,100	74,666	3.59	7.59	10.78
Turkestan	286,278	137,952	128,081	3.48	7.17	10.05
Almaty city	600,000	480,00	456,000	10.01	5.70	10.95
Nur-Sultan city	345,438	307,626	318,582	8.33	12.25	15.92
Shymkent city		216,178	215,066	-	18.28	22.77

Total	4,864,319	4,319,246	4,736,598	9.05	11.51	14.9
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Source: <https://stat.gov.kz>

The number of specialized enterprises and individual entrepreneurs for the collection and transportation of waste is 587 units.

In 2019, 3.9 mln. tons of waste were received at officially operating landfills (dumps), facilities for sorting and processing municipal waste. Of these, 65.3% were received for their further deposition, 27.3% were sorted out and 13.7% of them were sent for further processing, 6.4% were disposed of. At the end of 2019, more than 43.3 mln. tons of waste have been accumulated at officially operating landfills (dumps).

Table 1.5.5. Rating of landfills for compliance with environmental standards in 2019.

Rating of landfills	Region	Number of landfills for solid household waste, pcs*	Number of landfills that do not meet standards, pcs*	Number of landfills that meet standards, pcs *	Share of landfills that meet standards,% *
	Total for RK	3.292	2.691	601	18.26
1	Nur-Sultan city	1	0	1	100
2	Shymkent city	1	0	1	100
3	Zhambyl	163	0	163	100
4	Turkestan	163	13	150	92.02
5	Kostanay	266	155	111	41.73
6	Mangystau	24	16	8	33.33
7	Atyrau	86	64	22	25.58
8	Akmola	130	104	26	20.00
9	Karaganda	202	162	40	19.80
10	East Kazakhstan	430	404	26	6.05
11	North Kazakhstan	458	441	17	3.71
12	Aktobe	366	354	12	3.28
13	West Kazakhstan	208	206	2	0.96
14	Kyzylorda	145	141	4	2.76
15	Almaty	313	300	13	4.15
16	Pavlodar	336	331	5	1.49
17	Almaty 0 exported to the Almaty region				

Source: Ministry of Ecology, Geology and Natural Resources

According to the results of space monitoring of waste disposal sites in 2018, 8,680 unauthorized dumps were identified in 16 cities of Kazakhstan, of which 1,408 dumps were liquidated, which is 16% (Table 1.5.6). However, in 2019, 9,229 unauthorized dumps were identified including Turkestan region, 2,619 utilized, with a volume of over 389 thou. tons. The largest number of illegal dumps was recorded in Akmola, North Kazakhstan, Almaty, Karaganda and Aktobe regions.

Table 1.5.6. Distribution of illegal dumps by regions in 2018

Department of Ecology	Disposed waste within the area of interest	Current state of the surveyed			
		DE departures		Utilized	
		Qty	%	Qty	%
Nur-Sultan city	439	125	29	108	25
Almaty city	51	13	25	13	25
Shymkent city	320	192	61	37	12
Akmola region	1704	362	22	66	4
Aktobe region	633	620	98	17	3
Almaty region	806	47	6	10	1
Atyrau region	710	558	79	17	2
East Kazakhstan region	425	413	99	80	19

Zhambyl region	352	563	100	303	87
West Kazakhstan region	483	209	44	112	23
Karaganda region	675	176	26	176	26
Kostanay region	346	349	100	152	44
Kyzylorda region	240	330	100	97	43
Mangystau region	181	199	100	58	32
Pavlodar region	601	385	65	77	13
North Kazakhstan region	714	310	44	85	12
Turkestan region	0	0	0	0	0
Total	8,680	4,851	57	1,408	16

Source: Ministry of Ecology, Geology and Natural Resources

In order to develop the sphere of solid household waste processing, the following amendments have been made to the Environmental Code:

- the concepts of "separate collection of municipal waste", "secondary raw materials" have been introduced, requirements for them have been established;
- introduced extended obligations of manufacturers (importers);
- a ban was introduced on the disposal of certain types of waste at landfills.

Since 2016, it is prohibited to dispose at landfills mercury-containing lamps and devices; scrap metal; waste oils and fluids; batteries; electronic waste. On January 1, 2019, a ban on the disposal of plastics came into force; paperstock, cardboard and waste paper, glass, and from 2021 a ban on construction and food waste will come into effect.

At the local level, waste management issues are considered in the development programs of the respective territories. Within the framework of paragraph 15 of the National-level Plan (NLP) for the implementation of the Address of the Head of State to the people of Kazakhstan dated January 10, 2018 "New development opportunities in the context of the fourth industrial revolution", the akimats of the regions, of the cities of Nur-Sultan, Almaty and Shymkent have developed and approved Set of measures for modern disposal and recycling of solid household waste with the broad involvement of small and medium-sized businesses. The set of measures provides for the regulation of cooperation with business, attraction of investments, as well as the creation of favorable conditions for investors. The activities of the Set of Measures are implemented in accordance with the established deadlines. The Ministry of Ecology, Geology and Natural Resources coordinates and monitors their implementation.

Also, Roadmaps for the introduction of separate collection, sorting, recycling and processing of solid household waste until 2020 (hereinafter referred to as the Roadmaps) have been approved and are being implemented for the development of the waste collection, sorting and processing industry, as well as coordinating work in the regions and developing a unified approach.

Within the framework of the Roadmaps, separate collection, sorting and processing of solid household waste is gradually introduced in the regions of the country. The infrastructure for the separate collection of solid household waste is being created. As of the end of 2019, within the framework of EPR, 2,321 containers for the collection of mercury lamps, 12,196 containers for separate collection, and 150 containers for electrical equipment were installed in the regions. 147 points of reception of recyclable materials were created.

Thus, separate collection is being introduced in Akmola (Kokshetau city, regional centers Shchuchinsk, Stepnogorsk, Atbasar, Burabay settlement), Aktobe (Aktobe city, Alga city, Shubarkuduk settlement), Almaty (Taldykorgan city), Atyrau (Atyrau city, Kyzylkoga district), Zhambyl (Taraz city), West Kazakhstan (Uralsk city), Karaganda (Karaganda city, Temirtau city), Kostanay (Kostanay city, Rudny city, Zhitikara city, Zatonobolsk settlement), Mangystau (Aktau city), North Kazakhstan (Petrovsk city), South Kazakhstan (Shymkent city) regions, in the city of Nur-Sultan.

At the end of 2019, in the republic, out of 204 cities and regions, separate collection at different stages was introduced in 51, and sorting - in 30 communities.

At the same time, separate waste collection and sorting is being introduced both in large cities and in districts. Over a thousand jobs have been created at the sorting complexes.

The largest number of communities where separate collection has been introduced is in the West Kazakhstan region (13), and the sorting of solid household waste is in the Kostanay region (Table 1.5.7, 1.5.8.).

Table 1.5.7 The number of enterprises engaged in the separate collection, sorting and processing of solid household waste

Rating by separate collection	Region	Number of settlements where separate collection of SHW is introduced	Number of settlements where sorting of SHW is introduced	Number of enterprises for processing SHW
	RK	51	30	170
1	West Kazakhstan	13	1	15
2	Kostanay	7	9	8
3	Akmola	5	1	6
4	Almaty	4	2	8
5	Pavlodar	3	2	6
6	Aktobe	3	1	16
7	Atyrau	2	1	6
8	Zhambyl	2	0	9
9	Karaganda	2	2	8
10	Turkestan	2	5	9
11	Mangystau	2	2	5
12	North Kazakhstan	2	0	9
13	East Kazakhstan	1	1	17
14	Nur-Sultan city	1	1	6
15	Shymkent city	1	1	6
16	Kyzylorda	1	0	4
17	Almaty city	0	1	12

Source: Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan

Table 1.5.8 Rating of regions for creating infrastructure for separate collection of solid household waste

Activity rating by EPR mechanism	Region	Number of containers for mercury lamps and batteries	Number of containers for separate collection	Number of containers for electrical equipment	Number of SHW collection points
	RK	2,321	12,196	150	147
1	Nur-Sultan city	370	6,276	31	32
2	Almaty and Almaty region	190	1,457	600	78
3	Karaganda region	0	1,755	37	16
4	Pavlodar region	200	422	20	0
5	Kostanay region	145	587	8	0
6	North Kazakhstan	79	766	38	0
7	East Kazakhstan	0	565	10	0
8	Kyzylorda region	850	0	0	0
9	Mangystau region	0	368	0	9
10	Akmola region	154	0	0	12
11	Aktobe region	133	0	0	0
12	Zhambyl region	106	0	5	0
13	West Kazakhstan	54	0	0	0
14	Atyrau region	40	0	0	0
15	Shymkent and Turkestan region	0	0	0	0

Source: Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan

The total number of processing enterprises is 170, the largest number of enterprises is in the East Kazakhstan (17), Aktobe (16) and West Kazakhstan regions (15), the smallest number in the Kyzylorda (4), Mangystau (5) regions.

In January 2019, a waste sorting station with a capacity of 50,000 tons per year was launched in the village of Baskudyk, Munaily district, Mangystau region, a sorting line with a capacity of 100 thou. tons per year was installed at the solid household waste landfill in the city of Ust-Kamenogorsk, East Kazakhstan region, and in February in the city of Uralsk of West Kazakhstan region a waste sorting complex with a capacity of 100 thou. tons per year was launched at the solid household waste landfill.

The World Bank and the Korean Trust Fund, as well as the Ministry of the Environment of the Republic of Korea are working on the implementation of projects for the management of solid household waste in the cities of Almaty, Atyrau, Kokshetau and Kostanay.

Projects are being implemented using PPP mechanisms. For example, in 2018 in the city of Almaty, within the framework of a PPP, a project was implemented to build a waste sorting complex with a capacity of 550 thou. tons per year.

In 2016, Kazakhstan introduced the **principle of extended producer responsibility (EPR)** and importers for cars, tires, oils and batteries, and in 2017 - for electrical equipment and packaging. The EPR mechanism allows to stimulate and develop SMEs, to increase the share of waste processing, to involve in the circulation waste plastic, polyethylene, waste paper, glass, which makes up more than 40% of the volume of solid household waste. Within the framework of the EPR, the costs of the enterprises for the collection, transportation and processing of recyclable materials are compensated. Thanks to the extended responsibility tool, the number of small and medium-sized enterprises in waste sorting and recycling increased from 115 in 2016 to 150 in 2018, 170 in 2019.

Only in 2018, 14 facilities were commissioned: Bayan PE (Akmola region); Astana Clean Time LLP (Nur-Sultan city); Green Technology Industries LLP (Turkistan region); Hill Corporation LLP, Euro Crystal LLP (Shymkent); Green Recycle LLP (Almaty city); Element Resource PE, Urazbek PE, Kostanay eco city LLP (Kostanay region); Aktau Taza kala LLP, Global ecosort LLP (Mangystau region); Kama Center LLP (West Kazakhstan region); Ekibastuz commun service LLP (Pavlodar region); Aksu polygon LLP (Pavlodar region).

In 2018, the volume of assembled and recycled auto components amounted to 83,700 tons, which is 3 times higher than in 2017. The volume of collected and recycled packaging waste amounted to 95,872 tons, which is more than 2 times higher than in 2017. The volume of collected and recycled waste in 2019 amounted to 38,106 tons (Table 1.5.9.).

Table 1.5.9 Amount of recycled waste within the framework of EPR implementation

	2017	2018	2019
Collected and recycled tires	20,047	27,710	19,001
oils	4,198	11,252	16,936
accumulators	20,000	20,000	10,314
antifreezes	2,300	3,400	0
glass waste	5,634	22,772	17,854
Waste plastics	6,066	8,995	8,456
waste paper and cardboard	45,025	31,595	10,828
Volume of collected reusable glass containers, million pieces	4,334	3,621	789
Electronic waste, tons	2,461	4,666	0

Source: Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan

Utilization of old cars is carried out at a plant in Karaganda with a capacity of 50 thou. cars per year. The production process of the plant includes a full cycle of utilization of old cars, from their acceptance / delivery to the plant to the receipt of secondary raw materials and utilization in the form of alloys of ferrous and non-ferrous metals, gas synthesis.

Since the beginning (November 21, 2016) of the program for the reception of old cars, 124.9 thou. units of old cars have been accepted from the population, which allowed to stimulate business, contributed to the emergence of new enterprises.

State support measures for the waste recycling sector

According to the Ministry of National Economy of the Republic of Kazakhstan within the framework of the Unified Business Support and Development Program "Business Roadmap 2020", an instrument of state support is provided - the issuance of state grants. According to this Program, state grants are provided to small businesses operating in priority sectors of the economy in accordance with Appendix 1 of the Program, including activities for the collection, processing and disposal of waste, waste utilization, as well as reclamation and other services in the field of waste disposal (CCEA 38 and 39).

Also, the Program provides for such measures of state support as subsidizing interest rates and partial guarantees for bank loans.

The Entrepreneurial Code of the Republic of Kazakhstan dated October 29, 2015 (hereinafter referred to as the Code) provides for investment preferences for legal entities of the Republic of Kazakhstan when investing in fixed assets to create new, expand and upgrade existing production facilities.

According to Article 286 of the Code, investment preferences are granted when a legal entity implements an investment project for the types of activities included in the List of Priority Activities, approved by the Government of the Republic of Kazakhstan dated January 14, 2016 No. 13 (hereinafter referred to as the List).

The List, according to the common classifier of economic activities, contains the following types of activities in classes 38.12 "Collection of hazardous waste", 38.21 "Treatment and disposal of non-hazardous waste", 38.32 "Utilization of sorted materials, excluding the processing of waste and scrap of ferrous and non-ferrous metals".

The following types of investment preferences can be provided for these types of activities:

- exemption from customs duties and value added tax on imports;
- state in-kind grants.

The procedure and conditions for the provision of investment preferences are determined by Articles 285 and 286 of the Code.

Also, within the framework of the State Program for the Development of the Agro-Industrial Complex of the Republic of Kazakhstan for 2017 - 2021, investment subsidies are provided for manufacturers to reimburse part of the costs incurred in the acquisition of equipment for processing waste newly constructed in pig and poultry farms. However, this program does not fully cover the existing livestock complexes, many of them were put into operation 25 - 30 years ago. Since then, the treatment equipment has never changed, although it needs to be overhauled every 10-15 years due to wear and tear. Therefore, to solve this problem, costs from the state budget will be required.

The tax legislation of the Republic of Kazakhstan provides for tax preferences for legal entities implementing investment priority projects, within which the following benefits are provided:

- exemption from corporate income tax for 10 years;
- exemption from land tax for 10 years;
- exemption from property tax for 8 years.

According to the Decree of the Government of the Republic of Kazakhstan dated August 25, 2018 No. 522 "On approval of the State program for support and development of business "Business Roadmap-2020", collection, processing and disposal of waste, waste utilization are classified as priority sectors of the economy for potential participants of the Program.

In accordance with paragraph 94 of the Program, the participants in the second direction of the Program are valid entrepreneurs who implement and (or) plan to implement their own projects in the priority sectors of the economy indicated in Appendix 1 to the Program.

Within the framework of the second direction of the Program, measures of state support are provided in the form of subsidizing the interest rate on loans / financial leasing agreements of banks / development bank / leasing companies, partial guarantees for loans from banks / development bank,

development of production (industrial) infrastructure, creation of industrial zones, long-term leasing financing.

In addition, the European Investment Bank and the Damu Fund signed a framework agreement for 200 million Euro for long-term financing in Kazakhstan of "green" projects with the possibility of financing both public and private enterprises (without a state guarantee on the terms of the Damu Fund) projects from 50 thou. US dollars.

It is possible to implement projects, including on waste within the framework of public private partnerships, development of a separate program for small projects.

International cooperation in the field of waste management

International cooperation in the field of waste management is carried out in Kazakhstan. Thus, UNDP, UNEP and the Government of the Republic of Kazakhstan are currently implementing the project "Strengthening the national capacity of the Republic of Kazakhstan in terms of chemicals management by ensuring compliance with obligations under international multilateral environmental agreements" (2019-2021). The project aims to support the country's capacity-building efforts to implement an integrated approach to chemicals management at the national level, with the aim of effectively meeting the obligations of the Stockholm, Basel and Rotterdam conventions, Strategic Approach to International Chemicals Management and promoting the ratification of the Minamata Convention on Mercury.

Also in 2015-2018, by the UNDP / GEF / Government of the Republic of Kazakhstan was implemented the project "Updating the National Implementation Plan, Integration of Persistent Organic Pollutants Management into the Process of National Planning and Sustainable Management of Medical Waste in Kazakhstan".

International experience

The most appropriate practice in the world experience in the management of production and consumption waste is to comply with the principles and requirements set out in the so-called "chemical" conventions: Basel, Stockholm and Rotterdam.

According to international experts⁶² the establishment in Kazakhstan of a single coordination point for the Basel, Rotterdam and Stockholm conventions is a good approach to ensuring a consistent link with the secretariats of these conventions. However, there are shortcomings in the provision of the necessary information related to the lack of human and resource capacity to fulfill Kazakhstan's obligations under these conventions, transfer of information in accordance with the requirements of the conventions on chemicals. Kazakhstan is not a party to the Minamata Convention on Mercury, although preparatory work has begun for acceding to this Convention.

In this regard, the Authorized body in the field of environmental protection is recommended:

to review the work of the coordination point for the three conventions on chemicals issues, elaborate and amend to enhance the capacity to properly meet international obligations;
to take the necessary steps to become party to the Minamata Convention on Mercury.

From April 29 to May 10, 2019, the Joint Meeting of the Conferences of the Parties to the three "chemical" conventions was held in Geneva (Switzerland), which adopted a number of new guidance documents.

In particular, a revised Practical Guide on Extended Producer Responsibility and Financing Systems for Environmentally Sound Management was adopted, targeting all stakeholder groups, especially government authorities working on national EPR policies and regulations⁶³.

There are more than four hundred EPR systems around the world and there is sufficient experience to date to determine the minimum requirements for a successful EPR system. EPR systems can be either voluntary or mandatory⁶⁴. In any case, EPR systems need to have clear rules regarding the roles and responsibilities of all stakeholders, as well as a sufficient level of competitiveness to avoid creating monopolies. EPR systems should ensure equal treatment and non-discrimination

⁶² Third Environmental Performance Review of Kazakhstan. UNECE. 2018

⁶³ <http://www.basel.int/TheConvention/ConferenceoftheParties/Meetings/COP14/tabid/7520/Default.aspx>

⁶⁴ Extended Producer Responsibility - Updated Guidelines for Effective Waste Management, OECD, 2016.

between: producers of products on the market, producer responsibility organizations that implement EPR on behalf of these producers, and between private or public waste management operators. The EPR system should provide adequate geographic coverage in both rural and urban areas, and tender requirements should allow all types of businesses (including micro, small and medium-sized) to participate in the separate collection, recuperation and final disposal of products after they have become waste. The EPR system should ensure best practices for waste management in accordance with the waste management hierarchy, taking into account the concept of a life cycle, and can set targets for preparation for reuse, recycling, energy recuperation and final disposal (e.g. in a landfill), including requirements for removing hazardous components and parts. The economic, social and environmental achievements of the EPR system should be assessed, independently studied and published.

One of the most important steps in developing an effective EPR system is to define clear policy objectives and program goals. The goals include, but are not limited to:

- increasing measures to prevent waste generation, increasing the reuse and recycling of waste;
- closing the cycles of using materials to promote sustainable development;
- ensuring the elimination of hazardous components prior to recuperation and final disposal;
- reduction in final removal;
- internalization of waste management costs (and other external costs) into the product price, thus reducing waste management costs incurred by municipalities and / or taxpayers;
- development of cleaner production and products, which includes incentives for environmentally friendly products; preventing the presence of hazardous materials and components in new products to the extent technically feasible; development of new methods and capacities for elimination of environmental pollution and recycling; or improving materials management;
- formalization of the informal sector to ensure environmentally sound management (ESM).

Implementing an EPR system requires a clear and stable regulatory framework to ensure fair competition, with sufficient monitoring and equal rights for all, supported by enforcement (including sanctions). The parameters of such a regulatory framework may include the following:

- establishing national legislation, defining regulations and operational requirements (including requirements for transparency, accountability and competition rules), monitoring and implementing proper implementation of the EPR system by all stakeholders;
- the establishment of information exchange and cooperation between the authorities involved, taking into account the registration of producers, including the ministries of environment and finance, as well as the customs service. Customs has an important role to play in monitoring unscrupulous users, especially in the case of importing countries;
- organize formal and regular dialogue between the involved stakeholders;
- establish an agreed and reliable means of enforcing compliance by producers, waste operators, and all other involved stakeholders; registration of manufacturers; systems accreditation; education; providing information, among other things. As government capacity is often limited, third party audits should be considered. Rules should be developed for how to accredit external auditors;
- establish penalties in case of non-compliance. The sanctions should be proportionate in the event that objectives are not achieved and / or requirements are not met or fulfilled. The sanctions should be related to unpaid collection and recuperation costs.

Information should be provided and made publicly available on the environmental and technical performance of EPR systems (e.g., achievement of collection and disposal targets), as well as financial considerations (e.g. fees from producers, waste management costs, resale profits, information and awareness campaigns costs, management), especially since ROI is part of the performance indicator.

In addition, new or updated draft technical guidelines have been adopted by the Conference of the Parties:

- (a) updated general technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants;
- (b) new technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with short-chained chlorinated paraffins;

(c) updated technical guidelines for the environmentally sound management of wastes containing unintentionally produced polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, hexachlorobenzene, polychlorinated biphenyls, pentachlorobenzene or polychlorinated naphthalenes, or contaminated with them, to include hexachlorobutadiene;

(d) updated technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with hexachlorobutadiene.

At its third session, the UN Environment Assembly (December 4-6, 2017 in Nairobi) adopted a ministerial declaration to end pollution of the planet (UNEP / EA.3 / HLS.1) and a number of resolutions relevant to the Basel, Rotterdam and Stockholm conventions, in particular, resolution 3/1 on mitigation and control of pollution in areas affected by armed conflict, resolution 3/4 on environment and health, resolution 3/6 on managing soil pollution for sustainable development, resolution 3/7 on marine debris and microplastics, and resolution 3/9 on eliminating exposure to lead paints and promoting the environmentally sound management of waste lead-acid batteries.

The United Nations Environment Program (UNEP) is implementing SAICM (Strategic Approach to International Chemicals Management), which was adopted in 2006 as a voluntary policy framework to promote the sound management of chemicals throughout their life cycle.

The third meeting of the intersessional process (IP3) (Bangkok, Thailand, October 1-4, 2019) discussed possible elements of a new global platform for international cooperation on the sound management of chemicals and waste beyond 2020, presented five strategic objectives for an updated versions of SAICM that include the following:

- Strategic Objective A: Identify, implement and enforce measures to prevent and minimize harm from chemicals throughout their life cycle and from waste.

- Strategic Objective B: The acquisition, availability and accessibility of comprehensive and sufficient knowledge, data, information and details to all relevant entities to ensure informed decisions and actions are taken.

- Strategic Objective C: Identify, prioritize and resolve issues of interest that require global action.

- Strategic Goal D: Maximizing benefits and avoiding risks to human health and the environment through innovative and sustainable solutions and forward thinking.

- Strategic Goal E: Recognition by all relevant entities of the importance of sound management of chemicals and wastes for achieving sustainable development; accelerate action and build the necessary partnerships to strengthen stakeholder engagement and resource mobilization.

These strategic goals can be used in Kazakhstan in the development of program documents in the field of waste management. Moreover, according to the UNECE experts⁶⁵ the authorized body in the field of environmental protection of Kazakhstan should:

- review the current waste management policy and initiate a program aimed at establishing controlled landfills;*

- in collaboration with local executive authorities, analyze the existing system of financing municipal waste management and develop a strategy for the transition to financing the municipal waste management system on a cost basis.*

- develop a strategy for the implementation of a waste weighing system at all waste sterilization and dumping facilities;*

- assess the effectiveness of the existing waste management data system and make changes to ensure that reports from all sources of waste generation are included;*

- ensure collection of quantitative statistics on selected waste types.*

- develop and implement measures to improve the reporting of recyclable materials in cooperation with interested government authorities.*

- identify the key issues that impede the efficient and sustainable operation of the sorting infrastructure and develop a strategy that will fully use the existing sorting capacity.*

- initiate the preparation of a new National Profile for the Assessment of National Chemicals Management Infrastructure.*

⁶⁵ Third Environmental Performance Review of Kazakhstan. UNECE. 2018

provide support for a regional approach by concluding contracts for the collection and sterilization of medical waste.

Waste incineration

First of all, it should be noted that incinerators are listed in Part II a) of Annex C to the Stockholm Convention on Persistent Organic Pollutants (ratified by the Republic of Kazakhstan) as the main source of uncontrolled persistent organic pollutants (UPOPs), which include polychlorinated dibenzo-p-dioxins and dibenzofurans (dioxins and furans or PCDD / DF), but are not limited to. Other dioxin-like compounds, such as polychlorinated naphthalenes, are also present in emissions from incinerators. Guidelines for the operation of incinerators (and other key sources of UPOPs) under the NIP and NEP are submitted by the Stockholm Convention⁶⁶.

The main disadvantages of waste incineration and control include the following⁶⁷:

- in industrial pyrolysis processes, it is almost impossible to achieve a complete absence of oxygen, i.e. in fact, pyrolytic systems operate with a lower stoichiometric amount. Thus, during the pyrolysis of organochlorine compounds in the presence of even small amounts of oxygen, as well as metal oxides (for example, iron), there is a possibility of the formation of secondary dioxins;
- pyrolysis, as a rule, proceeds under pressure, which creates a risk of untreated waste process gases entering the environment through equipment leaks;
- at present, gas analyzers that allow to control the content of such POPs as polychlorinated dioxins / furans, polychlorinated biphenyls in an automatic online mode do not exist due to the peculiarities of the methods and sample preparation;
- with a lack of oxidizer in the zone of maximum temperatures in the reaction products, the formation of carbon monoxide and hydrogen is possible, which in the cooling zone of exhaust gases can cause the re-formation of polybrominated dibenzodioxins (PBDE) and furans (PBDD / F) and their analogues⁶⁸;
- during thermolysis at 510-630 ° C, PBDD / F is formed with a yield of up to 10%. Similar data were obtained during the pyrolysis of these compounds at 700-900 ° C;
- according to a number of experts, industrial environmental control at incinerators and enterprises that incinerate production and consumption waste in incinerators is formal and not completely transparent for the population and the public.

Problems of achieving the SDGs

Of the SDGs, waste issues directly address targets 3.9, 11.6, 12.4 and 12.5 of the 2030 Agenda for Sustainable Development (Table 1.5.10).

Target 3.9 of goal 3 is monitored in the statistics of Kazakhstan through the indicator "Mortality from unintentional poisoning", separately for the urban and rural population and for men and women. This indicator tends to constantly decrease and in 2017 reached 2.8 cases per 100,000 population. The global average death rate from unintentional poisoning in 2015 was 1.5 cases per 100,000 people⁶⁹.

Statistics are not monitored in Kazakhstan Indicator 11.6.1 of Target 11.6 of Goal 11. According to expert estimates, about half of solid household waste is regularly collected in Kazakhstan, and the coverage of regular collection is about 70% of the total population. With the exception of Nur-Sultan, no city in Kazakhstan has a waste disposal facility that meets modern standards for landfill waste disposal. Despite the existence of a regulatory framework, implementation and compliance with its requirements are not sufficiently efficient. Kazakhstan should establish a waste collection system based on regional sanitary landfills. Given the current approach to solid household waste management, Kazakhstan does not seem to achieve this Target by 2030⁷⁰.

66 <http://chm.pops.int/Implementation/BATBEP/BATBEPGuidelinesArticle5/tabid/187/Default.aspx>

67 Waste incineration plant and incinerators in the Russian Federation. Moscow, 2020

68 V.G. Petrov "Study of the thermodynamics of reactions of polybrominated dibenzo-p-dioxins and dibenzofurans in waste incineration plants". "Bulletin of the Udmurt University" 1. Physics and chemistry. UDC: 504.3.054. 2013.

69 Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

70 Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

To achieve Target 12.4 of Goal 12: Kazakhstan has ratified three chemical conventions (Basel, Stockholm and Rotterdam) and regularly maintains international reporting on them. Kazakhstan's accession to the Minamata Convention on Mercury is being prepared. Therefore, indicator 12.4.1 must be met.

With regard to Indicator 12.4.2, indicators of the total generation of hazardous waste are monitored in Kazakhstan, including according to hazard lists (red, amber, green). At the same time, according to UNECE experts, there are no reliable data on hazardous waste in Kazakhstan, since the definition of hazardous waste differs from the practice adopted in the OECD member countries. The average annual volume of hazardous waste generation per capita in the OECD countries was at the level of 150 kg in the period 2006-2011, while in Kazakhstan for the period 2006-2016 the average annual volume of generation was registered at the level of 18 tons per capita⁷¹. Based on the Indicator currently used in Kazakhstan, it is impossible to assess the progress towards Target 12.4. Kazakhstan needs to consider improving the reporting mechanisms for hazardous waste in line with international definitions of waste and hazardous waste.

To solve Target 12.5 in Kazakhstan, the indicators "The share of processing and disposal of industrial waste to their generation" and "The share of processing and disposal of solid household waste to their generation" are monitored. In 2017, these indicators reached 30.9% and 9%, respectively, while in OECD countries they reach 44% and 34%, respectively. Nevertheless, progress in this direction in Kazakhstan is significant.

Indicators 12.6.1, 12.7.1, 12.8.1, 12.a.1, 12.b.1 are not completely monitored in Kazakhstan.

Table 1.5.10. Problems of achieving the SDGs related to waste

Goals and targets of the SDGs	International indicators	Indicator in Kazakhstan	Problems in achievement	The need to introduce indicators
SDG 3. Ensure healthy lives and promote well-being for all at all ages				
Target 3.9. By 2030 substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination	3.9.2 Mortality rate attributed to unsafe water, sanitation, and lack of hygiene 3.9.3 Mortality rate attributed to unintentional poisoning	Mortality from unintentional poisoning	Almost double the world average	No
SDG 11. Make cities and communities inclusive, safe, resilient and sustainable.				
Target 11.6. By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	11.6.1 Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities	Providing the population with services for the collection and removal of waste Share of processing of solid household waste The share of landfills that meet environmental requirements and sanitary standards	Despite the existence of a regulatory framework, the implementation and compliance with its requirements are not provided effectively enough. Kazakhstan should establish a waste collection system based on regional sanitary landfills. There is a danger of not reaching.	Indicators of the relationship between morbidity and waste pollution are needed
SDG 12. Ensure sustainable consumption and production patterns.				
Target 12.4 By 2020, achieve the environmentally sound	12.4.1 Number of parties to international multilateral	Three chemical conventions have been ratified (Basel,	Definitions of waste and hazardous waste in Kazakhstan are	Kazakhstan needs to consider

71 Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment	environmental agreements on hazardous waste, and other chemicals that meet their commitments and obligations in transmitting information as required by each relevant agreement 12.4.2 Hazardous waste generated per capita and proportion of hazardous waste treated, by type of treatment	Stockholm and Rotterdam) and the ratification of the Minamata Convention on mercury is in preparation. Indicators of the general generation of hazardous waste, including those according to hazard lists (red, amber, green).	not equivalent to international ones, therefore, the target cannot be assessed	improving the reporting mechanisms for hazardous waste in line with international definitions of waste and hazardous waste.
Target 12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse	12.5.1 National recycling rate, tons of material recycled	percentage of recycling and disposal of industrial waste and municipal solid waste	No	No
Target 12.6. Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle	12.6.1 Number of companies publishing sustainability reports	Not tracked in Kazakhstan	No	An appropriate indicator is required
Target 12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities	12.7.1 Number of countries implementing sustainable public procurement policies and action plans	Not tracked in Kazakhstan	No	An appropriate indicator is required
Target 12.8. By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.	12.8.1 Extent to which (i) global citizenship education and (ii) education for sustainable development (including climate change education) are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment	Not tracked in Kazakhstan	No	An appropriate indicator is required
Target 12.a. Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production	12.a.1 Amount of support to developing countries on research and development for sustainable consumption and production and environmentally sound technologies	Not tracked in Kazakhstan	No	An appropriate indicator is required
Target 12.b. Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products	12.b.1 Number of sustainable tourism strategies or policies and implemented action plans with agreed monitoring and evaluation tools	Not tracked in Kazakhstan	No	An appropriate indicator is required

Plans for the future

The draft of the new Environmental Code, being developed, proposes to improve the waste management system. It is necessary to provide conditions when it will be more economically profitable to reuse, recycle or dispose of waste than to landfill. By taking into account the experience of the OECD countries, the foundations should be worked out and laid down for creating a system for effective collection (including separate), transportation, sorting, processing, neutralization, use and disposal of solid household waste. At the same time, it is assumed that more specific measures and incentive mechanisms will be determined during the development of the draft law based on the results of discussions with interested state bodies and organizations. In addition, the conceptual framework, waste classification system, permitting or notification regimes in the field of waste management will be improved.

In order to solve problems in the field of waste, it is planned to develop a state program in the field of production and consumption waste management (2020).

The Strategy for the development of the activities of the EPR Operator, agreed by the Ministry of Economics for solving the Operator's tasks and achieving the goals within the Strategy, defines the following strategic areas of activity:

- 1) organization of collection, transportation, processing, neutralization, use and (or) disposal of waste generated after the loss of consumer properties of products (goods) to which EPR applies;
- 2) financing of experimental, pilot, design, research work in the field of collection, processing, neutralization and (or) disposal of waste;
- 3) stimulating the delivery of ramshackle vehicles by the population for recycling;
- 4) the introduction of new technologies for the collection and use of waste as a secondary raw material, the construction of plants (production) for the sorting and (or) use of solid household waste and secondary resources, improvement of the material and technical base of organizations that collect and (or) use secondary resources, collection, sorting and (or) use of solid household waste;
- 5) organizational, technical and information support of the system for collection, transportation, processing, disposal and (or) disposal of waste products (goods), financing of advertising activities, educational, marketing research in the field of waste and secondary resources management.

On behalf of the Ministry of Economics, the Strategy also sets targets for the planned share of collected, recycled and disposed waste from the total amount of produced and imported (minus exported) products (goods) in the previous year:

- for spent storage batteries - 65%;
- for used oils and used tires - 50%.

The projected volumes of collection, processing and disposal of waste products (goods), by taking into account their uniform increase within the framework of the Strategy, are indicated in tables 1.5.11. and 1.5.12:

Table 1.5.11. Planned volumes of collection, processing and disposal

Name of waste products (goods)	Planned volumes of collection, processing and disposal *, thou. tons				
	2017	2018	2019	2020	2021
Waste batteries	12.0	12.5	13.0	13.5	16.5
Waste oils	10	15	22.5	30	40
Used tires	20	27	35	43	50

* the planned volumes may vary depending on changes in the volume of production (import) of the corresponding types of products (goods) (since they are based on the share of waste collection and disposal from the volume of production (import) of products (goods)), currently in the sphere of waste management, factors of socio-economic development, as well as from the amount of funds received by the Operator in the form of a fee.

Table 1.5.12. Actual and planned number of accepted and disposed of ramshackle vehicles

Year	2017	2018	2019	2020	2021
number of accepted and disposed ramshackle vehicles, thous.	40	50	50	50	50

According to the World Bank (2017), the main problems of Kazakhstan in the field of utilization of municipal waste are: 1) an increase in the growth and accumulation of solid household waste; 2) inefficient collection and transportation of waste; 3) insufficient environmental management of landfills (open dumps); 4) lack of waste separation; 5) low level of utilization of municipal waste.

In order to solve the existing problems associated with (1) pollution from solid household waste and (2) effective management of solid household waste, the following measures should be taken⁷²:

- 1) use standard methods and techniques such as planning, subsidizing, design, etc.;
- 2) use innovative solutions such as payments for ecosystem services, geographic information systems, etc.;
- 3) introduce a regional approach to waste management throughout the entire technological network, from separate collection at the source to disposal of solid household waste at landfills;
- 4) amend the current methodology for calculating tariffs, which should include not only the transportation of solid household waste, but also collection and disposal;
- 5) submit the landfill inspection to public or independent expert institutes;
- 6) application of a specific waste management model should be complemented by behavioral changes in the public;
- 7) introduce tax measures, as well as measures to stimulate the reuse of resources. To introduce exemptions for the payment of (1) corporate income tax, (2) value added tax, (2) land tax and (3) property tax for legal entities and individual entrepreneurs (whose main activity is collection, transportation, sorting, processing and disposal of waste); apply reduction ratios to profits from the sale of products manufactured using recyclable materials; provision of tax holidays.

In November 2019, an electronic exchange for the purchase and sale of waste (<https://waste-ex.kz/>) appeared in Kazakhstan, where you can place an ad to sell waste to recycling companies.

The Kazakhstan Association for Waste Management KazWaste has developed a single platform for the sale and purchase of various types of waste and secondary resources on the principle of sites for free posting of ads from individuals and legal entities. In 2020, the launch of a mobile application for the exchange is expected. On the website of the exchange, ads are also divided by type of waste - paper, cardboard, plastic, and so on. The site has registered processing companies that are ready to buy secondary raw materials. Each ad contains contact numbers by which the buyer can contact the seller or vice versa.

The Ministry of Ecology, Geology and Natural Resources announced a joint project with UNIDO (United Nations Industrial Development Organization) "Coordinated management of the disposal of ozone-depleting substances and persistent organic pollutants". Within the framework of the project, in 2020 it is planned to transfer a POPs destruction device to Kazakhstan free of charge. This device will be involved in the disposal of condensers of the Daryal-U facility containing polychlorinated biphenyls (PCBs).

1.6. Reducing air pollution

Current situation and achievement of targets

The concept for the transition of the Republic of Kazakhstan to a "green economy" provides for the achievement by 2030 of the European level for emissions of sulfur and nitrogen oxides into the environment.

In 2017-2019, observations of the state of atmospheric air in the territory of the Republic of Kazakhstan were carried out in 45 - 49 settlements of the republic at 140 - 146 observation posts, including 56 stationary posts⁷³. The dynamics of the number of posts from 1970 to the present is quite indicative (Fig. 1.6.1).

72 The World Bank. Green Economy: Realities and Prospects for Kazakhstan. 2018.

73 Information bulletins on the state of the environment in the Republic of Kazakhstan for 2017 - 2019. Kazhydromet.

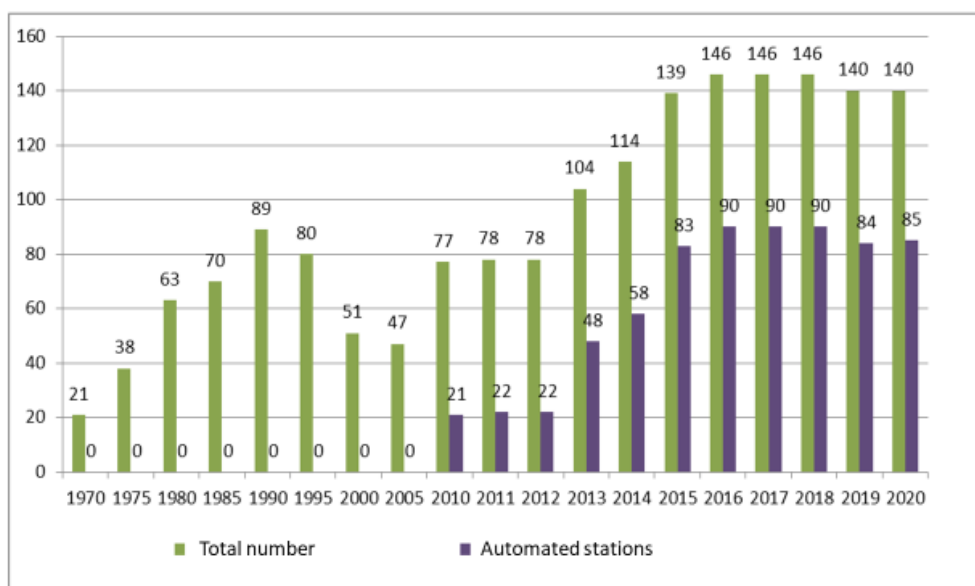


Figure: 1.6.1. Dynamics of the number of posts for atmospheric air quality from 1970 to 2020

At stationary posts and with the help of mobile laboratories, the following indicators are determined for the state of atmospheric air pollution: suspended particulate matters (dust), suspended particulate matters PM_{2.5}, suspended particulate matters PM₁₀, sulfur dioxide, soluble sulfates, carbon dioxide, carbon monoxide, nitrogen dioxide, nitrogen oxide, ozone (ground level), hydrogen sulfide, phenol, hydrogen fluoride, chlorine, hydrogen chloride, hydrocarbons, ammonia, sulfuric acid, formaldehyde, methane, the amount of hydrocarbons, inorganic arsenic compounds, cadmium, lead, chromium, copper, benzene, ethylbenzene, benz (a) pyrene, beryllium, manganese, cobalt, zinc, nickel, gamma background, mercury.

Kazhydromet's website⁷⁴ contains monthly, quarterly, semi-annual and annual newsletters on the state of the environment, including the region and city-specific following information:

- general assessment of the level of air pollution in cities;
- information on cases of high and extremely high air pollution;
- radiation state of the surface layer of the atmosphere;
- the density of radioactive fallout in the surface layer of the atmosphere.

Additional newsletters on the state of the environment are published by Kazhydromet on a quarterly, semi-annual and annual basis. They are dedicated to the following topics:

- the state of the environment on the territory of the special economic zone "Seaport Aktau";
- the state of the environment in the Kazakh part of the Caspian Sea;
- the state of the environment of the Nura River basin;
- the state of the environment and health of the Aral Sea population;
- the state of the environment of the Shchuchinsk-Borovoe resort area.

Since 2018, the Kazhydromet RSE has launched the AirKZ mobile application, which allows monitoring the quality of atmospheric air for 8 pollutants in 45 settlements and 140 ecological posts in Kazakhstan. Data from the mobile application is placed on LED screens of Pavlodar, Ekibastuz, Petropavlovsk, Uralsk, Aktau, Kostanay, Taldykorgan cities. Depending on the selected post, the application displays the concentrations of the main air pollutants, in particular nitrogen dioxide (NO₂), nitrogen monoxide or nitrogen oxide (NO), PM₁₀, PM_{2.5}, dust, SO₂, H₂S and CO. For each parameter, users can view the concentration level in mg / m³ and the level in relation to the MPC, represented by a color scale.

⁷⁴ kazhydromet.kz

The AirKz application is available in English, Kazakh and Russian and allows users to select the posts they want manually or according to geolocation data, when the application automatically detects the nearest post.

According to the Ministry of Ecology, Geology and Natural Resources (MEGNR), the volume of issued limits (regulatory emissions) of pollutants decreased from 4.5 mln. tonnes in 2016 to 4.2 mln. tonnes in 2017 and to 4.1 mln. tonnes in 2019. A similar decrease was noted for actual emissions (Table 1.6.1., Fig. 1.6.2.).

Table 1.6.1. Limits of emissions of harmful substances and actual emissions

Name of regions	2017		2018		2019	
	limit	actual	limit	actual	limit	actual
Akmola	142	90	164	103	162.5	115.4
Aktobe	352	194	318	185	319.6	182.3
Almaty	129	39	129	41	128	43.2
Atyrau	582	164	471	180	377.1	123.6
East Kazakhstan	186	79	194	130	189.4	130.5
Zhambyl	116	70	115	81	119.9	81.4
West Kazakhstan	125	63	177	63	141.7	55.4
Karaganda	831	590	822	587	939	560.0
Kyzylorda	69	28	70	26	74.9	26.9
Kostanay	218	116	201	115	210.3	117.5
Mangystau	146	100	158	53	218	56
Pavlodar	969	618	980	716	986.4	717.5
North Kazakhstan	116	44	117	78	117	78
South Kazakhstan	136	73				
Turkestan			61	32	76.1	28.9
Nur-Sultan city	69	49	98	49	85.7	61.7
Almaty city	71	34	71	36	71.4	37.9
Shymkent city			82	42	62.2	30.1
Total	4,254	2,352	4,227	2,516	4,279.3	2446.5

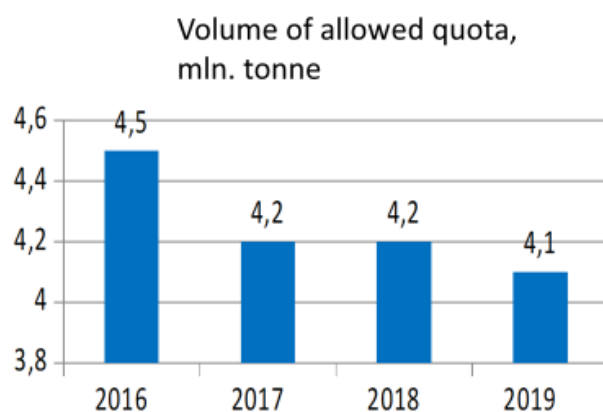


Figure 1.6.2. The dynamics of reducing the limits on pollutant emissions.

Source: Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan

According to statistics, in 2017, the actual emissions of pollutants into the air from stationary sources amounted to 2,352 thou. tons, and their level increased by 4.2%⁷⁵ compared to the previous year. In 2018, emissions of pollutants into the air from stationary sources amounted to 2,516 thou. tons and their level increased by 3.8% compared to the previous year, and at the end of 2019 decreased slightly to 2.45 mln. tons per year. In 2019, emissions of pollutants into the air from stationary sources amounted to 2,446.5 thou. tons, and their level compared to the previous year increased by 1.5%. At the same time, the share of Karaganda and Pavlodar regions accounts for 52% of the total volume of gross emissions.

According to statistics, out of the total volume of pollutants emitted into the air in 2017, 79.8% were gaseous and liquid substances, 20.2% were solids. In 2018, 79.2% were gaseous and liquid substances, 20.8% were solids. In 2019, 79.6% were gaseous and liquid substances, 20.4% were solids (Table 1.6.2).

Table 1.6.2. Emissions of the most common air pollutants from stationary sources

	thou. tons		
	2017	2018	2019
Total, thou. tons	2,357.8	2,446.7	2,483.1
including:			
solids	475.7	508.0	507.7
gaseous and liquid substances	1,882.1	1,938.7	1,975.4
of them:			
sulfurous anhydride	786.4	838.3	885.7
carbon monoxide	492.0	476.9	487.9
nitrogen oxides	264.7	272.2	313.9
hydrocarbons (no volatile organic compounds)	45.2	35.3	128.5
volatile organic compounds	87.2	91.7	158.7

Source: Committee on Statistics

In 2017, such specific pollutants as lead and its compounds in the amount of 254.8 tons, manganese and its compounds - 143.4 tons, copper oxide - 32.9 tons, sulfuric acid - 530.4 tons, arsenic - 7.9 tons, chlorine - 41.0 tons, mercury - 255 kilograms entered the air basin of the republic,.

In 2018, such specific pollutants as lead and its compounds in the amount of 241.5 tons, manganese and its compounds - 147.7 tons, copper oxide - 32.3 tons, sulfuric acid - 531.4 tons, arsenic - 41.6 tons, chlorine - 41 tons, mercury - 180 kilograms entered the air basin of the republic. The actual emission of these substances in 2017-2018 did not exceed the amount of the established maximum permissible emissions (MPE).

In 2019, such specific pollutants as lead and its compounds in the amount of 390 tons, manganese and its compounds - 200.6 tons, copper oxide - 366.2 tons, sulfuric acid - 430.4 tons, arsenic - 13.8 tons, chlorine - 49.6 tons, mercury - 186 kilograms entered the air basin of the republic. The actual emission of these substances did not exceed the volume of the established maximum permissible emissions (MPE).

The main emissions are from the electric power industry (coal-fired thermal power plants), the mining and metallurgical sector and oil production.

Pursuant to paragraph 57 of the National-level Plan of Actions (hereinafter referred to as the NLP), approved by the Decree of the First President of the Republic of Kazakhstan - Elbasy dated October 12, 2018 No. 772 "On measures to implement the Address of the Head of State to the people of Kazakhstan dated October 5, 2018 "Growing the welfare of Kazakhstanis: increasing income and quality of life", local executive bodies are developing target indicators of environmental quality (TIEQ). At the end of 2019, TIEQs were approved in 14 regions, excluding the cities of Nur-Sultan, Shymkent and Akmola region.

In order to achieve the TIEQs, the akimats, together with the public, are developing sets of measures to achieve the TIEQs, taking into account the solution of acute environmental problems. At

⁷⁵ Environmental protection and sustainable development of Kazakhstan. 2013-2017. Statistical compilation.

the beginning of 2020, the Complexes of Measures were approved in 13 regions (Almaty city, Aktobe, Almaty, Atyrau, East Kazakhstan, Zhambyl, West Kazakhstan, Kostanay, Kyzylorda, Mangystau, Pavlodar, North Kazakhstan and Turkestan regions). In other regions, work on the development of the Complex of Measures continues.

All akimats approved comprehensive plans to improve the environmental situation, which included sections on reducing the emission of pollutants into the atmosphere, developing the "green belt", landscaping and improvement, managing production and consumption waste, regulating water resources, protecting land resources, monitoring the state of the environment, information work.

Enterprises annually implement **environmental measures** to reduce the burden on the environment through the introduction of effective technologies. According to the Ministry of Ecology, Geology and Natural Resources, the total amount of allocated funds increased from 91.3 bln. tenge in 2008 to 123 bln. tenge in 2017, to 161.0 bln. tenge in 2018, and to 172 bln. tenge in 2019 (Fig. 1.6.3.).

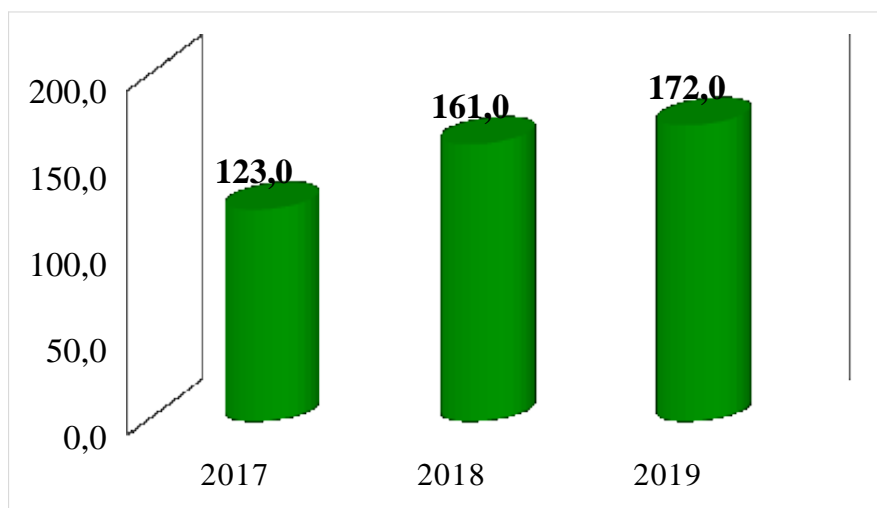


Figure 1.6.3. Dynamics of financing of environmental protection measures by enterprises in bln. tenge.

Source: Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan

According to the Committee on Statistics, in 2019, the total costs of environmental protection of enterprises and organizations in 2017-2019 increased to 420.4 bln. tenge, including 47.3% of investments in fixed assets, and 52.7% of operating costs. The volume of investments in fixed assets directed to environmental protection is provided to a greater extent (82%) due to investments in renewable energy sources. In terms of total expenditures on environmental protection in 2019, the leaders are Atyrau (55.4 bln. tenge), Aktobe (54.1 bln. tenge) and Zhambyl regions (52.8 bln. tenge).

The volume of operating expenses for environmental protection in 2019 amounted to 221.7 bln. tenge. Of the total operating expenses for the protection of atmospheric air and the problem of climate change account for 34%, for waste management - 30%, for wastewater treatment - 25%. By type of expenses, the operating expenses for environmental protection were distributed as follows: material costs - 68.3 bln. tenge or 31%, labor costs and deductions for social needs - 34.3 bln. tenge (15%), paid to other enterprises (organizations) for the provision of environmental services - 97.8 bln. tenge (44%).

In accordance with the legislation, the implementation of programs to stop the flaring of associated gas by oil producing enterprises is being completed. As a result, the volume of flared associated gas decreased from 4 bln. m³ to 900 mln. m³ (Fig. 1.6.4.).

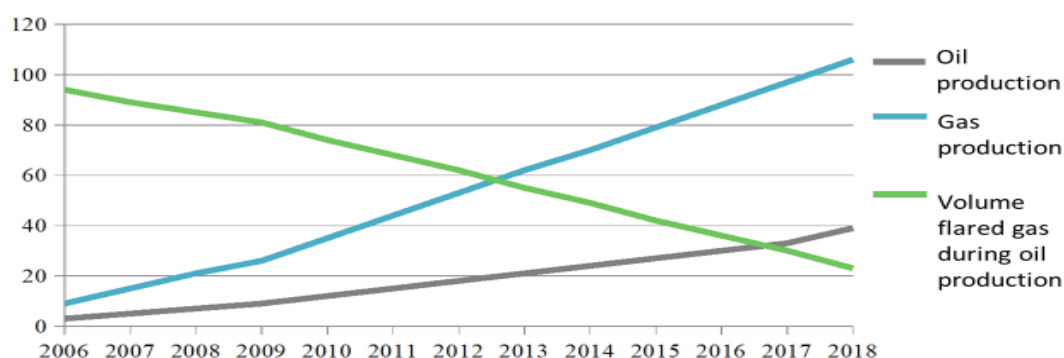


Figure 1.6.4. Dynamics of gas flaring during oil production

Reducing air pollution in transport

Since 2018, the import of cars below the Euro 4 standard has been banned in Kazakhstan. In order to prevent emissions from road transport, the Euro-5 standard has been introduced for motor fuel manufacturers, as a result of which vehicle emissions should be reduced by more than 50% (Table 1.6.3.).

Table 1.6.3. Comparison of pollutant emissions by different standards

Ingredient	Environmental Standard		
	Euro-3	Euro-35	Decrease, %
Nitrogen oxide (NOx)	0.50 g/km	0.18 g/km	64%
Carbon monoxide (CO)	0.64 g/km	0.5 g/km	22%
Hydrocarbons (CxHy)	0.56 g/km	0.17 g/km	69%

In 2017, the "Roadmap for the development of electric vehicle production and the creation of the necessary infrastructure" was approved, which outlines three areas: local production (using local raw materials and labor), infrastructure development (charging stations) and awareness raising to stimulate the acquisition of electric vehicles. The roadmap facilitated the creation of charging stations in Nur-Sultan and Almaty.

Kazakhstan has carried out a significant reform of excises on gasoline and diesel fuel. Since 2017, the excise rate on gasoline sales by manufacturers in the summer period (June-October) has more than doubled (from 4,500 tenge to 10,500 tenge), and on the sale of diesel fuel - 17 times (from 540 tenge to 9,300 tenge) (table 1.6.4.).

Similarly, the excise rates tax on retail sales by manufacturers and imports increased. Although this increase deserves a positive assessment, there is still a significant gap between the rates in force in Kazakhstan and those that are widely used in OECD countries.

According to the Tax Code, vehicle tax rates are differentiated depending on the engine size (cm³). For example, the tax rate for a vehicle with an engine volume of 3000 cm³ to 4000 cm³ is 15 times higher than for a vehicle with an engine volume of less than 1100 cm³, while for a car with an engine volume of over 4000 cm³ the rate is 117 times higher. From an environmental point of view, this could theoretically serve as an incentive to purchase smaller vehicles that, all other things being equal, are less harmful to the environment. However, this is contrary to practice in a number of OECD

countries that have a long history of using nonrecurring or recurring vehicle taxes based on CO₂ emissions or fuel efficiency to stimulate demand for fuel-efficient and cleaner vehicles⁷⁶.

Despite all the measures taken, the number of cars registered in Kazakhstan over 10 years old in 2019 increased by 2.1%, up to 2.6 mln..The highest concentration of old cars is observed in the Almaty region - 79.4% of all cars in the region, followed by Zhambyl (78.9%) and Pavlodar (78.2%) regions.

The monitoring of the transfer of public transport to **gas fuel** in large cities of the country showed that this event was most successful in Almaty, South Kazakhstan, West Kazakhstan, Mangystau, Kyzylorda, Zhambyl, Aktobe regions.

At the same time, there are a number of problems that prevent the widespread transfer of public transport to gas fuel: a large number of public transport in the regions has been in operation for over 10 years, public transport owned by individual owners account for more than 80%; unsatisfactory fuel quality; the lack of a developed gas transportation infrastructure limits the use of gas fuel, especially in public transport, and the use of gas as fuel is difficult due to the low air temperature in winter.

Table 1.6.4. presents data on gas stations in the context of regions for 2017:

Table 1.6.4. Data on gas stations by regions for 2017:

Region	Number of gas stations
TOTAL	1,142
Akmola region	58
Aktobe region	77
Almaty region	44
Atyrau region	26
West Kazakhstan region	28
Zhambyl region	25
Karaganda region	115
Kostanay region	37
Kyzylorda region	67
Mangystau region	199
South Kazakhstan region	208
Pavlodar region	46
North Kazakhstan region	60
East Kazakhstan region	22

By the action plan on expansion of use of natural gas as a motor fuel for 2019 - 2022, approved by the Decree of the Government of the Republic of Kazakhstan No. 797 dated November 29, 2018, the target indicators for the renewal of buses and special vehicles for the use of compressed and (or) liquefied natural gas as a motor fuel, as well as for the construction of autogas-filling compressor stations and (or) cryogenic auto-filling stations, are provided only for gasified regions of Kazakhstan.

The **production of electric vehicles** in Kazakhstan has been carried out since 2016 and in small batches. So, in 2016 - 10 units, in 2017 - 15 units, in 2018 - 14 units. A total of 39 units were produced in Kazakhstan.

According to the Association of Kazakhstan Auto Business, as of March 1, 2019, 696 cars with electric motors were registered in the Republic of Kazakhstan.

The first serial production of the JAC iEV7s electric vehicle is being prepared for launch (at the moment, samples of JAC iEV7s electric vehicles are undergoing certification tests at the NAMI car

76 Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

range in the Russian Federation). After receiving the vehicle type approval, it is planned to produce up to 200 units of JAC iEV7s electric vehicles in the first year of production.

The AZIA AVTO JSC enterprise has mastered the production of KIA Soul EV, LADA VESTA EV electric vehicles. Continuing work in this direction, AZIA AVTO JSC has tested prototypes and certified them. Currently, electric vehicles are located in car dealerships, if there is a demand, the production of LADA VESTA EV electric vehicle will be launched.

In addition, at present, domestic car manufacturers have mastered the production of buses on alternative fuels. So, SaryarkaAvtoProm LLP from 2016 to 2018 produced 20 hybrid buses, 79 gas buses. The Urbanway hybrid buses combine an electric traction system with a latest generation lithium-ion battery with a Euro VI internal combustion engine. Intelligent power management optimizes fuel consumption and emissions while driving, while excess braking energy remains in storage.

International experience

More and more attention is paid in the world to the problem of air pollution due to significant damage to public health.

The cost of health damage from air pollution is estimated by the World Health Organization (WHO) to be 1.6 trillion US dollars in Europe alone⁷⁷. Every year, 7 million people die prematurely from ambient and indoor air pollution, which is equal to the population of Bulgaria (WHO, 2014). This is more than the major high-mortality diseases - malaria, tuberculosis and AIDS - combined. It is the most significant of all environmental factors affecting morbidity. Air pollution causes and exacerbates a range of diseases, from asthma to cancer, respiratory disease and heart disease.

The main harmful air pollutants are nitrogen oxides (NO_x) and sulfur oxides (SO_x), ozone and particulate matter, especially less than 2.5 microns in diameter. The latter is especially dangerous, since its tiny particles penetrate deep into the lungs and affect the respiratory and vascular systems. The health effects of these substances depend on both the intensity and the duration of exposure.

Air pollution also affects ecosystems, acid rain, eutrophication, ozone in the ground layer, a decrease in oxygen concentration and other factors have a detrimental effect on natural ecosystems.

In 1979, realizing the transboundary nature of air pollution, countries came together to tackle the problem with the first legally binding international air pollution instrument, the Convention on Long-Range Transboundary Air Pollution (Air Pollution Convention).

The Convention and its Protocols call upon signatories to use best available techniques and emission limit values for individual pollution sources in order to reduce the amount of pollutants emitted into the atmosphere.

The emission reduction measures adopted under the 1979 Convention on Long-Range Transboundary Air Pollution and its protocols have yielded significant successes. Emissions have been significantly reduced, especially sulfur emissions; the direct relationship between economic growth and air pollution was gradually eliminated⁷⁸.

The costs of controlling air pollution are generally well below the costs of environmental and health damage. In most countries, a zero net effect on government income and employment is expected as a result of the measures taken to reduce pollution, since the production of new technologies will lead to the creation of new jobs.

The 2005 WHO Air Quality Guidelines provide global guidance on thresholds and maximum allowable levels for major air pollutants that pose a health risk. According to the Guidelines, by reducing particulate matter pollution (PM₁₀) levels from 70 to 20 micrograms per cubic meter, we can reduce air pollution-related deaths by about 15%.

The last revision of the guidelines for ambient air quality was made by WHO in 2005 and includes the following values:

- for PM_{2.5}: the average annual concentration is 10 µg / m³, the average daily concentration is 25 µg / m³ (its excess should not continue for more than 3 days a year);

77 UNECE. Clean air for life. 2016

78 UNECE, Way to Clean Air. 2016

- according to PM₁₀: average annual concentration 20 µg / m³, average daily concentration 50 µg / m³.⁷⁹

To facilitate a gradual transition to lower concentrations in the most polluted areas, in addition to these recommended values, intermediate targets are specified in the AQR for each air pollutant. If these targets were met, significant reductions in the risks of acute and chronic health effects from air pollution could be expected. However, the ultimate goal should be to achieve the recommended values. Since no threshold has been established for PM concentration below which no harm to health is observed, the guideline values should be considered as acceptable and achievable goals related to minimizing the impact on health in the context of local constraints, opportunities and public health priorities.

Europe is moving from stricter emissions regulations to a complete ban on internal combustion engines. For example, in Amsterdam (Holland) from next year, diesel vehicles over 15 years old will be banned from driving on the ring road around the city (and buses with diesel engines will stop driving in Amsterdam from 2022). And since 2030, the Dutch authorities have promised to ban cars and motorcycles with gasoline and diesel engines altogether.

60% of cars sold in Norway are completely electric, this result is a world record and perfectly characterizes the state's vector in the popularization of electric transport.

The exemption of electric vehicles from taxes charged on fuel vehicles has changed the transport pattern in Norway. Today brands such as Tesla and Nissan have taken root there. Recently, Renault is gaining popularity (Fig. 1.6.6).

Norway plans to completely abandon the internal combustion engine by 2025. Thus, the largest oil and gas producer in Western Europe is investing in green technologies, realizing that they are the future.

The fact of refutation of the myth about the problems of operating electric vehicles in northern climatic zones remains important. Modern lithium-ion battery technology is often tested in challenging winter conditions. An example of this is the recent test of an eSprinter van in the Arctic and the Swiss Alps⁸⁰.



Figure 1.6.6. Refueling electric cars in Norway.

Analytical material was presented by OECD experts within the framework of a project to develop measures to reduce air pollution in Kazakhstan. This project is implemented for the

79 WHO Ambient Air Quality Guidelines (<http://www.whois.com/mediacentre/news/releases/2016/air-pollution-rising/ru/>)

80 <https://building-tech.org/60-vseh-prodannyyh-v-norvegii-avtomobilej-polnostju-elektricheskije/>

Memorandum of Understanding signed on November 21, 2018 between the Government of Kazakhstan and the Organization for Economic Cooperation and Development (OECD).

The preliminary project report explicitly states that the current structure of the environmental regulation, environmental permitting and environmental payment system is hampering energy efficiency and enhancement of pollution monitoring at a faster rate⁸¹.

The current system of payments for environmental pollution by industrial operators is highly controversial. It focuses on **generating revenues**, in particular from foreign operators, rather than creating incentives to reduce environmental impacts.

The main recommendations of the OECD experts include:

- in general, continued efforts to approximate the legislation of the OECD countries;
- a significant reduction in taxable substances to the list stipulated by the obligations of the state and government programs, however, it is recommended to increase payment rates up to the cost of reducing emissions of taxable substances;
- the possible creation of environmental funds, but only after a thorough assessment;
- reforming the system of fines with the exclusion of a tough administrative approach using the “pyramid of law enforcement”;
- decriminalization of criminal legislation with the exclusion of connection with the amount of pecuniary damage, but at the same time increasing the effectiveness of penalties with the determination of minimum and maximum amounts per day;
- abolition of compensation for damage on the basis of fault (that is, liability arising in the event of unauthorized emissions or exceeding their limit provided for by environmental permits), exclusion of an indirect method of calculating damage;
- transition to the determination of the amount of compensation for damage using equivalence analysis (that is, with additional and compensatory recovery);
- strengthening the requirements for the creation of financial reserves by operators.

The UNECE recommends to reduce emissions:

At the national level:

- ratify and implement the protocols of the Convention on Long-Range Transboundary Air Pollution (the EMEP Protocol will continue to accede to the three most important Protocols: the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol), the Protocol on Heavy Metals and the Protocol on Persistent Organic Pollutants);

- implement effective climate and energy policies;
- introduce effective control over vehicle maintenance regulations;
- implement recycling programs for old cars and motorcycles;
- enact emission standards for farms and home stoves;

At the local level (city level):

- introduce low emission zones to encourage early disposal of old vehicles;
- introduce speed limits on highways near cities;
- promote the use of electric vehicles;
- improve infrastructure for public transport, cycling and walking paths;
- provide information to the public on air pollution from wood combustion and how to reduce it.

Problems of achieving the SDGs

Two sustainable development goals (3 and 11) explicitly set targets for reducing air pollution and set specific targets for reducing air pollution and greenhouse gas emissions (Table 1.6.6).

In Kazakhstan, statistics do not monitor mortality and morbidity from air pollution to solve Target 3.9 of Goal 3. The mortality from respiratory diseases, other diseases of the respiratory system, cardiovascular diseases, asthma, etc., monitored by statistics, may also be associated with smoking and other social factors. But particulate matter (PM) pollution is the most important factor, and other components (NO₂, SO₂, PAHs, O₃) also contribute.

81 SOLUTION OF THE PROBLEM OF INDUSTRIAL AIR POLLUTION IN KAZAKHSTAN. Guidelines for Policy Reform on Environmental Payments. OECD. Project from 20.02.2019.

In Kazakhstan, it is also necessary to monitor and compare with international indicators the achievement of targets 11.6 and 11.7, which are associated with pollution by particulate matter and parks.

In order to achieve Target 11.6 of Goal 11, Kazakhstan monitors the indicator "Average annual concentration of suspended particles PM_{2.5} and PM₁₀ in the ambient air (mg / m³) in cities where observations are conducted (per capita)". In many cities of Kazakhstan, the normative values of the average annual level of PM₁₀, established in the WHO Air Quality Guidelines, as well as the EU air quality standards, are exceeded.

According to a 2013 World Bank estimate, particulate matter air pollution is responsible for approximately 2,800 premature deaths annually in Kazakhstan and costs the economy more than 1.3 bln. US dollars in increased health care costs. According to the Green Economy Transition Concept, air pollution is responsible for up to 6,000 premature deaths per year. According to the findings of the 2013 Health Costs Resulting from Air Pollution in Kazakhstan study, the average estimated risk of death attributable to air pollution is about 16,000 cases per year with a 95% confidence interval not exceeding 25,500.

Therefore, in Kazakhstan, for a full assessment of Goal 3, it is necessary to identify and monitor diseases associated with environmental factors (Table 1.6.6.).

Table 1.6.6. Problems of achieving the SDGs related to air pollution

Goals and targets of the SDGs	International indicators	Indicator in Kazakhstan	Problems in achievement	The need to introduce indicators
SDG 3. Ensure healthy lives and promote well-being for all at all ages				
Target 3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	3.9.1 Mortality rate attributed to the household (indoor) and ambient (outdoor) air pollution	Not tracked The statistically monitored mortality from respiratory diseases, her diseases of the respiratory system, cardiovascular diseases, asthma, etc. may also be associated with smoking and other social factors.	According to a 2013 World Bank estimate, air pollution from particulate matter causes approximately 2,800 premature deaths annually in Kazakhstan and costs the economy more than 1.3 billion US dollars in increased health spending	Environmental-related diseases should be identified and monitored.
SDG 11. Make cities and communities inclusive, safe, resilient and sustainable				
Target 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	11.6.2 Annual mean levels of fine particulate matter (e.g. PM _{2.5} and PM ₁₀) in cities (population weighted)	Average annual concentration of PM _{2.5} and PM ₁₀ suspended particles in the ambient air (mg / m ³) in cities where observations are being conducted	Monitoring is required	Recalculation per capita and comparison with international indicators is required
Target 11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities	11.7.1 Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities	Not tracked	Monitoring is required	Number of park zones relative to the total area of settlements

Plans for the future

In order to solve air quality problems in the Strategic Development Plan of the Republic of Kazakhstan until 2025, there is a direct task of "Improving the environmental situation". At the same time, it is necessary to raise the environmental standards of Kazakhstan to the level of developed countries, including in terms of emissions into the atmosphere by industrial enterprises and vehicles.

Within the framework of this task, the following initiatives are envisaged:

initiative 5.17 "Revision of Environmental Legislation". As part of improving environmental legislation, the current system for assessing environmental impact will be revised, natural resource users will be stimulated to reduce emissions, the principles of emission regulation will be improved, and progressive mechanisms of environmental regulation will be introduced. Based on international experience and technical and economic capabilities, environmental standards of Kazakhstan will be revised.

initiative 5.19 "The Introduction of the "Polluter Pays" Principle". To prevent environmental pollution, the best international experience in the implementation of the "polluter pays" principle will be studied and adopted, which implies compensation for environmental damage from the enterprise. This will create real incentives for enterprises to reduce emissions of pollutants, invest in environmental protection measures, and will also allow the use of punishments and fines as a mechanism of state coercion only in extreme cases.

initiative 5.20 "Implementation of Integrated Environmental Permits for Companies". Instead of the existing system of environmental regulation of the impact of enterprises, based on the regulation of maximum permissible concentrations of pollutants at the boundaries of sanitary protection zones, a system for issuing integrated environmental permits based on the use of the best available technologies will be studied and introduced.

initiative 5.21 "Change in the process of assessing the impact of enterprises on the environment". To make environmentally sound management decisions by SMEs, the process of identifying the nature, intensity and degree of risk from the impact of any type of economic activity on the environment and public health will be changed to the process of assessing the impact on the environment.

initiative 5.22 "Active promotion of environmental policy". The emphasis on the broad promotion of green policies will be made through publications, direct contacts between the regulator and companies explaining the rules and principles, and the presentation of industry awards for achievements in the field of environmental protection.

The implementation of these initiatives will allow, among other things, to significantly improve the state of atmospheric air, which will be reflected in such measurements as raising Kazakhstan's position from 56th to 40th place in the UN Human Development Index, increasing life expectancy to 75 years, and reducing infant mortality (up to 7.2 per 1000 live births, respectively), expanding the coverage of preschool education and upbringing to 80% of children from 1 to 6 years old⁸².

In order to bridge the technological gap with the OECD countries, the Strategic Development Plan of the Republic of Kazakhstan until 2025 provides for Initiative 2.1 "Standardization of Technological Processes", which will ensure periodic updating of national standards in accordance with OECD standards, activate the work of sectoral government bodies in the field of standardization, tools to stimulate enterprises to obtain modern standards and improve technological competencies, a network of accredited laboratories is developed. As part of this work, government agencies will continue to analyze and update technical regulations and standards in industries for compliance with international requirements and new technological trends. In the same place, Initiative 2.5 "Promotion of Technology Transfer" provides for assistance to Kazakhstani companies in the search for, acquisition of high-tech and advanced technologies abroad, as well as by entering the international technology transfer network.

Development of cooperation with the OECD is one of the priorities of the foreign economic policy of Kazakhstan, since Kazakhstan aims to join this organization. Therefore, work will continue to implement the best practices and standards of the OECD, as well as to increase the level of Kazakhstani participation in the committees and working bodies of the OECD within the framework of the corresponding approved action plan (Objective 3. Deepening cooperation with the OECD).

82 Strategic development plan of the Republic of Kazakhstan until 2025.

In pursuance of the Address of the President N.A. Nazarbayev "Growth of prosperity of Kazakhstan: increasing income and quality of life" dated October 5, 2018, the National-level Plan of Actions (NLP) was approved. Clause 55 of the NLP entrusted the Ministry of Energy of the Republic of Kazakhstan with the development of a draft law on amendments and additions to legislation in terms of increasing the amount of administrative sanctions for violating environmental legislation, improving the mechanism for conducting environmental audits, as well as establishing a standard for channeling funds from payments for emissions into addressing issues related to improving the environmental situation in the relevant region.

Revision of environmental legislation based on international experience is also provided for by Initiative 5.17 of the Strategic Development Plan of the Republic of Kazakhstan until 2025.

In pursuance of the National-level Plan aimed at implementing the Address of the Head of State "New Development Opportunities in the Conditions of the Fourth Industrial Revolution", the draft Environmental Code in the new edition was submitted to the Mazhilis of the Parliament of the Republic of Kazakhstan in December 2019.

1.7. Reducing greenhouse gas emissions

National commitments to reduce GHG emissions

Kazakhstan is a party to the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol to it and the Paris Agreement, which replaces the Kyoto Protocol from 2021.

Within the framework of the Kyoto Protocol, Kazakhstan committed to keep greenhouse gas (GHG) emissions, excluding emissions and absorptions in the LULUCF⁸³ sector, at 95% of emissions of the base year 1990 by 2020.

Within the framework of the Paris Agreement, in 2015 Kazakhstan presented to the UNFCCC Secretariat its intended NDC (nationally determined contribution), expressing its readiness to reduce GHG emissions by 15% from 1990 levels by 2030, and subject to receiving external assistance (in the form of transferring new technologies) and a favorable economic situation - to bring the indicator to "-25%".

Following the ratification of the Paris Agreement and its entry into force⁸⁴, Kazakhstan confirmed the previously announced alleged NDC.

Current situation and achievement of targets

According to the "National Report of the Republic of Kazakhstan on the inventory of anthropogenic emissions from sources and removal by sinks of greenhouse gases not regulated by the Montreal Protocol for the period 1990-2018"⁸⁵, total national greenhouse gas emissions in 1990 excluding LULUCF amounted to 401.9 mln. tons of CO₂-eq., in 2018 - 396.6 mln. tons of CO₂-eq. (that is, they were 1.3% below the 1990 level). Net GHG emissions (including LULUCF) in 1990 amounted to 386.3 mln. tons of CO₂-eq., and in 2018 - 401,885.9 thou. tons of CO₂-eq. (that is, they have already exceeded the 1990 level by 4.05%).

Dynamics of GHG emissions in the Republic of Kazakhstan for 1990-2018 (Figure 1.7.1) correlates well with the dynamics of the country's GDP. Until 1996, inclusive, there was a progressive and rapid decline in GHG emissions associated with the economic recession of the transition period. From 1997 to 2000, we see fluctuations in the phase of "deep economic depression" when the economy was trying to regain on its feet. And since 2001, there has been a period of progressive

⁸³ LULUCF - land use, land-use change and forestry

⁸⁴ Kazakhstan ratified the Paris Agreement in 2016. In the same year, the Paris Agreement entered into force.

⁸⁵ National reports with data tables in the generally established CRF format are prepared annually by Zhasyl Damu JSC and submitted to the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan for transmission to the UNFCCC Secretariat by April 15. All national reports and CRF tables are available on the UNFCCC Secretariat website at <https://unfccc.int/ghg-inventories-annex-i-parties/2020>. 2019 data will be ready by April 15, 2021. Data are currently available for the period 1990-2018.

increase in GHG emissions, except for the years when the economy of Kazakhstan was affected by external economic crises.

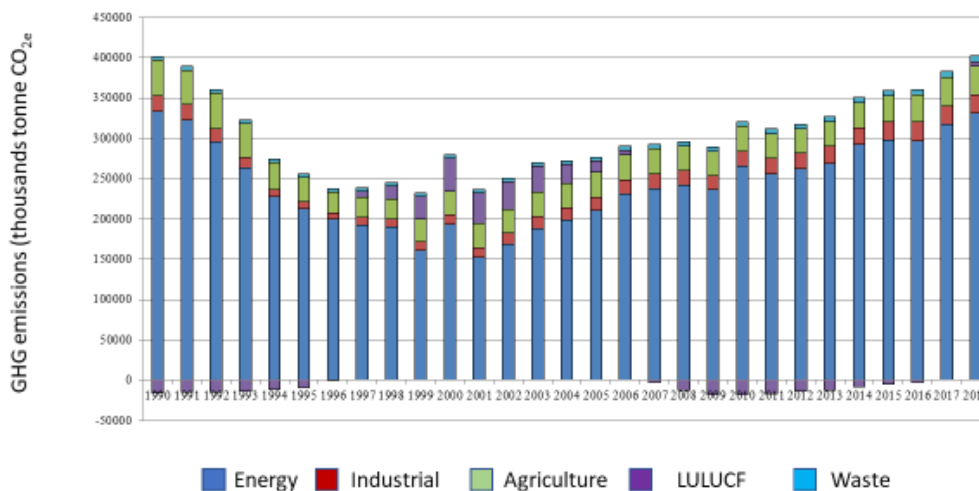


Figure 1.7.1. Dynamics of national GHG emissions and removals for 1990-2018

Source: National Emission Inventory, 2020

It should be noted that over 80% of GHG emissions in Kazakhstan are associated with the extraction, processing and combustion of fuels in all sectors of the economy (stationary and mobile sources), which are reflected in Figure 1.7.1 as “Energy”. According to the IPCC, all these emissions are grouped under the category of emission sources “Energy activities”. In 2018, the share of Energy Activities in GHG emissions was 83.5%. The share of GHG emissions not related to fuel combustion in industrial sectors was 5.6%, in “Agriculture” - 9.1%, in “Waste” - 1.7%.

Compared to the emissions of 1990 level, in 2018 emissions in the category of emission sources “Energy activity” are even lower by 0.6%, emissions not associated with fuel combustion in “Agriculture” are even lower by 17.4%, in industry they increased by 11.6%, in LULUCF - by 134.0%, in “Waste” - by 44.2%.

Regulation of GHG emissions in Kazakhstan

Since 2013, Kazakhstan has a national GHG emission quota system and emissions trading (ETS), which so far only regulates carbon dioxide emissions. Emissions of other greenhouse gases are not yet quoted.

The ETS covers all installations which emissions actually exceed 20 thou. tonnes of CO₂-eq per year. Allocation of quotas is free of charge. The carbon budget for the period is determined by the National Allocation Plan (NAP). NAP is approved by the resolution of the Government of the Republic of Kazakhstan.

ETS work in 2016-2017 under pressure from the Atameken National Chamber of Entrepreneurs, was temporarily suspended, as a result of which in 2017, national GHG emissions jumped by 7.4% immediately, taking into account the absorption in the LULUCF sector. In 2018, the ETS was re-launched in accordance with the NAP for 2018-2020, approved by the Decree of the Government of the Republic of Kazakhstan No. 873 dated December 26, 2017. The volume of quotas for the third budget period was approved in the amount of 485.9 mln. tons of CO₂-eq. (162 mln. tons of CO₂-eq per year), including the volume of the State Reserve for 3 years amounted to 35.3 mln. tons of CO₂-eq.

The total amount of allocated quotas was calculated in such a way as to ensure a 5% reduction in CO₂ emissions by 2020 compared to the 1990 level. It is important to note that the authorized body has the ability to regulate only 43% of national GHG emissions through ETS.

In the third budget period, plant operators were given the opportunity to choose the methods of calculating the volumes of free quotas allocated to them: the historical method and the method of applying GHG emission distribution coefficient (EDC). About 2/3 of the operators chose the EDC method, as this allows them to request additional free quotas from the State Reserve in case of increasing production volumes and introducing new sources.

To regulate GHG emissions in Kazakhstan, along with ETS, the State Inventory of GHG Emission and Removal Sources (Cadastre) and the State Register of Carbon Units (Register) have been introduced. All operators of installations which emissions are quoted under the national ETS are obliged to submit annually verified GHG inventory reports to the authorized body in the field of environmental protection.

The Operator of the ETS, the Cadastre and the Register is a subordinate structure of the authorized body - Zhasyl Damu JSC.

There is no carbon tax in Kazakhstan.

International experience

In 2018, the Intergovernmental Panel on Climate Change (IPCC) published a special report⁸⁶. Scientists from all over the world have reiterated that the large-scale emissions of carbon dioxide (CO₂) and the global climate change that this leads to, are caused by human activities. Therefore, in order to save the planet, they need to be reduced by almost 45% by 2030 compared to 2010.

However, according to report by the International Energy Agency (IEA) dated February 11, 2020, annual global carbon dioxide emissions stopped increasing in 2019, despite the fact that the world economy grew by 2.9%. The United States recorded the largest emission reductions by country, with 140 mln. tonnes, or 2.9%. US emissions are now down nearly 1 gigaton from their peak in 2000. Emissions in the European Union are down 160 mln. tonnes, or 5%, in 2019 due to reduced emissions from electricity generation. For the first time, more electricity was generated from natural gas than coal, while wind power almost caught up with coal. Japan's emissions were down 45 mln. tonnes, or about 4%, the fastest decline since 2009, as power generation from recently launched nuclear reactors increased. In the rest of the world, emissions rose by almost 400 mln. tonnes in 2019, with nearly 80% of this growth coming from Asia, where coal-fired electricity continued to grow. In advanced economies, electricity emissions have dropped to levels last seen in the late 1980s, when electricity demand was one-third lower than today. Coal-based power generation in advanced economies has declined by almost 15% year over year⁸⁷.

The 2018 Report of the Global Commission on the Economy and Climate says that in order to generate net economic benefits of 26 tln. US dollars by 2030 and put the global economy on a more stable climate path, the Global Commission calls for economic decision makers in the public and private sectors to take the following measures immediately (in full - <https://newclimateeconomy.report/2018/executive-summary/>):

1. Governments should set a price for carbon and move towards mandatory disclosure of climate risks to large investors and companies.

2. All countries must place much more emphasis on investment in sustainable infrastructure as a central driver of a new approach to growth. And it's often not about money. Rather, it is about building stronger leadership and technical capacity to shape robust growth strategies, investment plans and institutional structures that can be aligned with sectoral policies and foster private investment in sustainable infrastructure. This includes smarter buildings, transportation, energy and water systems and cities, as well as investments in the natural infrastructure that underpins our economy, such as forests and wetlands, that purify water and provide valuable flood control.

3. The full power of the private sector and innovation must be harnessed. Many companies and investors are already demonstrating leadership, while others are ready to build the right political

⁸⁶ <https://www.ipcc.ch/sr15/>

⁸⁷ <https://www.iea.org/news/defying-expectations-of-a-rise-global-carbon-dioxide-emissions-flatlined-in-2019>

signals around this agenda. By 2020, all Fortune 500 companies must have scientific goals that are in line with the Paris Agreement.

4. A people-centered approach is needed to ensure long-term, equitable growth and equitable transition. In developing and emerging economies, low-carbon transitions offer an opportunity to jump over the inefficient and polluting patterns of the past.

In recent years, the international community has issued **guidelines** that describe how a country can incorporate climate change adaptation issues into its legislation. For example, in 2013, the European Union published Guidelines for Integrating Climate Change and Biodiversity into Environmental Impact Assessment⁸⁸. This Guideline highlights the importance of integrating climate change issues into EIA processes. It also describes how to identify and assess climate change and biodiversity issues in EIA and how to overcome critical issues to address climate change and biodiversity issues in EIA⁸⁹.

In 2017, the International Institute for Environment and Development (IIED), in partnership with the Global Environment Facility (GEF), the United Nations Development Program (UNDP) and the United Nations Environment Program (United Nations Environment Program), released a guide to National adaptation plans: understanding mandates and sharing experiences⁹⁰. This guide discusses the legal mandates associated with national adaptation plans that different countries apply to adapt to climate change and suggests different ways to create national adaptation plans. Similarly, the OECD Guidance on Integrating Climate Change Adaptation into Development Cooperation⁹¹ provides useful information on how to mainstream adaptation into development processes, while the United Nations European Economic Commission's Guidance on Water and Climate Change Adaptation⁹² discusses various ways of adapting water resources into legislation.

Examples of legislation from different countries on combating climate change and adapting to climate change are given in the publication "Best International Practices for Taking Climate Change Adaptation into the Framework Laws on Environmental Protection". This publication was prepared for the Ministry of Energy of Kazakhstan by the Institute for Environmental Legal Studies under the C5 + 1 initiative funded by the United States Agency for International Development (USAID)⁹³.

To solve the climate problem, countries, non-profit organizations (NPOs) and leaders combine their efforts and knowledge, realizing that the fight against climate change is a global task.

To coordinate their work, NGOs unite in various "climate" networks, the largest of which is the Climate Action Network International (CAN-International). CAN is a worldwide coalition of over 1,300 non-profit organizations in 120 countries, including leading environmental organizations such as Greenpeace, WWF, Oxfam, Avaaz, scientific, religious and other development organizations. CAN joins the efforts of civil society in the international negotiations of the UN Framework Convention on Climate Change, in which they participate in observer status.

CAN distributes fresh "climate" news and organizes platforms for discussion of problems, including for negotiations and preparation for conferences and meetings, through several electronic mailing lists (CAN-talk, CAN JI / CDM, CAN Forestry, etc.). Thanks to these electronic tools, are

⁸⁸ European Union. The Guidelines to integrating climate change and biodiversity into environmental impact assessment. 2013 (<http://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf>).

⁸⁹ European Union. The Guidelines to integrating climate change and biodiversity into environmental impact assessment. 2013 (<http://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf>).

⁹⁰ Abasinghe A., Dambacher B., Byrnes R. National Adaptation Plans: Understanding Mandates and Sharing Experience. International Institute for Environmental Development. 2017 (http://www4.unfccc.int/nap/Documents%20NAP/Supplements/Understanding_mandates_NAPs.pdf).

⁹¹ Organization for Economic Cooperation and Development. Integrating Climate Change Adaptation into Development Cooperation: Policy Guidance. 2009 (<http://www.oecd.org/dac/environment-development/integrating-climate-change-adaptation-into-development-co-operation-policy-guidance-9789264054950-en.htm>).

⁹² United Nations Economic Commission for Europe. A guide to water and adaptation to climate change. 2009. Available at: https://www.unece.org/fileadmin/DAM/env/water/publications/documents/Guidance_water_climate.pdf.

⁹³ International best practices for integrating climate change adaptation into environmental framework laws. Prepared by Sofia Yazykova and Karl Brook. USAID. 2017.

held strategic sessions, daily meetings during negotiations to exchange news, make decisions, and form working groups and statements⁹⁴.

Meetings of the Subsidiary Bodies (SBSTA and SBI) of the UNFCCC on Climate Change were held from 17 to 27 June 2019 in Bonn, Germany. This is an annual preparatory stage where future solutions to climate change are discussed at an expert level. The sessions focused on the following aspects of the implementation of the Paris Agreement.

First, there is a need to define an overall time frame for the action of countries' nationally determined contributions (NDCs) to the Paris Agreement. So far, they have been defined for some countries until 2025, for others until 2030. Most likely, this difference will remain until 2030, and then a five-year period of the NDC is more likely. And it is important to remember that an updated NDC must be submitted to the Secretariat next year, even if it is determined by 2030.

Second, the implementation of the Paris Agreement requires the development of common methodological frameworks so that the results of measures taken in different countries can be aligned and compared. This will allow them to show their effectiveness at the international level and see progress with the implementation of the Paris Agreement in different countries. To this end, common formats are being defined for reporting on greenhouse gas emissions and removals, as well as on progress with the implementation of countries' declared contributions to the Paris Agreement.

During the first half of December 2019 in Madrid, it was concluded that the world's leading powers are not doing enough to prevent the impending climate catastrophe. In 2019, the average temperature has already exceeded the pre-industrial level by 1.1 ° C, according to the preliminary report on the state of the global climate.

Based on the results of a study regularly conducted by the German organizations NewClimate Institute and Germanwatch, as well as the international network Climate Action Network, a rating is compiled showing the effectiveness of measures against climate change taken in different countries. In 2019, there was no radical turn for the better again, and the top three places in the ranking remained vacant, because so far no country has done enough to meet the goals of the climate agreement⁹⁵.

Countries' actions were assessed on 14 dimensions in four main categories:

Greenhouse Gas Emissions, Renewable Energy, Energy Use and Climate Policy. Kazakhstan ranked only 54th out of 61 countries (Figure 1.7.2).

International Climate Change Performance Index 2020 (CCPI)			
1	-	32	Mexico
2	-	33	Thailand
3	-	34	Spain
4	Sweden	35	Belgium
5	Denmark	36	South Africa
6	Morocco	37	New Zealand
7	United Kingdom	38	Austria
8	Latvia	39	Indonesia
9	India	40	Belarus
10	Finland	41	Ireland
11	Chile	42	Argentina
12	Norway	43	Czech Republic
13	Luxembourg	44	Slovenia
14	Malta	45	Cyprus
15	Latvia	46	Algeria
16	Switzerland	47	Hungary
17	Ukraine	48	Turkey
18	France	49	Bulgaria
19	Egypt	50	Poland
20	Croatia	51	Japan

⁹⁴ http://livingasia.online/2019/05/27/kto_sledit_za_klimatom/?fbclid=IwAR3IcPVoRxiNfCcMRJX1tpsNIEWIwVQJncbXhgQUIWC8WleWP72_1EwwVdw

⁹⁵ <https://www.dw.com/ru/>

21	Brazil	52	Russian Federation
22	European Union	53	Malaysia
23	Germany	54	Kazakhstan
24	Romania	55	Canada
25	Portugal	56	Australia
26	Italy	57	Islamic Republic of Iran
27	Slovakia	58	Republic of Korea
28	Greece	59	Chinese Taipei
29	Netherlands	60	Saudi Arabia
30	China	61	USA
31	Estonia		

Figure 1.7.2. Results of the rating of the effectiveness of measures against climate change

Suddenly, India is in the top ten leading countries, having invested heavily in renewable energy sources and intends to provide 40% of energy consumption by 2030 at their expense. The last place was taken by the United States, since they are going to leave the Paris Agreement.

At the beginning of 2020, 120 parties to the UN Framework Convention on Climate Change, 15 subnational regions, 398 cities, 786 enterprises and 16 investors have announced their intention to achieve zero emissions by 2050. Denmark, France, New Zealand, Sweden and the United Kingdom have enshrined this obligation in legislation. The European Union adopted a comprehensive decarbonisation plan in 2019, dubbed the EU Green Deal. Part of this plan is to tighten regulation of GHG emissions in all sectors of the EU economy and introduce a carbon regulation system for imports of the most carbon-intensive products. Under this Deal, a draft Climate Law was developed in 2020 that will regulate the EU's becoming a carbon neutral continent.

According to international experts⁹⁶, Kazakhstan has great potential to reduce its ecological footprint as a global source of greenhouse gas emissions. However, the absence in Kazakhstan of a national policy and, accordingly, legislative acts that would be directly aimed at solving the problems of climate change, a specific strategic document on these issues does not allow giving the issues of climate change comprehensive recognition and its complex significance for various industries, such as energy, industry, agriculture, transport and urban planning. In this regard, the Government of Kazakhstan is recommended:

- develop and adopt a strategic document on climate change issues;
- encourage regions and cities to integrate climate change considerations into their development programs;
- promote the development and implementation of local adaptation plans;
- ensure that climate change issues are largely integrated into sectoral policy documents, plans and programs, in particular in the areas of housing, transport, agriculture, urban planning, health care, energy and industry, including mining.

Also, international experts⁹⁷ noted that many sectors of the economy in Kazakhstan are characterized by a general lack of a more strategic vision that would take into account environmental, social and other impacts from different sources, as well as the consequences of climate change and the resulting need to develop measures to mitigate the impact on climate and adaptation to climate change for this sector.

Therefore, they recommend to the Government of Kazakhstan:

- introduce strategic environmental assessment (SEA) as a support tool for formulating sound and coordinated sustainable development policies that take into account climate change aspects;*
- ensure that the aspects of climate change (mitigation and adaptation related to disaster risk reduction) are clearly an integral part of SEA;*
- ensure SEA is carried out in relation to strategic documents in the areas of housing, transport, agriculture, land use, urban development, energy and industry, including mining and other sectors, at*

96 Third Environmental Performance Review of Kazakhstan. UNECE. 2018

97 Third Environmental Performance Review of Kazakhstan. UNECE. 2018

the national and regional levels.

Scenarios of mitigation of climate change show that Kazakhstan will be able to achieve its unconditional goal of ensuring a 15% reduction in GHG emissions by 2030 compared to 1990 only if existing and additional measures are taken. At the same time, the World Bank recommends that Kazakhstan update climate change mitigation scenarios based on a more realistic forecast of 1% GDP growth and develop individual and realistic strategies and plans. It is also necessary:

consider the contribution to GHG emission reductions from non-Kaz ETS (transport, urban areas, housing, waste management, commercial activities), which are currently receiving insufficient attention.

strengthen the emissions trading system in Kazakhstan by moving away from the baseline / baseline allocation method;

take action on emissions from non-Kaz ETS sectors, including the development of comprehensive plans, specific activities and indicators to monitor progress in emission reductions;

introduce a carbon tax for sectors such as housing and the commercial sector to stimulate the transition to more sustainable technologies;

revise regulations to improve energy efficiency and expand the use of renewable energy sources for new and existing buildings in line with international standards for near-zero-energy buildings;

encourage the introduction of renewable energy sources such as photovoltaic devices, geothermal heat pumps and biogas plants in housing, street lighting, utilities, etc., as a partial alternative to coal.

Problems of achieving the SDGs

3 sustainable development goals out of 17 (9, 12, 13) set specific targets for reducing greenhouse gas emissions and adapting to climate change (Table 1.7.1).

Indicator 9.4.1 of Target 9.4 of the Goal 9 not monitored in Kazakhstan, but can be calculated.

In Kazakhstan, indicators related to the achievement of Goal 12 are not monitored, namely: target 12.1, target 12.4, target 12.7, target 12.c.

To achieve Target 13.1 of Goal 13, Kazakhstan monitors the indicator “The number of victims and deaths as a result of natural emergencies”, which does not have a clear tendency of changes. However, indicator 13.1.2 and indicator 13.1.3 are not tracked.

There are also no indicators for target 13.2 and target 13.3, although the country has included a significant number of climate change measures in its strategic documents.

Table 1.7.1. Problems of achieving the SDGs related to climate change

Goals and targets of the SDGs	International indicators	Indicator in Kazakhstan	Problems in achievement	The need to introduce indicators
SDG 9. Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation				
Target 9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities	9.4.1 CO ₂ emissions per unit of value added	Not tracked	Monitoring required	It is necessary to introduce an appropriate indicator
SDG 12. Ensure sustainable consumption and production patterns				
Target 12.1 Implement the 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns, all countries taking	12.1.1 Number of countries with sustainable consumption and production national action plans or sustainable consumption and production	Kazakhstan adopted the Concept for the transition to a "green economy"	Monitoring required	No

action, with developed countries taking the lead, taking into account the development and capabilities of developing countries	mainstreamed as a priority or a target into national policies			
Target 12.2 By 2030, achieve the sustainable management and efficient use of natural resources	12.2.1 Material footprint, material footprint per capita, and material footprint per GDP 12.2.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP	Not tracked	Monitoring required	Corresponding indicators needed
Target 12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle	12.6.1 Number of companies publishing sustainability reports	Not tracked	Monitoring required	Corresponding indicators needed
Target 12.c Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities	12.c.1 Amount of fossil-fuel subsidies per unit of GDP (production and consumption) and as a proportion of total national expenditure on fossil fuels	Not tracked	Monitoring required	Corresponding indicators needed
SDG 13. Take urgent action to combat climate change and its impacts				
Target 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	13.1.1 Number of deaths, missing persons and persons affected by disaster per 100,000 people	The number of victims and deaths as a result of natural emergencies	Monitoring required	No
Target 13.2 Integrate climate change measures into national policies, strategies and planning	13.2.1 Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other)	Not created		It is necessary to develop a Strategy for adaptation to climate change with appropriate indicators

Target 13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	13.3.1 Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula 13.3.2 Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions	Not created		It is necessary to develop a Strategy for adaptation to climate change with appropriate indicators
Target 13.a Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly \$100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	13.a.1 Mobilized amount of United States dollars per year starting in 2020 accountable towards the \$100 billion commitment	Kazakhstan ratified the Paris Agreement	Monitoring required	It is necessary to develop a Strategy for adaptation to climate change with appropriate indicators

Plans for the future

Despite a significant decline over the years of independence, the energy intensity of the economy of Kazakhstan, according to the IEA, is still almost twice as high as in Germany and higher than the world average.

The Climate Action Tracker is an independent scientific analysis that monitors government climate action and measures to meet Paris Agreement commitments, suggests that "Kazakhstan's targets for the share of renewable sources in electricity generation are 3% by 2020, 10 % by 2030 and 50% by 2050, which are envisaged in the Concept for the transition to a green economy, should be significantly strengthened to meet Kazakhstan's stated commitment⁹⁸. "In particular, the Climate Action Tracker argues that Kazakhstan's planned modernization of existing coal power plants, as well as the switch to gas in power generation are short-sighted, as natural gas is not a sufficiently long-term solution for the deep transformation required to achieve the goals of the Paris Agreement. Therefore, Climate Action Tracker concludes that national policy remains extremely weak and Kazakhstan is projected to largely fail to meet its Paris Agreement commitments.

To fulfill Kazakhstan's obligations under the Paris Agreement in the Strategic Plan until 2025, within the framework of Policy 6 "Green" Economy and Environmental Protection, a direct task 1 Achievement of the Goals of the Paris Agreement is envisaged. Kazakhstan's implementation of the Paris Agreement on Climate Change and further measures to create a Center for Green Technologies and Investment Projects on the basis of EXPO will be substantive steps towards the country's transition to a green economy. Along with expanding definitions related to a green economy, the

⁹⁸ Climate Action Tracker is based on a collaboration of two organisations: Climate Analytics and New Climate Institute, the Climate Action Tracker has been providing this independent analysis to policymakers since 2009.
<https://climateactiontracker.org/countries/kazakhstan/>

Concept for a Green Economy Transition will also be aligned with the Paris Agreement. Directions for the development of a green economy will contribute to mitigation and adaptation to climate change in order to achieve the commitments made to reduce greenhouse gas emissions through the application of green technologies.

International funds and private investments, as well as republican and local budgets will be used to finance "green" technologies.

The investment will be provided through the Green Climate Fund, an initiative of 124 governments to limit and reduce greenhouse gas emissions in developing countries, and to help adapt to the effects of climate change.

Public funds will be allocated through PPP projects. At the same time, the planning of financial resources will be carried out promptly and flexibly, since "green" technologies are constantly being improved and the cost of production processes is being rapidly reduced. In this regard, clear criteria will be defined for assessing the applied technologies of projects for further planning and accounting for the funds spent on the transition to a green economy.

Work will continue to develop the emissions trading market and measures will be taken to integrate it with foreign markets.

In addition, Kazakhstan intends to become a regional leader in the field of green finance based on the infrastructure of the AIFC and the established International Center for Green Technologies and Investment Projects.

In order to develop specific measures for decarbonization of the economy, a comprehensive assessment and accounting in the program sector documents of the economic impact of carbon dioxide emissions on the environment, on the conditions of doing business, quality of life, health and productivity of citizens will be carried out⁹⁹.

In order to implement Article 4, paragraph 19, of the Paris Agreement, parties should strive to communicate long-term low-greenhouse gas emission development strategies, taking into account Article 2, taking into account their common but differentiated responsibilities. This means that all countries, including Kazakhstan, in order to fulfill the requirements of the Paris Agreement, must submit their long-term Low-Carbon Development Strategy.

Together with the German Society for International Cooperation (GIZ), in 2019, the Ministry of Ecology, Geology and Natural Resources began to develop a **Low-Carbon Development Strategy of the Republic of Kazakhstan until 2050**. The main goal of the Strategy is to determine the ways for the Republic of Kazakhstan to implement the Paris Agreement until 2050.

The project will analyze the current situation (2019), collect data, develop scenarios and modeling, discuss, calibrate the model (2020), disseminate the results (2021).

In order to understand whether Kazakhstan will achieve its nationally determined contribution to reduce greenhouse gas emissions by 15% by 2030 in relation to 1990 emissions, as well as the possibility of reducing by 25% by 2030, the Low Carbon Development Strategy should identify opportunities and the benefits of replacing or reducing the use of fossil fuels, and:

- scenario for the development of the country's economy and energy until 2050, while maintaining the current structure of the economy, energy balance, existing trends in the development of the technological base in the main industries and sectors of the economy;
- scenario of greenhouse gas emissions until 2050, while maintaining the current rates of economic development and fulfilling current plans for the use of traditional types of energy;
- scenario of greenhouse gas emissions until 2050 with the development of renewable energy sources, the transition to gas and the achievement of energy efficiency indicators;
- benefits, co-benefits and risks under various scenarios of economic development;
- what contribution Kazakhstan can make to reduce greenhouse gas emissions, and what opportunities are there to increase its ambitions, will provide information on identifying potential conflicts of interest, as well as synergies between future policies.

The main areas of activity to achieve a high level of reduction of greenhouse gases are:

- reducing energy consumption (increasing energy efficiency, reducing energy intensity);
- cleaner electricity production;

99 Strategic development plan of the Republic of Kazakhstan until 2025.

- switching to cleaner fuels and reducing greenhouse gas emissions in industries not related to energy production;
- technologies for capturing and storing the remaining emissions.

An important issue in the development of the Strategy will be the issue of its inclusion in the State Planning System, therefore it is assumed that part of the Strategy will become a section of the Concept for the transition of the Republic of Kazakhstan to a "green economy".

UNDP in Kazakhstan has started the process of preparing the Eighth National Communication of the Republic of Kazakhstan for the United Nations Framework Convention on Climate Change and the preparation of two (fourth and fifth) biennial reports.

1.8. Conservation and effective management of ecosystems

Current situation and achievement of targets

The concept for the transition of the Republic of Kazakhstan to a "green economy" one of the main goals sets the goal of "Conservation, rational use and reproduction of fish, forest resources, wildlife resources, objects of the natural reserve fund". The same task is set in the current Strategic Plan of the Ministry of Agriculture of the Republic of Kazakhstan for 2017 - 2021¹⁰⁰. In particular, **in the field of forest conservation**, this plan sets targets for bringing the area of forested land in specially protected natural areas and territories of specialized forestry enterprises to 1,716 thou. hectares in 2020, to 1,721 in 2021 and to 1,726 in 2022.

The priority areas of forestry are: forest management on the territory of the state forest fund, aerial work on the safety and protection of the forest fund, reforestation and afforestation, artificial cultivation of flora objects, forestry design.

In addition, the Strategic Plan of the Ministry of Agriculture of the Republic of Kazakhstan for 2020-2024 provided for the achievement of the following target indicators:

- an increase in the number of rare and endangered species of ungulates and saigas, including tugai red deer - 0.7%, kulan - 0.9%, gazelle - 0.5%, argali - 1.4%, saigas - 10%;
- conservation of fish resources and other aquatic animals - 70 species, including: valuable species that are objects of fishing - 52 species, rare and endangered species - 18 species.

Reforestation and afforestation in Kazakhstan are of very significant international importance, since Kazakhstan's forests cover an area of about 13 mln. hectares.

The program target indicators were intended to reach the area of forested land in specially protected natural areas and the territories of specialized forestry enterprises for 2018, 2019, respectively, 1422.9 and 1544 thou. hectares. The actual target indicator, according to the forest fund accounting materials for 2018, 2019, amounted to 1540.17, 1711.39 thou. hectares, that is, the indicators were met.

The main target indicator in the field of forestry is to increase the forest cover of the republic up to 4.8%.

At the end of 2019, the area of the forest fund amounted to 30.0 mln. hectares (4.8% of the country's territory), having increased by 1.3 mln. hectares in comparison with 2010 (Table 1.8.1.). In 2017, the area of the forest fund was 29.8 mln. hectares, and in 2018 - 30.04 mln. hectares. The largest areas of forest land are concentrated in Kyzylorda (6.7 mln. ha), Almaty (5.4 mln. ha), Zhambyl (4.4 mln. ha), East Kazakhstan (3.8 mln. ha) and Turkestan (3.4 mln. ha) regions. At the same time, the positions of the indicator of forest cover of the territory are slightly shifted. In particular, the Zhambyl region has the highest forest cover of the territory - 15.9%, followed by Turkestan - 14.2%, Kyzylorda - 13.9%, Almaty - 9.4% regions.

Table 1.8.1. Main indicators of the forest fund (at the end of the year)

Indicators	2017	2018	2019
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¹⁰⁰ Strategic plan of the Ministry of Agriculture of the Republic of Kazakhstan for 2017-2021, approved by order of the Ministry of Agriculture dated 30.12.2016 No. 541.

Forest fund area (including forests transferred for temporary use), mln. hectares	29.8	30.1	30.1
Lands covered with forest, mln.ha	12.9	12.9	13.1
Total standing timber stock, mln. cubic meters	421.9	421.9	449.9
Forest cover of the territory, in percent	4.7	4.7	4.8

*according to the Committee for Forestry and Wildlife of the Ministry of Agriculture of the Republic of Kazakhstan.
according to the Committee on Statistics*

In 2018, together with the regional akimats, the development of a step-by-step plan to increase the volume of forest reproduction began. Plans for the creation of green areas around regional centers and landscaping of settlements were approved. As of 01.01.2020, there were 13.1 mln. hectares of forests in Kazakhstan (Table 1.8.2.), And 1.5 mln. m³ of timber was produced.

In 2019, forest reproduction was carried out on an area of 63.9 thou. hectares, which is 11.2 thou. hectares more than in 2018. In 2019, work was carried out to create a green zone for the capital of Kazakhstan, Nur-Sultan, on an area of 4.6 thou. hectares. Working projects and cartographic materials for creating green zones around the regional centers of Aktobe, Kyzylorda and Turkestan, by analogy with the green zone of the capital, have been developed. In October 2019, a republican tree planting campaign was held. More than 260 thou. people took part, more than 1 mln. trees were planted.

In 2019, in Almaty, Zhambyl, Kyzylorda and Turkenstan regions, 165.6 thou. saxaul seedlings were planted and 23.5 thou. hectares of saxaul seeds were sown.

Table 1.8.2. Scopes of reforestation work.

Years	Reforestation, thou. ha		Share of sowing and planting of forests in the total area where reforestation was carried out, in percent
	total	including planting and sowing forests	
2017	57.21	44.9	78.5
2018	52.7	42.9	81.4
2019	63.9	57.1	89.3

according to the Committee on Statistics

On the drained bottom of the Aral Sea, 61 thou. hectares of saxaul plantations have been created. Within the framework of cooperation between the Forestry Service of the Republic of Korea, a grant project was implemented for phytomelioration of the drained bottom of the Aral Sea in the Kyzylorda region, following which saxaul was planted on the drained bottom of the Aral Sea on a total area of 13.3 thou. hectares in 2018-2020.

It is also envisaged to expand the area of the "Barsakelmes State Reserve" Specially Protected Natural Area by including part of the delta of the Syrdarya River. In order to switch from direct sowing to planting saxaul seedlings, in Kazalinsk city of Kyzylorda region, a forest nursery to grow saxaul seedlings was created in 2019. The design capacity of the nursery is 4.4 mln. seedlings per year.

In order to restore the ribbon-like pine forest of the Irtysh region, on an area of 30 hectares, a forest nursery was created with a capacity of 15 mln. pieces of pine seedlings per year.

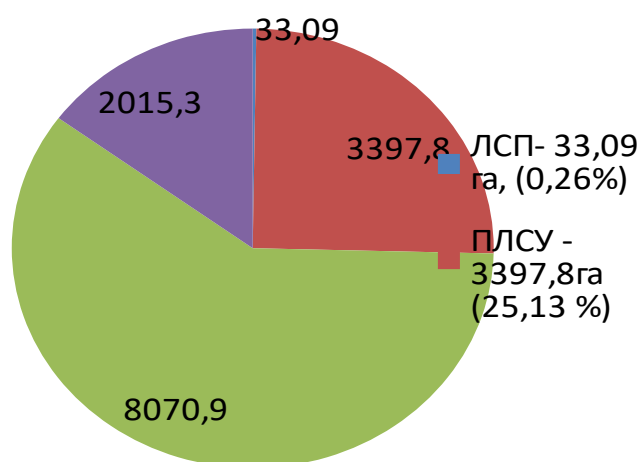
Unique for Kazakhstan is the creation of a sanitary protective green zone (SPGZ) of the capital of Kazakhstan, Astana (now Nur-Sultan), in an arid steppe, which is being created on behalf of the President of the Republic of Kazakhstan. In accordance with the Strategic Plan of the Ministry of Agriculture of the Republic of Kazakhstan for 2014 - 2018, approved by order of the Minister of Agriculture of the Republic of Kazakhstan No. 1-1 / 665 dated December 15, 2014, the total area of the Nur-Sultan green zone for the period of its creation from 1997 to 2019 year was 87 thou. hectares, by 2023 it is planned to increase the area up to 100 thou. hectares.

To provide forestry activities with planting material, 155 permanent forest nurseries with a total area of 4,238 hectares operate on the lands of state forest owners in 2019. The annual actual volume of production of planting material in the republic is more than 160 mln. pieces. In order to increase

the volume of forest reproduction and afforestation, to increase the survival rate of the created forest cultures on the territory of the Semey Ormany State Forestry Enterprise in the East Kazakhstan region, a forest seed complex was created, focused on growing planting material with a closed root system. The design capacity of the complex is 3.0 million planting material per year.

In 2019, the employees of the Republican Seed Breeding Center carried out an examination of the quality of forest seeds in the amount of 174.4 thou. kg of seeds, including 39.7 kg for the first quality class, 27.7 kg for the second, and 102,9 kg for the third, 4.1 thou. Kg - substandard in germination and purity.

Formation, accounting and certification of objects of selection and seed production were carried out on an area of 13,517.09 hectares, including 33.09 hectares of forest seed plantations, 3,397.8 hectares of permanent forest seed plots, 8,070.9 hectares of temporary forest seed plots, 2015.3 hectares of plus stands (Fig. 1.8.1.).



**ЛСП - Forest Seed Orchard*

ПЛСУ - Permanent Seed Plantation

Figure 1.8.1. Information on the availability of objects of selection and seed production as of 01.01.2019

In addition, the selection and genetic objects include 1,191 plus trees, 70,106.4 hectares of forest genetic reserves, 46.0 hectares of geographic crops, 8.37 hectares of archives of clones of plus trees, 12.4 hectares of test populations, 18.7 hectares of test cultures of plus trees, 7.2 hectares of test cultures of hybrids, works on the care and maintenance of these objects were carried out.

The area of foci of forest pests and diseases as of January 1, 2018 amounted to 161,321.2 hectares. After carrying out forest protection measures in 2017, the area of foci decreased by 36,816 hectares, and under the influence of natural factors it faded to 48,151.6 hectares, during the same period, new foci appeared on an area of 35,855.8 hectares (Figure 1.8.2.).

The area of foci of forest pests and diseases as of January 1, 2019 was 189,413.3 hectares. As a result of forest protection measures in the first half of 2018, the area of foci decreased by 12,515.2 hectares, and 13,210.3 hectares were faded under the influence of natural factors. During the same period, new foci appeared on an area of 68,070.4 hectares.

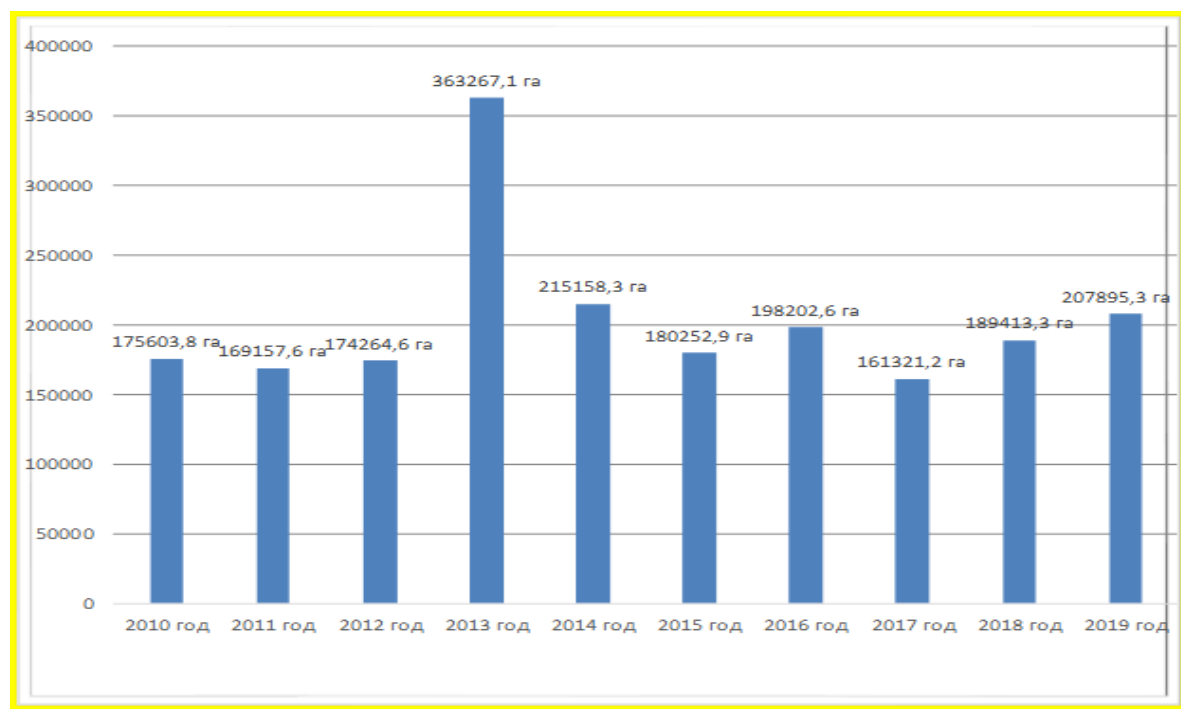
As of November 15, 2019, the area of forest pests was 207,895.3 hectares. After carrying out forest protection measures in 2019, the area of the foci decreased by 33,501.1 hectares. During the same period, new foci appeared on an area of 51,983.1 hectares.

The greatest damage to forests is caused by the gingerbread gipsy moth – 28,125.6 hectares, the pine web-spinning sawfly – 6,780 hectares, fir pine fungus – 95,852.4 hectares, stem rot – 21,279.9 hectares, apple blossom moth – 6,303.7 hectares, bacterial gummosis – 7,266.7 hectares, exaereta

ulmi – 1,669.3 hectares, scab - 12,218 hectares, calocalpe cervinalis – 2,647.6 hectares, haloxylonomyia gigas – 12,672.5 hectares, cimbex femoratus – 2,528.4 and others - 10551.2 hectares.

According to the results of research by the Institute of Zoology of the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan in the mountain forests of South-East Kazakhstan in 2015 - 2017 it turned out that among the 116 species of insects - stem pests identified here, 24 species were invaders from more northern (Altai, Sauro-Tarabagatai) or more southern (Western Tien Shan) mountain systems. This shows the high rates of dispersal of alien species in Kazakhstan.

The dynamics of the spread of foci of pests largely depends on weather conditions and biological characteristics of forest pests.



*Год - Year

Figure 1.8.2. Dynamics of the spread of forest pests and diseases.

In 2019, within the framework of the UNDP / Ministry of Ecology, Geology and Natural Resources Forestry Project, an assessment of the forest pathological state of forests was carried out in 5 pilot forest protection institutions of the Almaty region. The study area covered the saxaul, tugai and mountain forests of the Tien Shan and Zhetysu Alatau, the main forest-forming tree species of which are black saxaul, Schrenk's spruce, Asiatic poplar, elaeagnus, apple tree, etc. Based on the results of the work, were developed recommendations to improve forest protection and preventive measures to combat pests and diseases of forests. One of the recommendations is the introduction of biological preparations to combat forest pests. The use of biological preparations in Kazakhstan is 2%, while in China 60%, Germany - 90%, France - 95% and Belgium - 94%. The main advantage of using biological preparations is high efficiency and environmental friendliness. The disadvantage is the high cost.

The Aktarofit (Entolek K) biological preparation was tested to combat the apple moth. The biological preparations showed a high efficiency of 92-100%, not inferior to the chemical ones that were previously used by the forestry enterprise. The active ingredient of the drug is a complex of natural avermectins, which are produced by the Streptomyces avermitilis beneficial soil fungi. When use according to the instructions, it is not toxic to spiders, predatory bugs, ants, ground beetles, earthworms, etc., rapidly decomposes in the environment, which prevents its accumulation in fruits, vegetables and soil.

Protection of forests from fires is carried out by the Kazavialesokhrana Republican State Budget-Supported Enterprise annually on an area of about 30% of the territory of the state forest fund through aviation security. Also, state forestry institutions and subordinate organizations of the Committee are working on the creation and maintenance of fire barrier lines.

Plans are being developed and agreed to interact to combat forest fires of structural units of forestry of regional akimats, environmental institutions and subordinate organizations of the Emergency Situations Committee of the Ministry of Internal Affairs of the Republic of Kazakhstan.

The forest fire services are trained and instructed on the issues of fire-prevention arrangement of the territory and extinguishing forest fires, as well as the procedure for drawing up protocols for violation of the Fire Safety Rules in forests. Fire brigades are being formed. Repair of fire-fighting equipment, devices and observation facilities is in progress. Notices and panels on environmental topics are produced, indicating the phone numbers of forest fire services. Reserve stocks of fuel and lubricants are being created. The radio and telephone communications are being repaired.

The air divisions carry out annual retraining and admission to work on extinguishing forest fires of the instructors and amphibian personnel of the air fire service.

On the websites of subordinate forestry organizations, information is regularly posted on measures to prepare for a fire hazardous period.

As the snow cover melts, controlled firing of herbaceous vegetation is carried out on the territory of the forest fund and adjacent territories in order to reduce the fire hazard.

In 2018, for the purpose of fire-prevention propaganda and regular media coverage of issues related to the observance of fire safety rules in forest-steppe massifs, video clips on fire-fighting topics were shown in the state and Russian languages on republican and local TV channels.

For the protection of forests from fires, personal responsibility has been established for the first heads of territorial bodies and subordinate organizations of the Committee for Forestry and Wildlife of the Ministry of Agriculture of the Republic of Kazakhstan, as well as structural units of forestry of akimats of regions.

According to the Ministry of Internal Affairs of the Republic of Kazakhstan, up to 4 thousand natural fires and ignitions occur annually in the country, which cover over 200 thousand hectares, the damage caused by fires exceeds 150 million tenge.

At the same time, on average, 400 fires occur on the territory of the state forest fund of the republic. Simultaneously with forest fires, an average of 3.5 thousand steppe fires and ignitions are eliminated.

In 2018, the number of fires on the territory of the country's forest fund decreased by 36% and amounted to 358 fires, material damage by 3%. At the same time, the area covered by the fire increased 8 times (Table 1.8.3).

Table 1.8.3 Forest fires

Years	Number of forest fires, incidents	Forest area covered by fires, hectares	Damage caused by fires, in current prices, million tenge	Average area of one fire, hectares
2017	563	19,690	215.4	351
2018	358	162,605	209.6	454
2019	628	39,227	563.5	62.4

Source: Ministry of Ecology, Geology and Natural Resources Of the Republic of Kazakhstan

In 2019, 628 cases of forest fires with a total area of 73,512.6 hectares occurred in the forests of the Republic of Kazakhstan, including forest fires 39,226.9 hectares, including forest-covered 34,523.04 hectares, of which crown 773.29 hectares, non-forest area 34,288.68 hectares. The total damage from fires is 563.5 million tenge. The average forest area of the fire on the territory of the State Forest Fund was 62.4 hectares.

Based on world practice, the problem of annual uncontrolled burning of dry grass on agricultural lands is complex - the fire of burns goes to the lands of the forest fund and to settlements.

The situation is further aggravated by the absence of protective fire barrier lines or their untimely renewal.

In accordance with the Law "On Civil Protection", the responsibility to extinguish wildfires on the reserve lands falls within the competence of the local executive authorities. At the same time, in 2018, divisions of the Ministry of Internal Affairs were involved in extinguishing of 87 forest fires.

To respond to natural fires, the local executive authorities created 3,919 voluntary firefighting divisions, which are armed with more than 9 thousand units of equipment, including 283 fire trucks, 8,231 units of adapted equipment, 945 fire pumps. The personnel of the formations is over 42 thousand people.

The Ministry of Internal Affairs developed and agreed with the interested central state (Ministry of Ecology, Geology and Natural Resources, Ministry of Industry and Infrastructure Development, Ministry of Defense, Ministry of Digital Development, Innovation and Aerospace Industry, Ministry of Education and Science, Ministry of Health, Ministry of Economy, Ministry of Information and Social Development, National Security Committee) and local executive bodies a joint order of the Ministry of Internal Affairs and the Ministry of Agriculture "Action Plan for Disaster Risk Reduction and Elimination of Forest and Steppe Fires for the territory of the Republic of Kazakhstan in the fire hazardous season of 2019" (order of the Ministry of Internal Affairs No. 286 dated April 10, 2019 and the Ministry of Agriculture No. 160 dated April 18, 2019).

In 2018, 419 cases of illegal felling of timber in the amount of 3,553.64 m³ were recorded in the forests of the Republic of Kazakhstan. The total damage amounted to 46,531.4 thousand tenge.

In the forests under the jurisdiction of regional executive bodies and other state forest owners, 341 cases of illegal felling of timber were recorded in the amount of 3,102.79 m³. The total damage amounted to 34,710.4 thousand tenge. In the forests under the jurisdiction of the Committee for Forestry and Wildlife, 78 cases of illegal felling of timber in the amount of 450.85 m³ were recorded. The damage amounted to 11,821 thousand tenge.

In 2019, 367 cases of illegal felling of timber in the amount of 4,245.2 m³ were recorded on the territory of the state forest fund. The total damage amounted to 32,313.8 thousand tenge. In the forests under the jurisdiction of the regional executive bodies and other state forest owners, 303 cases of illegal felling of timber in the amount of 3,549.4 m³ were recorded. The total damage amounted to 25,380.4 thousand tenge. In the forests under the jurisdiction of the Committee for Forestry and f of forest growing conditions); a computer program "Modeling of foci and behavior of a fire in the larch forests of Kazakhstan Altai" was developed; a dendrochronological analysis of larch stands in the conditions of Rudny Altai, Southern Altai and Saura was carried out.

2. Kazakh Agro Technical University named after S. Seifullin JSC implements the scientific and technical program "Mycorrhizal macromycetes of the main forest-forming species of Central and North-Eastern Kazakhstan and their use for artificial mycorrhization of seedlings of forest tree species" (budget program 267 "Increasing the availability of knowledge and scientific research", program-targeted funding) for 2018-2020. Funding is 45,000 thousand tenge for 2018 - 2020, with annual funding of 15,000 thousand tenge. During the implementation of the program, recommendations were developed for the use of various strains of mycorrhizal macromycetes in afforestation and reforestation based on an assessment of their effectiveness, route surveys of the forests of Central and North-East Kazakhstan and forest plantations were carried out to study soil and climatic conditions, seedlings were planted on preparatory substrates, biological screening of seedlings of coniferous trees was carried out, the mycorrhizal-forming activity of strains in field nurseries was tested on seedlings and propagulum of various tree and shrub species.

According to the latest data, the **fauna** of vertebrates in Kazakhstan consists of 890 species, including mammals - 178 species, birds - 489 (388 of them nest in Kazakhstan, others come only for wintering or fly away in spring and autumn), reptiles - 49, amphibians - 13, fish - 147 and cyclostomes - 3, which are combined into 418 genera, 129 families, 50 orders, and 6 classes - from lampreys to mammals. (Kovshar A.F. and others. 2013). The objects of hunting are 34 species of mammals and 59 species of birds.

Also, about 100 thousand species of invertebrates live, including at least 50 thousand species of insects, among which the percentage of narrow-local endemic species is very high. There are also

quite a few alien invasive species among them. The study of these types of insects is extremely important at the moment.

The Red Book of Kazakhstan includes 128 species and subspecies of vertebrates and 96 species of invertebrates.

In 2013 - 2018 in Kazakhstan, as a result of the implementation of effective measures, stabilization of the number of rare and endangered species of wild ungulates in their habitats (tugai red deer, kulan, gazelle, argali) and positive dynamics of the population of saigas and game species of animals were achieved. As a result of the implementation of measures to preserve rare ungulates, the number from 2012 to 2019 increased among:

- red deer: from 451 up to 878 individuals;
- argali: from 13,872 up to 17,954 individuals;
- gazelle: from 12,623 up to 14391 individuals;
- kulan from 2,920 up to 4,197 individuals (table 1.8.4.).

Table 1.8.4. Dynamics of the number of rare and endangered species of wild ungulates in 2016 - 2019, individuals

Number, individuals	2017	2018	2019
Tugai deer	825	856	878
Goitered gazelle	13,727	14,055	14,391
Kulan	3,984	4,103	4,197
Argali	16,802	17,065	17,954

The total number of saigas in Kazakhstan in 2018 amounted to 215.1 thousand individuals, including the Betpakdala population - 76.4 thousand, Ustyurt - 3.7 thousand, Ural - 135.0 thousand individuals, but the dynamics of previous years did not always positive.

In 2019, according to the results of aerial surveys, the total number of saigas in Kazakhstan amounted to 334,400 individuals, including the Ural population - 217,000 individuals, the Betpak-Dala population - 111500 individuals and the Ustyurt population - 5,900 individuals (Table 1.8.5). In order to preserve and increase the number of saigas, by order of the Committee for Forestry and Wildlife of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan, in February 2020, the ban on the use of saigas, their parts and derivatives throughout the territory of the Republic of Kazakhstan was extended until 2023, except for use for scientific purposes.

Table 1.8.5. Dynamics of the number of saigas by populations in 2016 - 2019, thousand individuals

Population	Number of saigas, thousand heads		
	2017	2018	2019
Betpakdala	51.7	76.4	111.5
Ustyurt	2.7	3.7	5.9
Ural	98.2	135	217
Total	152.6	215.1	334.4

A new technology is being introduced for monitoring wildlife using satellite beacons (radio collars) and installing camera traps in specially protected natural areas. The main targets for the installation of radio collars were saigas, gazelles, kulans and wolves.

The protection of saigas and rare and endangered species of ungulates is carried out by the PO Okhotzooptom Republican State Budget-Supported Enterprise in the territories of 13 administrative regions with a total area of 123.0 million hectares, using vehicles in very difficult off-road conditions of the desert and steppe regions. In order to toughen the requirements for poachers, the amount of compensation for harm for unlawful taking of saigas has been increased from 200 MCI to 500 MCI for a male, and from 150 to 350 MCI for a female and young saiga.

In order to preserve animals and increase their numbers, a ban on spring hunting was introduced and the daily rate of taking one species of bird and fur game per hunter was limited to five

individuals, except for commercial hunting. These measures had a positive effect on reducing the incidence of poaching and increasing the reproduction of waterfowl.

Despite the measures taken to combat poaching of saigas, cases of their shooting do not stop.

So, in 2017, 58 facts of poaching were revealed, 470 carcasses and 1,174 horns were seized, respectively. These facts indicate the possibility of smuggling saiga products outside the country. The availability of a market for saiga horns within the republic and an established route for their smuggling abroad, the withdrawal of detainees from responsibility, represent a risk factor for the conservation of saigas, reducing the effectiveness of measures taken by the state to preserve them. In 2018, 77 cases of poaching were identified, 500 saiga horns were seized.

In total, in 2018, the territorial divisions of the Committee for Forestry and Wildlife revealed 7,330 violations, 6,292 people were brought to administrative responsibility, and 39 to criminal responsibility. Fines were imposed in the amount of 85.1 million tenge, 72.1 million tenge were collected.

In 2019, 9,124 complex raids and 1,045 inspections in the field of environmental management were carried out, while 8,801 cases of violations of environmental legislation were revealed, including 998 hunting, 1,171 in the forest, 6,632 concerning fish. 7,150 people were brought to administrative responsibility, including for hunting - 979, concerning forest - 812, concerning fish - 5359, 57 poachers were prosecuted. Administrative fines were imposed in the amount of 95,04 million tenge, of which 86,515 million tenge were collected.

The following were effective measures to protect wildlife:

- inter-farm hunting management of hunting grounds and biological and economic surveys were carried out, on the basis of which the reserve fund of hunting grounds was consolidated;
- accounting work was carried out and, based on the results of biological substantiation, limits were determined for the withdrawal of hunting species of animals that contribute to their natural reproduction and sustainable use;
- reintroduction of rare and endangered species of wild ungulates and other planned activities, determined for the implementation of national tasks in the field of fauna and hunting, have been carried out.

Together with Association for the Conservation of Biodiversity of Kazakhstan, the Irbis Project has been implemented. The project began in 2015 and was carried out jointly with the Zhongar-Alatau State National Natural Park on the territory of both the national park itself and the Toktinsky reserve.

Institute of Zoology RSE of the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan in 2017 - 2019 the following projects were carried out to study and develop conservation measures for the snow leopard:

1. "Regularities of the spatial structure and biotopic distribution of rare and economically important species of mammals in the protected and recreational zones of the Northern Tien Shan as a basis for their conservation and rational use" (grant from the Ministry of Education and Science of the Republic of Kazakhstan), where, in addition to the snow leopard was studied the Turkestan lynx, Tien Shan brown bear, Tien Shan argali, wolf, red deer (maral), Siberian roe deer, wild boar, Siberian ibex.

2. "Pilot studies on environmental monitoring of the snow leopard in the project area of the Ile Alatau"

3. Counting and development of recommendations for the conservation of the snow leopard (*Panthera uncia*) in the Kazakh part of the Altai-Sayan ecoregion" (together with the Wildlife Without Borders Public Fund).

4. Within the framework of the UNDP / GEF / Government of the Republic of Kazakhstan project "Conservation and sustainable management of key globally significant ecosystems for obtaining various benefits" the topic is being conducted: "A set of services for the study and management of the Kazakh population of the snow leopard".

5. Since 2016, Kazakhstan has launched a regional snow leopard conservation initiative between Kyrgyzstan, Kazakhstan and China - the "Snow Leopard Transboundary Initiative" (SL-TBI). This project was initiated by Marwell Wildlife (UK) in partnership with Beijing Forestry University (China), NABU (Germany) and the National Academy of Sciences of Kyrgyzstan. From the Kazakh side, at this stage, the project participants are the Institute of Zoology RSE of the Science Committee

of the Ministry of Education and Science of the Republic of Kazakhstan and the Wildlife Without Borders Public Fund.

6. At the beginning of 2018, a major Kazakhstani businessman, public figure and philanthropist Nurali Aliyev created the Snow Leopard Foundation, which, in partnership with the Institute of Zoology of the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan, launched the Kingdom of Snow Leopard project. The goal of the project is to recruit extinct and maintain decreasing populations of snow leopards in Kazakhstan through captive breeding, adaptation to natural conditions and subsequent reintroduction into natural habitats.

In 2017, the Institute of Zoology of the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan carried out research on a number of other species of invertebrates and vertebrates included in the Red Book, assessed their current state and proposed measures for their conservation: "Assessment of the diversity of the insect fauna of the Zhongar-Alatau State National Natural Park, its monitoring, conservation and sustainable use", "Demographic analysis of populations of the gray monitor (Reptilia: Sauria) in Kazakhstan", "Modern threats to survival, population trends and assistance to the conservation of vertebrates from the World Red List in the deserts of the Southern Balkhash region", "Influence of anthropogenic and abiotic factors on the structure of the insect fauna of the steppe zone of Kazakhstan in modern conditions", "Transcontinental migrations of waterbirds in Kazakhstan".

In 2017, the Institute of Zoology completed two projects aimed at solving environmental issues and the state of fauna populations: "Development of methods for monitoring the ecological state of water bodies in Kazakhstan" and "Assessment of the state of zoocenoses and development of measures to preserve the fauna of the coastal zone of the Caspian Sea". Based on the generalization of the results of many years of research in the field of assessing the ecological state of water bodies on the basis of chemical and biological methods, methodological recommendations were developed: a regional scale for assessing the level of toxic pollution of water bodies in South and South-East Kazakhstan was substantiated and proposed. The main regularities of changes in zooplanktonic communities in the gradient of abiotic factors are described. A scale for assessing the level of organic pollution of water bodies based on the structural indicators of zooplankton is proposed.

Since 2019, the program "Monitoring of migratory bird species in Kazakhstan" has been launched. The program is aimed at fulfilling the obligations of the state, under a number of International Conventions (On Biodiversity Conservation, Ramsar Convention on Wetlands, On the Conservation of Migratory Animals), International Agreements: (AEWA, On the Conservation of Birds of Prey) and Memorandums of Understanding (on slender-billed curlew etc.) on monitoring, development of measures for the conservation of biodiversity and birds in particular. The results of the work will make it possible to determine the geographical connections of bird populations, as well as the possible ways of spreading such diseases as "bird flu", West Nile fever, meningitis and others.

The Institute of Zoology of the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan, together with SPNA, monitors migratory birds and studies their migrations by ringing them. To date, data on the sightings of birds tagged in Kazakhstan in 63 states have been received. Together with the Institute of Virology and Microbiology and the Institute for Biological Safety Problems of the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan, the transfer of viral and bacterial infections by migratory birds was recorded: bird flu, swine flu, New Castle disease, etc.

In 2017, Association for the conservation of biodiversity of Kazakhstan, together with the Forestry and Wildlife Committee, in a pilot mode, carried out an event using a helicopter to transport kulans from the Altyn Emel State National Natural Park to the Zhangeldi District of the Kostanay region to practice actions for their resettlement and adaptation on the spot. During the work, 6 kulans were marked with satellite radio beacons. The Torgai steppe is currently the largest steppe region with the potential for the restoration of extinct wild equids - the kulan and Przewalski's horse (*Equus przewalskii*) - in a place that was probably once their main habitat.

Also, work is underway to introduce the houbara bustard and saker falcons, cervus elaphus bactrianus and even a tiger.

More than 2,000 birds are released annually by the Houbara Bustard Breeding Center. More than 300 local residents are involved in the work to ensure the functioning of the Center. In total, in the period 2009 - 2019, 20,489 individuals of houbara bustards and 625 falcons were released into the nature of Kazakhstan. According to practical observations, the survival rate is at least 50%, observations are carried out before migration.

As part of the implementation of the "Memorandum of Understanding on the Conservation and Restoration of Bukhara Deer (*Cervus elaphus bactrianus*)" in 2017 in the Bairkum tract in the floodplain of the Syrdarya River a second enclosure for the preservation and reproduction of Bukhara deer was built at the expense of the South Kazakhstan regional akimat. On the territory of the nurseries of the Syrdarya-Turkestan Khanguly State Regional Nature Park - Bukhara deer were released already in 2000 in the amount of 8 heads. After 20 years, the number of Bukhara deer, according to park inspectors, reached 130.

On September 8, 2017, the Ministry of Agriculture of the Republic of Kazakhstan and WWF (World Wildlife Fund) signed a Memorandum of Cooperation on the implementation of the Tiger Reintroduction Program in Kazakhstan with the World Wildlife Fund, as part of the Astana EXPO-2017 International Exhibition. The area of possible tiger recovery is the southern shore of Lake Balkhash in the area of the Ili River delta and to the east of it.

The International Union for Conservation of Nature (IUCN) has supported the Kazakhstan Association for the Conservation of Biodiversity project for the conservation of gazelles in Kazakhstan. Over the past decades, the number of gazelles in the country has decreased by over 90%, the main reasons being poaching and loss of habitats. Within the framework of the project, field research is planned, tagging of gazelles with satellite transmitters, work with the local population and other activities aimed at assessing the state of the species population in order to develop additional measures for its conservation. In addition, it is planned to find out how the border barriers on the border of Kazakhstan and Turkmenistan affect animal migration. The work will last until autumn 2021. The project was made possible by the launch in 2019 of the IUCN Save Our Species program for the Central Asia region, which supports the Central Asian Mammal Initiative (CAMI) of the Convention on the Conservation of Migratory Species of Wild Animals, better known as the Bonn Convention (CMS).

Protection of biodiversity in Kazakhstan is carried out through the activities of environmental institutions and the expansion of the area of specially protected natural areas.

The total area of **specially protected natural areas** in 2019 amounted to 27,279.51 thousand hectares (10% of the country's area). At the same time, specially protected natural areas with the status of a legal entity occupy 7,590.8 thousand hectares or 2.78% of the republic's area (Table 1.8.6).

In 2018, 2 environmental institutions were created: the Tarbagatai State National Natural Park in the East Kazakhstan region on a total area of 143.5 thousand hectares and the Ile-Balkhash State Nature Reserve in the Almaty region on a total area of 415, 2 thousand hectares.

In 2019, measures were launched to expand the territory of the Burabay National Park and the Barsakelmes Reserve, but the total area of the specially protected natural areas has not changed. In 2020, it is planned to create a new Ulytau National Park, which will allow protection of the steppe ecosystems of Central Kazakhstan.

Table 1.8.6. Specially protected natural areas

Name	Unit	Years		
		2017	2018	2019
Country area, thou. hectares	thou. ha	2,724,900	2,724,900	2,724,900
National categories of specially protected natural areas				
Total area of specially protected natural areas	thou. ha	25,879.98	27,279.51	27,279.51
State natural sanctuaries	thou. ha	1,611.41	1,611.41	1,611.41

State natural reserves	thou. ha	2,714.10	3,129.26	3,129.26
State national natural parks	thou. ha	2,523.81	2,667.36	2,667.36
State botanical gardens of republican significance	ha	470.3	470.3	470.3
State natural monuments of local importance	ha	1,643.8	1,643.8	1,643.8
State natural monuments of republican significance	ha	6,484.1	6,484.1	6,484.1
State natural refuges of republican significance	thou. ha	5,945.93	5,945.93	5,945.93
State protected areas	thou. ha	11,311.92	11,311.92	11,311.92
Share of the area of specially protected natural areas in the country's area	%	9.5	10	10

according to the Committee for Forestry and Wildlife of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan.

Eco-tourism is currently a priority industry and contributes to sustainable development of the economy, but there is no official statistical information on eco-tourism.

State national natural parks have the greatest potential for the development of ecological tourism, the main task of which, along with the protection and restoration of ecosystems, is to regulate the use of the territory of the national park and its protected zone for ecological educational, scientific, tourist, recreational and limited economic purposes.

Tourist and recreational activities in national parks are carried out directly by the national park with a license for tour operator activities, as well as by individuals and legal entities that provide tourist services.

Currently, there are 4 Visiting Centers: in the Naurzum, Aksu-Zhabagly and Korgalzhyn reserves and the Burabai National Park.

The most popular are the Ile-Alatau, Bayanaul, Kokshetau and Burabay State National Natural Parks.

There are 233 tourist routes and trails in the specially protected natural areas (159 routes and 74 trails), on which measures for their arrangement are carried out on an ongoing basis.

The work on the arrangement and reconstruction includes measures for the establishment of viewing platforms, the placement of bivouac fields, tent camps for tourists and the placement of billboards, information stands, maps of tourist routes and trails, signs in three (Kazakh, Russian and English) languages, as well as includes activities to renovate and install gazebos, benches, toilets and waste bins.

The development of ecological tourism in specially protected natural areas entails environmental education of citizens of the country to respect nature, and also provides the local population with new jobs in the service sector.

As part of the implementation of the State Program for the Development of the Tourism Industry of the Republic of Kazakhstan for 2019 - 2025, signed an agreement on joint activities for the development of ecological tourism in state national natural parks between the National Company Kazakh Tourism Joint Stock Company and 3 state state national natural parks - Kokshetau, Ile-Alatau and Charyn.

A master plan for the development of ecological tourism in the Ile-Alatau State National Natural Park was developed, a roadmap for the implementation of the master plan was developed. Work is underway to adjust the master plan for the development of the infrastructure of the Ile-Alatau SNNP. By analogy, master plans are being developed for the development of ecological tourism in the State National Natural Parks of the Almaty Mountain Cluster (Charyn, Altyn-Emel, Kolsay kolderi).

In 2017, the total number of visitors to specially protected natural areas (tourists) was 1,233,058 people, in 2018 – 1,234,362 people. In 2019, 1.5 mln. people visited SPNA.

The main problems in the development of ecotourism in national parks are the low quality of accommodation facilities, catering and the lack of appropriate infrastructure: equipped trails, information centers, rental points, souvenir shops, viewing platforms.

In Kazakhstan, it was decided to use the American model for the development of national parks, according to which preference will be given to the development of hiking trails and routes, without capital construction, with the placement of glamping sites, campings, viewing platforms, ethno-auly, tent camps along the trails. A master plan for the development of ecological tourism in the Ile-Alatau National Park was developed. In the next 4 years, the investor will invest at least 12 bln. tenge and create about 1000 jobs.

As part of the current activities of the national committees that are part of the structure of the National Commission of the Republic of Kazakhstan for UNESCO and ISESCO, Kazakhstan is working on an ongoing basis to include specially protected natural areas of Kazakhstan in various UNESCO programs: the list of World Natural Heritage sites, the Man and the Biosphere Program (MAB, World UNESCO Biosphere Reserves Network) and the UNESCO Global Geoparks Network Program. Currently, there are only two Kazakhstani natural sites on the UNESCO World Heritage List:

1) "Saryarka - steppes and lakes of Northern Kazakhstan" (2008, Nurzum and Korgalzhyn State Nature Reserves)

2) "Western Tien Shan", jointly with Uzbekistan and Kyrgyzstan (2016, Aksu-Zhabagly and Karatau State Natural Reserves and Sairam-Ugam State National Natural Park). According to the UNESCO website (<http://whc.unesco.org/en/tentativelists/state=kz>), the following Kazakhstani natural sites are in the preliminary list of UNESCO World Natural Heritage Sites: Northern Tien Shan (Ile-Alatau State National Natural Park), and Aksu-Zhabagly State Natural Reserve, and Altyn-Emel State National Natural Park.

In 2019-2020 in the Kazakhstan National Committee on World Heritage, work is underway to update the preliminary list, the results of which will be presented on the UNESCO website at the end of 2020.

Since 2011, the Kazakhstan National Committee of the UNESCO Man and the Biosphere (MAB) Program has been actively nominating Kazakhstani SPNAs of republican significance to the UNESCO World Network of Biosphere Reserves. On the basis of SPNAs of three categories (state nature sanctuary, state national natural park and state nature reserve), UNESCO biosphere reserves are being created. Currently, there are already 10 specially protected natural areas of Kazakhstan in Kazakhstan that have the international status of a UNESCO biosphere reserve: Korgalzhyn Nature Reserve (2012), Alakol Nature Reserve (2013), Akzhaiyk State Natural Reserve (2014), Katon-Karagai State National Natural Park (2014), Aksu-Zhabagly Nature Reserve (2015), Barsakelmes Nature Reserve (2016), Karatau Nature Reserve (2017), Altyn-Emel State National Natural Park (2017), Charyn and Zhongar National Natural Parks (2018). In 2017, the first in Asia transboundary biosphere reserve Greater Altai was created on the basis of two national biosphere reserves from Kazakhstan (Katon-Karagai BR) and Russia (Katunsky BR).

In 2019, Kazakhstan submitted applications to UNESCO to include two more specially protected natural areas in the UNESCO World Network of Biosphere Reserves - West Altai and Almaty Nature Reserves (<http://www.kazmab.kz>). In 2020, work is underway to draw up a national application for the Kolsai Kolderi Biosphere Reserve.

Based on the proposals of the Kazakhstan National Committee for MAB and Forestry and Wildlife Committee on improving the legislative framework, amendments to the Law on Specially Protected Natural Areas were adopted in 2017, which was supplemented by a new chapter 9-1 "Biosphere Reserves", which are not a separate category of specially protected natural areas and are created on the basis of existing specially protected natural areas (state nature sanctuaries, state national natural parks and state nature reserves and their buffer zones). This is consistent with the understanding of a biosphere reserve as defined by UNESCO, which does not provide for additional protection status relative to that already provided by national legislation.

As of March 2018, there are 10 areas classified as wetlands of international importance, with a total area of 3,281,398 ha.

In 2017, the Government amended the Law on Specially Protected Natural Areas, which was supplemented with a new article on key bird areas in order to protect the habitats of a significant number of birds, rare and endangered bird species, birds characteristic of certain landscapes,

significant nesting or migratory flocks of birds (including waterfowl). A regulated regime of economic activity is established in these territories. All key bird areas in Kazakhstan are internationally recognized as IBA. As of March 2018, there were 127 IBA in Kazakhstan with a total area of 15,414,627 hectares.

In the field of **preservation of fish resources**, the Concept outlines the preservation of fish resources and other aquatic animals, including: valuable species that are objects of fishing - 52 species of fish, as well as rare and endangered species - 18 species of fish¹⁰¹. The same task is set in the current Strategic Plan of the Ministry of Agriculture of the Republic of Kazakhstan for 2017 - 2021¹⁰², which notes that fisheries are of great importance as a source of income, a base for economic growth, employment of the population, and increase in the export of fish products, other potential opportunities and as a renewable source of biological diversity. The priority areas for 2017 - 2021 in fisheries are: conservation of fish resources is focused on the protection and reproduction of fish resources, as well as on the regulation of their sustainable use, scientifically based, rational use of fish resources.

The basis of the country's **fisheries** is the fishery fund of reservoirs, which includes the waters of the Caspian and Aral Seas, lakes Balkhash, Zaysan, Bukhtarma, Kapshagay, Shardara reservoirs, Alakol lake system and other water bodies with a total area of over 3 mln. hectares and which are home to more than 70 species of fish, including the most valuable in commercial terms (sturgeon, pike perch, carp, grass carp, silver carp, etc.). In addition, there are introduced fish species (peled, whitefish, etc.) in water bodies, which are also of high commercial value.

In 2019, the total volume of the fish and fish products market in Kazakhstan amounted to about 66 thou. tons, of which 45 thou. tons are fishery, and 7.4 thou. tons are fish farming. At the same time, 30 thou. tons are exported, 43.5 thou. tons of products are imported.

In the medium term, there is the potential to increase the volume of the domestic market up to 120 thou. tons, which will reduce the volume of imports through the cultivation of trout and Atlantic salmon, while simultaneously increasing the volume of exports to world markets, in particular, to China, Russia and Europe.

Commercial fishing in the Republic of Kazakhstan is carried out by more than 1 thou. subjects of fisheries, which are assigned to 1,646 fishery reservoirs and their sections. The industry employs 11 thou. people. The main fishing regions are Atyrau - 13.1 thou. tons (29.2%), East Kazakhstan - 8.2 thou. tons (18.3%), Kyzylorda - 7.4 thou. tons (16.4%), Almaty - 6.6 thou. tons (14.6%), Mangystau - 2.3 thou. tons (5.2%) and Turkestan - 2 thou. tons (4.5%).

Fish farming is developing dynamically in Kazakhstan - over the past 7 years the volume of fish raised has increased 9 times from 800 tons up to more than 7 thousand tons. Fish farming in the country is carried out by 180 fish farms, where more than 1 thousand people are employed.

Since 2006, work has been carried out on the long-term assignment of water bodies and their sites to users, which, guaranteeing access to fish resources for a long time, allows the systematic work to involve users' own funds in the development of fish farming in assigned water bodies and sites, their protection, reproduction and conducting scientific research, as well as attracting investments. So in 2019, out of 364 sites of water bodies of international and republican significance, 236 sites or 64% were assigned to 129 users. For water bodies of local importance, out of the existing 2,907 water bodies (sites) of local importance, 1,410 water bodies (sites) or 48.0% are assigned to 943 fishery organizations. Since the beginning of 2019, fisheries entities have invested 1.9 bln. tenge) in 2018 - 2.7 bln. tenge), mainly on measures for the technical re-equipment of processing facilities.

An important direction is the augmentation of fish resources through the implementation of measures to create conditions for natural reproduction, as well as the implementation of artificial reproduction using the factory method.

¹⁰¹ Concept for the transition of the Republic of Kazakhstan to a "green economy". Approved by the Decree of the President of the Republic of Kazakhstan dated May 30, 2013 No. 577.

¹⁰² Strategic plan of the Ministry of Agriculture of the Republic of Kazakhstan for 2017-2021, approved by order of the Ministry of Agriculture dated 30.12.2016 No. 541.

In accordance with the Law "On the protection, reproduction and use of the animal world", the functions of artificial rearing of juveniles of valuable fish species with the subsequent release into their natural habitat are carried out by the republican state government enterprises:

- Atyrau Sturgeon Hatchery;
- Ural-Atyrau Sturgeon Hatchery;
- Kamyshlybash Fish Hatchery;
- Petropavlovsk Fish Hatchery;

In 2018, within the framework of the state order, state fish-breeding enterprises raised and released into natural reservoirs 51 mln. pieces of juveniles of valuable fish species - sturgeon, whitefish, carp and phytovorous fish.

In addition, as part of the fulfillment of contractual obligations, users of fish resources released about 116 mln. juveniles of valuable fish species into their natural habitat.

In 2019, the state order for the release of sturgeon juveniles was 100% completed.

Annually, on the basis of the biological basis of the fishery scientific organization and the positive conclusion of the state ecological expertise, the catch limit for fish and other aquatic animals is approved in fishery reservoirs and (or) areas of the republic.

The catch limit for 2017 was approved by the order of the authorized body in the field of protection, reproduction and use of wildlife in the amount of 45.0 thousand tons. The catch limit for 2018 was approved by order of the Ministry in the amount of 40.4 thousand tons.

In 2018, the development of the catch limit amounted to 36.4 thousand tons (90%). The republican budget received 699 mln. tenge of payments for the use of fish resources.

The fish catch limit for 2019 was approved in the amount of 51.8 thousand tons. At the end of 2019, 42.5 thousand tons of fish (82%) were caught. For the use of fish resources, the republican budget received 784.3 mln. tenge. At the same time, more than 2 thousand brigades of fishermen are involved in commercial fishing, thus ensuring employment of the population, mainly in rural areas, as well as loading production facilities for processing fish, indicative for export (Table 1.8.7.).

An obligatory condition for the provision of reservoirs for fish farming is the annual investment of funds in development. In 2019, fisheries entities invested 2.7 bln. tenge in the development of fisheries.

Table 1.8.7. Development the catch limit for fish and other aquatic animals in the fishery reservoirs of the republic

Years	Limit (thousand, tons)	Development (thousand, tons)	Payments for the use of fish resources (million tenge)
2017	45.0	40.4	744.9
2018	40.4	36.4	699
2019	51.8	42.5	784.3

According to the Committee on Statistics, the official (recorded) catch of fish in Kazakhstan in 2017 amounted to 41 thousand tons, in 2018 - 37.3 thousand tons. According to expert estimates, taking into account the unaccounted catch, the total catch may reach 60 thousand tons. If we make full use of the fish productivity of reservoirs, then the potential catch is 100 thousand tons, as it was in the 1960s.

Kazakhstan has a rich fishery water fund and favorable conditions for the intensive development of commercial fish farming (aquaculture). According to FAO, aquaculture is the most dynamically developing area in the production of protein foods in the world. In this regard, the State Program for the Development of the Agro-Industrial Complex forecasts an increase in the volume of commercial fish farming (aquaculture) from 1.6 up to 5 thousand tons by 2021. The use of specialized feed for growing valuable fish species is expected to reach 12,230 tons by 2021.

In 2018, 180 fish farms were engaged in the rearing of marketable fish, of which: 10 cage farms, 98 Commercial Lake Fish Farms, 52 pond and 20 recirculating water and basin farms. In 2018, with

the plan of 2,252 tons, according to the Committee on Statistics, 5,653 tons of marketable fish were grown, of which 3,972 tons of fish were sold (2,776 tons were grown in 2017, 1,878 tons in 2016). The objects of fish farming are sturgeon, salmon (salmon, trout), carp whitefish and phytovorous fish species.

In 2019, the volume of products (services) in fisheries and aquaculture increased by 7.2% compared to the previous year and amounted to 10,574.8 mln. tenge. 45.6 thousand tons of fish were caught, of which 15.3 thousand tons of freshwater bream, 6 thousand tons of pike perch, 3.2 thousand tons of crucian and 1.8 thousand tons of carp. In 2019, 6,933 tons of marketable fish and 204.3 mln. pieces of fish seed were reared. The total area of the water surface of reservoirs for the cultivation of commercial fish and fish seed was 113.1 thousand hectares. The main share in the total volume of manufactured goods (services) fell on Turkestan (21%), Atyrau (16%), Kyzylorda (14%), East Kazakhstan (14%) and Almaty (12%) regions.

To support entrepreneurs engaged in commercial fish farming, the Ministry of Agriculture provides for the following areas of state support:

- reimbursement of part of the costs for investment in the purchase of machinery and equipment for fish farms;
- reimbursement of 30% of the cost of fish feed costs when growing sturgeon, salmon and carp fish species.

In addition, through KazAgro, loans are provided for investment projects aimed at developing agriculture, including financing fish farming projects with export potential.

At the same time, every year, at the expense of budgetary funds, measures are carried out for the artificial reproduction of fish resources and stocking of fishery reservoirs.

In 2018, within the framework of the state order, state fish-breeding enterprises reared and released into natural reservoirs 51 mln. pieces of juveniles of valuable fish species - sturgeon, whitefish, carp and phytovorous fish. In addition, within the framework of fulfilling contractual obligations, users of fish resources have released about 116 mln. juveniles of valuable fish species into their natural habitat.

In 2019, within the framework of the state order, fish-breeding enterprises reared and released into fishery reservoirs 73.8 mln. pieces of juveniles of valuable fish species (juveniles of sturgeon, whitefish larvae, underyearlings and two-year-old carp and phytovorous fish species (grass carp, silver carp).

To preserve the ecosystem of the Caspian Sea, the following measures are being implemented:

1. A method of time-based accounting of stocks of semi-anadromous fish species in the Zhaiyk River has been developed and tested, which gives more substantiated results than the previously used biostatistical method of stock assessment.

2. In 2015 - 2017 studies of the state and number of seals in the Kazakh sector of the Caspian Sea were carried out, factors that threaten the population were identified, areas for the creation of specially protected natural areas for the protection of seals were identified.

3. Every year in the Zhaiyk-Caspian basin, a large-scale fish conservation campaign "Bekire" is held, aimed at identifying and suppressing the facts of illegal fishing during spring spawning. This action takes place annually with the participation of the Inspectorate for the Protection of Fish Resources, environmental and law enforcement agencies of the Republic of Kazakhstan. Its results are shown in Table 1.8.8. In 2018, during the action, about 20 tons of fish were seized from violators, of which 3.7 tons of sturgeon species, 11.4 kg of sturgeon fish caviar, 460 units of fishing gear and 53 units of swimming and transport vehicles.

4. Annually, in order to preserve and reproduce sturgeon fish species in the Caspian Sea, two sturgeon hatcheries (Atyrau and Ural-Atyrau Sturgeon Hatcheries) raise and release juveniles of sturgeon fish species into the natural environment within the framework of the state order. In 2015, 7.5 mln. juveniles were produced, in 2016 - 7.86 mln., in 2017 - 6.8 mln. juveniles.

Table 1.8.8. Results of the fish protection campaign

Indicators	2017	2018	2019
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Number of detected violations	1,024	1,136	1,242
Number of persons brought to administrative responsibility	826	864	913
Number of criminal cases initiated	129	57	62
Fines imposed (mln. tenge)	13.4	13.3	16.1
Fines collected (mln. tenge)	8.6	9.1	9.3

Within the framework of the signed "Agreement on the Conservation and Rational Use of Aquatic Biological Resources of the Caspian Sea" (Astrakhan, September 29, 2014, entered into force on May 24, 2016), the first meeting of the Commission on Aquatic Biological Resources was held on November 21-23, 2017 in Baku (Azerbaijan), during which the Commission's Rules of Procedure were adopted, the necessary groups were created and the draft Protocol on Cooperation of the Parties in Organizing the Fight against Illegal Extraction of Aquatic Biological Resources of the Caspian Sea, etc. was discussed. The second meeting of the Commission was held on November 27 - 29, 2018 in Baku (Azerbaijan).

Despite artificial reproduction, the sturgeon population continues to decline. Natural reproduction of sturgeon has practically ceased in the Zhaiyk River, sturgeons have not been recorded in the Kigash River for several years. At the same time, the measures taken managed to stabilize the population of the Caspian seal included in the IUCN Red List. A proposal was prepared and adopted to withdraw the kutum from the Red Book of Kazakhstan as a species that has restored its numbers

Annually, from May 1 to May 31, in order to clean up fishery reservoirs from abandoned fishing nets and clean up coastal areas, as well as form a positive public opinion in relation to the bodies that protect fish resources, at the initiative of the Committee for Forestry and Wildlife of the Ministry of Agriculture of the Republic of Kazakhstan in the republic the environmental action "Clean water bodies" is being carried out.

In 2017, a number of regulatory legal acts were amended related to flora and fauna. The Law on the Regulation of Trade Activities was amended to prohibit the sale of saxaul timber products and prohibited fishing equipment. The sale of fishing nets made of monofilaments was prohibited (due to the cheap cost of such nets, fishermen often forgot about them, leaving them in the water). The amendments introduced in 2017 also regulate the catch of sturgeon fish in order to prevent the sale of illegally caught sturgeon. In 2017, the concept of biosphere reserves was introduced into the 2006 Law on Specially Protected Natural Areas. In addition, the requirement was added to this Law to establish coordination councils at environmental institutions. Since the beginning of 2018, work has been underway to create such councils; it is expected that they will become a mechanism to ensure that the interests of various parties are taken into account, and, in particular, will solve the problem of the increasing pressure on specially protected natural areas from the tourism sector.

Amendments to the Forestry Code adopted in 2017 make it possible to transfer lands of other categories to the forest fund. This should make it possible to enrich the forest fund by including in it wooded areas that are not currently part of its lands. Also, amendments and additions were made to forestry legislation establishing norms for the social protection of officials of the state forest protection and environmental institutions, which provide for an increase in the official salaries of specialists working in rural areas by 25%, the payment of one-time allowances for young specialists and the provision of them with office housing.

At the end of 2017, amendments were made to some articles of the Code of Administrative Offenses related to subsoil use, water resources, and the protection of forests and wildlife. The analysis of judicial practice, prepared for the Almaty region, showed that the majority of court cases on administrative offenses in the field of environmental protection in 2016 were initiated under articles on illegal acquisition / sale / import of wild animals and plants (62 cases), violation of fishing rules (48 cases), violation of hunting rules (23 cases) and illegal construction in water protection

zones and lines (17 cases); other articles of the Code of Administrative Offenses related to environmental protection were not applied in the indicated year.

By order of the Chairman of the Committee for Forestry and Wildlife of the Ministry of Agriculture of the Republic of Kazakhstan dated May 14, 2018, No. 17-5-6 / 135, amendments were made to the "Restrictions and prohibitions on the use of wildlife objects" in the Zhaiyk-Caspian basin. The boundaries of the zone prohibited for fishing in the pre-estuary space of the Zhaiyk River (Ural), where the pre-spawning concentration of sturgeon and semi-anadromous fish species occurs, as well as the feeding of their juveniles, have been significantly expanded.

The order of the authorized body for fisheries approved "Restrictions and prohibitions on the use of fish resources and other aquatic animals", where, in particular, fishing is limited in the delta of the Ile River, on the Shardara reservoir, extended the term of the spring ban on fishing in the Zhaiyk River, a number of other measures have been taken to protect migration routes and breeding grounds for aquatic animals.

In terms of reducing the impact on specially protected natural areas of industrial enterprises in the Law of the Republic of Kazakhstan "On Specially Protected Natural Areas" in 2017, in Article 34, sources of financing for specially protected natural areas were added by donations, voluntary contributions from individuals and legal entities, including for the inflicted and (or) inevitable harm to facilities of the state natural reserve fund when they conduct economic and other activities.

On June 15, 2017, the Law of the Republic of Kazakhstan No. 73-VI "On amendments and additions to some legislative acts of the Republic of Kazakhstan on flora and fauna" was adopted, within the framework of which, in order to develop the hunting industry:

- introduced new concepts "game breeding" and "hunting farm";
- hunting is prohibited in the zone of limited economic activity of state national natural parks and the buffer zone of state natural reserves;
- the use of animals bred and kept in captivity and (or) semi-free conditions in hunting farms is allowed;
- given the right to hunting farms to determine the timing of the beginning and end of hunting in the assigned lands within the time limits established by the Hunting Rules;
- the right to the territorial subdivisions of the department of the authorized body to make a decision to postpone hunting for an earlier or later date (up to fifteen calendar days) within the hunting period, depending on the climatic conditions of the region;
- the use of aircraft, auto, motor vehicles and snowmobile equipment is prohibited in the production of wolf hunting on assigned hunting farms for amateur (sports) purposes;
- to ensure the protection, reproduction and sustainable use of wildlife, local executive bodies should have specialized organizations.

In 2019, on the issues of improving criminal, criminal procedure legislation and strengthening the protection of individual rights", the following amendments were made:

- in Articles 335 and 337, criminal offenses are changed to a crime, and a new part is introduced in Article 337 - part 6 with the sanction of imprisonment for up to 10 years;
- Article 339 introduced a new part 1-1, which provides for the illegal gaining, acquisition, storage, sale, import, export, shipment, transportation or extermination of the saiga, its parts or derivatives, including the horns of the saiga, for which the sanction provides for the restriction of either imprisonment from 3 up to 5 years, with confiscation of property;

- Article 380-1 provides for criminal liability for encroachment on the life of state inspectors for the protection of wildlife and a specialized organization for the protection of wildlife and a huntsman (in the old edition only in relation to employees of a law enforcement, special state body and a soldier);

- a new article 380-2 was introduced, which provides for criminal liability for the use of violence against the state inspector for the protection of wildlife and a specialized organization for the protection of wildlife and a huntsman with imprisonment for up to 12 years.

Kazakhstan is a party to the Convention on Biodiversity Conservation (CBD) since 1994 and in 2018 prepared the 6th National Report (6ND) on biodiversity conservation in Kazakhstan. This report has been prepared in accordance with the Reporting Guidelines developed by the Secretariat of the

Convention on Biological Diversity. The 6ND provides a final overview of the progress made in the implementation of the Strategic Plan for Biodiversity 2011-2020 and the 2010 Aichi Biodiversity Targets, including related national targets. The 6ND contains five required sections, structured according to the specific Aichi Targets and a section on national contributions to the Global Strategy for Plant Conservation Targets.

In 2015, Kazakhstan acceded to the Nagoya Protocol on the Regulation of Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the CBD, and in January 2018, an Interim National Progress Report was submitted on the implementation of the Protocol, according to which Kazakhstan has not yet taken any legislative, administrative or policy measures to ensure fair and equitable sharing of benefits. In this area, in 2019, the UNDP-GEF Project began work on the development of a Concept for the creation of a genetic bank of forest seeds, which provides for an integrated approach to the conservation and sustainable use of the genetic fund of forest tree and shrub plant species in Kazakhstan using the ex situ method.

In addition, Kazakhstan has not yet acceded to the Nagoya-Kuala Lumpur Additional Protocol on Liability and Redress to the Cartagena Protocol on Biosafety, which entered into force in March 2018.

The Protocol on Biodiversity Conservation (Ashgabat, 2014) has not yet entered into force, as it is expected to be ratified by Azerbaijan and Kazakhstan. The provisions of this Protocol contain measures for the conservation of species (including the implementation of national and regional action plans for the conservation of species), the development of the Caspian Red Book and the establishment of marine and coastal protected areas. When submitting the National Report on the implementation of the Convention, Kazakhstan also included extensive information on activities to achieve the objectives of this MEA, which have not yet formally become mandatory.

International experience

In March 2019, the UN declared 2020-2030 as the decade for ecosystem restoration. At the UNECE / FAO Congress on Forestry, which was held from 28 to 31 May in the Issyk-Kul region of Kyrgyzstan, the countries of Central Asia and the Caucasus demonstrated their activities and achievements in the field of forestry monitoring and landscape restoration

The UN Environment Background Report to the Assembly, serving as the basis for identifying challenges and identifying new areas for action, provides a strong case for urgent action. The report is titled “Innovative Solutions to Environmental Challenges and Sustainable Consumption and Production,” and it sees innovation as a culture that encourages ingenuity to address environmental challenges.

The report examines five main emerging problems: the latest developments in synthetic biology; the critical benefits of interconnected landscapes; complex interactions and vulnerability of peatlands in permafrost; the challenges of widespread nitrogen pollution; the dangers of inappropriate adaptation of the world to climate change. The report also provides estimates of the value of: lost ecosystem services between 1995 and 2011 (4-20 tln. US dollars), the growing pressure on the environment from agriculture (3 tln. US dollars annually), and the costs of pollution (4.6 tln. US dollars annually)¹⁰³.

UNECE and FAO have released a very important publication on the state of forests in the Caucasus and Central Asia, where information is available for the first time since 1990! This report describes the forest resources, the forest sector in the region and the main threats facing forests. It also discusses forest sector policies, institutions and responses that are planned or already in place, and lists the main problems and challenges facing the forest sector in the region.

Forests in the Caucasus cover less than 15% of the territory, and in Central Asia - less than 10%. The exception is Georgia, more than 40% of which is covered with forests. However, together, forests and other forest lands of the eight countries of the Caucasus and Central Asia cover more than 30 mln. hectares, which corresponds to the size of Italy.

103 Innovative solutions for environmental challenges and sustainable consumption and production. United Nations Environment Assembly of the United Nations Environment Programme Fourth session Nairobi, 11-15 March 2019

The region's forests are special because of their critical role in protecting against erosion and soil loss in particularly vulnerable ecosystems. Almost 90% of forests and other forest lands are designated for protective functions. In many areas, non-wood forest products - nuts (pistachios, walnuts, almonds, hazelnuts), fruits and berries, hay, medicinal herbs, mushrooms, honey, flower bulbs, tree seeds and others - play an important role in rural areas livelihoods. Saxaul plantations, for example, are one of the few means of helping villages around the Aral Sea, where shrinking water areas have created a salty desert where toxic dust is blown away, damaging health and the environment.

All forests in the region are state-owned and managed by state-owned forestry organizations financed from central government budgets. All countries have forest laws and policy statements. At the same time, at the highest political level, forestry issues are hardly covered.

“There is significant potential to increase the contribution of the forests of the Caucasus and Central Asia to society and the environment,” said Olga Algayerova, UNECE Executive Secretary. Realizing this potential, however, requires a long-term commitment at the political level to achieve ambitious yet realistic goals and provide sufficient resources to the forestry sector to ensure truly sustainable forest management in the region.¹⁰⁴

The UNESCO Man and the Biosphere (MAB) Program is a UNESCO intergovernmental science program aimed at establishing a scientific basis for improving relations between people and the environment at the local and global level. It is a system of interdisciplinary research aimed at studying the conservation of biological and ecosystem diversity, as well as the relationship between humans and the environment. One of the main activities of the program is the development of the World Network of Biosphere Reserves. The name "MAB" is a Russian phonetic abbreviation for the English name of the program "Man and Biosphere" (MAB), this English-language abbreviation has taken root in Russian. The MAB Program was officially adopted in 1970 at the XVI session of the UNESCO General Conference. The governing body of the program is the International Coordination Council (ICC), which includes 34 states, which are regularly re-elected at sessions of the UNESCO General Conference. Between ICC sessions, the operational management of the MAB program is carried out by the ICC Bureau and the Secretariat, which coordinates the activities of the MAB National Committees in each country. Currently, the Republic of Kazakhstan is a member of the International Coordination Council for four years from 2020 to 2024.

The Lima Action Plan (LAP) for Biosphere Reserves 2016-2025 was adopted at the 4th World Biosphere Reserves Congress held in Lima, Peru. This document complements the MAB Strategy 2015-2025 and details how MAB, through the World Network of Biosphere Reserves (WNBR), will contribute to the achievement of the 2030 Development Agenda and the Sustainable Development Goals (SDGs). One of the 12 experts in the drafting of the text of the current MAB Strategy and the Lima Action Plan was a Kazakh representative, who was in 2014-2016 Vice-President of UNESCO MAB for Asia and the Pacific Ocean (Yashchenko R.V., since 2020 - UNESCO Adviser for Biosphere Reserves, Director General of the Institute of Zoology of the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan since December 2018). Also, in June 2017, at the 29th session, the MAB Council adopted the document "Process for improving and upgrading the quality of WNBR, as well as improving the quality of all members of the World Wide Web". The goal of this new process is to ensure that all biosphere reserves meet current UNESCO criteria and become fully functional by 2020, and have reported to the MAB Council on the upcoming periodic review no later than 2019 if they wish to remain part of the WNBR. All Kazakhstani biosphere reserves fully comply with modern requirements and the process of exclusion from the World Wide Web did not affect them. This shows the high level of the national system of specially protected natural areas and the high quality of the work of the Kazakhstan National MAB Committee. Later, in July 2018, at the 30th Session of the MAB Council, the Global Communication Strategy and MAB Action Plan was presented, which was developed as a guideline to support all biosphere reserves to engage with stakeholders and move towards common communication goals.

104 https://www.unece.org/info/media/presscurrent-press-h/forestry-and-timber/2019/unece-and-fao-take-stock-of-the-state-of-forests-of-the-caucasus-and-central-asia-in-first-ever-study/doc.html?fbclid=IwAR0wl8mWPT4oT1y0qLuepy3z_yDQKtTdT6CdBP3E9UUMdYu_kqdIjBsrD80

On May 29 - June 2, 2018, the 15th meeting of the East Asian Network of Biosphere Reserves was held in Almaty, within the framework of which the participants had an opportunity to exchange experience in the field of creating and managing biosphere reserves. A field assessment of the Altyn-Emel Biosphere Reserve was also organized, during which foreign experts visited the reserve and gave their recommendations. Representatives from participating countries reviewed recent developments and set new priorities for the development of UNESCO's East Asian Biosphere Reserve Network (EABRN). The meeting was organized by the UNESCO MAB National Committee of Kazakhstan and the Secretariat of the East Asian Network of Biosphere Reserves (EABRN) of UNESCO with the support of the National Commission of the Republic of Korea for UNESCO, the Ministry of Environment of the Republic of Korea, as well as the National Commission of the Republic of Kazakhstan for UNESCO and ISESCO and the UNESCO and Department for Sustainable development of KazNU named after Al-Farabi.

The Congress was attended by representatives of seven EABRN member states - China, Democratic People's Republic of Korea, Republic of Korea, Japan, Republic of Kazakhstan, Mongolia and the Russian Federation, representatives of EABRN biosphere reserves, as well as other regional networks (South and Central Asian, South and East Asian, Pacific). In addition, representatives of international organizations such as UNESCO, UNDP, IUCN, WWF and government agencies of the Republic of Kazakhstan were present among the participants. In total, the meeting was attended by about 70 representatives from different countries.

A subregional workshop for Central Asian countries on biosphere reserves was held on 28 - 31 May 2019 in Almaty. The work of the workshop is aimed at implementing the Lima Action Plan and contributing to the achievement of the Sustainable Development Goals, intensifying the development processes of the MAB program and biosphere reserves, as well as building the capacity of the three Central Asian countries (Kyrgyzstan, Tajikistan and Uzbekistan). The main objectives of the event are to exchange best practices, as well as discuss existing gaps in the national network of biosphere reserves in Kazakhstan, improve communication on issues related to biosphere reserves, and follow up on the recommendations of the 2019 Meeting of the South and Central Asia Biosphere Reserves Network (SACAM) ¹⁰⁵.

Pursuant to the Decree of the President of the Republic of Uzbekistan dated January 17, 2019 No. VII-5635 "On the State Program for the Implementation of the Strategy of Action in Five Priority Areas of Development of the **Republic of Uzbekistan** in 2017-2021 in the Year of Active Investments and Social Development" and the resolution of the Oliy Majlis of the Republic of Uzbekistan dated May 6, 1995 No. 82-1 "On the accession of the Republic of Uzbekistan to the Convention on Biological Diversity signed in Rio de Janeiro in 1992", as well as in order to ensure the conservation and sustainable use of biological diversity, the development and expansion of protected natural areas, the implementation of a set of measures to reduce the rate of degradation of natural ecological systems, the restoration of rare and endangered species of animals and plants, the development of international relations in the field of biodiversity conservation, the Cabinet of Ministers of the Republic of Uzbekistan approved the "Strategy for the conservation of biological diversity in the Republic of Uzbekistan for the period of 2019 - 2028", providing for the implementation of the following priority tasks:

- expanding the area of protected natural areas to 12 percent of the country's territory;
- afforestation of the drained bottom of the Aral Sea, bringing the forest area to 1.2 mln. hectares;
- breeding gazelles in the Bukhara specialized nursery "Jeyran" with bringing their number up to 1,000 individuals;
- creation of a unified system for monitoring biodiversity components with a central link - reference ecosystems of state reserves;
- creation of a unified information database of state monitoring and state cadastre of biodiversity based on modern geoinformation technologies (GIS technologies);
- carrying out an annual geobotanical survey of vegetation of natural pastures and hayfields in the amount of 2 mln. hectares;

105 https://www.kt.kz/rus/ecology/v_almaty_nachal_otkrylsya_seminar_po_voprosam_biosfernyh_1377884994.html

- integrating biodiversity conservation issues into all sectors of the economy.

The Action Plan for the implementation of the Strategy for the Conservation of Biological Diversity for the period of 2019 - 2028 was also approved.

Kazakhstan does not have a duly approved strategy for the conservation and sustainable use of biological diversity.

At the World Economic Forum Summit in Davos on February 22, 2020, a major new initiative, the Trillion Trees Champions Platform, led by UNEP and FAO, was officially briefed. Overall, the initiative aims to plant 1 tln. trees worldwide by 2030. This will keep the temperature rise at the level of 1.5 ° C at the lowest cost.

The **Norwegian government** will be the first country in the world with a commitment against deforestation. The government is requiring government procurement to not support rainforest deforestation¹⁰⁶. Parliament and government will no longer authorize contracts for any company that cuts and destroys forests. Many products that are widely used around the world are associated with deforestation, from tropical timber and soybeans to palm oil.

The Norwegian Rainfores Foundation encouraged other countries to do the same, notably the UK and Germany, with which the Norwegian government made a joint statement at the 2014 UN Climate Summit in New York. The three countries said they want to "promote national commitments that encourage deforestation-free supply chains, including through public procurement to ensure a sustainable supply of commodities such as palm oil, soybeans, beef and timber".

*Synthetic biology: environmental modification*¹⁰⁷.

The ability to successfully make changes to organisms at the genetic level has excited both scientists and the general population. Genome editing technologies are advancing rapidly, with promising biological and environmental benefits, from eradicating human disease to preventing species extinction. CRISPR-Cas9 is the newest, fastest tool in the genetic editing arsenal, allowing you to manipulate genomes with extraordinary precision. However, the ability to create artificial life and alter existing DNA carries **risks of cross-contamination and unwanted consequences**. Hacking the source code of life can have consequences so widespread that governing bodies need to cooperate and collaborate to keep research and development in this area safe. A serious cause for concern about the lack of regulation of the sphere is the increase in cases of "self-made" biohacking, as well as the increased risks of unintentional release of genetically modified organisms into the environment. This exciting chapter explores the many challenges and benefits of synthetic biology.

Biodiversity conservation compensation mechanism (biodiversity offsets).

Biodiversity offsets, based on International Standards for projects to ensure environmental and social sustainability (Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources), is not a single, but internationally recognized and OECD-recommended solution for the conservation of the natural environment.

The planning of this mechanism is necessary at the initial stage of the development of oil and gas production projects. At the same time, the preparation of compensatory measures should be supported by scientific justifications, observations prepared by scientists (botanists, soil scientists, narrow specialists in animal and bird species).

The purpose of the compensation mechanism is to ensure adequate compensation for the loss of biological diversity and ecosystems and to take measures to prevent and restore their losses. One of the main principles of the compensation mechanism is the observance of the hierarchical principle, as indicated below:

- 1) prevention of loss: taking measures aimed at avoiding any impact on the components of biodiversity from the very first stages of the project cycle;
- 2) minimization of losses: taking measures to reduce the duration, intensity and / or degree of impacts (both direct and indirect) that cannot be avoided;

106 https://www.iflscience.com/environment/norway-is-the-first-country-to-commit-to-zero-deforestation/?fbclid=IwAR3TtBuD0YiDeRbDzEsjvoRm_dfvnblDFCHwUbCTpmdxytBQmsYnnWw2cQ

107 UNEP Cutting Edge 2018/19 (<https://www.unenvironment.org/ru/resources/doklad-peredovye-rubezhi-201819-goda-namechayuschiesya-problemy-imeyuschie-ekologicheskoe>)

3) mitigation of loss (restoration): taking measures to restore degraded or destroyed ecosystems after taking measures for mitigation impacts, that cannot be completely avoided or minimized;

4) compensation for loss: measures to offset any residual adverse impacts that cannot be avoided, minimized and / or rehabilitated in order to achieve “total zero loss” or “overall positive impact” on biodiversity. Compensating measures can be implemented in areas where biodiversity loss occurs or is predicted, in the form of restoration of degraded habitats, stopping degradation processes or reducing other risks, as well as creating specially protected natural areas.

In the international conservation community, the idea and practice of creating biodiversity offsets is still a source of much controversy. The main concerns are related to the fact that environmental regulatory authorities may accept as a rule the issuance of permits for the implementation of projects that have an irreversible impact on the state of biodiversity, since, when justifying such projects, it is proposed to create facilities that compensate for the loss of diversity, thereby “blessing” production companies for any impact in areas of project activity, if these companies guarantee the creation of compensating facilities in other areas.

Examples:

Russia. One example of compensation is the creation of the Bureysky Specially Protected Natural Area with an area of 132,000 hectares on the basis of two existing refuges and the area around a future reservoir in the Amur Region of the Russian Federation, as compensation for biodiversity during the construction of the Nizhne-Bureyskaya HPP. For the construction of the hydroelectric power station, it was necessary to flood an area of about 15,000 hectares, which was a habitat for animals, birds and plants. To preserve the biodiversity of this territory, measures were taken to build feeding complexes, supports for nesting and transplanting plants on the territory of the created Bureysky Natural Park. Thus, a set of measures made it possible to preserve the biodiversity of this territory and at the same time build a hydroelectric power station.

Madagascar. One example is the development of the ilmenite deposit in Madagascar at the Rio Tinto mine. The negative impact on biodiversity was the loss of about 1.665 ha of littoral forest (3.5% of the total habitat of Madagascar's littoral forests). To compensate for the loss of forest biodiversity of Rio Tinto, was planted about 6,000 hectares of littoral and non-littoral forests.

Canada. Compensation mechanism - creation of an ecological fund and resettlement of key species. Terasen company was to expand the Trans Mountain gas pipeline to boost exports to international markets, as well as Eastern Canada and North America. But this gas pipeline passed through two specially protected natural areas - Jasper National Park and Mount Robson State Park, which are included in the list of UNESCO World Heritage Sites. The goal was set to achieve zero losses and gains in biodiversity. During the expansion of the gas pipeline, measures were taken to protect sensitive habitats of rare plants and communities, wild animals, forests, as well as measures to reduce noise levels. The company has undertaken to monitor the state of ecosystems and biodiversity of the territories affected by the expansion of the gas pipeline within five years after the completion of the project. The company also carried out a comprehensive environmental impact assessment of the pipeline expansion project.

The compensation was 3 mln. US dollars, of which 2.3 mln. US dollars was spent on an environmental fund called the Trans Mountain Heritage Foundation. The Trans Mountain Heritage Foundation annually successfully conducts conservation activities and research on the territories of two parks.

Due to the absence of an approved National Biodiversity Strategy and Action Plan (NBSAP), Kazakhstan does not have effective strategic instruments, which would focus on the issues of biodiversity conservation or development of a network of specially protected natural areas. Article 6 of the CBD requires each party to develop national strategies, plans or programs for the conservation and balanced use of biodiversity. The Aichi Target 17 of the CBD Strategic Plan for 2011–2020 states: “By 2015, each Party has developed and adopted as a political instrument an effective, joint and updated national strategy and action plan, and started to implement them”. Compliance with the above basic requirements of the CBD will generally contribute to the fulfillment of international obligations by Kazakhstan, incl. Targets 11.4 and 15.5 of the 2030 Agenda for Sustainable Development. In this connection, it follows:

develop, adopt and start an effective, joint and updated national biodiversity strategy and action plan, taking due account of the existing CBD strategic plans and related work programs;
develop, adopt and start implementation of action plans and / or programs for the conservation of ecosystems and biological species;
*mobilize sufficient resources to ensure that such action plans are implemented over the long term*¹⁰⁸.

Problems of achieving the SDGs

Biodiversity conservation is directly related to goals 14 and 15 of the 2030 Agenda for Sustainable Development (Table 1.8.9.).

Kazakhstan has no access to the ocean and there are no sea areas in Kazakhstan with an international legal status. The Caspian Sea is an inland water body and has no connection with the world's oceans. Its status is determined by the Convention of the Five Caspian States on the Legal Status of the Caspian Sea. Nevertheless, according to many geographic characteristics, the Caspian Sea, as the largest inland water body, has marine features. Therefore, in Kazakhstan, target 14.5 of Goal 14 can be assessed.

In Kazakhstan, a State Protected Area has been created in the northern part of the Caspian Sea, the area of which (662,630 ha) is much more than 10% of the total area of marine areas (Indicator 14.5.1). However, this specially protected natural area does not have the status of a legal entity and, in terms of the protection regime, weakly meets the IUCN criteria for specially protected natural area. Oil and gas production, fishing, shipping, etc., are underway within this specially protected natural area.

Along with other water quality parameters of the Caspian Sea, Kazhydromet assesses the Average acidity indicator “the pH value of sea water measured in an agreed group of representative sampling stations (Caspian Sea)”, which corresponds to target 14.3. The values of this indicator do not yet inspire concerns about acidification of water in the Caspian Sea.

At the same time, the following are not monitored in Kazakhstan:

- indicator 14.2.1 of target 14.2;
- indicator 14.4.1 of target 14.4;
- indicator 14.6.1 of target;
- indicator 14.7.1 of target 14.7;
- indicator 14.a.1 of target 14.a;
- indicator 14.b.1 of target 14.b;
- indicator 14.c.1 of target 14.c.

Although the latter indicator may not be relevant to Kazakhstan.

To solve Target 15.1 of Goal 15, Kazakhstan monitors the indicator “Forest area as a percentage of total land area” and the indicator “Share of specially protected natural areas from total area”. These indicators have positive, but insufficient dynamics to reach the world average.

Difficulties for Kazakhstan in the percentage increase in the share of protected forests, wetlands and specially protected natural areas in the scale of the territory of Kazakhstan. Even with significant efforts being made, it is difficult for Kazakhstan to achieve Aichi Target 11 (at least 17% of land and inland water areas). The share of protected terrestrial and freshwater areas important for biological diversity, by ecosystem type (Indicator 15.1.2), cannot be adequately estimated due to the lack of data (for example, their inventory data with the definition of such important areas for each type of ecosystem and their area). The coverage of various types of natural ecosystems by specially protected natural areas is uneven, and several key ecosystems are very poorly represented in the system of specially protected natural areas. Moreover, several types of ecosystems are not covered by the most effectively protected natural areas with the status of a legal entity. Consequently, the solution to Objective 15.1 will require the expansion of the state network of specially protected natural areas to sufficiently cover all natural ecosystems present in Kazakhstan, in particular, mountain, forest, desert and wetland ecosystems.

¹⁰⁸ Third Environmental Performance Review of Kazakhstan. UNECE. 2018

To solve Target 15.2, the indicator "annual planting" is monitored, which, to fully reflect the solution to the problem, should be compared with the annual loss of forest cover.

To solve Target 15.4, the indicator "area of mountain forests" is monitored, but there are no indicators of mountain SPNAs and an index of mountain vegetation. Coverage by specially protected natural areas of sites important to mountain biodiversity (Indicator 15.4.1) cannot be adequately calculated due to the lack of an estimate of the total area of sites considered to be important for mountain biodiversity. Likewise, the Mountain Land Cover Index (Indicator 15.4.2) cannot be calculated until the total area of forest cover in all mountainous regions of Kazakhstan has been determined (which would require a clear definition and delineation of mountain areas). However, target 15.4 can still be completed on time.

To solve Target 15.5, there are lists of animal and plant species included in the Red Book of Kazakhstan, but there are no indicators of changes in this list by year. In addition, the Red Book of Kazakhstan is not assessed according to the criteria for rare and endangered species by the IUCN. To calculate the Red List Index, all species in the group had to be assessed for the IUCN Red List at least twice, therefore, for the calculation, at least two editions of the national Red Lists must be prepared using the IUCN criteria. According to international IUCN estimates, 16 plant species and 66 animal species living in Kazakhstan are under the threat of complete extinction in the world as a result of destruction, which clearly indicates the top priority of scientific research in these areas and monitoring of biodiversity with a special emphasis on the above species, as well as updating or adopting special national conservation programs for these species. The same applies to endemic species found only in Kazakhstan, previously classified by IUCN as "insufficient data". Otherwise, Target 15.5 will never be implemented¹⁰⁹.

The following indicators are missing in Kazakhstan:

- indicator 15.3.1 of Target 15.3. There are insufficient data to properly estimate the area of land degraded as a percentage of the total land area in each biogeographic zone. In particular, degraded pastures account for about 15% of the total pasture area;

- indicator 15.6.1 of Target 15.6. The Nagoya Protocol on the Regulation of Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the CBD entered into force for Kazakhstan on September 15, 2015, according to the Interim National Report dated January 15, 2018. Kazakhstan has not yet undertaken any legislative, administrative or policy measures (Indicator 15.6.1) related to access and benefit-sharing (DCI measures) that are needed to meet Target 15.6;

- indicator 15.7.1 of Target 15. There are no official statistics reflecting reliable data on the number of species of specially protected flora and fauna, illegally collected or poached. Nevertheless, the number of cases of violation of the law (in particular, poaching) is constantly decreasing;

- indicator 15.8.1 of Target 15.8. Currently, there are no relevant government programs for monitoring alien invasive species, which is a vital next step towards achieving Target 15.8;

- indicator 15.9.1 of Target 15.9;

- indicator 15.a.1 of Target 15.a;

- indicator 15.b.1 of Target 15.b;

- indicator 15.c.1 of Target 15.c.

Progress in achieving the SDGs cannot be properly assessed without conducting scientific research aimed not only at solving the listed targets, but also at monitoring of monitored and other rates and indicators of the state of wildlife.

Table 1.8.9. Problems of achieving the SDGs related to climate change

Goals and targets of the SDGs	International indicators	Indicator in Kazakhstan	Problems in achievement	The need to introduce indicators
SDG 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development				
Target 14.2 By 2020, sustainably	14.2.1 Proportion of	Not monitored		Need to develop a

109 Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans	national exclusive economic zones managed using ecosystem-based approaches			Biodiversity Conservation Strategy with appropriate indicators
Target 14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics	14.4.1 Proportion of fish stocks within biologically sustainable levels	Number of conserved fish resources and other aquatic animals, units	Monitoring required	A fisheries management program with appropriate indicators is needed
Target 14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information	14.5.1 Coverage of protected areas in relation to marine areas	The share of the state protected area of the northern part of the Caspian Sea, lake ecosystems in the total share of specially protected natural areas	Totalling 2.67%, increase required	It is necessary to develop a Strategy for Biodiversity Conservation with appropriate indicators
Target 14.6 By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation	14.6.1 Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing	Fight against poaching is being carried out in Kazakhstan	Monitoring required	Indicators are required that are comparable to international
Target 14.a Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries	14.a.1 Proportion of total research budget allocated to research in the field of marine technology	Not monitored	Monitoring required	It is necessary to develop a Strategy for Biodiversity Conservation with appropriate indicators
SDG 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss				
Target 15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands,	15.1.1 Forest area as a proportion of total land area 15.1.2 Proportion of important sites for terrestrial and	Forest area as a percentage of total land area The share of specially	Monitoring required	It is necessary to develop a Strategy for Biodiversity Conservation with appropriate indicators

in line with obligations under international agreements	freshwater biodiversity that are covered by protected areas, by ecosystem type	protected natural areas		
Target 15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	15.2.1 Progress towards sustainable forest management	Annual planting volume	Monitoring required	It is necessary to develop a Strategy for Biodiversity Conservation with appropriate indicators
Target 15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world	15.3.1 Proportion of land that is degraded over total land area	The area of eroded land as part of agricultural land as a percentage of the total land area	Monitoring required	Indicators are required that are comparable to international
Target 15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development	15.4.1 Coverage by protected areas of important sites for mountain biodiversity 15.4.2 Mountain Green Cover Index	Not monitored	Monitoring required	It is necessary to develop a Strategy for Biodiversity Conservation with appropriate indicators
Target 15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species	15.5.1 Red List Index	Not monitored	Monitoring required	It is necessary to develop a Strategy for Biodiversity Conservation with appropriate indicators
Target 15.6 Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed	15.6.1 Number of countries that have adopted legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits	Not monitored	Monitoring required	It is necessary to develop a Strategy for Biodiversity Conservation with appropriate indicators
Target 15.7 Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products	15.7.1 Proportion of traded wildlife that was poached or illicitly trafficked	Not monitored	Monitoring required	It is necessary to develop a Strategy for Biodiversity Conservation with appropriate indicators
Target 15.8 By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species	15.8.1 Proportion of countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species	Not monitored	Monitoring required	It is necessary to develop a Strategy for Biodiversity Conservation with appropriate indicators
Target 15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts	15.9.1 Progress towards national targets established in accordance with Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011-2020	Not monitored	Monitoring required	It is necessary to develop a Strategy for Biodiversity Conservation with appropriate indicators
Target 15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems	15.a.1 Official development assistance and public expenditure on conservation and sustainable use of biodiversity and	Not monitored	Monitoring required	It is necessary to develop a Strategy for Biodiversity Conservation with appropriate indicators

	ecosystems			
Target 15.b Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation	15.b.1 Official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems	Not monitored	Monitoring required	It is necessary to develop a Strategy for Biodiversity Conservation with appropriate indicators
Target 15.c Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities	15.c.1 Proportion of traded wildlife that was poached or illicitly trafficked	Not monitored	Monitoring required	It is necessary to develop a Strategy for Biodiversity Conservation with appropriate indicators

Plans for the future

Further development of the **network of specially protected natural areas** is provided for by the Basic Provisions of the General Scheme for the Organization of the Territory of the Republic of Kazakhstan (Government Decree No. 1434 of 2013), according to which it is planned to increase the network up to 29.1 mln. hectares (10.67% of the country's territory) by 2020 and 41.6 mln. hectares (15.27%) by 2030. However, these planned changes will still not ensure the solution of the Aichi Target No. 11 of the KBR, according to which by 2020 at least 17% of land areas and inland waters and 10% of coastal and marine areas are conserved through effective and equitable management, ecologically representative and well-connected systems of protected areas.

The Strategic Development Plan of the Republic of Kazakhstan until 2025 within the framework of Target 7. Conservation of biological diversity envisages that Kazakhstan will continue its policy of preserving biological diversity by increasing the forest cover of the territory and bringing it to 4.8%, within the framework of the national strategy for sustainable land management, work will continue on implementation of strategic measures aimed at a systematic solution to the problem of land degradation and desertification, it is planned to increase the volume of forest reproduction and afforestation, the creation of green zones around regional centers, the development of private afforestation.

Kazakhstan will continue the policy of preserving biological diversity also through the preservation of the population of fish species and the development of commercial fish farming and aquaculture¹¹⁰.

In May 2019, NCOC N.V. company and the Federal State Budgetary Institution of Science Institute of Ecology and Evolution named after A.N. Severtsov of the Russian Academy of Sciences (IEE RAS) have signed an Agreement on scientific cooperation and interaction and a draft Program for the research of the Caspian seal in the water area of the Northern Caspian for 2019 - 2023 was developed.

On July 3, 2019, a conference was held in the city of Nur-Sultan with the participation of scientists from the Republic of Kazakhstan (Scientific Research Center of Fisheries, Scientific Research Center of Microbiology and Virology, Kazakhstan Agency of Applied Ecology), the Russian Federation (IEE RAS) and representatives of the Ministry of Foreign Affairs of the Russian Federation, Representative Office of Gazprom PJSC in the Republic of Kazakhstan in the city of Nur-Sultan, PSA LLP, NCOC NV Company, at which the Program for 5 years was discussed and approved.

One of the final results of the Program is to issue a biological justification for the creation of a specially protected natural area (SPNA) to preserve the main habitats of the Caspian seal in the Kazakh part of the Caspian Sea.

¹¹⁰ Strategic Development Plan of the Republic of Kazakhstan until 2025, approved by Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636

At the same time, it was proposed to ensure the development of a Natural Scientific Justification (ENO) and a feasibility study for the creation of specially protected natural areas with the Seal Research and Rehabilitation Centers (SRRC) in the cities of Aktau, Bautino and Atyrau.

Kazakhstan is one of the countries implementing the BIOFIN Global Biodiversity Financing Initiative, which aims to support countries in identifying trends in biodiversity financing and developing financial solutions that can mobilize financial resources for biodiversity conservation. BIOFIN is seen as important support for the ambitious CBD Strategic Plan for Biodiversity 2011-2020.

To cover the existing financial deficit, the experts of the BIOFIN project in Kazakhstan have developed a Plan for Mobilizing Financial Resources for Biodiversity Conservation, which includes the most promising financial solutions. As part of the Resource Mobilization Plan, experts recommend the implementation of the following financial solutions: increasing the capacity of specially protected natural areas to improve their financing, introducing carbon offsetting, improving financing for hunting farms, subsidizing game farming, supporting organic farming, tax incentives for the development of ecotourism, introducing compensations for the loss of biodiversity, attracting external investments for the conservation and sustainable management of forest resources.

Having studied the rich experience of managing US national parks, Kazakh Tourism NC JSC of the Ministry of Culture and Sports of the Republic of Kazakhstan is implementing a pilot project for the development of ecotourism in three national parks of Kazakhstan. In order to implement this project, on August 14, 2019, the chairman of the company signed bilateral agreements on a joint activities with the heads of the Charyn State National Natural Park RSE, the Ile-Alatau State National Natural Park RSE, as well as the Kolsay kolderi State National Natural Park RSE. Joint activities will be aimed at the development, implementation and promotion of innovative ideas, programs, projects and technologies aimed at developing high-quality tourism infrastructure, taking into account the interests of preserving the existing ecosystem. The development of ecological tourism in the National Parks is expected in the territories where tourists are allowed to stay. In the course of joint activities, international experts and organizations will be involved to implement best practices. Specific territories for attracting investments will be determined. Successful implementation of pilot projects will make it possible to apply this experience in all National Parks of the Republic of Kazakhstan. Thanks to the introduction of the new model, it is planned to increase the tourist flow from 1.3 mln. tourists per year up to 3.4 mln. tourists by 2025. These measures will create about 20 thousand new jobs and attract about 100 bln. tenge of investments in the next 5-7 years.

1.9. Formation of ecological culture of the population

Current situation and achievement of targets

One of the main principles defined by the Concept for the transition of the Republic of Kazakhstan to a "green economy" declares education and the formation of environmental culture in business and among the population. To implement this principle, the following necessary condition has been determined - the education of a new eco-culture on environmental protection among the general public, for which it is necessary to fully include topics related to environmental protection in the curricula of educational organizations¹¹¹. This will allow the younger generation to foster a culture of respect for natural resources and will bring additional benefits.

The holding of the international exhibition EXPO-2017 in June-August, 2017 in Nur-Sultan was of great importance in the formation of the ecological culture of the population. The exhibition presented the latest generation of energy efficient technologies, as well as the evidence base for how and why they should be used. EXPO-2017 focused on the idea of personal responsibility and personal participation of each in the creation and implementation of a sustainable plan for the production, distribution and use of the Energy of the Future. Expo-2017 hosted the World Congress of Engineers and Scientists WSEC-2017 "Energy of the Future: Innovative Scenarios and Methods for Their Implementation" and a large number of other events.

¹¹¹ Concept for the transition of the Republic of Kazakhstan to a "green economy", approved by the Decree of the President of the Republic of Kazakhstan dated May 30, 2013 No. 577

Environmental education in Kazakhstan is part of the general education system and is implemented in educational organizations through the curricula of the State Compulsory Standard of the Republic of Kazakhstan. Environmental education is aimed at fostering love, respect and care for the Motherland and the nature of the native land.

The study of the ecological component in general education schools is considered within the framework of the natural biological cycle and is carried out through the ecologization of the content of individual disciplines:

1) initial level (grades 1 - 4) - environmental aspects are included in the content of the subject "Knowledge of the world" (2 hours a week);

2) basic average and general average levels (grades 5-11) - environmental aspects are included in the content of the subjects "Biology", "Geography", "Chemistry".

More than 800 thousand children and adolescents participate in various programs of the tourist and local lore movement of students: "Atameken", "Bolashak", "Zhas Urap", "Shugyla" and others. Within the framework of the tourist and local lore expedition of schoolchildren "Menin Otanym - Kazakhstan", dozens of hiking, skiing, water, cycling and other trips, expeditions and excursions along a variety of routes are held annually, in which thousands of young tourists and their adult mentors participate.

Local history project teams and clubs operate in schools, tourist and local history expeditions and excursions are held, there are 1,670 school museums, including 856 historical museums, 290 military glory, 42 literary and artistic museums, 85 natural scientific (geographical, nature conservation, geological) museums, 155 ethnographic, 36 folk art, 60 memorial, 146 others. At present, more than 90 thousand children aged 7 to 17 are covered by local history tourism.

Currently, there are:

- 40 stations and centers for young tourists-local lore students with coverage of 22,935 schoolchildren;
- 2,581 environmental project teams with coverage of 58,169 schoolchildren;
- 2,179 tourist and local lore project teams with coverage of 46,923 schoolchildren;
- 2,581 tourist and local lore project teams in secondary schools, covering 58,169 children and adolescents.

Since 2017, the Republican forum of young local historians, ecologists and naturalists "Tabigatty ayala" has been held annually with the participation of the best local history teams of the country (more than 2,500 participants), the Republican meeting of tourist expeditionary teams "Menin Otanym - Kazakhstan", the Republican exhibition of local history decorative and applied art "The city of craftsmen: preserve and increase the heritage of our ancestors", etc.

An electronic club for young naturalists operates on the website www.ziyatker.org, and an Internet community for children has been created.

Educational magazines for children "Ecoalem" and "Temirkazyk" are published quarterly on the website www.ziyatker.org in electronic format (4 issues).

On February 23, 2018, an expanded meeting of the Republican Coordination Council of the heads of organizations that implement educational programs in the tourism and local history direction of additional education for children was held on the topic: "New opportunities for the development of youth tourism" within the framework of the "Rukhani Zhagyr" program. The event was attended by 115 people.

The issues of defining new approaches and organizational forms for the development of children and youth tourism in the regions on the basis of strengthening interdepartmental interaction, the prospects for the development of tourism and local lore activities in educational institutions, updating the content of educational programs in the tourist and local history direction of additional education for children in the context of the implementation of the program "Rukhani Zhagyr" were discussed.

During the meeting, memorandums of cooperation in the development of additional education for children, including tourism and local lore, were signed with National Company Kazakh Tourism JSC, Kazakhstan National Federation of UNESCO Clubs PA, Kazakhstan Association of Preschool Organizations PA.

According to the special project "Tugan zher" within the framework of the subprogram "Tarbie zhane bilim" in 2018, 1,619 events were held at the republican, regional and district levels, covering 3,162,316 people (99.2%). Students of all levels of education from preschool to universities are involved in the events.

There are about 900 Rukhani Zhangyru centers in the republic. In 2018, 59 small offices were opened in universities, 123 offices of the same name in colleges and 531 in schools.

The country's universities have held about 659 scientific and practical conferences, round tables and discussions on the program. More than 1000 articles and monographs have been published.

In 2019, the reader "Regional Studies" was introduced as an additional resource (over 490 thousand copies were purchased). This course is of great educational value for studying the history of the small homeland, strengthening the national code of the younger generation.

The material of the integrated course "Regional Studies" is studied within the framework of the academic subjects "History of Kazakhstan", "Kazakh literature" ("Kazakh language and literature" for schools with a non-Kazakh language of study), "Geography", "Music" in grades 5-7.

The volume of the study load of the course "Regional Studies" is 20 hours. In addition, "Regional Studies" is studied within the classroom hours, extracurricular activities, museum lessons.

The practice of conducting lessons on the basis of museums, cultural organizations and historical sites continues successfully.

All regions are provided with textbooks "Olketanu / Regional Studies".

In March 2019, the publishing house "Almatykitap Baspasy" developed a general reader "Regional Studies" for all regions, which passed all stages of quality assessment, corresponds to the curriculum of the "Regional Studies" discipline and is included in the List of textbooks and educational-methodical complexes, manuals and other additional literature, including on electronic media (order of the Ministry of Education and Science of the Republic of Kazakhstan dated May 17, 2019 No. 217).

According to the Ministry of Education and Science of the Republic of Kazakhstan, annually, the state educational order is formed on the basis of applications from sectors of the economy, as well as taking into account regional needs and is aimed at providing state and sectoral programs. Training of personnel for the "Green Economy" sphere is carried out within the framework of the groups of educational programs "B050 - Biological and Related Sciences", "B051 - Environment", "B062 - Electrical Engineering and Energy", "B162 - Heat Power Engineering" and "B081 - Land Management".

On July 4, 2018, the President of the Republic of Kazakhstan signed the Law "On Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan on the Expansion of Academic and Administrative Independence of Higher Education Institutions".

Within the framework of the Law, the academic and managerial independence of universities has been expanded, in particular, the main competencies of universities (24 powers).

The approved new Classifier of Personnel Training Directions (Order of the Minister of Education and Science of the Republic of Kazakhstan No. 569 dated October 13, 2018) will allow universities to develop new educational programs that meet the International Standard Classification of Education and are focused on learning outcomes.

According to the State Compulsory Standard of Higher Education (Order of the Minister of Education and Science of the Republic of Kazakhstan No. 604 dated October 31, 2018), the academic independence of universities in the development of bachelor's degree educational programs has been expanded to 85%. In this regard, universities develop and approve educational programs based on professional standards, taking into account the requirements of the labor market, employers' expectations, the interests of students and social demands of society. Personnel training in the specialties "Ecology" and "Life safety and environmental protection" is carried out on the basis of 51 universities of the republic.

Today, the educational programs at the bachelor's level include new disciplines that contribute to the formation of special skills and knowledge in the field of ecology: "Environmental aspects of natural science", "Environmental chemistry", "Environmental biogeography", "Ecology of animals and plants", "Environmental monitoring", "Geoecology" and others.

At the master's level, there are two educational programs: "Ecology" and "Integrated Water Resources Management". The "Ecology" direction is aimed at training specialists in the field of applied ecology and ensuring environmental safety.

In 2019, the branches of the Academy of Public Administration under the President of the Republic of Kazakhstan held a seminar for civil servants of Corps B on the topic "green economy".

KazNU named after Al-Farabi, together with foreign partner universities, developed and approved educational programs in the specialty 6M071700 "Heat power engineering" - "Green energy for industry", in the specialty 6M073500 "Food safety" - "Green biotechnology and food security".

For these educational programs, basic universities have created laboratories for "Green Energy for Industry", "Green Biotechnology and Cell Engineering". These laboratories are equipped with modern equipment, taking into account the best world standards.

According to the schedule of advanced training and retraining courses for civil servants of the Academy of Public Administration under the President of the Republic of Kazakhstan, from November 21 to 24, 2017, 25 civil servants underwent advanced training on the topic "Green Economy". These continuing education courses are planned on an annual basis.

Also KazNU named after Al-Farabi is the Central Asian Regional Hub for Sustainable Development under the UNESCO - UNITWIN program. In 2017 - 2019, the work of the UN Global Hub for Sustainable Development was successfully carried out, two UNESCO Chairs for Sustainable Development and Communication were opened. An important event was the creation of the Institute for Sustainable Development in KazNU jointly with the Earth Institute of Columbia University in the USA. One of the important results of this event was the initiative of KazNU to create a CONSORTIUM OF UNIVERSITIES, the main goal of which is the training and retraining of personnel for sustainable development. To discuss this project at the global level, a virtual communication platform was created at KazNU named after Al-Farabi "Green Bridge through Generations". The main goal of this program is to achieve the optimal level of consumption of energy and other natural resources by all countries by the middle of the 21st century. On the eve of EXPO-2017 at KazNU named after Al-Farabi launched the Green Technologies Center, which is MINI-EXPO for the implementation of innovative green energy projects using various energy technologies: wind, solar, hydro and geothermal, biogas and hydrogen energy.

The Information and Analytical Center for Environmental Protection RSE (IAC EP) of the Ministry of Energy regularly organizes three-day training seminars specifically devoted to environmental protection issues. About 25 training seminars are held annually throughout the country with training of more than 300 students. Seven thematic programs have been developed that address in detail the requirements of the Environmental Code, environmental regulation and SEE, state environmental control, greenhouse gas inventory, waste management, environmental safety in the oil and gas industry and environmental regulation. The training seminars at the IAC EP are mainly attended by employees of enterprises, environmental departments of the Committee for Environmental Regulation and Control and local executive authorities, as well as NGO participants.

To form a modern ecological worldview of students and to popularize the principles of "green economy" in the universities of Kazakhstan, various ecological clubs, sections and project teams are being created. The tasks of environmental clubs in universities are to increase environmental literacy and culture of students, develop environmental educational and research projects.

At Aktobe University named after S. Baishev, the ecological club "Ecogid Aktobe" works. Together with the teaching staff of the Department of Ecology, the club solves the following tasks: fosters students' love for nature, respect for the use of natural resources, involves them in environmental protection; generates interest in science, production activities in the field of environmental protection.

The main goal of the club is to include the city of Aktobe among the ecologically clean cities of the Republic of Kazakhstan.

On November 8, 2018, the International Youth Anti-Nuclear Online Forum "To the Youth of Peace Relays!" Was held at the Karaganda State Technical University with the participation of Olzhas Suleimenov, the poet, public figure, president of the international Nevada-Semipalatinsk anti-nuclear movement.

At the Kazakh National University named after Al-Farabi, the ecological project team "Zhas ecologist" works. The main purpose of the team is to familiarize students with the environmental problems of our time. The activities of the "Zhas ecologist" team are carried out on such topics as: "Study of the ecological situation of the city of Almaty and the Ile-Alatau National Park", "The current state of the Aral Sea and ways to improve it", "Environmental problems of the Caspian region and ways to solve them", etc.

A scientific student club "Environmental Law" was created at the Faculty of Law of the University to study modern scientific topics in the field of ecology and environmental protection.

At the International Humanitarian and Technical University (Shymkent) on the basis of the Department of Chemistry, Biology and Ecology, there is the "Young Ecologist" project team. The members of the team conduct various environmental actions: litter picks in the territory of the district, city, planting green spaces, etc.

At Narxoz University there is a student ecological club PINE and a Student Research Club, which were created with the aim of participating and solving the problems facing modern society - improving ecological culture through the education of an ecological personality.

In 2018, the Ministry of Education and Science of the Republic of Kazakhstan carried out work to determine the carbon footprint in the main leading universities in Kazakhstan. KazNU named after Al-Farabi is conducting research on the Indonesian Greenmetrics carbon footprint methodology. The calculation of the carbon footprint according to IU GREEN METRICS was prepared based on the calculation stage shown on the website <http://carbonfootprint.org> (the calculation is based on the total electricity consumption per year and the traffic load per year).

The Foundation for the Development of Socially Significant Initiatives in secondary schools of the republic held events with the demonstration of video clips, as well as organized events for environmental education, including the formation of skills among students in the separate collection of garbage.

Nazarbayev Intellectual Schools Autonomous Educational Organization in partnership with UNDP in Nur-Sultan held the International conference "Step into a "green" future". The conference was dedicated to the problems of ecology, in which more than 200 teachers of ecology, geography, biology of general education and Nazarbayev Intellectual schools took part. At this conference, the educational resource "Climate Box" was presented - a set of educational and game materials for schoolchildren on the topic "Climate Change". The sectional sessions discussed domestic and international experience of actively combating global warming through the use of green technologies in educational institutions of Kazakhstan. Within the framework of the conference, an exhibition of research and design works of students, winners of the competition for children's and youth environmental projects "Water in Aul" and regional competitions of the Nazarbayev Intellectual Schools was organized.

From September 1, 2018, eco-seminars with the demonstration of videos have begun in secondary education organizations. For this purpose, the Public Movement "Kazakhstan-2050" and "Samruk Kazyna" Trust have developed educational and methodological manuals for conducting "Green means thrifty" class hours for schoolchildren of grades 2-4 of secondary schools.

At the same time, the Education Departments of the regions and cities of Nur-Sultan, Almaty are working on the creation of student clubs on the "green economy" on the basis of colleges in order to generate new knowledge on the development of a green economy, increase the interest of young people in nature conservation, introduce innovative technologies in various spheres of the economy, etc.

The republican large-scale environmental campaign #Birge #TazaQazaqstan started in July 2019. Over 300 thousand Kazakhstanis all over the country took part. Collected over 250 thousand tons of garbage.

In October 2019, the Republican ecological hour was held. 6,166 schools took part with the participation of more than 2.6 mln. students. More than 60 thousand parents, 10 thousand members of the Board of Trustees, akims of all levels, heads of state bodies also took part. The event is timed to coincide with the World Day for the Conservation of Habitats, an international holiday designed to draw the attention of mankind to the problem of preserving the habitat of the fauna of the Earth. Eco-

hour is based on a dialogue with schoolchildren discussing issues of respect for nature, homeland, preservation of natural resources, conservation of flora and fauna, water resources, development of healthy eco-habits: eco-recreation, separate collection of solid household waste, proper nutrition and much more.

With the aim of attracting the attention of the younger generation to urgent environmental problems, popularizing conscious behavior and the formation of rational environmental management skills among children and young people, "My Planet", "Second Life of Waste", "Let's Save the Planet Together", "Waste to Income", "Magic Forest", "Globe of the World", "Ecoleader", "Know Your Land" competitions were held.

Also, within the framework of the Eco-hour, volunteer work, clean-up of natural areas from garbage, flash mobs were held on landscaping of the territories of educational organizations. On this day, more than 120 thousand trees were planted on the territory of schools.

Also, within the framework of almost all international projects implemented in Kazakhstan, there are components for training and informing the population, training materials and programs are being developed, various training seminars, round tables and conferences are held. For example, within the framework of the GEF-UNDP-Government of Kazakhstan project "Increasing the sustainability of the system of specially protected natural areas in desert ecosystems through the promotion of biodiversity-compatible livelihoods in and around specially protected natural area" (Desert Project), a number of educational materials and programs have been developed for use in the education system from the level of schools to universities. In particular, on the basis of two agro-technical national universities, a comprehensive master's program has been introduced with an annual training of 16 specialists in the specialty "SPNA management". For this, standard training modules were prepared and approved at the national level in 5 areas: research and monitoring; protection of natural objects; environmental education and ecotourism; SPNA management; management of financial and administrative resources.

In 3 project areas of the Desert Project (Ile-Balkhash, Aral-Syrdariya and Ustyurt) and in Nur-Sultan, on the basis of 4 pilot schools, a program of additional environmental education was introduced for grades 6, 7, 8, which is focused on obtaining additional knowledge about the biodiversity of the desert regions of Kazakhstan. A training manual for secondary school teachers in Kazakh and Russian languages has been developed and published. 128 teachers of natural sciences from 3 regions of the republic and the city of Nur-Sultan took part in a training seminar on the introduction of this training course in their schools.

Within the framework of the BIOFIN¹¹² project, in order to widely inform the public and stakeholders, a video film has been created in Russian and English, revealing the issues of financing biodiversity in Kazakhstan, and publication materials have been developed and issued. The results of the project were presented to the general public and stakeholders at the final workshop and more than 50 people received extensive information about the resource mobilization plan. Also, information about new economic mechanisms and mobilization of resources, problems of financing biodiversity are presented to the media in the framework of the "green cafe". Through this event, the knowledge and capacity of journalists in the sustainable use of ecosystems and biodiversity is increased.

Within the framework of the project "Economic Assessment Mechanisms for Improving Decision Making and Management of Commitments under Global Environmental Agreements"¹¹³, a training module with interactive applications on 8 (eight) methodologies for the economic assessment of ecosystem services in 2014-2017 was developed and adopted by two higher educational institutions for implementation since 2018 in the curriculum of undergraduate students of specialties in economics and environmental management. This module was developed based on the results of the economic assessment of ecosystem services of the Ile-Balkash nature reserve. The module was tested during the training course and more than 20 representatives of Kazakhstani universities and research institutes

¹¹² Report on the progress of the project "Creation of transformational policies and financial mechanisms to increase investment in biodiversity management (BIOFIN)". UNDP in Kazakhstan. 2017.

¹¹³ Final Report on the Implementation of the Project "Economic Assessment Mechanisms to Improve Decision Making and Manage Compliance with Commitments under Global Environmental Agreements" (CB2). UNDP in Kazakhstan. 2017.

received new knowledge on methods for assessing ecosystem services. The results of the project are presented to the media in the framework of the "green cafe" and the problems of economic assessment of biological resources in decision-making are highlighted. Through this event, the knowledge and capacity of journalists in the sustainable use of ecosystems and biodiversity has been increased. In general, during the period of the project, more than 700 representatives of research organizations, government bodies and the private sector received new knowledge and increased their potential through seminars and training on the economic assessment of ecosystem services.

Since 2017, a transition to a new media planning system has been carried out, which ensures full correlation of the activities of all government agencies in the information, image and media space. For this purpose, on the basis of proposals from all central state bodies, the Unified Republican Media Plan "Kuatty Kazakhstan" for 2017 was formed, including the main directions of media work. This Plan was approved at the Government meeting on February 21, 2017.

Within the framework of the state information strategy, Media plan, value map, outreach activities work is carried out through information messages in the country's leading media and social networks through interviews, press tours, TV programs on the country's leading TV channels.

In general, in 2017, the media published a total of 5,593 materials on the "green economy", including: 2,930 items were broadcast on republican and regional TV channels, 972 items were published in the republican print media, and 1,022 items were published in regional media, 669 publications were posted on Internet resources.

In particular, on the transition to a "green economy" in the republican TV channels "Khabar", "Khabar24", "Qazaqstan" organized news releases and stories "Zhasyl Economy", "Green Economy", "Essentially", "Negizinde", "Technology of the future", "Arnays zhoba", "Basty takyryp", "EXPO life" and others.

Also, on the air of the regional TV channels "Kazakhstan-Kokshetau", "Kazakhstan-Oral", "Kazakhstan-Taraz", "Kazakhstan-Atyrau", "Kazakhstan-Oskemen" appeared in news stories and programs "Ozekti angime", "Kuatty shygys", "Aleumet", "Economic press digest", "Direct connection", "Honestly speaking", "Modernization of Kazakhstan".

The republican newspapers "Liter", "Egemen Kazakhstan", "Kazakhstanskaya Pravda", "Aikyn", "Komsomolskaya Pravda Kazakhstan" on the transition to the "green economy" published the following materials: "Tezektin kyzyuyn pellettin zhyluy almastyra ma?", "Commitment Kazakhstanis to a "green" economy", "New energy for sharp thoughts", "Zhihandy zhailagan zhasyl tehnologiya", "In search of clean energy", etc.

This topic is published in the regional newspapers "Znamya Truda", "Ontustik Kazakstan", "Didar", "Arka akshamy", "Ak zhaiyk", "Akmeshit aptalygy", "Almaty akshamy", "Vecherniy Almaty", etc.

In addition, materials on the transition to a "green economy" have been published in the Internet resources baq.kz, informburo.kz, inform.kz, bnews.kz, tengrinews.kz.

It is very important to constantly increase the information flow on biodiversity conservation. In most of the specially protected natural areas, nature museums have been created, school forestries operate in state forestry and environmental institutions, which organize and conduct annual environmental actions: "March of Parks", "Zhasyl Zhapyrak", "All-Kazakhstan Day of Planting Trees", "Earth Day", "Plant own tree", "Green Kazakhstan" and others. Dozens of films have been made on biodiversity conservation issues and are shown on television screens.

Also, within the framework of almost all international projects implemented in Kazakhstan, there are components for training and informing the population, various training seminars, round tables and conferences are held.

International experience

The UN 2030 Agenda calls for the provision of quality, inclusive and equitable education at all levels: preschool, primary, secondary, high and technical education, as well as vocational training. All people, regardless of gender, age, race or ethnicity, as well as persons with disabilities, migrants, indigenous peoples, children and young people, especially those in vulnerable situations, should be able to learn throughout their lives. These obligations fully apply to environmental education.

Therefore, SDG 4.7 calls for by 2030 to ensure that all students acquire the knowledge and skills necessary to promote sustainable development, including through education on sustainable development and sustainable lifestyles, human rights, gender equality, promoting a culture of peace and non-violence, citizenship peace and awareness of the value of cultural diversity and the contribution of culture to sustainable development.

From 11 to 15 of March 2019, in Nairobi (Kenya), the fourth session of the UN Environment Assembly was held. The UN Background report - Environment for the Assembly, prepared by UNEP, provides a framework for identifying problems and identifying new areas for action, and provides a compelling case for urgent action. The report is titled “Innovative Solutions to Environmental Challenges and Sustainable Consumption and Production” and looks at innovation as a culture that encourages resourcefulness to address environmental challenges¹¹⁴.

A number of conditions are required to stimulate and strengthen an innovation culture. They include leadership and management tools that encourage innovation and cyclicity while fostering openness and collaboration; education and continuous capacity building to facilitate the transition to a knowledge society; and the commitment of finance and technology to sustainable development.

Addressing environmental challenges is addressed in this report through innovative approaches in three main areas: (a) environmental challenges associated with poverty and natural resource management, including sustainable food systems, food security and halting biodiversity loss; (b) life-cycle approaches to resource, energy and chemical management and waste management; and (c) innovative sustainable business development during a period of rapid technological change.

“Innovation” is viewed in the report in the broadest sense of the word, not only as a technology, but rather as a mindset or a supportive culture accessible to all countries and organizations, which includes streamlining and simplifying processes, and removing barriers to acting in as a stimulator of innovation - “do different things and do things differently”.

An ever-growing skill gap for a dynamic, resource-efficient economy was identified as one of the main challenges to innovation. Effective education and training are essential preconditions for driving innovation, attracting investment flows and accelerating technological progress.

Investing widely in environmental education for sustainable development, with a focus on gender, can foster a generation that innovates and adapts more quickly to innovations that address global environmental challenges. Educational institutions can lead by example by prioritizing educational methods that develop competencies that foster innovation and innovation management, including creative thinking, design skills, organizational change management, and the ability to work in teams to solve problems. Equally important, integrating topics such as environmental, sustainable chemistry and sustainable business models into existing curricula will help shape a new generation of scientists and entrepreneurs who can advance the implementation of the 2030 Agenda.

In terms of financing environmental solutions, there is a need for widespread adoption of smart, “money-saving” innovations that can have a significant positive impact on the environment with very limited investment. This is especially important for poor and developing countries.

An example for developing countries in the field of environmental education can be the Bologna educational process in European states, the goal of which was to create an economically strong, competitive Europe and overcome a number of serious environmental, social, economic and demographic problems characteristic of modern Europe.

Back in 1988, at the conference of rectors of European universities in Bologna, the Universal Charter of Universities (Magna Charta Universitatum) was adopted, in which universities were named centers of culture, and for the first time the task of creating an academic European space was outlined. This question arose in connection with the real threat of the expansion of US educational services in Europe, as a reaction to the defense of the proper European cultural educational space. Thus, the Bologna Declaration became the result of the preparatory stage of the formation of the basic principles of the organization of the European ecological educational space. In June 1999, in Bologna, the Ministers of Education of 29 European countries signed the "Declaration on a European Area for

114 Innovative solutions for environmental challenges and sustainable consumption and production. United Nations Environment Assembly of the United Nations Environment Programme Fourth session Nairobi, 11–15 March 2019

Higher Education". The Declaration has become a key document of a new stage in the harmonization of national systems in the process of creating an all-European space for higher environmental education.

The "European dimension in environmental education" is focused on the upbringing of a person with a clear civic position and a professional environmental component, a person of the "European type" - professing tolerance, pluralism, appreciating the cultural heritage of the community, a participant in the European integration process and preserving the environment. The adoption of uniform all-European standards made it possible to expand the migration flows of students, young specialists in environmental specialties and contributed to the preservation of the environment of the European continent.

In Kazakhstan, joining the Bologna process began in 2007, when the Law of the Republic of Kazakhstan "On Education" provided for a three-stage model of training specialists: bachelor's-master's-doctor PhD, and a credit technology of education was introduced.

The problem of harmonizing the relationship between man and nature has emerged as the cornerstone of numerous pedagogical concepts of the past. The modern practice of educational research also pays special attention to the problem of the development of environmental education abroad.

Environmental education in the United States has two levels: environmental and conservational. They are closely related to each other and complement each other. The environmental level covers issues of natural dynamic balance, organization of the biosphere, heredity, adaptation, changes in nature. And at the conservational level, the issues of rational nature management, nature protection are touched upon. Skills and abilities are an integral part of the educational content. They are divided into individual and search ones. The former contribute to the effective understanding of environmental knowledge, the latter are aimed at mastering pupils and students by methods of independent creative scientific research.

Environmental education in Japan spans elementary, middle and high school. Educational programs are compiled according to the "kaleidoscope" method. There are seven main elements in them. Among them, the main ones are:

- a) the study of nature;
- b) the study of cities and villages;
- c) the formation of a person's attitude to nature, life, values and morality based on the knowledge gained after mastering the elements "a" and "b".

An important role in the development of environmental education in Kazakhstan was played by the UNDP project on the climate box. The Climate box includes a set of educational materials for students. It is used in 8 countries in Eastern Europe and Central Asia. In Kazakhstan, the #climate box appeared in 2016 and has since been taught in 50 schools, covering 13.5 thousand students and 800 teachers. It has become a catalyst for the eco-movement throughout the country - republican and international conferences are organized, master classes and round tables on environmental topics are held. But most importantly, the Climate box has contributed to the development of continuous #environmental education in Kazakhstan, which will become part of the country's educational system.

Environmental education in Kazakhstan is well integrated with the system of preschool and general secondary education. The introduction of the updated curriculum allowed Kazakhstan to take an effective path towards achieving SDG targets 4.7 and 12.8 regarding the integration of sustainability report into national education policies and into the curricula of preschool, primary and secondary education of students. Integration of sustainability report into the system of vocational and higher education, as well as professional development of teachers, remains ineffective. Therefore, the EPR makes a recommendation to include the subject "Environment and Sustainable Development" in the list of compulsory disciplines for senior secondary schools, vocational and higher education institutions. The most difficult challenge for specialties related to nature conservation is to ensure that the specialization and the number of graduates continue to match the needs of the labor market. In particular, an important task is to provide training in the specialties necessary for the country's

transition to a green economy. There is a need to assess the needs of the labor market on an ongoing basis and to adapt and diversify accordingly the professions related to environmental protection¹¹⁵.

Problems of achieving the SDGs

Environmental culture and environmental education is directly related to SDG 4 (Table 1.9.1).

In 2017, 49.3% of schools in Kazakhstan used decentralized sewerage systems and 9.7% had decentralized water supply. Of all schools, 86% provided hot meals for students, and 9.7% used imported drinking water for cooking. Schools regularly monitor the condition of lighting, furniture and the quality of food. However, the results of the SEARCH II study (2011-2012) indicate high levels of air pollution from chemical pollutants in the schools covered by the survey¹¹⁶.

To achieve the objectives of the 4th Global Sustainable Development Goal (SDG), the UN recommends to purposefully increase funding for education and allocate at least 4-6% of GDP for its needs. In Kazakhstan, since 1991, this indicator has averaged 3.8% of GDP annually. However, if the share of GDP expenditures on secondary education in Kazakhstan is comparable to OECD countries (2.1% and 2.2%, respectively), then the share of expenditures on preschool, technical and vocational education and higher education is three times lower than in OECD countries.

The Ministry of Health, together with the Ministry of Education and Science, should take measures to improve the indoor environment, in particular in schools, kindergartens and other public buildings for children, by:

(a) Developing legislation defining the roles and responsibilities of public authorities in creating a child-friendly and healthy indoor environment in places where children live, learn and play, as well as requirements for organizational, technical and other measures to reduce risks for health and the creation of a healthy indoor environment;

(b) Establishing a national indoor environmental monitoring system for public buildings for children and preparing an updated risk assessment of indoor exposure to indoor pollutants on children's health¹¹⁷.

Also in Kazakhstan, indicators 4.7.1 are not monitored to achieve Target 4.7.

Table 1.9.1. Problems of achieving the SDGs related to the issues of ecological culture of the population

Goals and targets of the SDGs	International indicators	Indicator in Kazakhstan	Problems in achievement	The need to introduce indicators
SDG 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all				
Target 4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development	4.7.1 Extent to which (i) global citizenship education and (ii) education for sustainable development, including gender equality and human rights, are mainstreamed at all levels in: (a) national education policies, (b) curricula, (c) teacher education and (d) student assessment	Share of university students involved in socially useful activities Indicators corresponding to international	Monitoring required	Indicators corresponding to international

¹¹⁵ Third Environmental Performance Review of Kazakhstan. UNECE. 2018

¹¹⁶ Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

¹¹⁷ Third Environmental Performance Review of Kazakhstan. UNECE. 2018.

Plans for the future

For 10 years, Kazakhstan has been in the top 8 countries in the world according to the UNESCO Education Development Index due to its high rates of coverage by primary education, adult literacy, the proportion of students reaching grade 5 and gender equality. However, only 47% of the analyzed 78 national curricula mention the term “environmental education”.

OECD experts note that the education of Kazakhstan needs to improve the work on training highly qualified specialists. They propose to go beyond formal education, improve the level of management and strengthen the formation of professional skills, taking into account the development of small and medium-sized businesses. All of the above applies accordingly to environmental education.

At present, the issue of streamlining the list of available sources and defining ways to search for information from individual sources, approaches to the subsequent processing of information, ways to ensure accessibility and identify problems resulting from the unavailability of information has not been resolved. A very important aspect is to identify the risks associated with the reliability of individual sources. A necessary step in this is the creation of an effective mechanism - the Interdepartmental Information and Analytical Center.

To be able to use the available information, it is necessary to develop a special system that would accumulate and process information to make strategic decisions. An important point in building an information support system for making strategic decisions is the analysis of modern management accounting tools in the context of obtaining information for formulating and implementing a strategy.

In 2011, the Ministry of Science and Education of the Republic of Kazakhstan and the World Bank launched a pilot project “Technology Commercialization” to demonstrate the increased efficiency and commercial value of scientific research carried out by interagency teams of scientists selected on a transparent competitive basis. The next phase of the project (2014-2020) with a budget of 110 mln. US dollars is focused on providing grants for groups of junior researchers, creating public-private multilateral consortia, consolidating the technology commercialization cycle, strengthening the coordination of the national innovation system and creating a team on project execution to implement monitoring, evaluation, awareness raising and capacity development activities. Water resources, in particular water treatment, are among the areas of research.

One of the effective mechanisms for the conservation of biodiversity is the development of a system of information and scientific support, an increase in the level of education of representatives of state bodies and the public in the field of conservation and sustainable use of biological resources, and ensuring public participation in solving issues in this area. To achieve these criteria, first of all, a full-scale information campaign is needed, the purpose of which should be to inform everyone, without exception, from a common man in the street to representatives of government agencies, about the conservation of ecosystems and the sustainable use of biological resources. An important role is given to the relevance of information, its reliability.

The current situation is characterized by: a wide variety of social, religious, national characteristics in different population groups; predominance of consumerism towards nature, orientation towards the use of natural resources, low level of biological literacy and lack of understanding of the importance of biodiversity conservation; rapid changes in public opinion in the context of social and economic reforms.

A new medium-term strategic document is the Strategic Development Plan of the Republic of Kazakhstan until 2025, which contains the Target "Ensuring the economic independence of the regions"¹¹⁸, the solution of which can contribute to Aichi Target 18. Within the framework of this target, Initiative 5.4 "Further strengthening of local self-government bodies" is envisaged. In cities of district significance, villages, townships and rural districts with a population of over 2 thousand people, an independent budget and communal property of local self-government will be introduced. From 2020, these norms will apply in all localities. This will involve the population in solving local issues. The issue of creating a representative body of local self-government at the level of cities of district significance, villages, townships and rural districts will be worked out, which will allow the

¹¹⁸ Strategic development plan of the Republic of Kazakhstan until 2025, approved by the Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636

local community to participate in approving the budget. The issue of further increasing the revenue sources of local government budgets will also be considered. Measures will be implemented to improve the competence of maslikhats in terms of the budget process.

Within the framework of Reform 6. Modernization of public consciousness, Initiative 6.3 "Development of "ecological" culture among the population" is envisaged. Outreach activities will be carried out aimed at the rational use of natural resources for both personal and industrial consumption.

Within the framework of the "Preservation of national identity" priority, the importance of preserving national traditions and customs, language, music and literature is indicated, and provides for Initiative 6.10 "Organization of the "Sacred Geography of Kazakhstan" project, internal and external cultural and tourist routes in sacred places will be launched, and their wide popularization in the country and in the world will be ensured, and Initiative 6.11 "Organization of local history work and support of social initiatives" will be provided. Within the framework of this initiative, local history work will be organized in the field of education, ecology and improvement, the study of regional history, the restoration of cultural and historical monuments and cultural sites of local importance. Also, assistance will be provided to social initiatives put forward on behalf of businessmen, officials, representatives of the intellectuals and youth to support their small homeland.

In 2020, the Ministry of Education and Science and the United Nations Development Program (UNDP) in Kazakhstan launched a project to develop environmental education. The goal of the project is to support the measures taken by the government to form an active life position of citizens and the ecological culture of society, supported by the principles of sustainable development. The main result of the project will be the training of more than 6 thousand teachers and the development of teaching aids in the field of environmental protection, nature management and ecological and economic security¹¹⁹.

Within the framework of the project, 17 educational organizations of different levels will be equipped with green and resource-saving technologies; methodological materials on ecological culture will be prepared for the organization of preschool education; pupils of grades 1-4 on the subject "Knowledge of the World" will be able to use thematic board games and interactive video lessons.

The joint initiative will begin with the creation of a comprehensive model of continuous environmental education for sustainable development, which will become an integral part of the state education system at all levels.

The project is aimed at the formation of environmental responsibility in society, necessary for the rational use of natural resources, for the full and sustainable development of the state and the global world through improving legislation and creating a legal framework for the inclusion of environmental education in the educational system of Kazakhstan. Environmental education will include critical aspects of the global sustainable development agenda such as climate change, biodiversity conservation, sustainable consumption and production. In the implementation of the project (2020 - 2024), assistance will be provided by the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan, the International Center for Green Technologies and Investment Projects.

In July 2020, the President of Kazakhstan, Kassym-Jomart Tokayev, expressed his indignation at the lack of culture of Kazakhstanis in places of outdoor recreation: "The general lack of culture of citizens in places of outdoor recreation continues. Virtually irreversible damage caused by our compatriots to the unique "pink" lake Kobeituz caused just indignation. These negative facts again exposed the problem of environmental education of the younger generation. The ministries of education, ecology, information should consider this task as a priority," Tokayev wrote on Twitter (Source: www.kt.kz). Earlier, the head of state proposed to introduce the subject of environmental education of children in schools of the country: "We need to introduce a subject in schools - environmental education of children," Tokayev said during an extended government meeting on July 9, 2020.

119 <https://www.kz.undp.org/content/kazakhstan/ru/home/presscenter/announcements/2020/june/undp-and-the-ministry-of-education-and-science-of-kazakhstan-lau.html?fbclid=IwAR1DtmuNCVCXGc7Cd8tV8xaVBYQsxkbr9BR5VdV9gUzohLmiIMKRdPk4FAQ>

1.10. Green Economy Transition Council

Meetings of the Council for the transition to a "green" economy under the President of the Republic of Kazakhstan (hereinafter-Council) are held annually twice a year.

In 2017, 2 meetings of the Council were held.

On June 2, 2017, the sixth meeting of the Council was held, where the reports of the Vice Minister of Agriculture Nysanbayev E.N., akim of the South Kazakhstan region Tuimebayev Zh.K. were heard on the execution of the Action Plan for the implementation of the Concept for the transition of the Republic of Kazakhstan to a "green economy" for 2013 - 2020 in the sections: "Waste Management", "Water Resources Management".

On October 19, 2017, the seventh meeting of the Council was held, where the reports of the Minister of Energy Bozumbayev K.A. on the implementation of the Action Plan of the Concept for the transition of the Republic of Kazakhstan to a "green economy" for 2013 - 2020, Akim of the Atyrau region Nogaev N.A., Akim of Almaty city Baibek B.K., Akim of the East Kazakhstan region Akhmetov D.K., Akim of Almaty region Batalov A.G, Akim of Karaganda region Koshanov E.Zh., Akim of Kostanay region Mukhambetov A.B., in the section "Solid household waste management" were heard.

By the Decree of the President of the Republic of Kazakhstan dated October 20, 2017 No. 568 "On amendments and additions to some acts of the President of the Republic of Kazakhstan and invalidation of some acts of the President of the Republic of Kazakhstan", the composition of the Council was supplemented by two participants: the Minister of Health of the Republic of Kazakhstan and the Director of the United Nations Environment Program in Central Asia.

On May 14, 2018, the eighth meeting of the Council took place. The reports of the Vice-Minister of Agriculture, akims of the East Kazakhstan and Kyzylorda regions on the results of the implementation of the Action Plan of the Concept for the transition of the Republic of Kazakhstan to a "green economy" for 2013 - 2020, a speech by the Chairman of the Presidium of the Association of Environmental Organizations of Kazakhstan, as well as consideration of the National Report on the transition to a "green economy" were considered.

The ninth meeting of the Council took place on December 20, 2018. The report of the Minister of Energy on the section "Reducing air pollution" was heard. Representatives of the Kazakhstan Association for Waste Management "Kaz Waste", the Scientific and Educational Center "Green Academy", UNEP, Atameken National Chamber of Entrepreneurs also spoke.

On December 18, 2019, the 11th meeting of the Council was held under the chairmanship of the Prime Minister of the Republic of Kazakhstan Askar Mamin. Energy Minister Nurlan Nogayev reported on the progress in implementing the action plan for the concept of Kazakhstan's transition to a "green economy" for 2013-2020. Akim of Nur-Sultan Altai Kulginov and Deputy Akim of Almaty Mukhit Azirbayev also reported on measures to improve the environmental situation and develop the "green economy" in the regions.

The development of renewable energy sources was also discussed, 84 renewable energy facilities with an installed capacity of 938.8 megawatts operate in the country. The volume of electricity generated by renewable energy sources for 10 months in 2019 amounted to 1.7 bln. kilowatts per hour, with an increase of 65 percent compared to the same period in 2018. In 2020, the number of renewable energy facilities is planned to be increased up to 108 (1,610 megawatts), in 2021 - to 119 (2,096 megawatts).

The progress of the construction of the Saryarka gas pipeline for gas supply to the capital, northern and central regions of the republic was considered separately. It is noted that this is one of the five social initiatives of the First President.

1.11. International cooperation on the "green economy"

The holding of the international exhibition EXPO-2017 in Kazakhstan was of great importance in the formation of international environmental culture and education. Never before has an international exhibition of such a scale been held in the Central Asian region and the CIS.

EXPO-2017 is an international specialized exhibition under the auspices of the International Bureau of Exhibitions (IBE), which took place in the capital of Kazakhstan, Nur-Sultan, from June 10 to September 10, 2017. During this time, the exhibition was attended by about 4 mln. people. It was visited by high-ranking officials from 40 states, and dozens of companies presented their products. In total, 115 countries and 22 international organizations took part in the exhibition¹²⁰.

The topic "Future Energy" chosen by Kazakhstan is in line with the global trend on the need for a gradual transition to renewable energy sources. The Future Energy project is based on the ideology of sustainable development, which is understood as a process aimed at meeting economic and social needs while preserving cultural diversity and a clean environment. Energy of the Future also implies raising awareness of energy as one of the basic values of humankind, assuming a responsible and efficient approach.

EXPO-2017 focused on the idea of personal responsibility and personal participation of each in the creation and implementation of a sustainable plan for the production, distribution and use of the Future Energy. Within the framework of EXPO-2017, the World Congress of Engineers and Scientists WSEC-2017 "Energy of the Future: Innovative Scenarios and Methods for Their Implementation" and a large number of other events were held.

In order to further implement the Green Bridge Partnership Program (GBPP), the Action Plan (Roadmap) for the further promotion of the GBPP for the period 2018 - 2020, approved by the First Deputy Prime Minister of the Republic of Kazakhstan, Mamin A.U. is being implemented.

At the end of 2018, 16 countries (Kazakhstan, Russia, Kyrgyzstan, Georgia, Germany, Mongolia, Belarus, Montenegro, the Republic of Latvia, Albania, Finland, Hungary, Bulgaria, Sweden, Spain, Poland) and 16 non-governmental organizations are participants in the Charter for the Green Bridge Partnership Program.

In order to promote the GBPP, 5 major international conferences "Green Bridge" were held. In particular, on July 12 - 13, 2017, the Fifth International Forum "Green Bridge Partnership Program" was held on the territory of the EXPO-2017 International Exhibition. Within the framework of the Forum, issues of low-carbon technologies and policies in the implementation of the Paris Climate Agreement and mobilization of green finance were discussed. Memorandums of cooperation in the field of green technologies were signed with the Austrian Institute of Technology and the Finnish company Kauko International Group.

Also developed and signed a Memorandum of Understanding between the Ministry of Energy and UNESCAP on the joint implementation of sustainable development priorities within the framework of the GBPP.

As part of the development of the green finance system at the AIFC site, in 2017, the Concept for the implementation and development of instruments and principles of green finance, as well as the AIFC Regional Leadership Strategy in the field of green finance, were adopted. The AIFC Green Finance Council was established, which includes the AIFC Governor, representatives of the EBRD, the Climate Bonds Initiative and the Research Center for Green Finance Development of Tsinghua University.

Also in February 2018, the AIFC Stock Exchange adopted the Rules for the Issue and Circulation of Green Bonds, developed on the basis of the Green Bonds Principles of the International Capital Market Association and the provisions of the Climate Bonds Initiative international organization. In April 2019, the AIFC Stock Exchange became a signatory of the Green Investment Principles under the Belt and Road program.

In June 2018, the AIFC Green Finance Center was established, which is currently negotiating with potential issuers for the issue of the first green bonds in Kazakhstan. Also, the Center conducts seminars and trainings for market participants on an ongoing basis. So, on May 21 - 22, 2019, a two-day Climate Bonds Initiative training was held on issuing green bonds for financial market

120 https://www.inform.kz/ru/itogi-ekspo-2017-predstavili-v-mezhdunarodnom-byuro-vystavok_a3072543

participants. The purpose of these events is to prepare a community of professionals who are already operating or intend to become active participants in the green bond market.

On April 1, 2019, at the AIFC site, a seminar was held on the development of a taxonomy of green finance for the Republic of Kazakhstan with the participation of a member of the AIFC Green Finance Council, Dr. Ma Jun, who is a developer of the green finance system in China, a special advisor to the Governor of the People's Bank, as well as the Chairman of Green Finance Committee of China. Green taxonomies for China and Mongolia have been developed with his participation.

Green taxonomy is the basis for the development of green finance, representing a harmonized system for classifying economic activities and projects that meet technical selection criteria.

Detailed classification, taking into account local specifics, should become a common and understandable language for all participants in the financial system, in particular, investors and lenders when determining the content and degree of “greenness” of projects, as well as the financial regulator - to monitor and stimulate green financial flows.

1.12. Proposals for adjusting the setting parameters of the Concept of the transition of the Republic of Kazakhstan to a «green economy»

Since 2012, there has been a tendency in Kazakhstan to reduce the number of strategic documents, which negatively affected strategic planning in the field of environmental protection and the use of natural resources.

The green economy transition concept does not cover many environmental issues (e.g. environmental regulation, biodiversity, ecosystems, forests). Some of the advanced concepts of environmental legislation (for example, integrated permitting, environmental auditing, or environmental insurance) introduced into Kazakh legislation ten years ago are not yet functioning properly. The Concept did not set a goal and is not capable of replacing a full-fledged strategic document on environmental protection. In addition, targeted government funding is not allocated for the implementation of the Concept and its Action Plan.

The Green Economy should also be one of the leading directions for solving environmental problems, but not sufficient. The modern approaches of the Green Economy show that economic measures are more effective than traditional environmental regulation. The effect of their implementation is obtained not only for the environment, but also for the economy and for the social sphere. Unfortunately, the Concept of Transition to a Green Economy does not provide for such economic measures.

As a result, the analysis of the international situation shows a significant lag of Kazakhstan from the trends of transition to a "green economy", not only developed, but also developing countries. This is especially true for the development of renewable energy sources and energy conservation, which leads to a significant reduction in greenhouse gas emissions. Kazakhstan significantly lags behind in terms of development of organic agriculture, aquaculture and water conservation, processing of production and consumption waste, development of a network of specially protected natural areas and afforestation.

According to the World Bank, while Kazakhstan recognizes the need for a transition to a green economy and sustainable growth, promoting the implementation of projects **in the field of renewable energy sources and energy-saving technologies, currently implemented measures are not enough** to achieve the set goals. The authorities have initiated a number of reforms and large-scale projects in the field of the environment, but the overall institutional environment remains insufficiently favorable for the large-scale introduction of green technologies¹²¹. Special attention and resources need to be devoted to expanding institutional capacity and improving governance. Subsidies and other incentive instruments may need to be revised to cover more investors and projects, and to provide a more automated institutional framework for new green projects. The government **needs to improve the reliability and efficiency of existing financing mechanisms and adjust incentives for investors** in order to begin a broad-based transition to

121 The World Bank. Green Economy: Realities and Prospects in Kazakhstan. 2018.

sustainable growth. This can be achieved through a comprehensive reform of national economic, budgetary, tax, investment and environmental programs and specific instruments to support business and green initiatives in Kazakhstan.

In 2016, Kazakhstan acceded to the OECD Declaration on Green Growth and the Declaration on Reducing Lead Risks, according to which signatory countries declare their efforts to implement green growth strategies, promote green investments and sustainable natural resource management; and domestic policy reform to eliminate environmentally harmful measures such as fossil fuel subsidies. The country seeks to actively participate in the work of the OECD Committee on Environmental Policy and its subsidiary bodies, to exchange best practices. Kazakhstan needs to use the OECD guidelines to strengthen its own green growth policy.

Also, the regulatory framework for public procurement in Kazakhstan does not provide sustainability criteria for goods and services procured in specific sectors such as buildings, roads and infrastructure, vehicles, agricultural waste and irrigation systems. There are no technical specifications or provisions for environmental or green procurement as such; in addition, there is no link with the Concept for the transition to a green economy. Awareness raising and capacity development work is currently insufficient for the practical implementation of the electronic public procurement system in Kazakhstan.

Kazakhstan could use the **Sustainable Public Procurement Principles** developed in 2015 under the Sustainable Public Procurement Program under the Ten-Year Program Framework (SPP 10PF) and the OECD 2014 Sustainable Procurement Good Practice as useful guidelines for integrating environmental considerations into public procurement in a transparent and cost effective manner¹²².

To facilitate trade in environmental goods and services (for example, to combat air pollution, protect natural resources), Kazakhstan should:

- support the inclusion of specific environmental provisions in all regional trade agreements in the context of WTO accession and, together with the competent authorities of the Eurasian Economic Union;

- develop ambitious and consistent environmental standards, including voluntary ones, for behavioral change (of companies);

- encourage trade in environmental goods and services in all regional trade agreements.

To introduce green jobs, Kazakhstan should:

- formulate a definition of “green” jobs for Kazakhstan and identify the necessary competencies to create “green” jobs in the country using the ILO definition;

- gradually introduce the aspects of green jobs in the field of vocational education, higher education and training in the context of, for example, the State Program "Digital Kazakhstan". Examples include occupational standards, educational standards and training programs, as well as qualifications assessment and certification.

Accordingly, SDG indicators 12, 17, 8, 15 should appear among the setting parameters of the Concept for the transition to a green economy to address the following tasks:

- Target 12.7: Promote public procurement practices that are sustainable, in accordance with national policies and priorities

- Target 12.c Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities;

- Target 17.10: Promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system under the World Trade Organization, including through the conclusion of negotiations under its Doha Development Agenda;

122 Third Environmental Performance Review of Kazakhstan. UNECE. 2018

- Target 8.3: Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services

- Target 15.a: Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems.

In general, the Concept of Kazakhstan **must clearly link the transition to a green economy with sustainable development and its new goals (SDGs) until 2030**, adopted by the UN in 2015. At the same time, it is necessary to take into account the mandatory complexity of planning and implementing the SDGs, since achieving one goal contributes to the achievement of other goals and vice versa, underestimation of any direction of development can negatively affect all other aspects. This is indicated by a number of international experts. For example, SDG 1 (poverty reduction) cannot be achieved without addressing the following targets: food security (SDG 2), macroeconomic policies for achieving full and productive employment and decent work for all (SDG 8), reducing inequality (SDG 10) and combating climate change and its impacts (SDG 13). Achieving these goals also contributes to ensuring healthy lifestyles and well-being for all at all ages (SDG 3). At the same time, there are negative linkages: expanding agricultural land to eliminate hunger (SDG 2) can lead to the loss of ecosystems (SDG 15), pollution of water resources (SDG 6), which in turn threatens food security¹²³.

Along with the implementation of the Sustainable Development Goals in the Concept, it is **necessary to clarify the general terminology of the “green economy”**. Such a need has become urgent in connection with the development of a new edition of the Environmental Code, which proposes to introduce new legal concepts such as “green” technologies, “green” projects, “green financing” for the purpose of economic stimulation of activities aimed at environmental protection. That is, these concepts are being introduced already for specific legal actions to support various aspects of the “green economy”.

Due to the lack of clear definitions, the transfer of the latest green technologies is still an intractable problem of overcoming the global inequality of developed, developing and poor countries, including for Kazakhstan.

It is not enough just to know about green technology or to draw up a register of such technologies, it is necessary that they come to the country. The initiative of the First President - Elbasy “Green Bridge” is dedicated to this problem.

Once at the beginning of independence, the Republic of Kazakhstan provided significant benefits and preferences for any investment in our growing economy. The result is the current economic condition of our Republic. Now is the time to provide similar benefits and preferences for green investments, which will have a triple effect: in the economy, in the environment and in the social sphere.

Likewise, all over the world, advanced countries are required to present their latest green technologies free of charge on a turnkey basis. In turn, developing countries must provide an enabling environment for green investment. All partner countries provide free markets for “green goods” produced by “green technologies”. This is a brief vision of the Green Bridge Partnership Program, which should help overcome perhaps the most important problem of modern society development - the ever-growing antagonism not only between states, but also between different sectors of civil society within one state, even between government bodies, between generations and individual personalities (“all against all”). Therefore, one of the main principles of the Green Economy should be the principle of partnership (**“The Green Bridge is being built for everyone”**).

But for this it is necessary to define clear criteria for green technologies and investments and economic mechanisms and instruments for their attraction, gradually stopping active support for “brown” technologies, which also need definitions and criteria.

Currently, there is still little attention in the available documents to green reforms **at the local level**, where a green economy is most in demand, taking into account, among other things, the

123 Green economy and sustainable development goals for Russia: collective monograph / under scientific edition of S. N. Bobylev, P. A. Kiryushin, O. V. Kudryavtseva. - Moscow: Faculty of Economics, Lomonosov Moscow State University, 2019 -- 284 p..

ongoing processes of decentralization of production and distribution. Local authorities are little or formally involved in green reform processes, and national programs do not provide clear incentives, signals and mechanisms for the integration and promotion of green reforms at the local level.

Insufficient attention is paid to the role and participation of the private sector, which is a key player in attracting green technologies and innovation. Many documents mention the private sector, but in Kazakhstan, in the real processes of preparation and implementation of reforms, the private sector is not only not active, but often does not support them due to lack of understanding or disbelief in the seriousness and long-term intentions of the government and reforms.

The interests and opportunities of small and medium-sized businesses, as a potential stakeholder in promoting a green economy, are practically not taken into account. In addition to the existing mechanisms for supporting SMEs, it is necessary to create many more institutions, such as incubators of green technologies, revolving funds and others.

The weakness is public participation. Over the past period, the public was practically not involved in the development of green initiatives, with the exception of some of the most active environmental NGOs.

Finally, **education and mainstreaming** must have for the transition to a Green Economy. Only an economically literate population can correctly calculate the financial risks and benefits from the introduction of green technologies and correctly invest in their implementation.

A new area that needs to be highlighted in the revised Concept is **“green financing”**.

In recent years, the world has made significant progress in financial policy, including banking regulation, pension regulation, insurance regulation and macroprudential approaches that can stimulate environmentally sound investment¹²⁴. National and international efforts to reallocate financial flows needed to achieve sustainable development through transforming the global financial system were documented and supported by a study on developing a sustainable financial system launched by the United Nations Environment Program (UNEP) in 2014. To stimulate investment in cyclical, green and low-carbon growth and align global finance and investment with the 2030 Agenda, Governments and regulators must pay increased attention to the “rules of the game” governing financial and capital markets.

2. Implementation of measures and achievement of indicators of transition to a "green economy" in the regions of the Republic of Kazakhstan

2.1. Akmola region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

Akmola region is one of the agricultural regions of the Republic of Kazakhstan. Territory of the region - 146.1 thousand sq. km. The population, according to the Statistics Committee of the Ministry of National Economy of the Republic of Kazakhstan, increased from 734.4 thousand people at the beginning of 2017 up to 738.6 thousand people at the beginning of 2019, but then decreased to 736.7 thousand people at the beginning of 2020. The region specializes in agriculture, mining of gold-bearing ores, uranium, mechanical engineering, chemical industry.

The GRP of the region in 2017 amounted to 1,552.7 billion tenge, per capita - 2,107.8 thousand tenge, with a nominal growth of 15.5% by 2016. In 2018, the GRP of the region increased to 1,699.9 billion tenge, per capita - to 2,301.0 thousand tenge, and in 2019 - to 1,933.6 billion tenge, and per capita - to 2,621.2 thousand. tenge. GRP growth is 13 - 16% per year, which exceeds the average republican level.

Promising deposits for development are the development of mining of gold-bearing ores (Vasilkovskoye deposit, promising deposits - Aksu, Bestobe, Zholymbet, Kvartsitovye gorki), iron

124 Innovative solutions for environmental challenges and sustainable consumption and production. United Nations Environment Assembly of the United Nations Environment Programme Fourth session Nairobi, 11–15 March 2019

ores (Orken and Masalskoe deposits), uranium (promising Zvezdnoye and Glubinnoye deposits), raw materials for cement production (in Tselinogradsky, Birzhan sal and Zerendinsky districts), common minerals (building stone, sand, ASG, clay, etc.). The region has the highest density of railways in the republic - 10.66 km per 1000 sq. km of territory (average for the Republic of Kazakhstan - 5.53). The Almaty-Ekaterinburg¹²⁵ highway of international importance passes through the region.

The Kokshetau airport complies with ICAO requirements and can receive all types of aircraft.

According to statistical data, in 2017 the volume of **industrial production** amounted to 561,290 million tenge, in 2018 - 659,726 million tenge, and in 2019 - 791,162 million tenge.

In the structure of industrial production in 2019, the manufacturing industry occupies a large part, the volume of which amounted to 641,930 million tenge (81.1%), having slightly increased since 2018 (80.8%). The **processing industry** of the region is represented by the production of food products, light and chemical industries, the production of rubber and plastic products, the production of other non-metallic mineral products, metallurgy and mechanical engineering. In order to increase production volumes and develop new deposits, the Kyzyltu copper-molybdenum deposit (Ereimentau district) is being developed and a raw kaolin enrichment plant Arai Pro LLP with a capacity of 80 thousand tons per year is being built.

In general, the indicator of labor productivity in the manufacturing industry of Akmola region is 2 times lower than the average for the Republic of Kazakhstan, and is approximately at the level of such regions as North Kazakhstan region, West Kazakhstan region, Kostanay region, Kyzylorda region, South Kazakhstan region, where one of the most highly productive sectors is oil refining.

The region's share in the gross **agricultural output** in 2018 was 9% (5th place).

	Gross agricultural output, billion tenge	Crop production, billion tenge	Livestock production, billion tenge
2017	378,2	254	123,3
2018	406,7	268,8	136,9
2019	487,5	318,2	167,9

**Data from the statistics Committee of the Ministry of national Economy of the Republic of Kazakhstan*

The primary agricultural products of the region are cereals, the sown area of which in the region is the largest in Kazakhstan – 4.3 million hectares, or 27.9% of the total sown area in the country.

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture

In 2017, compared to the previous year, the area under wheat decreased by 3.5%, vegetables - by 2.1%. The area of oilseeds increased by 24.1% up to 272.7 thousand hectares, potatoes by 0.5%.

In 2019, the region carried out spring sowing on an area of over 4.8 million hectares, including grain and leguminous crops were planted on an area of 4.3 million hectares. Oilseeds were planted on an area of 260.5 thousand hectares, forage crops - 178.2 thousand hectares. In general, in the region, the total area of fodder (including perennial grasses of previous years) amounted to 677.1 thousand hectares. Planting potatoes and vegetables, taking into account the population, was carried out on an area of 17.4 thousand hectares and 3.8 thousand hectares.

In order to increase the productivity of livestock in the household sector, work is being carried out on artificial insemination and crossing of cattle with pedigree animals in herds of households, peasants and farms. In 2017 in the field of artificial insemination, 44.8 thousand heads of cows and heifers were covered. The coverage of the broodstock in the whole region was 21.6%. Measures are

¹²⁵ Hereinafter the Program for the development of the territory of Akmola region for 2016 - 2020 and reports on its implementation for 2018 and 2019.

being taken to carry out the breed transformation. As a result, as of August 23, 2019, 53.6 thousand heads of breeding stock or 25.8% of the total breeding stock were involved in this process.

The area of pastures on agricultural land in the region is 4,493.4 thousand hectares, including watered 1370.6 thousand hectares, or 31%. As part of the action plan for pasture watering, approved by order of Acting Minister of Agriculture of the Republic of Kazakhstan dated 07.04.2017 No. 154 additionally built 31 wells (bores).

The total area of the **land fund** of the Akmola region as of the end of 2017 was 14,613.2 thousand hectares. In the total structure of the land fund of the region, agricultural land accounted for 74%, or 10,817.7 thousand hectares, and compared to 2016 by 33.8 thousand hectares or 0.3%. At the same time, due to the transformation of agricultural land, the involvement of deposits and provision on a competitive basis, the arable land area increased by 57.8 thousand hectares. (5,772.1 thousand ha). The increase in pastures compared to 2016 (4,493.4 thousand hectares) amounted to 10.6 thousand hectares (4,504.0 thousand hectares).

The average bonitet score for the region is 30. According to the information of a specialized organization that maintains the state land cadastre, as of January 1, 2017, 13,179.7 thousand hectares of agricultural land were subject to degradation, including the area of crushed lands amounted to 2,390.8 thousand hectares, saline – 1,556.7 thousand hectares, halophytic – 3,186.2 thousand hectares, washed away - 562 thousand hectares, deflated - 9.6 thousand hectares, waterlogged - 164.5 thousand hectares, swampy - 115.6 thousand hectares.

Lands of citizens for peasant farming as part of agricultural land make up 22.8% (2,469.2 thousand hectares). Lands of state agricultural legal entities account for 0.2% (19.8 thousand hectares). The area of land of citizens for gardening and dacha construction is 7.0 thousand hectares (0.1%).

Development of energy, including renewable energy and energy supply to the population

Power supply to the settlements of the Akmola region is carried out by 4 power grid companies: AREK JSC, Kokshetau Energo LLP, Energopromkompani LLP, Stepnogorsk Energotransit LLP.

In 2017, the share of power supply networks in need of repair in Akmola region was 40%. The level of customer satisfaction with the quality of power supply services was 94% (compared to 2010, an increase of 34 points). The number of accidents per 1 km of networks at power supply facilities was 0.01%. The level of regulatory losses was 24%. The total length of electrical networks is 821.3 km. 44.2% of the networks are in good condition and 55.8% require repair.

In the structure of electricity consumption in Akmola region, 33% falls on the industrial sector, including energy, 22% on the transport sector, 11.2% population, 12.3% agriculture, 20.5% other sectors of the economy. 93.5% of the housing stock in the region is in good condition, 5.4% requires repair and 1.1% is in disrepair. The residential sector consumes about 11.2% of electricity and 61% of heat supplied.

In 2019, 66 km of street lighting using energy-saving lamps were modernized in the region, 130.8 million tenge was spent. In general, the technical condition of the street lighting is satisfactory; in order to increase energy efficiency, reconstruction works are continuing.

The share of electricity generated by **renewable energy sources** in the total volume of electricity generated was 16.7% in 2018 against the plan of 16.7%.

In the Akmola region in recent years, the following projects have been and are being implemented:

- “Wind power plant” of Agrofirma Rodina LLP in the Tselinograd region (design capacity - 657 kW);
- “Wind power station” of First wind power station LLP in the Ereymentau region (design capacity - 45 MW.).

In addition, the following projects are being implemented in the field of renewable energy and energy-saving technologies:

- “Solar Power Plant” of KB ENTERPRISES LLP in the Tselinograd region (with a capacity of 100 MW);

- "Vetropark" of Tsatek GreenEnergy LLP in Arshalyn district (with a capacity of 100 MW);
- "Construction of a wind power station" in the Ereymentau region (with a capacity of 50 MW with the prospect of expanding up to 300 MW) of the Ereymentau Wind Power LLP (PEVS LLP);
- "Construction of a wind power plant" in the city of Kokshetau (with a capacity of 3.75 MW) of the Veter Invest Kokshetau LLP;
- "Wind power plant in Sandyktau region" (with a capacity of 7.0 MW) of the Vichi LLP.

As a result of the implementation of all projects, Akmola region can become a leader in terms of the share of renewable energy in total electricity production. This figure is expected to rise to 45% by 2023.

In 2017, the total length of **heating and steam networks** was 903.6 km, of which decrepit networks - 221.1 km, or 24.5%, need to be replaced - 234.1 km, or 25.9%, were replaced - 32, 2 km. The number of heat supply sources amounted to 290 units, installed boilers (power plants) - 761 units. The volume of heat energy consumption decreased from 2,385.6 thousand Gcal in 2015 to 2,355.2 thousand Gcal in 2017, while it decreased for enterprises and increased for the population.

In 2019, the total length of heating and steam networks increased to 978.8 km, of which decrepit networks - 244.8 km, or 25%, need to be replaced - 256.0 km, or 25.9%, were replaced - 17.6 km. The number of heat supply sources was 520 units, installed boilers (power plants) - 1,029 units. The volume of heat energy consumption is 2,280.8 thousand Gcal.

Within the framework of measures to ensure a centralized gas supply and abandon the use of gas cylinders in apartment buildings in the regional center, half of the group tank installations was restored. In 2018, 101 out of 226 group tank installations are operating in Kokshetau, which provides gas to more than 13 thousand apartments. The work to restore the group tank installations continues.

The fifth social initiative of the Head of State dated March 5, 2018 provides for the construction of the SARYARKA gas pipeline for gasification of Nur-Sultan, the central and northern regions of the republic. A Roadmap has been developed and funds are provided for the development of design estimates for the construction of gas distribution networks to the main gas pipeline in the Akmola region. The implementation of projects for the construction of gas distribution networks will allow at the first stage to gasify the settlements of Arshaly and Tselinograd districts.

Condition of water supply and sewerage, provision of the population with centralized water supply and sewerage

In total, there are 93 **hydraulic structures** on the territory of the region, of which 18 are in the republican, 66 - in the communal, 8 - in private ownership, 1 - ownerless.

In 2017, 535,394 consumers were provided with centralized water supply, 53,121 consumers were provided with decentralized water supply, of which 1,169 were supplied by means of bringing (in the districts of Birzhan Sal, Egindykol, Zerendi). In fact, only residents of Stepnogorsk are 100% provided with drainage and water supply systems. In 2017, 372 settlements (59.8%) of the region are provided with central water supply. Access to central water supply was: in urban areas - 86%, in rural areas - 58.8%.

In 2019, access to central water supply was: in urban settlements - 97.8%, to central sewerage - 61%, in rural settlements, respectively - 60.7% and 4.7%.

According to the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan, the length of water supply networks in the region is constantly growing from 5,727.5 km in 2017 up to 5,904.2 km in 2019, however, their length in need of replacement is constantly growing too, from 1,177 km (20.5%) in 2017 up to 1,610.5 in 2019. The replacement rate is far from adequate to the need. So for 2015 - 2017 in the region, 299.9 km of water supply networks were replaced, in 2018 - 191.8 km, in 2019 - 13.8 km. As a result of the work carried out on the renovation and repair of water supply networks, it was possible to reduce the accident rate at the sections from 347 to 120 cases in 2017 and 146 cases in 2018 and to 140 cases in 2019). Provided with water meters 96% of subscribers. The level of water loss in cities was 22.2%. Compared to 2015, decreased by 7.3%.

In 2017, the provision of housing stock with **centralized sanitation** in 2017 amounted to 60.9% (in 2014 - 46.7%): in urban areas - 72.2% (in 2014 - 67.5%), in rural areas - 51.2% (in 2014 - 27.5%).

According to the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan, the length of the **sewerage network** was 1,048.4 km in 2017, 1057.3 in 2018 and 1058.1 km in 2019. More than 70% (743.8 km in 2017, 747.7 km in 2018 and 748.5 km in 2019) of the total length of sewerage networks falls on urban areas.

In the region, 27 settlements are provided with centralized drainage networks. At the same time, treatment facilities are available only in Kokshetau, Stepnogorsk, Schuchinsk cities, as well as in the villages of Kosshy and Akmol. In the rest of the settlements, wastewater is discharged into natural filtration fields. The share of treated wastewater in 2019 reached 87.3%.

As a result of the measures taken to repair and modernize sewerage networks in recent years, the industry has reduced the accident rate at sections and networks: from 19 units in 2014 up to 9 units in 2017, 10 units. - in 2018 and up to 5 in 2019.

Fully biological treatment facilities are operating in the cities of Kokshetau, Stepnogorsk, Shchuchinsk, Burabay region and in the village of Akmol, Tselinograd region. However, in the cities of Kokshetau, Stepnogorsk, as well as in the villages of Shantobe and Arshaly, biological and mechanical treatment plants were built in the 70-80s, they have a large percentage of buildings worn out, and require major repairs or complete replacement. 238.8 km in 2017 and 359.7 km in 2018, sewerage networks in the region needed to be replaced.

State of the environment, reduction of air and water pollution

According to Kazhydromet, the settlements of the Akmola region are characterized by a low level of pollution, including the cities of Kokshetau and Stepnogorsk (IPS = 1-4). Individual excess of the average monthly and maximum one-time concentration for dust and nitrogen oxides up to 2-3.5 MPC were noted in the city of Kokshetau and for ground-level ozone up to 1.65 MPC in the city of Stepnogorsk.

Cases of high pollution (HP) and extremely high pollution (EHP) of atmospheric air were not detected¹²⁶. At the other observation points in the region, including the village of Kalachi, the MPC was not exceeded.

Compared to 2016, the state of atmospheric air has not changed.

Over the past six years, the **number of emission sources** in the region has been growing. In 2013-2017, this indicator increased 1.6 times, from 11.8 thousand units up to 18.6 thousand units. The main sources of air pollution in the region are industrial and thermal power plants (in particular, boiler houses in winter), as well as vehicles. However, the emission limit is constantly decreasing and in 2015 it amounted to 168.318 thousand tons, in 2016 - 160.845 thousand tons, in 2017 - 158.896 thousand tons, with a decrease of 1.2% compared to 2016. In the first half of 2018, the volume of limited industrial emissions into the air in the Akmola region amounted to 68.93 thousand tons (2016 - 80.42 thousand tons, 2017 - 79.44 thousand tons).

The gross **emission of pollutants** into the atmosphere increased from 94.3 thousand tons in 2015 to 94.55 thousand tons in 2016 and decreased to 86.9 thousand tons in 2017 and to 76.7 thousand tons in 2019. This is due to the installation of cyclones, treatment facilities, CCGT units at enterprises, the implementation of dust suppression works, the effective implementation of environmental protection measures aimed at reducing emissions of pollutants.

The most polluted areas of the Akmola region are Stepnogorsk and Kokshetau, Zerendi, Burabay, Atbasar districts, which account for about 54.3% of all atmospheric emissions in the region.

The main sources of pollutant emissions in the region are motor vehicles and heat power plants. The largest stationary sources of atmospheric pollution: Stepnogorsk CHPP of Jet-7 LLP and Kokshetau Zhylu Unitary Enterprise based on the Right of Economic Management.

From 2012 to 2017, the number of passenger cars increased by 24.2% from 143.3 thousand units up to 178 thousand units. Currently, 60.7% of passenger cars in the region are over 10 years old, 166.9 thousand units, or 93.8%, of passenger cars run on gasoline.

According to the Akimat of Akmola region, out of 246 units of public transport, 27 units were converted to gas in 2017 and 3 units in 2016.

126 Bulletins on the state of the environment in the Republic of Kazakhstan for 2017, 2018 and 2019.

According to the Committee on Statistics, current expenditures on environmental protection in 2016 amounted to 2,128.6 mln. tenge, 2,049.5 mln. tenge, in 2018 - 2,715.4 mln. tenge. And in 2019 – 3,165.4 mln. tenge.

In Akmola region, certificates for **greenhouse gas emissions** were received by: Stepnogorskaya TEC LLP, Altyntau Kokshetau JSC, Kokshetau Zhylu UE on REM, Kotelnaya ASI LLP.

According to the Kazhydromet RSE, based on the analysis for 2018, a high level of water pollution was noted on the Zhabay, Sileti rivers, Kopa, Burabay, Ulken Shabakty, Shchuchye, Kishi Shabakty, Zhukey, Karasye, Tekekol, Katarkol lakes. Water of "extremely high level of pollution" - Kylshykty, Shagalaly, Aksu rivers, Maybalyk lake.

Compared to 2017, the water quality in lakes Kopa, Burabay, Tekekol, Katarkol has deteriorated; in the Sarybulak river, Lebyazhye lake - improved; rivers Yessil, Akbulak, Nura, Bettybulak, Zhabay, Kylshykty, Shagalaly, Vyacheslavskoe reservoir, Nura-Yessil canal, lakes Sultankeldy, Zerendi, Shchuchye, Ulken Shabakty, Karasye, Kishi Shabakty, Sulukol, Maybalyk did not change significantly.

According to the Unified classification, the water quality of water bodies on the territory of the Akmola region for 2019 is assessed as follows: class 2 - Vyacheslavskoe water reservoir; class 3 - Silett River; class 4 - rivers Yessil, Nura, Nura-Yessil canal, Sultankeldy Lake, Bettybulak; not standardized (> class 5): rivers Akbulak, Sarybulak, Zhabai, Aksu, Kylshykty, Shagalaly, lakes Sulukol, Zhukey, Zerendi, Kopa, Burabay, Ulken Shabakty, Shchuchye, Kishi Shabakty, Karasye, Katarkol, Tekekol, Maybalyk, Lebyazhye.

Discharge of polluted wastewater decreased from 6.0 thousand tons in 2016 to 4.0 thousand tons in 2017.

Production and consumption waste management and waste processing

Industrial waste generated on the territory of the region is not utilized due to the absence of enterprises for their processing. There are 4 units of tailing dumps: 3 of them are on the balance of Kazakhaltyn JSC (Stepnogorsk) and 1 - Vasilkovsky GOK JSC (Kokshetau). At the enterprise of Stepnogorsk Mining and Chemical Combine LLP radioactive waste is generated as a result of enrichment of polymetallic ores and technological solutions.

One of the largest tailing dumps for radioactive waste from uranium production is located 25 km from Stepnogorsk. There is a danger of exposure of radioactive contamination not only to nearby settlements, but also of a wider spread of contamination. In general, about 70 thousand people live in the territory of Stepnogorsk together with the suburbs (Prigorodny, Aksu, Kvartsitka, Zavodskoy villages), who are at risk of radioactive contamination.

In 2017, the formation of industrial waste amounted to 41,343.3 thousand tons, in 2018 - 43,877.3 thousand tons. The increase in the production of industrial waste was influenced by the increase in overburden mining at the largest mining enterprises in the region. The volume of utilization from the total accumulation of industrial waste in the enterprises of Akmola region amounted to 8,558.0 thousand tons or 19.5%.

In 2018, 241 thousand tons of solid household waste was generated, of which 2.93% was processed. In 2017, the volume of generated solid household waste amounted to 234 thousand tons, of which 2.11% was processed. In 2018, 44.50% of the region's population was covered by services for the collection and removal of solid household waste. Only 28 out of 400 SHW disposal facilities comply with environmental and sanitary requirements and standards, which was 7%.

At the beginning of 2020, there are 130 solid household waste dumps in the region (there is a land act). The share of solid household waste disposal facilities that meet environmental requirements and sanitary rules (of the total number of disposal sites) was 20%.

In 2018, there were 27 (in 2019 - 36) enterprises and organizations for the collection and removal of municipal waste in the region.

Due to the absence of waste processing plants, municipal waste processing in the region is not carried out.

Akimat of Akmola region purchased 199 containers for collection of used mercury-containing lamps and thermometers.

In 2017 - 2018 in the Akmola region, construction of 2 waste processing facilities was carried out: EcopromBurabay LLP located in the city of Shchuchinsk of Burabay region and GreenEcoService LLP located in the Karaotkel village of the Tselinograd region.

The main activity of the EcopromBurabay LLP complex is waste reception, sorting, pressing of recyclable materials and sale. The capacity of the complex is 30,000 tons per year. Ecopromburabay LLP was put into operation.

The main activity of the GreenEcoService LLP waste recycling plant is the processing of solid household waste with further production of products (roll, toilet paper, napkins, cardboard and all types of paper products). The company plans to install self-sorting equipment and a production workshop. Sorting equipment capacity is up to 600 tons per day.

At the beginning of 2020, there are 4 enterprises operating on the territory of the Akmola region that collect, sort the second raw materials for sale: 1) LS Kokshetau LLP, Kokshetau city; 2) Ecopromburabay LLP, Burabay district, Schuchinsk city; 3) EcoServiceBurabay LLP, Burabay district, Shchuchinsk city and 4) Bayan IE, Tselinograd district, Kabanbai batyr village.

LS Kokshetau LLP has installed 30 containers for waste collection. The main volume of recyclable materials comes from enterprises and organizations of the region. The volume of collected recyclable materials amounted to 5,912.03 tons, including: waste paper, cardboard – 3,366.76 tons, plastic waste - 3.32 tons, polyethylene waste - 379.5 tons, waste glass – 2,146.13 tons.

Eco-Service Burabay LLP installed 172 containers for waste collection. The volume of collected solid household waste was 4,012.71 m³. Recyclable materials are pressed and transferred to LS Kokshetau LLP with subsequent sale to interested parties.

Bayan IE collects recyclable materials for further sale to interested parties. The volume of collected recyclable materials amounted to 1,133.70 tons, including: waste paper, cardboard - 360.9 tons, plastic waste - 167.9 tons, polyethylene waste - 321.4, waste glass - 162.7, wood - 112, metal - 8, the waste was transferred for recycling to third parties.

Akimat developed a feasibility study "Construction of a solid household waste landfill with a waste sorting point in the city of Kokshetau, Akmola region".

The state of biological resources and the development of forestry, fishing and hunting industries, specially protected natural areas and ecological tourism

The total area of forest-covered lands of the state forest fund subordinated to the Akimat of Akmola region is 223.8 hectares, while the plan for 2018 is 220.3 hectares. The forest cover of the region is 2.6%. The index of actual volume of investments in fixed assets of forestry amounted to 101.7%.

In 2018, planting of forest cultures was carried out on an area of 1,271 hectares, including 825 hectares at the expense of the regional budget, 35 hectares for paid services of institutions, by tenants of long-term forest use of 411 hectares. The natural regeneration of forests was promoted on an area of 510 hectares.

In 13 forestry institutions of the regional akimat, 11 cases of forest fires were registered on a total area of 29.9 hectares, including a forested area of 23.3 hectares, and 0.2 hectares of non-forest area. Damage to forestry amounted to 861.3 thousand tenge. The average area of one forest fire on the territory of the state forest fund, which is under the jurisdiction of the local government, was 2.7 hectares, while the plan for 2018 is 9.5 hectares.

The **hunting sector** of the Akmola region is represented by 160 hunting grounds on an area of 12.2 mln. hectares of hunting grounds and 524 fishery reservoirs.

In 2018, 136 hunting farms were assigned to 78 nature users (on the area of hunting grounds - 10 mln. hectares), while the area of reserve hunting grounds is 2.2 mln. hectares. Of the available 524 fishery reservoirs, 390 reservoirs and areas are assigned, 134 reservoirs remain not assigned.

In **2019**, according to statistical data, the volume of products (services) of fisheries and aquaculture amounted to 131,714.6 thousand tenge, of which 129,839.6 thousand tenge in fishing, and 1,875 thousand tenge in aquaculture. In 2019, legal entities and individual entrepreneurs caught 521 tons of fish, including 166 tons of crucian carp, 74 tons of freshwater perch, 59 tons of freshwater bream, 55 tons of carp. The main share of the fish catch falls on Burabay (30.1%), Korgalzhyn

(16.7%), Zerendi (16.1%) districts. Vouchers for catching fish were sold in the amount of 22,570 thousand tenge, in the amount of 39,296 pieces. The Burabay region accounts for 63.7% of all sold vouchers, Zerendi - 22.4%, Arshaly - 7.7%. In the nurseries and other reservoirs, 16,860.3 thousand pieces of fish stock were grown during the year, which is 5.8 thousand pieces more than in the last reporting year. The total area of the water surface of reservoirs for the cultivation of marketable fish and fish stock amounted to 25.9 thousand hectares. All types of feed for feeding marketable fish and fish stock were consumed 20.4 tons.

Specially protected natural areas play an important role in the preservation and restoration of the unique flora and fauna of the region.

The largest state reserve, the Kurgaldzhy reserve, is located within the Akmola region. Its total area is 281 thousand hectares, including forested area – 1,263 hectares. Also, on the territory of the Shchuchinsk district, there is a state national natural park (hereinafter - SNNP) "Burabay". Its area is 129.5 thousand hectares, including the forested area - 79.0 thousand hectares. On the territory of the Zerendi district, there is a part of the State National Natural Park "Kokshetau" with an area of 47.6 thousand hectares, including forested - 37.9 thousand hectares.

In 2011, as a result of the merger of the Buiratau Natural Park, Belodymovskiy and Ereimentau zoological refuges, the Buyratau State National Natural Park was created. Its total area in Akmola region is 60.8 thousand hectares, including forest-covered – 7,514 thousand hectares.

Also on the territory of the region are the Eastern State Nature Refuge (zoological), Bulandy State Nature Refuge (zoological), Atbasar State Nature Refuge (zoological).

In the Akmola region, the **industry of recreation and tourism** is one of the priority sectors of the economy. The tourist cluster of the region includes over 700 tourism enterprises (338 accommodation facilities, 45 health resort institutions, 266 roadside service entities, 68 travel agencies licensed to carry out tourism activities, 3 state national natural parks "Kokshetau", "Burabay", "Buyratau", Korgalzhyn State Natural Reserve, Burabai Damu LLP).

The cultural and historical segment of the cluster is represented by 900 monuments, the largest of which are under state protection and are used to provide excursion programs.

The total tourist flow in 2017 amounted to 1,122,835 people, an increase of 107.1% (this information is generated once a year).

In May 2017, the Visit Aqmola Tourist Information Center was opened, the main goals of which are the formation and dissemination of information about the unique tourism potential of the region, and the holding of mass events.

To ensure the attractiveness of the Burabay resort and year-round loading with the involvement of business, the concept of "Four seasons" is being implemented.

A local history museum was created on the basis of the Visit Center and a museum of Botay culture, the Zhailau ethno-aul and auto camps were opened.

KazWay modular pavilions are installed in the resort area and along the autobahn.

A street food network (20 shopping pavilions) was organized.

The AsiaWaters Company has launched the industrial production of the new Qulager Burabay medicinal table water.

Info tours were held with the participation of 110 tour operators from Kazakhstan, Russia, Taiwan, Uzbekistan.

Implementation of new technologies and projects demonstrated at the EXPO

Transfer of public transport to gas (Global Gas Group LLP) - Russia - Kazakhstan, 2019 - signing of a PPP agreement (the term has changed in connection with the implementation of the construction of the Sary Arka MGL). Price per 1 m³ of commercial (natural) gas on the burner for the consumer will be: for the population 30 tenge / m³, which is lower than the existing gas price by 13.4% (liquefied gas for the population costs 400 tenge / m³), for other consumers 105 tenge / m³. The implementation of the project in the Burabay region to transfer boiler houses to gas has been suspended due to its unprofitability (construction of the Sary Arka MGL is underway). The conclusion of a PPP agreement with Kokshetau Bus Park LLP for the transfer of passenger transport to gas is being considered.

Implementation of computer control technology in the power transmission network of AREK JSC 2020 – 2023. Installation of Smart Grids will lead to a decrease in accidents on electrical networks, will allow to detect problems in a timely manner and quickly eliminate them, which, in general, will improve the quality of services provided. Reducing air emissions through the use of smart grids. The introduction of the technology provides for the replacement of outdated equipment with modern digital ones. Project profitability depends on consumption volumes. The technologies are of interest, but due to the high cost of the project, it is planned to start implementation in 2020 (when adjusting the investment program).

Modernization of treatment facilities (Stepnogorsk-Vodokanal UE on REM) Zengir NS Company, Almaty, 2020. Reducing energy costs by reducing the volume of wastewater by 1.5 - 2%; reduction of the volume of electricity up to 30% to technologies; full automation of control and monitoring of the technological process using digital technologies. It will increase production efficiency by saving electricity, reagents and reducing the consumption of source water. Production safety due to the rejection of liquid chlorine. Improves the quality and safety of drinking water. In Stepnogorsk city, a project is planned for the modernization of treatment facilities using the technology of 2-stage membrane ultrafiltration with preliminary coagulation of the Stepnogorsk-Vodokanal UE on REM. Construction began in 2018, funds were allocated from the republican budget in the amount of 726.5 mln. tenge, in 2019 - 4.5 bln. tenge for the implementation of the "LED source of illumination" project at educational facilities of Akmola region of Kazakhstan by Led Media System LLP for 2018 – 2020.

In 2018, the company collected initial data for replacing lighting devices in educational institutions of the region. In the third quarter, a business plan was developed for the implementation of the project "Modernization and operation of the lighting system of educational facilities (schools) in the city of Kokshetau in order to improve energy efficiency and energy saving" as a private financial initiative through a PPP mechanism.

Transfer of the boiler room of the Rixos-Borovoe hotel complex to gas by Global Gas Group LLP (Kazakhstan-Russia), 2018. The transfer of the boiler room of the hotel complex to gas made it possible to save money and improve the environmental situation. Construction and installation work on the project has been completed. The project has been completed.

Installation of interactive benches in Burabay village of Burabay region, 2018. Improving the social well-being of the population. Creation of a comfortable urban environment. Introduction of innovative approaches to city development. In July 2018, 2.4 mln. tenge was allocated from the local budget for the installation of 2 benches. The project has been completed.

Construction of a wind farm with a capacity of 25 MW in the Taibai rural district of the Ereimentau district by Golden Energy Corp LLP in 2018 - 2023 will increase the capacity generated by renewable sources, create jobs during the construction and implementation of the project, will reduce emissions into the atmosphere due to the generation of "clean" energy. The concept of the project provides for the construction of 14 wind turbines with a capacity of 1.8 MW. A feasibility study was developed, an agreement was concluded with the Financial Settlement Center for the purchase of electricity, a land plot was formalized.

Construction of a wind farm with a capacity of 50 MW in the city of Ereimentau by Ereimentau Wind Power LLP, Kazakhstan, 2018 – 2021, will increase the capacity generated by renewable sources, create jobs during the construction and implementation of the project, reduce emissions into the atmosphere due to the generation of "clean" energy. The concept of the project provides for the construction of 15 wind turbines with a capacity of 3.5 MW. In February 2019, the development of design estimates began.

Warm stops - 2 units, 2018. Increase the flow of information for further processing in the smart city control center. Improving security in the city due to round-the-clock monitoring of urban space and video stream from surveillance cameras. Increasing the quality of services provided by the city's transport infrastructure. There is an air conditioner and a video surveillance camera. Accessible information panel with the bus schedule for passengers, WI-FI distribution point. The project has been completed.

The board "Interactive city map", 2018. It is a cognitive map of the city for nonresident citizens and tourists. Creation of a comfortable urban environment. Serves as a web portal of the city, displaying information and work of users of all levels. A single access point for all city life support services. The project has been completed.

Aerial platform "aerostat", 2018. Monitoring of dangerous areas, operational radio communication and video monitoring of stations from high altitudes. Air pollution control. Video surveillance coverage up to 100 km. The project has been completed.

2.2. Aktobe region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

Aktobe region is an industrially developed region of Kazakhstan and is the second largest region of Kazakhstan with an area of 300.6 thousand square kilometers¹²⁷. The population of the region as of January 1, 2017, according to the Statistics Committee of the Republic of Kazakhstan, amounted to 845.7 thousand people, and as of January 1, 2020 - 881.7 thousand people.

In 2014, the GRP amounted to- 3,039.8 bln. tenge, and per capita, and 3,396.8 thousand tenge. The index of actual volume of the gross regional product at the end of 2019 amounted to 104.9%. Positive dynamics is noted in all major areas of the economy.

In 2018, the region's **industry** grew by 5.1%, products were produced for a record amount - 1,866.0 bln. tenge (2017 - 1,597.1 bln. tenge). In 2019, the volume of industrial production (goods, services) amounted to 1,856.8 bln. tenge, the index of industrial production in % to 2018 amounted to 104.9%.

The volume of industrial production (goods, services) in the manufacturing industry in 2017 amounted to 531,508 mln. tenge, in 2018 - 606,534 mln. tenge with an increase of 9.8%, for 2019 - 605,300 mln. tenge, industrial production index of 2019 in % to 2018 amounted to 101.1%.

Also, at the end of 2018, labor productivity in the manufacturing industry amounted to 32.2 thousand US dollars per person, which is 13.7% more than in the same period of the previous year. In 2019, labor productivity in the manufacturing industry amounted to USD 29.6 thousand US dollars per person. The volume of exports of manufactured products amounted to 1.2 bln. US dollars. The manufacturing industry is based on the following subsectors: metallurgical industry, ferrous metallurgy, food production, chemical industry, mechanical engineering, production of other non-metallic mineral products, production of coke and petroleum products, etc.

The metallurgical industry is one of the main directions of the manufacturing industry in the region, the share of which is 10.5%. The main enterprises of the metallurgical industry: Aktobe Ferroalloy Plant branch of TNK Kazchrome JSC (ferroalloys), Aktobe Rail and Beam Plant LLP (125 m rails, long products), Aktobe Metal Structures Plant LLP (metal structures, sandwich panels, block-boxes), Caspi Plus LLP (metalworking, fasteners), Energo Alliance LLP (grinding balls), Ulan Kompaniyasy LLP (metal structures and metal products).

The Aktobe Ferroalloy Plant for the first time in Kazakhstan mastered the production of metallic chromium, granulated ferrosilicon, ferrotitanium, and developed the technology for producing ferrovanadium.

Within the framework of the Address of the Head of State "The third modernization of Kazakhstan: global competitiveness", 55 enterprises of the region were modernized in 2018 for 85 bln. tenge. This made it possible to increase their competitiveness, labor productivity by 10%, and reduce the cost of production by 2%.

The main enterprises of the chemical industry: AZKhS JSC (chromium salts), KazTsKUBNitrokhim LLP, BVR Center LLP (explosives), Temir Service LLP (phosphate rock), Amanat LLP (chemical reagents), Chilisai Chemicals (complex mineral fertilizers such as DAF / MAF).

¹²⁷ Hereinafter, the Program for the development of the territory of the Aktobe region for 2016 - 2020 and reports on its implementation for 2018 and 2019.

The main enterprises of the oil and gas industry: SNPS-Aktobemunaigas JSC, Kazakhoil Aktobe LLP, KMK Munai JSC, Sagiz Petroleum Company LLP, Firma Ada Oil LLP, Alties Petroleum Capital LLP, Kazakhturkmunai LLP and etc.

The **agro-industrial complex** is one of the largest and socially significant sectors of the regional economy. In the structure of the gross regional product, the share of agriculture is 5.1%.

According to statistical data, gross agricultural output amounted to 200,631.3 mln. tenge in 2017, 234,336.4 mln. tenge in 2018 and 274,534.2 mln. tenge in 2019, with the predominant development of animal husbandry (64.4%).

In 2017 - 2018, more than 40 investment projects in the field of agriculture were implemented in the region. In 2018, were attracted investments in agriculture - 17.7 bln. tenge, in food production - 2.6 bln. tenge. The index of actual volume of investments in fixed assets in agriculture was 161%, the index of actual volume of investments in fixed assets in food production - 111%.

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture

Agricultural land increased by 1,800.7 thousand hectares, which is associated with the growth of entrepreneurial activity in the field of agriculture, as well as the ongoing measures for the inventory of agricultural land to identify unused lands and involve them in farming business.

In accordance with the instructions of the Head of State, in recent years, purposeful work has been carried out in the region to diversify the structure of sown areas. As a result of the work carried out, the share of wheat in the structure of sown areas of agricultural crops has been reduced by almost two times, the area of forage crops has increased by the same amount.

In 2019, the area of irrigated land was increased from 21.9 up to 30.2 thousand hectares, the area under crops of agricultural crops - by 11.5% (from 656 thousand hectares up to 731.4 thousand hectares). On irrigated fields, the areas of drip irrigation and sprinkler irrigation are increasing. So, in 2017, the sown area of drip irrigation was 200 hectares, in 2018 - 310 hectares. The area of sprinkler irrigation increased from 2.1 thousand hectares up to 2.7 thousand hectares. In addition, in 2018, new greenhouse complexes were put into operation on an area of 5.0 hectares, the total area of greenhouses was brought to 35.7 hectares. In agriculture, as a result of the application of modern technologies, the efficiency of water resources use has doubled.

With the help of digitalization elements (electronic accounting of areas, aerospace monitoring), 291 land plots with an area of 595.3 thousand hectares were returned to the state, incl. arable land - 26.4 thousand hectares. 427 plots with an area of 771.5 thousand hectares were issued for the further development of agriculture, incl. for arable land - 36 thousand hectares.

In 2019, in livestock production, the number of cattle increased by 6.3%, horses - by 12.1%, sheep-goats - by 1.6% and camels - by 2%. Production of meat increased by 8.5%, milk - by 3.2% and eggs - by 2.6%. The share of cattle participating in breed transformation was 30.5%, small cattle - 14.3%.

The area of pastures on agricultural land is 8865.5 thousand hectares, watered 4,075.5 thousand hectares, or 46%. The need for watering pastures in 2017 was 30 wells (bores), 74 wells (bores) were built, or 247%. Equipping of "shepherd points" is carried out for the development of distant livestock breeding. Wind power plants and solar panels are being introduced, which makes it possible to reduce the cost of developing agricultural infrastructure. As of the end of 2019, 145 alternative energy sources (wind turbines and solar panels) have been installed on distant pastures and 300 wells drilled.

The volume of plant and livestock production is sufficient to provide the region's population with basic food products. The volume of beef exports increased 2 times, amounting to 4.4 thousand tons. The meat is exported to Russia, Uzbekistan and Iran, and in the future, the volumes and geography of supplies will significantly increase, for example, to the UAE, China and other countries.

Development of energy, including renewable energy and energy supply to the population

The total length of **power lines** in the region is 17,371 km, including REC Energosistema LLP – 14,798.52 km, KEGOK JSC - 439.4 km, Batys Transit JSC - 440.2 km, MK KTZh – 1,661.3 km, ZhemMunayEnergo LLP - 31.7 km. The depreciation of fixed assets of the electric power enterprises

of the region is about 61% or more than 10,000 km. At present, the provision of the region with electric energy is 100%.

SNPS-Aktobemunaigas JSC commissioned an expansion facility for a 160 MW gas turbine power plant with an investment volume of 22.5 bln. tenge.

In the industrial zone, it is planned to implement the project of Aktobemunai-finance JSC for the construction of a gas piston thermal power plant with a capacity of 97 MW.

In order to consolidate regional power grid companies, according to the Plan of the Nation-100 Specific Steps, an inventory of ownerless power facilities was carried out in the context of districts and the city of Aktope. Currently, the identified ownerless power facilities are registered with the justice authorities with their further transfer to the balance of REC Energosistema LLP, which will improve the reliability of power supply, reduce the cost of electricity transmission and reduce the cost of electricity for consumers.

In 2019, funds in the amount of 2,086,295.0 thousand tenge are provided for the implementation of electricity from the republican budget. The development amounted to 2,086 94,178 thousand tenge or 99.9%. 44,773.0 thousand tenge have been allocated from the local budget, fully utilized. As a result, 58,743 km of power supply were built. In order to reduce the deterioration of power facilities within the framework of the repair fund in 2019, 646.4 km of power lines and 221 transformers were repaired. By 2020, 4 transferring facilities, 5 facilities were commissioned. In order to provide uninterrupted electricity to consumers in the region and improve the reliability of the energy system, in 2019, the "Plan for the development of 35-500 kV electrical networks of the Aktope region for the future until 2030" was developed.

Renewable energy sources. A wind map of the Aktope region was compiled to calculate the wind potential. Construction of 3 wind power plants is underway - Zhelenergo LLP in Martuk district (450 kW), which is scheduled to be commissioned by the end of 2019.

In the Kargaly district in 2019, the Arm Wind company commissioned a wind farm with a capacity of 48 MW. In 2019 - 2020, it is planned to implement the project Kimpersay Energy LLP (from 100 to 300 MW per year).

Work has begun on the implementation of a project to install a wind farm in cooperation with transnational companies ENI and General Electric.

C2energy GMBH (Germany) company plans to build a 50 MW solar power plant in Alga at its own expense.

The total length of the regional **heating networks** in 2019 was 522.3 km (in 2017 - 519.7 km), of which 148.3 km are dilapidated (28.4%), 78 km are in need of replacement (14.9%). Heat-generating enterprises generate 6,725.7 thousand Gcal of heat (in 2017 – 5,592.1 thousand Gcal), with a demand of 2,148.5 thousand Gcal (in 2017 - 2,164.6 thousand Gcal). Losses in networks in 2019 amounted to 487.1 thousand Gcal. Due to the modernization of networks and equipment in the region, it was possible to reduce the wear and tear of heat supply networks in Aktope, Alga, Mugalzhar, Khromtau, Shalkar districts. At the same time, the wear and tear of networks in these areas, as well as in the Kargalinsky areas, remains high.

At the beginning of 2020, the total length of the region's **gas pipelines** is 6,720 km. Of the 315 settlements in the region, 113 (35%) are gasified, in which more than 792 thousand people live, or 90.1% of the region's population. Currently, 11 gas supply projects with a total value of 2.2 bln. tenge are being implemented, which are planned to be completed by the end of 2020. As a result, 6 settlements with a population of 6,000 people will be gasified.

At the same time, there is a gas deficit in the region due to the congestion of the gas pipeline branch from the Bukhara - Ural main gas pipeline, as well as the deterioration of the networks of the Zhanazhol - Aktope main gas pipeline from the Zhanazhol gas processing plant and the projected growth in gas demand. In this regard, at the moment, the Akimat, together with the Government, is working on the implementation of the projects "Construction of the 3rd string of the main gas pipeline branch in the city of Aktope, Aktope region". It is also planned to implement the project "Construction of the 2nd string of the Zhanazhol - Aktope MGP in Aktope". Construction of the 2nd string will create conditions for uninterrupted gas supply to the Mugalzhar, Baigany, Temir, Uil, Algin districts with a population of over 187,000 in 135 settlements.

The Regional Comprehensive **Energy Saving Plan** of the Aktobe region for 2016 - 2020 was formed and is being implemented.

A street lighting control system was introduced in Aktobe, special equipment (32 units) was installed in the amount of 30.1 mln. tenge. The modernization of street lighting is underway (replacement of old lamps with LED - 850 pcs, reinforced concrete poles with metal - 310 pcs, wires of street lighting lines - 20 km) in the amount of 150.6 mln. tenge.

The modernization of housing and communal services is being carried out in stages. Together with the EBRD, a project is being implemented to renovate the sewerage networks of the regional center.

Work is underway to install individual and general household water consumption and heat meters for consumers. The regional average indicator for meters is 91% coverage of subscribers. As a result of the measures taken, the cost of heating was reduced by up to 45%, for hot water by up to 30%, which also had a positive effect on reducing payments for the population.

Condition of water supply and sewerage, provision of the population with centralized water supply and sewerage

Currently, 8 cities of the region (100%) are equipped with **centralized water supply**.

In 2018, within the framework of the state program of the Aktobe region, 5,235.8 mln. tenge was allocated from the republican budget for the implementation of 25 water supply projects in rural settlements, 100% was mastered. As a result, 294.2 km of water supply networks were built and reconstructed. 18 facilities were commissioned.

At the end of 2018, access to centralized water supply in cities was 98.5%, in rural areas - 54.6%, wastewater treatment coverage in cities - 67.4%, in villages - 6.6%.

According to the results of work in 2019, the provision of the population with central water supply increased from 94.6% to 95.2%. In total, 7 projects were implemented in 2019 as part of the development of water supply and sanitation systems in the region. In 2020, it is planned to implement 18 water supply projects, which will increase the coverage of the population to 95.7%.

In Aktobe region, the total length of water pipelines was 3,114.9 km in 2017, 4,763.8 km in 2018, and 5,017.2 in 2019, of which 1,401.7 km or 45% of the networks in 2017, 479.5 km or 10% in 2018 and 411.6 km or 8.2% in 2019 needed replacement and repair. The greatest deterioration of water supply networks was observed in the cities of Aktobe, Temir district, Shalkar district, Khromtau district.

In 2019, 1501.4 mln. tenge is provided for the implementation of 12 water supply projects in rural settlements. For the development of urban water supply from the republican budget, 856.5 mln. tenge are provided for the implementation of 2 projects.

As a result of the implementation of these projects, an economic effect will be achieved, expressed in the following indicators: the indicator of access to water supply in the RA will reach 100% in 2020, the wear of water supply networks will decrease by 12% (from 45% to 33%). For the implementation of water supply projects, in addition to budget funds, investments of international financial organizations will be used.

In 2017, a feasibility study was developed for the project "Modernization of sewage treatment facilities in Aktobe city of Aktobe region". The estimated cost of the project will amount to about 16.9 bln. tenge.

As a result, in 2018 the total length of sewerage networks in the region reached 936.9 km, 389.8 km in 2019, of which 41.5 km needed to be replaced in 2018 and 47 km in 2019, 31.8 km were replaced in 2018 year and 7.4 km in 2019.

At the end of 2019, was achieved the provision of centralized water supply in cities - 98.5%, in villages - 56.5%, coverage of wastewater treatment in cities - 67.4%, in villages - 6.6%.

State of the environment, reduction of air and water pollution

To systematize the work being carried out, the Action Plan to improve the environmental situation of the Aktobe region for 2018 - 2020 and the Target indicators of the quality of the environment of the Aktobe region for the period 2018 - 2025 were formed and approved.

Observations of the state of **atmospheric air** in 2017, 2018 and 2019 in Aktobe were carried out at 6 stationary posts.

From 2017 to 2019, the level of atmospheric air pollution in the city of Aktobe worsened somewhat (APS increased from 6 (increased level) to 7 (high level), SI ranges from 13 up to 30 (> 10 very high level)).

The largest environmental pollutants in the region are the enterprises of the oil and gas production complex: SNPS Aktobemunaigaz JSC, KazakhoilAktobe LLP, Intergas CA JSC, Aktobe Gas-Main Pipeline Management (gas transportation), enterprises of the mining, metallurgical, chemical and thermal power industries: TNK Kazchrome JSC - branches DGOK JSC and AZF, Aktobe Copper Company LLP, AZHS JSC, Aktobe CHP JSC, utilities.

In total, there are 181 enterprises of the 1st category in the region, including enterprises of the oil and gas sector - 53 (29%), the mining industry - 47 (26%), the utilities sector - 8 (4.4%), metallurgy - 2 (1.1%), agriculture - 7 (4%), others - 64 (35.5%).

For 2018, regional enterprises received 2,753 permits for atmospheric emissions from stationary sources. The permitted volume of emissions is 312.65 thousand tons, the actual volume of emissions in 2018 is 185.2 thousand tons, compared to 2017, decreased by 4.7%.

The decrease in the actual volumes of pollutant emissions in 2018 is associated with a decrease in:

- repair work at Aktobe Gas-Main Pipeline Management, ICA JSC (by 12.29 thousand tons);
- a decrease in the volume of oil production by Kazakhoil Aktobe LLP (8.31 thousand tons),
- at the same time: SNPS-Aktobemunaigas JSC in connection with the overhaul at ZhNGK increased actual emissions by 4.49 thousand tons.

In 2019, according to statistical data, air emissions decreased to 136.6 thousand tons.

In Aktobe region, in the regional center - Aktobe, more than 497 units of buses of large, medium and small capacity are used for regular city routes. Of these, 172 buses use gas fuel, 325 buses use diesel fuel. On intraregional routes 120 units are involved, 104 units of them are gas-fueled.

The main cause of atmospheric air pollution with hydrogen sulfide in Aktobe is emissions from sewage pumping stations of Akbulak JSC.

Industrial effluents enter the city sewerage system along with domestic wastewater. Due to the ineffective operation of the waste water treatment plant of Akbulak JSC, the incoming wastewater is insufficiently cleaned and creates conditions for rotting and decomposition of pollutants with the formation of hydrogen sulfide, which worsens the state of the atmospheric air in Aktobe. The absence or ineffective operation of local treatment facilities at enterprises is one of the main causes of hydrogen sulfide emissions in Aktobe. In this regard, a project for their modernization is being developed, which is planned to begin in 2020 (cost - 16.9 bln. tenge).

The second source of hydrogen sulfide emission is the sludge beds formed in the primary settling tank I and the secondary settling tank II of WWTP. The sludge beds area is 25 hectares. Number of beds 56 pcs. As of the current year, 26 beds are filled with sludge. According to the Department of Ecology, the actual concentration of hydrogen sulfide at a depth of 0-10 cm is 496 mg / kg.

In 2017 - 2019, Akbulak JSC performed a number of measures to eliminate and minimize hydrogen sulfide emissions:

- at WWTP: installation of a wet barrier, covering the surface of sand traps, distribution, receiving chambers;
- 3 modern drainage stations were put into operation;
- organized control over compliance with DAC standards in industrial wastewaters and termination of services for receiving wastewater if it does not comply;
- introduced the use of IVKAZ preparation in the wastewater disposal system to purify wastewater from hydrogen sulfide and eliminate odors. Laboratory studies have shown a significant reduction in the content of hydrogen sulfide in sewage. Directly at the WWTP, the oxygen content in the incoming wastewater increased (from 0 to 0.23 mg / dm³).

Experimental work was carried out on sludge lagoons (sediment accumulation after wastewater treatment), where lactic acid bacteria were used. Also, this method (processing with lactic acid

bacteria) was tested on the lagoons of the stillage accumulator, during the year 15 liquid lagoons were processed with bacteria.

As a result of the measures taken, the cases of fixing the excess of hydrogen sulfide have decreased, if in 2017 the stationary stations of the RSE Kazhydromet recorded more than 144 cases of exceeding the MPC for hydrogen sulfide, and in 2018 - 7 cases of exceeding the MPC for hydrogen sulfide.

In 2018, the **volumes of utilization of associated petroleum gas** amounted to 6,474.085 mln. m³ against 6,282.324 mln. m³ in 2017. The volume of burnt gas in 2018 is 248.54 mln. m³, which is less by 80.528 mln. m³ in comparison with 2017, 97% of all emissions from flares are accounted for by 3 oil and gas producing and processing enterprises: SNPS-Aktobemunaigas JSC, KazakhOilAktobe LLP and Aman Munai LLP.

A decrease in the volume of associated gas flared in flares is associated with an increase in the volume of associated gas utilization. At the same time, the volume of associated petroleum gas production at SNPS-AMG JSC in 2018 increased by 194.237 mln. m³ (6,155.107 mln. m³ of gas was produced against 5,960.87 mln. m³ in 2017).

Of the total volume of emissions from stationary sources (185.2 thousand tons), the share of emissions from the combustion of associated gas in flares is 16.3 thousand tons (8.8%).

At the end of 2018, a modern gas processing complex with a capacity of 40 thousand m³ / hour or 326.4 mln. m³ / year was put into operation in the Baigany district at the Kozhasai field. As a result, the technologically inevitable volume of flared associated petroleum gas will decrease by 316.0 mln. m³ / year, while the volume of pollutant emissions by 5.6 thousand tons / year.

As part of the Action Plan to improve the environmental situation of Aktobe region for 2018 - 2020:

- vehicles of budgetary organizations (850 units) and more than 60% of public transport were transferred to gas fuel (only 23% of the total number of vehicles registered in the region were transferred to gas fuel);
- 64 crossroads of the city are connected to the automated traffic control system (ATCS);
- through the Department of Ecology, together with the Department of Internal Affairs, vehicle emissions are monitored for smoke and toxicity.

Observations of surface water pollution in 2017, 2018 and 2019 on the territory of the Aktobe region were carried out at 12 water bodies: the rivers Yelek, Kargaly, Kosestek, Aktasty, Oyil, Ulken Kobda, Kara Kobda, Emba, Temir, Or, Yrgyz and Lake Shalkar.

In 2017, the water quality is assessed as follows: water of "high level of pollution" - the rivers Yelek, Or, Kargaly, Yrgyz, Kosestek, Temir; "moderate level of pollution" - the rivers Emba, Oyil, Aktasty, Kara Kobda, Ulken Kobda, Lake Shalkar. In 2017, 15 cases of high pollution and 1 case of extremely high pollution were detected in the Elek River.

In comparison with 2016, the water quality in the rivers Yelek, Kosestek, Aktasty, Oyil, Or, Shalkar Lake did not change significantly, the Ulken Kobda, Kara Kobda, Emba rivers improved; in the rivers Yrgyz, Kargaly, Temir worsened¹²⁸.

In 2018 - "moderate level of pollution" - the rivers Or, Kargaly, Kosestek, Yrgyz, Ulken Kobda, Oyil, Emba, Temir and Shalkar Lake; water of "high level of pollution" - rivers Yelek, Aktasty, Kara Kobda. On the territory of the Aktobe region, 40 cases of high pollution were found in the Yelek River. Compared to 2017, the water quality in the Kargaly, Or, Kosestek, Temir rivers has improved; in the Kara Kobda River has worsened; in the rivers Yelek, Ulken Kobda, Yrgyz, Emba, Oyil, Aktasty and Shalkar Lake has not changed significantly¹²⁹.

According to the Unified Classification, the water quality of water bodies in the territory of Aktobe region for 2019 is assessed as follows: 4 class - the rivers Yelek, Kargaly, Or, Kosestek, Aktasty, Ulken Kobda, Kara Kobda, Temir, Emba, Yrgyz and Shalkar Lake; not standardized (> grade 5): Oyil river¹³⁰.

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130 Information bulletin on the state of the environment in the Republic of Kazakhstan for 2019.

In the basin of Ilek River has been intensively contaminating ground and surface waters with hexavalent chromium compounds from accumulated, chromium-containing sludge of Aktobe Plant of Chromium Compounds and slags of the ferroalloy production of Aktobe Ferroalloy Plant (dump) for more than 50 years. The area of groundwater pollution in the basin of Ilek River with hexavalent chromium was originally 12.0 km².

The maximum concentration of chromium in the surface waters of the Ilek River was recorded during the cold period of time (December-March), when the volume of river flow is minimal (low - water period). The highest concentration of hexavalent chromium in the surface waters of the Ilek River was recorded in the 1st quarter of 2014 along the profile near the Georgievka village - 0.25 mg / l, along profile IV (near the village of Tselinnoe) and V (near the border with Russia) - 0.15 mg / dm³. It should also be noted that, on the instructions of Zapkaznedra, in the area of chromium pollution (from the North-Western Industrial Zone of Aktobe to the settlement of Yaysana), AKPAN LLP conducts constant state monitoring of groundwater at more than 100 points.

In 2007 - 2009 carried out research and experimental work on water purification from pollution with chromium (VI) in the area adjacent to the Ilek River, spent 24.95 mln. tenge. A feasibility study for an investment project to eliminate pollution of chromium from the Ilek River, disbursed 8.0 mln. tenge.

In the period of 2012 - 2013, the Ministry of Environmental Protection and Water Resources of the Republic of Kazakhstan carried out the implementation of the project "Purification of underground waters of the experimental industrial site No. 3 from contamination with hexavalent chromium in the area adjacent to the Ilek River". The contractor of the project Production Company "Geotherm" LLP managed to eliminate the pollution at the experimental site No. 3 in a short time.

In December 2018, according to the monitoring data of the department of laboratory and analytical control, an increase in the concentration of hexavalent chromium is observed along the Ilek River, cases of high pollution have been established (more than 10 MPC). The repeated control has established the concentration in the section of Georgievka village at 12 MPC. In order to determine the reasons for the increase in the concentration of chromium (VI), an analysis of monitoring data from underground wells located at the Ilek test site is carried out. In this regard, it is necessary to restart groundwater treatment works to avoid transboundary chromium pollution.

The total area of distribution of groundwater contaminated with boron according to the available data is 21.1 km². According to the data of the Kazvodokanalproject Institute, more than 890 tons of boron have been accumulated in the underground horizons of the sludge ponds. Currently, according to the chemical composition of water, Ilek River has a pollution index in the Alga city area of 13.7, which corresponds to the 7th class of water quality and is characterized as *"extremely dirty water"*.

In 2008, research and experimental work was carried out to clean up groundwater from boron pollution in the zone adjacent to the Ilek River. A feasibility study for an investment project for the purification of underground waters of the Ilek River from boron pollution has been developed.

In 2014, the regional akimat adjusted the project "Purification of groundwater in the Ilek River basin from boron pollution". Since November 2014, the project has been sent to the Gosexpertiza RSE 4 times. Gosexpertiza RSE proposes to develop a new feasibility study, or to carry out experimental work on cleaning at the experimental site. To date, funding to eliminate the source of pollution of the Ilek River remains open. To eliminate the source of pollution of the Ilek River with boron will need over 10 bln. tenge.

At the site of contamination of groundwater with boron, constant state monitoring is carried out by the AKPAN LLP company for 92 regime wells. Also, constant (monthly) monitoring of the Ilek River is carried out by the Department of Ecology, where the average annual frequency of boron excess for 2018 at point No. 2 (Alga city) is 14.6 MPC, Tselinnoye village - 10.4 MPC, Georgievka village - 10.4 MPC. In this regard, it is necessary to resume funding for the elimination of the source of boron pollution, in addition, it is necessary:

- to strengthen state control over water bodies of the Aktobe region;
- to organize additional gauging stations of the Kazhydromet RSE for sampling surface water on the Ilek River in order to obtain background indicators and determine a more accurate influence of objects of historical contamination with boron.

As part of the Action Plan to improve the environmental situation of Aktobe region for 2018 - 2020:

- in 2018, the development of design and estimate documentation for the modernization of a complex of treatment facilities for the city of Aktobe began. Development period 2018 - 2020, cost 348.0 mln. tenge;
- at the expense of the EBRD's credit resources, construction and installation work was carried out on the object "Reconstruction of the gravity sewage system of the Zhilgorodok district";
- carrying out work with business entities to install local wastewater treatment plants at city enterprises. As a result, equipment for wastewater treatment was installed at 85 industrial enterprises, and grease traps were installed at 136 catering establishments.

Production and consumption waste management and waste processing

In 2018, 55,174.93 thousand tons of **industrial waste** was generated in the Aktobe region (in 2017 - 62,774.94 thousand tons), of which 54,549.034 (98.8%) in the mining industry, 446.143 (0.80 %), oil industry 179.76 (0.3%). In general, the volume of industrial waste generation compared to 2017 decreased by 12.1%.

In the region, 8,070.77 thousand tons of waste was processed and used, which is 14.6%. The volume of waste generation in the oil industry was 179.76 thousand tons, of which 109.8 thousand tons of waste were processed, which is 61%. Thus, SNPS - AMG JSC produced 69.2 thousand tons of sulfur, of which 58.0 thousand tons were exported as finished products.

Almost all mining enterprises have a waste management system that includes all stages of the waste technological cycle, such as prevention and minimization of waste generation, accounting and control, accumulation, as well as collection, processing, utilization, transportation, storage and disposal of production waste.

So, in order to reduce the negative impact on the environment, waste of overburden and enclosing rocks of the Donskoy GOK branch of TNK Kazchrome JSC is placed (used) in the mined-out area of open pits, which, in turn, allows to reduce waste storage on dumps. These rocks are not of commercial interest as secondary raw materials and are stored on the ground.

For Aktobe region, the problem of land degradation and desertification remains relevant. The population raises questions of land degradation due to the movement of sands caused by the ecological disaster of the Aral Sea. The main contributing factor for desertification is the poorly formed soil and vegetation cover and its dynamism.

In 2018, 298.6 thousand tons of solid household waste was generated, of which 11.69% was processed. In 2017, the volume of generated solid household waste amounted to 300 thousand tons, of which 3.51% was processed. Out of 357 solid household waste disposal facilities, only 13 comply with environmental and sanitary requirements and standards, which is 3.47%.

The regular collection and removal of solid household waste covers 74% of the population living in cities, regional centers and large settlements. In Aktobe, this figure is 100%. At the same time, only 60% of the population registered in the database of garbage collection companies pay for garbage collection services, the rest evade payment.

In order to stimulate garbage collection companies in terms of the development of waste sorting, the system of the Unified Payment Document has been introduced, where the payment for garbage collection is in the same payment with other public services. Currently, the tariff for collection and removal of solid household waste is 104 tenge, one of the lowest in Kazakhstan.

The region has 14 authorized landfills for receiving and placing solid household waste. Of them:

- 7 communal: Neo Plus LLP (Aktobe city), Trumova PE (Algin district), Bimakhanov PE (Shalkar district), Nur Sapar LLP (Khromtau district), SK Kenkiyak PSE and Temir Tazalyk LLP (Temir district), Tazalyk KOS LLP (Aitekebi district);
- 7 private: Environmental Technologies LLP (Baigany district), ZHES LLP (Mugalzhar district), Real Rakurs LLP (Emba city), SNPS-Aktobemunaigaz JSC, KazakhOil Aktobe LLP and Aktobe NGS LLP (Mugalzhar district), Taza Dala Kom LLP (Temir district).

In other settlements, special places for the storage of solid household waste have been identified.

The share of solid household waste disposal facilities that meet environmental requirements and sanitary rules in 2018 amounted to 3.46%.

In 2018, design and estimate documentation was developed for the construction of landfills in Martuk, Khobda and Karaulkeldy, as well as a feasibility study for landfills for Shubarkuduk and Badamsha villages.

Currently, solid household waste landfills have been transferred to trust management, while the activities of the landfills remain without proper control by local executive bodies. For example, the former Temir-Tazalyk LLP and Tazalyk Kos LLP are currently not working.

More than 20 enterprises and small businesses are involved in sorting and processing waste. The waste sorting complex of Soyuzgrand LLP, today extracts up to 15% of the waste components from the waste entering the city landfill. The share of solid household waste utilization in the region is about 7% of the volume of waste generated.

On August 13, 2018, by the resolution of the regional akimat No. 372, "A set of measures for modern disposal and processing of solid household waste with the wide involvement of small and medium-sized businesses for 2018 - 2022 in the Aktobe region" was adopted, within which work will continue to resolve solid household waste issues involving business.

In the regional center, the approach to the system of solid household waste management and sanitary cleaning of the city has been completely reformed. 19 management companies have been created, more than 350 people are involved in the sanitary cleaning of the city.

In 2017, 345 modern euro containers were purchased and installed, in 2018 - 321. There are 310 mesh containers for collecting plastic containers at the container sites of the city. In the regional center in public places, 88 triple bins have been installed for the separate collection of plastic, paper and glass. Within the framework of the mechanism of extended obligations of manufacturers (importers), 133 containers for the collection of mercury-containing lamps and batteries were transferred to the city of Aktobe free of charge.

Also, within the framework of the pilot project, the company Neo Plus LLP purchased and installed 3 buried containers of solid household waste (it is planned to purchase and install 60), a collection point for recyclable materials was opened.

The 2020 budget provides for the purchase of 800 containers and the installation of 60 container sites.

In 2017, together with SPC Aktobe, a waste sorting complex was launched (the investor is SoyuzGrand LLP with an investment of 600 mln. tenge). However, for various reasons, this waste sorting plant was suspended from October 2018 till the 2nd quarter of 2019. Today, the waste sorting complex extracts up to 20% of the waste components from waste entering the city landfill.

It is planned to expand production, launch a second sorting line.

A reception point for secondary raw materials has been opened in Aktobe, land plots have been allocated for 3 more reception points.

Within the framework of the regional budget for 2020, funds in the amount of 450 mln. tenge were allocated for the start of construction of 3 landfills for solid household waste in the Kobda village of Kobdy district, Karaulykeldy of Baigany district and Martuk village of Martuk district. The implementation of the projects will increase the share of solid household waste disposal facilities that meet environmental requirements and sanitary rules. At the same time, the issue of construction of solid household waste landfills in the Uil, Irgiz, Komsomolskoye and Karabutak villages is being considered as planned.

The state of biological resources and the development of forestry, fishing and hunting industries, specially protected natural areas and ecological tourism

Aktobe region is one of the least wooded regions of the Republic of Kazakhstan. The **forest resources** of the region represent separate birch-aspen choppings, floodplain forests along the largest rivers - Ilek, Kargala, Ural, Kobda, Uil, Temir and their tributaries. In addition, there are plantings along the railways and highways.

The total area of the state forest fund of the Aktobe region is 1.4 mln. hectares, including forest lands 95.4 thousand hectares, the forested area is 52.8 thousand hectares. In 2019, forest crops were

planted on an area of 925 hectares. Grown 3,500 standard planting material. For fixing moving sands in the Zhaltyr village, forest plantations were carried out on an area of 24 hectares. A plan for the reconstruction of the sanitary protection green zone around the city of Aktobe is being implemented.

On the territory of the region there are 62 species of mammals and 214 species of birds, of which 35 species of mammals and 80 species of birds are hunting and commercial ones, 10 species of animals and 35 species of birds are included in the Red Book of the Republic of Kazakhstan. The current state of most species of wild animals is stable and does not cause any particular concern. Currently there is no commercial hunting. The main direction of hunting is the organization of amateur hunting for waterfowl, hares and, in small numbers, licensed hunting for roe deer and wild boar.

In the region there are 100 **fishery reservoirs**, including 13 rivers with tributaries, 48 lakes, 8 reservoirs and 31 ponds. The fund of fishery reservoirs refers to two large water basins: Tobol-Torgai and Ural-Caspian. The main fishing zones are: reservoirs of the Irgiz-Turgai lake-river system, as well as large Aktobe, Kargaly, Magadzhan reservoirs.

For 2018, on the basis of scientific biological surveys conducted by the West Kazakhstan branch of the Kazakh Research Institute of Fisheries LLP, by order of the Minister of Agriculture, a **fish catch limit** of 365 tons was approved for the reservoirs of the Aktobe region. The issuance of permits for users to fish in accordance with the approved limit is issued by the Department of Natural Resources and Environmental Management of the region. So in 2018, 95 permits for 330 tons were issued, as well as 1 permit for 19 tons for catching Artemia cysts, budget revenues amounted to 7.5 mln. tenge. The actual catch of fish as of January 1, 2019 was 300 tons. 65.5% of the total limit falls on the reservoirs of the Irgiz region, located on the territory of the Torgai nature refuge, in connection with which fishing on these reservoirs begins only from September 1.

At present, for fish farming, 67 water bodies with river sections are assigned to 49 nature users (in 2015, the number of assigned water bodies was 26, in 2016 another 16 water bodies were assigned, in 2017 - another 13 water bodies).

The main obligations of users in the conduct of fisheries are annual stocking of fish, scientific research, material and technical equipment and the maintenance of a ranger service for the protection of assigned water bodies.

In total, 1,047 thousand fish fry were released into the water bodies of the region in 2018. At the same time, Prigorodny LLP, Rad Agro LLP, Ais LLP carried out work to compensate for damage to fish resources, the Ilel River was stocked with 18 thousand year-old carp.

Of the **pecially protected natural areas** in the region, there is the Irgiz-Turgai state nature reserve, created in 2007 on an area of 763.5 thousand hectares and the Turgai state reserve on an area of 296 thousand hectares.

The territory of the reserve borders on the Kyzylorda, Karaganda and Kostanay regions. In accordance with the order of the Committee dated July 6, 2007 No. 224, the protection of the Irgiz-Turgai State Nature Refuge is assigned to the Reserve. Taking into account the territories of the refuge, the area of the protected area by the Reserve is 1,060 thousand hectares. The availability of flora and fauna species: flora - 390, mammals - 42 (including those listed in the Red Book of the Republic of Kazakhstan - 2), birds - 250 (including those listed in the Red Book of the Republic of Kazakhstan - 32), amphibians - 4 and reptiles - 14 species.

By the Decree of the Akimat of Aktobe region dated 19.02.2010 No. 51, on the territory of the Kargaly district of the Aktobe region, a state natural refuge of local importance "Ebita" with an area of 83,770 hectares was created.

By the Decree of the Akimat of Aktobe region dated 12.12.2012 No. 451, the state nature refuge of local importance "Orkash" with an area of 33,395 hectares was created.

By the Decree of the Akimat of Aktobe region dated 06.12.2017 No. 424, on the territory of the Martuk district of the Aktobe region on the creation of a state natural refuge of local importance "Martuk" with an area of 133,796 hectares and the decree of the Akimat of Aktobe region dated 06.12.2017 No. 425, on the territory of the Kobdy district of the Aktobe region on creation of the state nature refuge of local significance "Kobda" with an area of 34,655 hectares, state nature reserves were created.

In order to preserve Kokzhide in 2019, a specially protected natural area "Kokzhide - Kumzhargan" was created, where ground and surface waters are monitored on an ongoing basis.

The **flow of tourists** arriving in the Aktobe region is steadily growing. So, according to the results of 9 months of 2018, the accommodations of the Aktobe region served 81.7 thousand tourists from other regions (an increase of 17.1%) and 8.7 thousand tourists from other countries (an increase of 15.4%). Also, for 9 months of 2018, 235.1 thousand room-nights were provided by places of accommodation (an increase of 13.7%).

In Aktobe region there are various attractions, unique monuments of history, nature and architecture, religious sites that are of interest to tourists. For example, the Motherland of the Batyrs is a monument of the period of the Golden Horde, the necropolis of Abat-Baitak, the mausoleum of Kobylandy batyr in the Kobdy region, the Khan molasy of the great Khan Abilkaiyr, a commander, ruler and politician of the 13th century in the Aitekebi district, Mugolzhary is the birthplace of ancient volcanoes, agate and jasper valleys in the Mugalzhary district, Aydarlyasha international section is the standard of Carboniferous and Permian in Khromtau district.

The Irgiz-Turgai State Natural Reserve, created in 2007, functions; the natural-scientific justification for the creation of the reserve provides for the organization of ecological paths, tourist routes and guest houses, the creation of a nature museum; Turgai State Natural Refuge (zoological) - transferred to the jurisdiction of the Irgiz-Turgai State Natural Reserve and the issues of creating the infrastructure of the Turgai Refuge should be resolved in conjunction with the reserve. Birdwatching is developed in the reserve - observation of pink flamingos and other species of birds, observation of wild animals.

The Great Silk Road is rightfully considered one of the remarkable achievements of ancient civilizations and cultural heritage. This is an excellent platform for the development of tourism in the border areas of Aktobe and Orenburg regions. There are all the prerequisites and opportunities for mutually beneficial cooperation. This is an exchange of school and student groups, these are weekend tours, pilgrimage tours and tours to places of Power, acquaintance with specially protected natural areas, geological and archaeological monuments, visits to various exhibitions and fairs. Cooperation is possible, since we are closest neighbors and we have a common past, there is the Great Silk Road, which unites us and gives a new impetus to our relations and the development of tourism without borders.

For information support on the official website of the Department of Foreign Relations and Tourism of the Aktobe region, the section "Tourism" is working and being updated. A powerful prerequisite for the development of domestic tourism is the functioning of the international transit corridor "Western Europe - Western China", including through the development of roadside service facilities.

At the same time, the Program for the Development of Tourism of the Aktobe Region for 2016 - 2020 was developed and approved, which defines the main activities for the development of tourism.

The main problem of the development of the tourism industry in the Aktobe region is the quality of the tourism and transport infrastructure, especially in the remote areas of the region. So more than 90% of the volume of services provided falls on the city of Aktobe. The contribution of the rest of the region to the tourism industry is small. This is partly due to the inaccessibility of necropolises, mausoleums and other attractions of the region due to the poor condition of roads and the lack of access roads. There is also a lack of a sufficient number and high quality of guest houses, roadside cafes and other tourist infrastructure.

2.3. Almaty region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

The area of the region is 223.6 thousand square km. In the region as of January 1, 2018, the population was 2,017.3 thousand people or 11.1% of the country's population. 77% of the population

lives in rural areas, 23% - in urban areas, against 57% on average in the republic. As of January 1, 2020, the population was 2,055.7 thousand people.

According to the Committee on Statistics, the gross regional product of the region for 2017 amounted to 2,472.0 billion tenge, the index of actual volume is 104%, per capita – 1,235.8 thousand tenge. In 2018, the GRP of the region amounted to 2,795.1 billion tenge, the index of actual volume - 103.1%, per capita - 1,378.2 thousand tenge. For 2019, GRP - 3,246.1 billion tenge, per capita - 1,585.5 thousand tenge, index of actual volume- 105.1%.

There are 1,313 industrial enterprises in the region, including 99 large and medium-sized ones, which account for about 80% of the volume of production.

According to the Committee on Statistics, the volume of **industrial production** (goods, services) for 2017 is 795.7 billion tenge, for 2018 - 892.8 billion tenge, for 2019 - 1,009.8 billion tenge, including the volume production in the **manufacturing industry** for 2017 - 677.4 billion tenge, for 2018 - 770.3 billion tenge (103.5% to 2017), for 2019 - 883.0 billion tenge. Industrial production index, 2019 in % to 2018 in the manufacturing industry amounted to 111.0%. Labor productivity in the manufacturing industry in 2017 amounted to 29.4 thousand US dollars/person and increased in relation to 2016 by 10.4% (26.6 thousand US dollars/person). Labor productivity in the manufacturing industry in 2019 amounted to 32.9 thousand US dollars/person.

The **agrarian sector** of the region is diversified, in the structure of gross production, crop production occupies 53.1%, livestock - 46.6% and services - 0.3%. According to the Committee on Statistics, the gross output of agricultural products in 2017 amounted to 630.9 billion tenge, in 2018 - 734 billion tenge, and in 2019 - 846.6 billion tenge, with the advantage of crop production (54.8%).

In the Agro-industrial complex in 2017-2018, 41 investment projects were put into operation in the amount of 17.4 billion tenge, including 13 facilities for the processing of agricultural raw materials.

Labor productivity in agriculture in 2019 amounted to 2,413.2 thousand tenge with the index of actual volume - 102.1%. 97% of agricultural land has been digitized.

The sown area of agricultural crops in 2017 was 947.9 thousand hectares, and in 2019 it was brought to 961.6 thousand hectares. Seedlings of perennial crops were planted on 1,741 hectares, the total area of gardens occupies 23.5 thousand hectares (in 2018 - 18.1 thousand hectares), including intensive - 2.4 thousand hectares, under Apport - 1.6 thousand ha.

In 2019, cereal crops were threshed in the amount of 1,412.8 thousand tons, which is 2.1% more than the level of 2018 with an average yield of 31.0 c/ha (in 2018 - 22.3 c/ha). Harvested 995.4 thousand tons of vegetables and 120.6 thousand tons of melons, compared to 2018, an increase in yield at the level of 1.6%, 129.5 thousand tons of fruit were also produced, which is by 4,3 thousand tons more than in 2018. The volume of the oilseed crop amounted to 316.2 thousand tons or more by 4.1%¹³¹.

In order to diversify, over a three-year period, wheat sowing has been reduced by 10 thousand hectares, the area of corn for grain has been expanded by 6.6 thousand hectares, oilseeds - by 9.5 thousand hectares, sugar beet - by 7.8 thousand hectares.

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture

The share of crop rotations in arable land is 60.5%. In crop production, the area used by moisture-saving technologies in 2018 was brought to 147.5 thousand (2017 - 145.8 thousand hectares) and water-saving technologies to 16.2 thousand hectares (2017 - 15.3 thousand hectares). In 2018, the overhaul of 4 objects was completed, 1,070 hectares were restored, and water supply improved on 7,192 hectares. In 2019, the reconstruction of irrigation networks at the expense of the Islamic Development Bank is being carried out in Yeskeldy (1.5 billion tenge) and in Aksu districts (5.3 billion tenge), design and estimate documentation has been developed for Panfilov, Uygur, Karasai districts and Taldykorgan city. In addition, projects are being developed in 7 regions (Balkhash, Zhambyl, Ili, Karatal, Raiymbek, Sarkan, Talgar). In total, at the expense of international financial organizations, 137.8 thousand hectares of land were restored. In order to involve new irrigated lands with an area of 81.8 thousand hectares into farming business, it is planned to reconstruct and build

131 Here and below the source: the official website of the Akimat of Almaty region <http://www.zhetysu.gov.kz>

new irrigation networks, build new water storage facilities (reservoir Bien of Aksu district, reservoir Pokatilovskoye of Sarkan district, reservoir Maly Dikhan and Tigermen of Uygur district) and restoration of emergency reservoirs (reservoir Kyzylagash of Aksu district) and ponds.

In 2019, resource-saving technology was applied on 166 thousand hectares. Since the beginning of the year, 760 units of agricultural machinery have been purchased for 9.2 billion tenge, the level of renewal of the machine and tractor fleet has been brought to 6.4%. 6 SPCs were created with the transfer of 164 units of special equipment (5 for sugar beet, 1 for potatoes). Greenhouses with a total area of 96 hectares are functioning (in 2015 - 53.5 hectares, in 2017 - 89.2 hectares), 3 greenhouses on 2.7 hectares were put into operation.

In the region, the total area of irrigated land is 579.9 thousand hectares, including arable land - 473.6 thousand hectares. Water intake from irrigation sources, its supply to farms is carried out by 356 hydraulic structures. In general, as a result of the work carried out, about 2.0 thousand hectares of irrigated land are restored annually.

Irrigation networks were certified at the expense of the regional budget. The length of all irrigation networks is 16,780 km (in republican ownership – 6,781 km, in communal ownership – 4,345 km, in private ownership – 5,653 km). Over the past two years, more than 8.1 thousand km of ownerless irrigation canals have been taken into communal ownership.

Livestock specialization is represented by meat and dairy cattle breeding, sheep breeding, horse breeding, camel breeding, and industrial poultry breeding. The share of breeding cattle in 2018 increased to 18.8% (in 2017 - 18.5%), sheep - to 22.9 (22.7%), horses - to 15.4% (15.3%). In 2019, the breed transformation covered 37.4% of the breeding stock of cattle.

The basis of the region's fodder base is pastures and hayfields, field fodder production. In 2017, the sowing of forage crops was expanded to 244.6 thousand hectares). The area of pastures is 7,113.6 thousand hectares, of which improved - 33.6 thousand hectares, watered – 5,857.7 thousand hectares. The share of pasture rotation in the composition of natural pasture lands was 28.8%. Construction and restoration works are carried out to water the pastures. As part of the action plan for watering pastures for 2017, 150 wells (bores) were built, or 103% of the plan. In 2019, 286 wells were modernized.

In the region for 2018 - 2019, an **audit of all agricultural land** was carried out, as a result, local executive bodies of districts and cities, together with the prosecutor's office, established 808.7 thousand hectares (including arable land 39.5 thousand hectares, perennial plantations 0.5 thousand hectares, hayfields 7.6 thousand hectares, pastures 760.7 thousand hectares, other 0.4 thousand hectares) of unused agricultural land.

As a result of the measures taken: 94.9 thousand hectares were returned to state ownership, 47.6 thousand hectares were registered as ownerless property, 504.4 thousand hectares after the measures taken began to use land and are involved in farming business, materials for 129,8 thousand hectares are under consideration by local executive bodies of districts and cities.

Development of energy, including renewable energy and energy supply to the population

The region's need for electricity is covered by its own production only by 62%, the rest is purchased from the northern regions, Zhambyl HPP and Kyrgyzstan. The volume of electricity consumption at the end of 2017 amounted to 3.1 billion kW * h (including from external sources - 1.2 billion kW * h). Compared to 2015, the growth is 0.54 billion kWh or 17.2%. In the regional context, 95% (1,111.6 MW) of the region's generating capacities are located in the Almaty region, including Karasai (48.1%), Ili districts (15.4%) and Kapshagai city (31.2%). The Taldykorgan region contains only 4.7% (52 MW) of the region's power generating capacities, which cover only 20% of the territories' electricity needs. The largest producer is KazZinkTEK LLP in Tekeli city (2.91% of the region's capacity). The total length of power lines is 34.2 thousand km, substations - 7.7 thousand units. The technical condition of the power grids is unsatisfactory.

There are 21 hydroelectric power plants with an installed capacity of 798.2 MW, 2 wind farms with a capacity of 9 MW and one solar power plant with a capacity of 2 MW in the region.

As part of the development of renewable energy sources in 2017, the Korinskaya HPP-1 with a capacity of 28.5 MW was put into operation on the Kora River.

Almaty region has great potential for the development of renewable energy sources. A total of 20 hydroelectric power plants, 2 wind and 1 solar power plants operate in the region. Large HEPPs in the region are Kapchagai (362 MW) and Moinak (300 MW). With the commissioning of new capacities, the share of green electricity in total consumption increased from 13.4% in 2011 up to 35.2% in 2017.

Further development of renewable energy sources is planned within the framework of the program for the development of renewable energy sources in the Almaty region for 2017 - 2025. Implementation of renewable energy projects in the region is divided into 2 stages.

At the first stage of the program implementation (2017 - 2020), it is envisaged to commission 32 priority renewable energy facilities with a total capacity of 829.2 MW, with real executors, feasibility studies, design estimates and, in general, resolved issues with funding sources. These are 17 HEPPs, 11 WPPs, 3 SPPs and 1 - BioPP.

At the second stage of the program implementation (2020 - 2025), it is envisaged to commission 46 promising renewable energy projects for which issues with sources of funding are not being resolved.

In total, within the framework of the RES development program for 2017-2025, it is planned to provide 811.3 million kWh or 37.8% of the total electricity generated by RES facilities.

So, in August 2019, a 100 MW solar power plant was put into operation in the Almaty region near the city of Kapshagai, the Eneverse KunKuat (EKK) company reported, which implemented this project¹³². The completed project includes the construction of a solar park on an area of 270 hectares, a 220 kV substation and 220 kV high-voltage lines. The construction of the solar power plant facilities began in September 2018. The total project cost of the solar power plant was 27.7 billion tenge, of which EKK invested 10.4 billion tenge in the project. Also, for financing, borrowed funds from Development Bank of Kazakhstan JSC (KZT 10.8 billion) and financial leasing of DBK-Leasing JSC (KZT 6.5 billion) were attracted. And the regional budget financed the construction of 220 kV high-voltage lines in the amount of 233 million tenge. According to the project, the SPP will annually generate about 160 million kWh of electricity and conditionally reduce CO₂ emissions into the atmosphere by 150 thousand tons per year.

Eneverse KunKuat LLP is a subsidiary of the Singapore company Eneverse KunKuat PTE. Ltd. The ultimate controlling owner of EKK is Universal Energy Co., Ltd (UE). UE's activities are focused on solar and wind energy, with offices in Shanghai, Hong Kong, Singapore, Almaty, and the total capacity of renewable energy projects in Kazakhstan is 380 MW. In October 2017, the Ministry of Energy of Kazakhstan included the EKK in the list of energy producing companies for renewable energy sources.

Heat is supplied by 34 boiler houses with a total capacity of 728 Gcal. The length of heating networks in 2019 was 661.2 km, and in 2017 - 624.4 km; (losses on heating networks were more than 30%). The level of provision with centralized heat supply is 26% of the population, the level of provision of settlements is 3% (urban area - 100%, rural area - 1.4%).

By the end of 2017, 123 settlements with a population of 718.5 thousand people were **gasified**, the level of gasification in 2017 was 26.2%. Compared to 2015, the number of gasified settlements increased by 27, the level of gasification increased by 5.9%. In 2018, due to the gasification of 19 settlements, the gasification level was increased to 30.1%. In 2019, 6.6 billion tenge of budget funds were allocated for the gasification of the region, private investments were attracted in the amount of 32.8 billion tenge. In total, at present, 144 settlements are supplied with gas in the region, where 1.1 million people live.

The condition of water supply and sewerage, provision of the population with centralized water supply and disposal

In 2017, out of 741 settlements, 647 settlements (87.3%) were provided with **centralized water supply**, which is 6.5% higher than in 2015. For the construction, reconstruction, overhaul and current repairs of water supply and sewerage systems in 105 settlements, 9.4 billion tenge was allocated and

¹³² <https://vlast.kz/novosti/35081-solnecnuu-elektrostanciu-na-100-mvt-vveli-v-ekspluataciu-v-almatinskoj-oblasti.html?fbclid=IwAR2HVLKe2Mif7JBZMrg-3mlh-Tfxh-6yNvj0m237Bx1rCVTMd63NcdrFjyNcdrFjy>

spent. Construction and installation works were completed on 93 facilities (water supply-88, water disposal-5), 12 facilities are being transferred to 2018.

In 2018, according to the regional akimat, within the framework of the Regional Development and Nurlı Zhol programs, 10.6 billion tenge were allocated for the implementation of 67 projects for the construction and reconstruction of water supply and disposal facilities, of which 29 projects were completed. As a result, 17 additional settlements gained access to drinking water, and the quality of drinking water was improved in 10 villages. The level of provision of settlements with centralized water supply increased to 89.6% (665 settlements out of 742), decentralized - 11.5% and imported water - 1.2%.

The total length of water supply networks in 2018 was 6,918.3 km, in 2019 – 6,924.6 km, of which 1,298 km needed replacement in 2018 and 1,212 km - in 2019 (data from the Committee on Statistics).

Access of the urban population to centralized water supply in 2018 reached 96.8%, rural - 89.5%. In the region, 665 settlements (89.6%) were provided with centralized water supply, 68 settlements by decentralized and 9 (1.2%) settlements are provided with imported water.

In 2019, within the framework of the Regional Development until 2020 Program, 10.2 billion tenge was allocated for the implementation of 53 projects (10 new, 43 transferred from 2018) (republican budget - 6.3 billion tenge, local budget - 3.9 billion tenge). Additionally provided 10 settlements of the region with a population of 14,300 people. The provision of centralized water supply compared to 2018 increased by 1.4%, which amounted to 91% or 675 settlements. Work is underway to approve the groundwater reserves of 40 settlements in the region. For these purposes, 345.160 million tenge was allocated from the regional budget for the implementation of 3 projects, the development as of October 1, 2019, is 311.770 million tenge. Completion of work under the contract is scheduled for 2020.

There are **sewerage systems** in 57 settlements of the region, which is 7.6% of the total number of settlements. The length of the sewerage networks is 1238 km (wear of the networks - 58.5%). The share of water disposal in rural settlements of the region is 6.6% of the total number of rural settlements (731). Access of the urban population to water disposal amounted to 45% in 2018, and 7.2% for the rural population.

The total length of sewer networks reached 1,407.8 km in 2018 and 1,463.4 in 2019, of which 449.4 km need to be replaced in 2018 and 455.3 km in 2019 (data from the Committee on Statistics).

Sewage treatment facilities for complete and mechanical biological treatment are available in the cities of Taldykorgan (capacity is 36 thousand m³ / day), Kapshagai (capacity is 25.4 thousand m³ / day), Usharal (capacity is 7.0 thousand m³ / day), Zharkent (capacity is 7.0 thousand m³ / day), Tekeli (capacity is 11 thousand m³ / day), Sarkan city of the Sarkan district (capacity is 0.8 thousand m³/day), Talgar city of the Talgar district (capacity if 1200 m³/days), Kaskelen city of the Karasai district (capacity is 600 m³/day), Balpyk bi village of the Koksu district (WWTP with a capacity of 1,400 m³ / day) and the Chundzha village of the Uygur district.

The cities of Talgar, Kaskelen partially and the village of Otegen batyr of the Ili district discharge wastewater into the collector of Almaty city (Sorbulak). The rest of the settlements discharge through mechanical treatment plants or filtration fields.

In order to more stable and trouble-free operation of the existing treatment facilities, improve the environmental situation, their reconstruction is necessary, which will have a positive effect in terms of maximum use of the existing volumes of facilities and increasing the efficiency of wastewater disposal systems with a significant increase in water consumption.

In 2019, within the framework of the Regional Development until 2020 Program, 2.3 billion tenge were allocated for the implementation of 7 wastewater disposal projects. A project has been developed for the construction of a WWTP for - 6.5 thousand m³/day on the coast of the Alakol Lake, Alakol district. The preliminary cost of the project is 5.5 billion tenge.

Within the framework of the PPP mechanism, it is planned to implement the project "Reconstruction and construction of treatment facilities in the city of Kapshagai, Almaty region". The project cost is 5.8 billion tenge.

State of the environment, reduction of air and water pollution

The region has a low level of environmental pollution. However, the ecology is significantly influenced by the city of Almaty, as one of the main sources of technogenic air pollution and degradation of agricultural areas in the adjacent regions.

In 2017, the **volume of emissions of pollutants into the atmosphere** decreased by 21.2% against the level of 2015, including liquid and gaseous substances decreased by 26.8%, but solids increased by 0.89%, sulfur dioxide increased by 0.94% and nitric oxide - by 13.2%. At the same time, the most polluted districts remain Karasay and Ili, where the heat and power complexes of APK JSC (CHPP-2, CHPP-3) of Almaty city are located, which account for 70% of the total emissions.

In 2018, the amount of **permitted emissions** was 0.129 million tons against the plan of 0.150 million tons.

In 2019, total emissions were reduced to 48.1 thousand tons by accounting for emissions from CHPP-3 in Almaty.

For the 9.2 million tenge allocated from the regional budget in 2017, target environmental quality indicators (TEQI) in the Almaty region for 2017-2021 were developed and approved by the decision of the regional maslikhat No. 31-163 dated May 23, 2018.

In order to gradually achieve environmental quality standards in the region, as well as in order to reduce the environmental hazard to the environment and public health, an Action Plan was developed and approved to achieve the target environmental quality indicators for the Almaty region for 2018-2021, which was sent to all interested authorities and businesses for execution.

In the Almaty region, in order to achieve the TEQI in 2019, the following works were carried out:

1. monitoring of the quality of atmospheric air, surface water, soil and gamma background at monitoring points, in the amount of 5.4 million tenge;
2. development of a project of maximum permissible emissions for the city of Tekeli in the amount of 1.7 million tenge.

According to the results of the measurements (2 times in the summer and autumn periods), according to the analysis of the soil-vegetation cover in the city of Tekeli, it was established that the maximum permissible concentration of zinc exceeded the standard indicator by 2 times. In the city of Tekeli, since 1965, a tailing dump of lead-zinc ore wastes has been operating, which previously belonged to the Tekeli lead-zinc combine, and therefore there was an excess of the zinc index. At present, in connection with the technical re-equipment of production activities with the Tekeli Mining and Processing Complex LLP, industrial waste is not allowed in the tailing dump. In order to solve this environmental problem, the regional akimat is implementing measures to restore the soil fertility of the Tekeli tailing dump.

Observations of surface water pollution in 2017, 2018 and 2019 in the territory of the Almaty region were carried out at 33 water bodies.

The main pollutants of surface waters are industrial and manufacturing utilities, there is an increase in wastewater.

In 2018, the number of permitted discharges was 0.170 million tons with the same plan.

In order to maintain water bodies and water management structures in a condition corresponding to sanitary, hygienic and environmental requirements, water protection zones and strips of water bodies and water management structures are established. In 2018, design estimates were developed for water protection zones and belts of 5 rivers in the region. To ensure the normal operation of the channels to Lake Balkhash, mechanized cleaning of the Topar channel of the Ili river delta and the construction of a dam of the Muzdybai channel were carried out in connection with the threat of flooding of the Karoy village, Balkhash district.

In accordance with paragraph 7 of Article 20 of the Environmental Code of the Republic of Kazakhstan, for 9.2 million tenge allocated from the regional budget in 2017, target environmental quality indicators in Almaty region for 2017 – 2021 were developed and approved by the decision of the regional maslikhat No. 31-163 dated May 23, 2018.

In order to gradually achieve environmental quality standards in the region, as well as in order to reduce the environmental hazard to the environment and public health, an Action Plan was

developed and approved to achieve the target environmental quality indicators for the Almaty region for 2018-2021, which was sent to all interested authorities and businesses for execution.

A positive conclusion of the state ecological expertise for the project "Development of target environmental quality indicators of the Almaty region" for 2017 - 2021 dated December 29, 2018 No. KZ61VCY00146038 was received.

In order to implement measures to achieve the TEQI in the Almaty region for 2018-2021, within the framework of the environmental action plan of the region, the following measures are being implemented this year:

1) Monitoring the quality of atmospheric air, surface water bodies, soil and gamma background at the monitoring points specified by the program;

2) Development of a project of maximum permissible emissions for the city of Tekeli.

Production and consumption waste management and waste processing

The total volume of accumulated solid waste in the Almaty region is about 9.0 million tons, while about 1.8 million tons of solid waste are generated annually, including 440 thousand tons are generated and come from the territory of the city of Almaty. In this case, the generated waste is disposed of in landfills without preliminary sorting and neutralization. There are 742 settlements in the region. Collection and removal of solid waste is provided by 72 enterprises. The coverage of the population of the region with the removal of solid waste in 2018 was 75%. All cities, regional centers and large settlements are fully covered (100%).

In 2018, the Maslikhat approved the "Program for Waste Management of the Almaty Region" for 2017 - 2025 (decision of the Maslikhat dated 20.02.2018, No. 27-137), as well as the regional akimat developed a feasibility study for the project "Regional Waste Management System of Almaty Region" (GE dated 18.06.2018, No. 01-0216/18). So, the coverage of settlements with the removal of solid waste is planned at 77% and the share of processing of solid waste is 24% of their generation. In this regard, the main task is to increase the volume of processing and disposal of waste through the construction of waste processing plants.

In 2017, the volume of generated solid waste amounted to 629 thousand tons, of which 24.77% were processed. In 2018, 628.7 thousand tons of solid waste was generated, of which 27.55% was processed. In 2017, 9 out of 354 storage and disposal sites for solid waste met the environmental requirements of the Republic of Kazakhstan. In 2018, only 13 out of 357 solid waste disposal facilities comply with environmental and sanitary requirements and standards, which is 3.47%.

Collection and removal of solid waste is provided by 72 enterprises of various forms of ownership, which have 460 units of specialized equipment, 19 thousand containers. However, the wear of specialized equipment is 75 - 80%.

In the Almaty region, 11 enterprises are engaged in the processing of secondary material resources (Kazakstangakazy JSC, KagazyRecycling LLP - recycling of waste paper, SAF JSC - waste glass, Kainar AKB LLP - waste batteries, UtilEkoservice LLP, EcoserviceArman LLP, Q-recycling LLP - processing of automobile tires, KazPetPolymer LLP - processing of polymer waste, InterMed group LLP - special treatment of medical waste, Taza Zher MPK LLP, ADAL DAMU CAPITAL LLP - sorting solid waste).

With the participation of the EPR Operator, a separate collection of solid waste is being introduced in the region, first of all, where sorting complexes are already operating (Taldykorgan, Ili district, Kapshagai city). 190 containers for disposal of especially hazardous waste, electronic and household appliances have been installed in the region. In order to popularize the separate collection of household waste, 270 pieces of underground containers were installed in Taldykorgan with separation into dry and wet types of household waste. To service these containers, 7 units of specialized equipment were purchased. Also, 200 mesh containers were installed to collect waste paper, cardboard and aluminum cans.

On the territory of the region there are 3 complexes: in the regional center there is a waste sorting complex with a capacity of 100 thousand tons / year (the initiator is ADALDAMU LLP, the investment volume is 180 million tenge); in the Panfilov district - a waste processing complex with a capacity of 10 thousand tons / year (MPK Aulet LLP, investment volume - 180 million tenge); In

2019, a waste processing complex with a capacity of 200 thousand tons / year was commissioned in the Ili district (the initiator was Taza Zher MPK LLP, the investment volume was 180 million tenge).

In 2019, a waste recycling plant with a pyrolysis method with a capacity of 10 thousand tons with a waste sorting line was put into operation in Zharkent city. It is planned to introduce separate collection in Talgar, Enbekshikazakh, Karasai, Zhambyl, Panfilov districts. In the Ili district, it is planned, together with the Kazakh-Spanish company WasteEnergyKazakhstan LLP, to build a full cycle waste recycling plant with a capacity of 120 thousand tons per year, as well as a waste recycling plant of ZOR BIO LLP with a capacity of 100 thousand tons per year, which provides for a complete recycling technology of SHW with biogas production with its subsequent combustion in order to obtain and sell electricity, as well as biocarbon and fertilizers. The estimated capacity of the first project of WasteEnergyKazakhstan LLP is 8 MW (the first stage is 4 MW), and the second project of ZOR BIO LLP is 4 MW.

Within the framework of the developed feasibility study of the project "Regional waste management system of Almaty region" it is planned:

- creation of an operator for 14 territorial complexes (3 are inter-district and 11 district complexes);

- construction of 16 landfills (3 existing - reconstruction and expansion, 2 existing - modernization, 11 - new construction), 16 waste sorting complexes, 15 waste transfer stations, 3 waste processing plants (in the region of Almaty - 2, Taldykorgan-1).

AlatauTazalykService LLP has been designated as the territorial operator, 11 complexes are being developed, including: 4 waste sorting, 6 waste transfer and construction of 1 solid waste landfill in accordance with the new legislation. The search for investors for the construction of these complexes is underway. The implementation of projects is planned through the mechanism of public-private partnership, with the participation of the EPR Operator.

Also, design and estimate documentation for two closed landfills for solid waste in Zharkent and Tekeli cities is being developed for the amount of 40 million tenge. In the Ili district, it is planned to build a full-cycle waste processing plant with a capacity of 120 thousand tons / year (investor is WasteEnergyKazakhstan LLP). It is also planned to build a plant for the processing of organic waste with a capacity of 100 thousand tons / year and the production of 10 thousand tons of solid fertilizers and electricity up to 9.4 MW t / h per year (investor - ZorBiogas LLP, total investment - 17, 7 million Euro, payback period - 5 years).

The regional akimat approved an **action plan to address environmental problems** of the Almaty region for 2018 - 2021.

The Action Plan includes 6 environmental issues with an indication of the responsible persons and deadlines, including:

- problems of handling production and consumption waste in the settlements of the region, the elimination of unauthorized dumps identified by means of the earth remote sensing system (Geoportal);
- reducing the negative impact and environmental risk of Lake Sorbulak (waste water storage in Almaty);
- elimination of radioactive dumps of the Panfilov uranium deposit;
- emergency state of sewer networks and treatment facilities in settlements: Saryozek village of Kerbulak district, Karabulak village of Eskeldi district and Zarechnoye village of Kapshagai district;
- liquidation and conservation of hydrogeological self-flowing wells located in the Enbekshikazakh and Panfilov districts of the Almaty region;
- elimination of the negative impact of the tailing dump located in the city of Tekeli.

The state of biological resources and the development of forestry, fisheries and hunting farms, specially protected natural areas and ecological tourism

The total area of the state forest fund of the Almaty region is 5.3 million hectares, including wooded lands of 1.9 million hectares.

Conservation, protection, forest management and reproduction of forests of the state forest fund is carried out by 14 communal state forestry institutions, with a total staff of 1,026 specialists and

workers. For 2019, the felling-area resources was approved in the amount of 5850.2 m³, including the removal of 700 m³ of debris outside the felling area. Harvested 5,820.9 m³ or 99%.

In 2019, a spring planting of forest cultures was carried out on an area of 123.5 hectares. (spruce, apricot, apple, oleaster, elm). The addition of forest crops was carried out on an area of 170.2 hectares¹³³. Autumn planting and forest planting were carried out on an area of 316.5 hectares (Alakol Municipal Institution - 21 hectares, Bakanas planting - 20 hectares and sowing - 100 hectares, Zharkent - 50 hectares, Kaskelen - 15 hectares, Uygyr - 10.5 hectares, Ushtube - 100 ha). In total, 2.1 tons of black saxaul seeds were harvested for sowing in the state forest fund and nursery. (Bakanas - 1000 kg, Zharkent - 700 kg, Ushtube - 400 kg).

In 2019, the spring planting of forest crops was carried out on an area of 91.3 hectares, 327.8 thousand seedlings and propagula were planted (spruce, apricot, apple, elm, oleaster, birch). Autumn planting of forest crops was carried out on an area of 119.6 hectares (elm, black saxaul) and sowing of black saxaul seeds on an area of 213.5 hectares. The addition of forest crops was carried out on an area of 205.2 hectares. In forest nurseries, tree seeds were sown on an area of 2.0 hectares in spring. Nursery gardens were laid on an area of 9.2 hectares, where 208.4 thousand seedlings of juniper, fir, Shrenk's spruce, blue spruce, Crimean pine, eastern arborvitae, poplar, birch, ash, oak, willow, privet, catalpa, lilac, walnut and apple sivers were planted. For landscaping the settlements of the region, 137.2 thousand pieces of planting material were used for 23.8 million tenge. (In 2018, 123.8 thousand pieces of planting material were used for the amount of 17.1 million tenge).

Since the beginning of 2018, 1,128 environmental compliance raids have been carried out. Were revealed 31 cases of illegal tree felling, with a total weight of 242.8 cubic meters. The damage amounted to 2,140.0 thousand tenge, 325.4 thousand tenge were recovered. Materials on 31 cases of illegal felling were transferred to law enforcement agencies.

Since the beginning of 2019, 934 raids have been carried out to ensure compliance with environmental legislation. 37 cases of illegal tree felling were identified, with a total weight of 118.93 cubic meters. The damage amounted to 3421.7 thousand tenge, of which 1,238.0 thousand tenge were recovered. For the purpose of fire-prevention propaganda and prevention of forest fires, communal forestry agencies have planned the construction of fire barrier lines for 59 km, all 59 km have been completed, maintenance of the fire barrier line is planned - 2085 km, of which all 2085 km have been completed, been fixed notices, panels, billboards - 880 pieces, 1,726 warnings and obligations were issued to individuals and legal entities, farms, whose lands border on the territory of the state forest fund, 2,452 pieces of leaflets were distributed, seminars, lectures, conversations were held - 270, articles were published in print publications - 203, 4 speeches were given on television. In addition, the regional TV channel "Zhetisu" broadcasts daily video clips on the prevention and suppression of forest fires, illegal felling and protection of wildlife from poaching. 11 forest fires were registered on the territory of the state forest fund. The total area is 465.91 hectares, including the forest area of 303.71 hectares, of which the forested area is 280.31 hectares, the non-forest area - 162.2 hectares. Damage – 9,635.7 thousand tenge.

Aviation and ground chemical treatment was carried out on an area of 2,513.7 hectares, of which: Taldykorgan Forestry Municipal Institution on an area of 400.0 hectares, Uygur Forestry Municipal Institution - 13.7 hectares (three times), Uygentas Forestry – 2,000.0 hectares (air), Alakol Forestry Municipal Institution - 100.0 hectares.

On the territory of the Almaty region, there are 123 **hunting farms**, which are assigned to 83 hunting users. The total area of assigned hunting grounds is 5,099,166 hectares, including the state forest fund of 1,046,842 hectares.

In 2019, at the request of game users, 1,612 permits for the bag of wild animals were issued for a total of 53.7 million tenge (for 2018 - 943 permits were issued for a total of 42.6 million tenge). For 2019, 9.27 million tenge has been allocated from the regional budget for shooting harmful predators. Communal state forestry institutions destroyed 581 harmful predators, including 349 wolves and 232 jackals, the allocated funds were used in full (in 2018, 496 harmful predators were destroyed, including 319 wolves and 177 jackals, 8.1 million tenge were spent).

133 Source: the official website of the Akimat of Almaty region <http://www.zhetysu.gov.kz>

On the territory of the Almaty region, there are 135 **fishery sites**, of which 89 fishery sites have been assigned to 41 fisheries entities for fish farming, the remaining 46 sites remain in reserve. According to the order of the Ministry of Agriculture of the Republic of Kazakhstan No. 58 dated 01.02.2018 "On approval of the limits for the taking of wildlife objects from February 15, 2018 to February 15, 2019", a total limit of 4,965.5 tons of fish was allocated in the Almaty region. Of these, 4,095.2 tons for Lake Balkhash and the Ile River delta, 195.6 tons for the Alakol Lake system, 639.7 tons for the Kapshagai reservoir and 35.075 tons for local water bodies. According to the order of the Ministry of Agriculture of the Republic of Kazakhstan No. 59 dated 11.02.2019 "On approving the limits for the taking of wildlife objects from February 15, 2019 to February 15, 2020", a total limit of 7,495.592 tons of fish was allocated in the Almaty region. Of these, 5,975.729 tons for Lake Balkhash, 101.923 tons for the Ile River delta and the Ile River, 509.078 tons for the Alakol Lake system, 890.741 tons for the Kapshagai reservoir and 15.121 tons for local water bodies.

The Almaty region is one of the most promising in terms of **ecological tourism**. There are 2 state nature reserves Almaty and Alakol, 6 state national natural parks - Ile-Alatau, Altyn - Emel, Charyn, Kolsai lakes, Zhongar-Alatau, the state natural reserve Ile-Balkhash created in 2017, 7 state refuges: Lepsinsky, Totinsky, Kukansky, Verkhnekoksuyksy, Pribalkhashsky, Karaoisky, Almatinsky, 3 state natural monuments - "Charyn ash forest dacha", "Chinturgen spruce forests", "Singing dunes", Ili botanical garden and Issyk state dendrological park.

There are also 2,343 historical monuments, including 454 - heritage sites and urban planning monuments, 1,862 - archeology monuments, 7 natural monuments, 4 UNESCO monuments, 10 monuments of national importance and 10 new monuments.

For the year that has passed since the establishment of the Ili-Balkhash reserve, a lot has been done: 2 offices have been organized in the Bakanas village and Karoy village, the reserve staffed with qualified personnel, the foundation has been laid for the formation of a material and technical base, radio communication has been established, to ensure effective protection of the territory, checkpoints Kors and Karamergen have been created and equipped for year-round operation, raids and patrols of the territory by the security service are regularly carried out. Biotechnical measures are being taken to increase the number of ungulates, scientific research and biodiversity monitoring is being carried out, a management plan for the reserve for 2019-2023 has been developed. A nursery has been created to restore tugai vegetation, lost under the influence of anthropogenic factors, and over the past period, native tree species have been planted on the territory of the reserve. Active environmental education activities are underway.

The development of tourism in the Almaty region is carried out in accordance with the Concept for the development of the tourism industry of the Republic of Kazakhstan until 2023, the Program for the development of the service sector in the Republic of Kazakhstan until 2020, which includes key tourist attractions (archaeological landscape of Tamgaly with petroglyphs (UNESCO site); Altyn-Emel SSPE, included in the preliminary list of UNESCO; Charyn canyon on the territory of the Charyn SSPE; Kapshagai reservoir; ski areas near the city of Almaty with the Ile-Alatau SSPE included in the preliminary UNESCO list), the Akbulak international tourist center, Zhongar-Alatau SSPE, Kolsay kolderi, Khan Tengri peak and other objects.

The tourist potential of the region makes it possible to develop almost all types of tourism: mountain, hiking, water, ecological, cultural and educational and others. 122 tourist routes have been developed in the region.

The Master Plan for the Development of Tourism of the Almaty Region was approved, which identified 5 cluster directions: Talgar-Issyk cluster (resort), Kapchagai cluster (resort), Karadala cluster (resort), Raiymbek cluster, Alakol-Zhetysay and East Balkhash clusters.

According to statistical data, the indicators of the tourism sector are showing stable growth. So, for the period of 2015 - 2017, the number of accommodations increased by 46.7% and amounted to 449 units at the end of 2017 (2015 - 306 units). There are 8,204 rooms in accommodation facilities (2015 - 4,666 units), while the one-time capacity is 21,608 beds (2015 - 10,890 beds).

The main part of the accommodations (69.5%) is concentrated in Alakol (38.5%), Uyгур (8.2%), Panfilov (6.5%) districts, Kapshagay (9.6%), Taldykorgan cities (6.7%).

The number of visitors served in 2017 amounted to 703,663 people, an increase over the same period in 2015 by 2.7 times (264,819 people).

For the period of 2015-2017 in the region, there has been a tendency for the growth of visitors served by accommodations for domestic tourism (residents). In 2017, this target indicator was 701,336 people, which is 61.7% higher than the planned indicator, 1.6 times higher than in 2016 (433,325 people), 2.7 times higher than in 2015 (264,084 people).

The increase in the target indicator "The number of non-resident visitors served in comparison with the previous year" in 2017 amounted to 21.6% (2,327 people) or 3.2 times more compared to 2015 (735 people).

To increase the awareness of the population about the tourist objects of the region, a tourist navigation system using QR coding has been created in the region. 255 signs and pointers were installed to tourist sites along highways, on the territory of state national natural parks, at the exits from the cities of Almaty and Taldykorgan.

In the reporting period, work was carried out to promote the tourism product of the region in the domestic and international markets of tourism services. A tourist information Internet portal has been created, videos have been prepared, pages on social networks Facebook and Instagram have been opened. Also, by order of the Tourism Department, the BBC broadcasting organization shot a video about the nature and sights of the Almaty region.

Information tours for foreign tour operators were organized, presentations of tourist objects of the region were held in the format of a workshop for travel agents in the region and in the Almaty, Nur-Sultan cities.

2.4. Atyrau region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

Territory of the region - 118.6 thousand sq. km. According to the Committee on Statistics, the population at the beginning of 2018 was 620.7 thousand people, at the beginning of 2019 - 633.8 thousand people, and at the beginning of 2020 - 645.3 thousand people.

GRP of Atyrau region in 2017 amounted to 5,947.7 bln. tenge, the index of actual volume is 116%. GRP per capita amounted to 9,685.1 thousand tenge, among the regions it takes 1st place. In the volume of the republican GDP, the share of the gross regional product of the region amounted to 10.9%. In the GRP structure: industry - 46.9% (including mining industry - 41.7%, manufacturing industry - 4.5%), agriculture - 1%, trade - 7.1%, transport and warehousing - 6.3 %, construction - 7.8%. For 2018, the GRP of the region is 7,818.8 bln. tenge, and per capita – 12,465.5 thousand tenge. For 2019, GRP – 9,327.3 bln. tenge, per capita – 14,584.4 thousand tenge, index of actual volume - 107.4%.

The volume of industrial **production** in 2017 amounted to 5,508.2 bln. tenge, in 2018 – 7,077.5 bln. tenge, in 2019 – 7,888.1 bln. tenge. In the structure of industrial production, the largest share belongs to the extraction of crude oil and associated gas, oil distillation, production and distribution of electricity. The volume of manufactured goods in the Atyrau region in 2016 amounted to 489.3 bln. tenge, in 2017 increased to 512.5 bln. tenge, in 2018 - to 584.8 bln. tenge, and in 2019 decreased to 525, 6 bln. tenge.

Labor productivity in the manufacturing industry in comparison with 2015 increased in 2017 by 31.7% (69.5 thousand US dollars/person). Labor productivity in the manufacturing industry in 2019 amounted to 82.1 thousand US dollars/person.

Within the framework of the business support map (regional level), 28 projects are being implemented for the amount of 74.2 bln. tenge with the creation of 1,578 jobs¹³⁴.

134 Hereinafter, the Program for the Development of the Territory of Atyrau region for 2016 - 2020 and reports on its implementation for 2018 and 2019.

The SEZ territory is 3,475 hectares, which consists of 3 sites: Karabatan, Tengiz and Atyrau city. 15 participants are registered on the territory of SEZ NINT (Special Economic Zone "National Industrial Petrochemical Technopark"), 4 of which are strongly developing their activities:

1) Kazakhstan Petrochemical Industries Inc. LLP - a project for the production of polypropylene with a capacity of 500 thousand tons / year - in-progress;

2) KLPE LLP - a project for the production of polyethylene with a capacity of 1,250.0 thousand tons / year - together with the Borealis company;

3) Karabatan Utility Solutions LLP - construction of infrastructure facilities of SEZ NINT (gas turbine power plant with a capacity of 310 MW) - in-progress;

4) Polymer Production LLP - a project for the production of polymer products, completed (October 2015).

In order to attract domestic and foreign investments into the economy of the region, the ATYRAU INVEST International Investment Forum is held annually in the region. So, in the period from April 11 to 12, 2017, the next IV International Investment Forum "ATYRAU INVEST - 2017" was held in Atyrau. The main purpose of the Forum was to inform about the investment potential of the Atyrau region, to attract investments in specific investment projects and the region's economy. Within the framework of the Forum, 9 Memorandums of Cooperation and the implementation of a number of investment projects were signed for a total amount of 3.3 bln. US dollars.

Also, the region annually hosts the North Caspian Regional Exhibitions "Global Oil & Gas Atyrau" and the construction exhibition "Atyrau Build", at which the regional akimat organizes exhibitions of investment projects requiring investment. Within the framework of these events, presentations of export-oriented enterprises of the region are held for guests from near and far abroad, in case of interest, site visits are organized.

The share of **agriculture** in the region's GRP is only 2.3%, agriculture employs 12% of the region's working-age population. Gross agricultural output in 2019 amounted to 76.7 bln. tenge, with the advantage of animal husbandry (58.7%).

In arable farming, the main stake is made on the diversification of the industry, an increase in agricultural production through the transition to scientifically based resource-saving technologies for growing crops, and the involvement of new and currently unused lands in farming business.

In animal husbandry, the main priority is to increase the genetic potential of animals through the creation of large and medium-sized farms and family-type farms.

In the field of agricultural products processing, the main reference point remains the technical and technological modernization of the industry, the introduction of international quality standards into production, and the entry of domestic goods to foreign markets.

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture.

As of November 1, 2017, the area of the territory of the Atyrau region is 11,863.1 thousand hectares, of which the area of agricultural land is 21.2%.

Agricultural land in 2015 - 2017 increased by 204.7 thousand hectares and occupy an area of 2,522.6 thousand hectares or 21.2% of the total area of the region. The increase was due to the provision of land plots from reserve lands.

In the structure of the sown area, the largest share is occupied by vegetables (29.9%), as well as potatoes (23.8%) and forage crops (31.8%). New progressive methods are applied: moisture-saving and drip irrigation technologies. In 2018, the volume of areas cultivated using drip irrigation technology, compared to 2010, increased by 8.7 times and amounted to 2.54 thousand hectares, and in 2019 - 2.8 thousand hectares.

In total, greenhouses with a total area of 14.8 hectares are registered in the region and all are provided with the method of drip irrigation. By 2020, it is planned to increase the volume of greenhouses in the region to 25 hectares, to double the volume of vegetables produced out of season.

There are 20 facilities of farms for breeding livestock in the region. Including cattle breeding - 7 farms, breeding of pedigree sheep - 7 farms, breeding of pedigree camels "Kazakhtyn aiyr orkeshi" - 4 farms and 2 pedigree horse breeding. 1,838 peasant farms, 184 agricultural formations and 49.3

thousand households are engaged in the production of agricultural products in the region. It should be noted that the share of households in the total volume of livestock production is still quite high, which determines the small-scale nature of the industry's production.

The area of pastures on agricultural land is 2,250 thousand hectares, watered 1,096.1 thousand hectares, or 49%.

The area is a region with a significant proportion of its inhabitants traditionally engaged in fishing and processing of **fish resources**.

In the region, 19 facilities of fisheries carry out their activities. The largest of them are: “Imeni Amangeldy” LLP, “Zhemchuzhina” LLP and “Kaspiy Balyk” PK.

“Imeni Amangeldy” LLP and “Abylai-Khan” LLP have introduced the European Union veterinary norm compliance standard. This makes it possible to export fish products directly to the countries of the European Union.

In total, about 11 thousand tons of fish are caught per year and almost all of it is processed.

Fish products of the region are exported to the CIS countries such as Russia, Azerbaijan, Uzbekistan, Ukraine and the EU France, Germany, Lithuania, Latvia.

Commercial fish farming is an economically promising area of fish farming. In the Atyrau region, 2 projects are being implemented in this direction.

In September 2014, “Caspian Royal Fish” LLP implemented an investment project “Creation of a fish-breeding complex for growing marketable sturgeon fish and obtaining edible sturgeon caviar in a closed water supply system in Atyrau”. The design capacity of the plant is the production of 100 tons of marketable fish and the production of 1 ton of edible sturgeon caviar. In 2017, 26 tons of marketable fish and 225 kg of food caviar were produced. Today the manufactured products are sold in Almaty and Atyrau.

Since May 2017, a cage farm for growing sturgeon fish species has been put into operation on the Ural River in the Atyrau region of “Lugovskoy Konnyi Zavod” LLP. At the first stage in 2018 - 2020, it is planned to grow and sell 25 tons of sturgeon fish. At the second stage, in 2021-2023, production volumes will grow to 100 tons of sturgeon fish and 1.0 tons of edible caviar. The total cost of the project is 350 mln. tenge. Today 35 thousand heads of sturgeon fish are raised.

Development of energy, including renewable energy and energy supply to the population

Currently, the region is supplied with **electricity** by “Atyrauskaya Teploelectrocentral” JSC and obtaining power from off-balance energy sources through the networks of “Atyrau Zharyk” JSC from Russia and through the networks of “KEGOC” JSC from the Mangystau region.

Atyrau CHPP with gas turbine units with a total capacity of 414 MW fully meets the needs of the Atyrau region with electricity. Gas turbine power plants with a total capacity of 18 MW of “ANPZ” JSC meet the electricity needs of the Atyrau Refinery. Gas turbine power plants with a total capacity of 478 MW of HS-144 and HS-480 cover the needs of the facilities of “Tengizchevroil” LLP (TCO). Gas turbine power plants with a total capacity of 236 MW of NCOC meet the needs of the Karabatan plant. Electricity from “MAEK-Kazatomprom” LLP is supplied by the networks of “KEGOC” JSC. On the balance of “KEGOC” JSC are power lines with a length of 1,679.5 km and 5 substations with a voltage of 220 kV.

In 2019, the construction of 3 substations began (220 kV "Bozaryk", 110 kV "Akzhar") for a total amount of 1 bln. tenge. The construction of these facilities is going to 2020.

As a result, when the substations are put into operation, provision of high-quality electricity will be achieved for 250 thousand people.

The transmission and distribution of electrical energy from the Atyrau CHPP is carried out through the electric grids on the balance of the regional power grid company (RPGC) of “Atyrau Zharyk” JSC, which includes a complex of power transmission lines with a length of 9,475.9 km, 1,714 units of transformer substations, 77 units of substations with a voltage of 0.4 - 110 kV. There are also networks of “Kazakhstan Temir Zholy” JSC (ET-4) with a length of 733 km of power lines, transformer substations of 90 pcs. and 1 substation. In addition, on the balance of akimats and districts there are communal power supply networks with a length of 1,499.24 km of power lines, 585 pcs. of

transformer substations and 1 substation. A total of 13,701.3 km of power lines, 2,389 transformer substations, 84 substations in the region.

In the region, measures are being taken to introduce projects of **renewable energy sources**. To provide stable electricity to peasant farms in remote settlements of Isatay, Inder, Kurmangazy, Makat, Kyzylkoga districts, 67,630.2 thousand tenge were allocated for the purchase of renewable energy sources within the framework of the Employment 2020 program for the construction of 7 wind and 19 solar power plants with a capacity of 2 up to 5 kW.

In the village of Manash of the Isatai district, the Atyrau region, in 2016, the construction of a 52.8 MW wind farm was started. It was planned to install 36 wind turbines. For 2018, 24 units were built. With the completion of construction in 2019, the share of renewable energy sources in the region was 4%.

In the Atyrau region, since 2017, within the framework of a public-private partnership, the project "Construction of a street lighting network in Atyrau" is being implemented. The contractor of the project is "Batys Transit" JSC. Within the framework of this project, 39 streets with a total length of 106 kilometers were built, 20 transformer stations and 42 units of automatic lighting control systems and 2,816 LEDs were installed. Project cost: 5.2 bln. tenge.

There are 5 sources of centralized **heat supply** and 634 autonomous heat supply in the region.

The source of centralized heat supply for the city of Atyrau is the Atyrau CHPP with 14 boiler units with raising hot water boilers with an installed capacity of 736 Gcal/h. The district heating zone includes the right bank, the left bank and the South-Eastern industrial region. There is also a boiler house with a capacity of 13.23 Gcal / hour in the area of the 1st section of the city of Atyrau, which is on the balance of "AtyrauSuArnasy" PSE.

Heat is supplied to consumers in Atyrau through the networks of "Atyrauskie teplovye seti" JSC. "Atyrauskie teplovye seti" JSC has 426.7 km of heating networks, 44 heating points. In total, in 2019, there were 290.8 km of heating networks, including 110 - dilapidated and 95.3 km - in need of replacement.

The existing network of **gas pipelines** in the Atyrau region currently allows 2 cities and 130 villages from 166 settlements to be supplied with natural gas. The level of gasification of settlements is 79.5%. 34 settlements remain not supplied with gas.

Natural gas from "Tengizchevroil" LLP is carried out by the networks of the AB of "InterGazCentralAzia" JSC from the main gas pipelines of republican significance Central Asia Center and Makat - North Caucasus. Gas supply to the region is carried out by AB of "KazTransGazAimak" JSC, "AtyrauGazInvest" LLP and "ZhylyoyGaz" LLP. The total length of gas pipelines in the region is 5,448.5 km.

As the structure of energy consumption in the Atyrau region shows, 71% falls on the industrial sector, including energy, 4.5% on the transport sector, 18% population, 4% agriculture, 2.5% other sectors of the economy.

84% of the housing area in the region is in good condition, 12% requires repair and 4% is in disrepair.

The level of wear of engineering systems in the municipal sector of the Atyrau region is as follows:

- heat supply 39.3% in standard condition and 60.7% in need of repair (total length 520 km);
- power supply 59% in standard condition and 41% in need of repair (total length 13,103.4 km);
- gas supply 67% in standard condition and 33% in need of repair (total length 5,448.5 km).

In street lighting today, there are 13,927 light points (bulbs) of outdoor lighting, including energy-saving 70% or 9,811 (number) light points.

The implementation of energy saving measures is currently one of the main tools for modernizing industry, housing and communal services and the transport sector. Successful implementation of energy saving and energy efficiency measures ensures energy and environmental security, as well as increasing the competitiveness of the economy.

Condition of water supply and sewerage, provision of the population with centralized water supply and disposal

Access of the urban population to **centralized water supply** is 100% in Atyrau and Kulsary cities. In total, in the region in 2018, there were 164 rural areas (RA) (328,575 people), of which 130 rural settlements or 79.2% have access to centralized water supply, 13 rural settlements or 7.9% use decentralized water supply, 21 rural settlements or 12.9% use imported water.

The population of the region is provided with drinking water from the underground waters of the Ural, Kigach, Sharon rivers, the Koyandy, Muzdybulak, Taisoigan, Keregen Sagiz deposits and the Kigach-Mangyshlak group water pipeline.

The total length of water supply networks in the region in 2018 – 4,137.5 km, in 2019 – 4,212.2 km, of which only 77.2 km needs to be replaced in 2018 and 97.1 km in 2019 (data of the Committee on Statistics).

Within the framework of the program for 2011 - 2018, construction was completed and 108 water supply facilities were commissioned. As a result, during this period, the indicator of centralized water supply to rural settlements increased from 52% up to 79.2%. In cities, 100% of the population is provided with centralized water supply.

Design estimates have been developed for the construction of a main water supply system in the Suyunduk-Asan-Ushtagan village of Kurmangazy district and construction of water supply networks in the Karagay village of Zhylyoi district.

In addition, design estimates are being developed for the construction of water supply systems in the Alga, Karakol, Golbin, Kokarna and Kotyaev-Kudryashov villages of Kurmangazy district.

In the region, there are **sewerage systems** in the city of Atyrau, Kulsary and 12 settlements, which is 8.4% of the total number of settlements. The total length of sewerage networks does not change and is 415.7 km, of which 62.8 km need to be replaced in 2018 and 73.7 km in 2019 (data from the Committee on Statistics).

State of the environment, reduction of air and water pollution

For 2017-2019, according to Kazhydromet, the **level of atmospheric air pollution** in the city of Atyrau was observed at 5 posts and was assessed as low in 2017, the APS is 4 (low level) to a high in 2018 and 2019, the APS is 7 - 8 (low level). SI = 13.6 - 52 (> 10 very high level), HR = 8 -18% (raised level). Average ozone concentrations (ground level) amounted to 1.1 MPC daily average (2017), nitrogen dioxide - 1.1 MPC daily average (2018), the content of other pollutants did not exceed the MPC¹³⁵.

There are 147 nature users in the region, belonging to the 1st hazard category. Of these, 6 enterprises included in the list of large enterprises of the Republic: “Tengizchevroil” LLP branch of the “North Caspian Operating Company N.V.” (NCOC), “Atyrau” Trunk Gas Pipeline Administration of “Intergas Central Asia” JSC, “KazTransOil” JSC Western Branch, “EmbaMunayGas” JSC, “Atyrau Oil Refinery” LLP, which account for over 85% of all emissions.

The main share of air pollution (over 85%) in the region is accounted for by enterprises engaged in oil and gas production and oil refining business.

In 2016, there was a peak in actual emissions of pollutants into the atmosphere, this is due to the start of commissioning of the “Kashagan” field and the “Bolashak” plant of NCOC. To date, NCOC has entered the second stage of production indicators of oil production.

Also, currently “Tengizchevroil” LLP is working on further expansion of production within the framework of the Future Expansion Project (FEP).

The goal of FEP is to increase production capacity and achieve a higher oil recovery factor. Within the framework of the FEP, it is planned to build a third generation plant and a third generation gas reinjection system.

In general, both limited and actual indicators of the region are affected by the volume of technologically inevitable gas flaring at the flares of TCO and NCOC.

Compared to 2017, in 2018 there is a decrease in emissions of pollutants into the atmosphere - 179.5 thousand tons, and in 2019 to 164.5 thousand tons.

A significant contribution to air pollution in the city of Atyrau is made by the lack of sewage treatment facilities in the city. The main sources of hydrogen sulfide emission are the "Tukhlaya

135 Information bulletins on the state of the environment in the Republic of Kazakhstan for 2017-2019.

Balka", "Kvadrat" evaporation fields and sewage pumping stations. The reason for air pollution is the saturation of effluents with dissolved hydrogen sulphide gas and their further discharge to the "Tukhlaya Balka" and "Kvadrat" evaporation fields without purification.

According to the Committee for Environmental Regulation and Control of the Ministry of Energy of the Republic of Kazakhstan, the main reason for the high and extremely high air pollution of the city of Atyrau with hydrogen sulfide is industrial enterprises ("Atyrau Oil Refinery" LLP, 663 km Oil Pumping Station, ANU WB of "KazTransOil" JSC, "Storage Park liquefied petroleum gas"), located on the territory of the city, the storage pond "Kvadrat" in the right-bank part of the city, as well as the "Tukhlaya Balka" evaporation fields in the left-bank part.

The Department of Natural Resources and Environmental Management in 2017-2018 has developed and is currently undergoing a stage of approval of target indicators of the quality of the environment of the Atyrau region for 2019-2023.

A set of measures has been developed to achieve the target indicators, including the reduction of atmospheric air pollution in Atyrau with hydrogen sulfide.

For the development of a consolidated maximum permissible volume of emissions from large oil and gas production enterprises, which most negatively affect the quality of the environment, 24.0 mln. tenge were allocated from the regional budget. The work is being carried out according to the schedule on the basis of an agreement with Nomad Eco LLP.

The number of vehicles running on gas fuel is constantly increasing in the region. According to the regional department of internal affairs, in 2017 – 9,307 vehicles, in 2018 – 10,402 vehicles, as of May 1, 2019 - 13,000 vehicles.

Monitoring of **surface water pollution** on the territory of the Atyrau region is carried out by the branch of the "Kazhydromet" RSE in the Atyrau region at 4 water bodies (the Ural, Emba rivers, Kigach arm and Sharonov channel).

Monitoring of the quality of sea waters in 2017 and 2018 were carried out at the following coastal stations and age stacks: marine navigable canal, Tengiz field, seashore of the Zhaiyk River; the islands of the Shalygi-Kulaly Bay; additional stacks "A" and "B", Kurmangazy, Darkhan, Kalamkas, area of flooded wells, area of Kulaly island. Seawater samples were analyzed for suspended solids, pH, soluble oxygen, main ions, biogenic substances, organic pollutants (oil products, phenols), easily oxidized organic substances (according to BOD₅), heavy metals. The water quality according to the Combinatorial Water Pollution Index (CWPI) at all ranges of the North Caspian is assessed as "normatively clean". No excess of MPC was found. Compared to 2016, the water quality of the North Caspian remained unchanged.

In 2019, monitoring of the quality of sea waters were carried out at the following coastal stations: the Sea Navigable Canal (2 points), the coast of the Zhaiyk River (5 points), the Islands of the Shalygi Bay (5 points), the coast of the Volga River (7 points), Zhanbai village (5 points). The water quality of water bodies on the territory of the Atyrau region for 2019 is assessed as follows: not standardized (> 5 class) - the Caspian Sea.

Due to the lack of wastewater treatment in the regional center and the accumulation of a large volume of untreated wastewater, in 2017 the construction of sewage treatment facilities began in the left-bank part of the city of Atyrau with a capacity of 70,000 m³/day. In addition, design and estimate documentation is being developed for the reconstruction of the WWTP in the right-bank part of the city of Atyrau.

In December 2018, a massive extinction of fish occurred on the Ural River, due to the volley of chlorine and other pollutants by the "Atyrau Su Arnasy" PSE and "Atyrau CHP" JSC. In general, from December 2, 2018 to March 24, 2019, 118.5 tons of dormant fish were collected on the Ural River. But the fish died not only in the river, but also at fish farming enterprises. The investigation into this egregious case is still ongoing.

On April 4, 2019, the first part of the conclusion of a comprehensive forensic-ecological examination was received, according to which, the fish selected for expert research on December 27, 2018 from points starting from the Atyrau Su Arnasy PSE and downstream of the Ural River, died as a result of entering highly toxic chlorine water. According to the conclusion of the examination, the

heads of the Atyrau Su Arnasy PSE were recognized as suspects in the case, the qualifications of their actions were determined.

Production and consumption waste management and waste processing

Solid household waste. In 2018, the population of the region was 629,562 people, of which 100% was covered by services for the collection and removal of solid household waste (it should be noted that the coverage indicator has not changed since 2016). Out of 81 objects of solid household waste disposal, only 17 comply with environmental and sanitary requirements and standards, which is 20.9%.

In 2019, there are 86 polygons in the region. Of these, 22 have received permits for emissions into the environment.

The share of separately collected and sorted waste in the sources of generation (of the total volume of waste generated) in 2018 was 16.7%, in 2019 - 10.44%. In 2018 - 22,771 tons, in 2019 - 20,009 tons of solid household waste were selected and processed.

At container sites for residential, industrial and social facilities, about 40 containers have been installed to collect used mercury-containing lamps, about 120 mesh containers for collecting plastic waste.

Acceptance and sorting of solid household waste in the region in the city of Atyrau is handled by “Arnauyavtobaza” LLP, “West Dala” LLP, “Ecoplastic” LLP, in the Zhylyoi district – “Zhylyoi Tazalyk” LLP, “Promekologiya” LLP, “Eco Kala XXI” LLP, in the Makat district – “Tazalyk Kogal” LLP, in the Makhambet district – “Eshmanova” PE, “Zhasyl Aimak” LLP, in the Inder district – “Bytovoye obsluzhivanie” LLP, in the Isatai district – “Rysbayev” PE, “Isataigazstroysservice” LLP, in Kurmangazy district – “ArTri” LLP, “Tayashov E.” PE, “Calibri” LLP. Sorted recyclable materials in pressed form are exported to the cities of Almaty and Shymkent, as well as to the Russian Federation.

As part of the expanded obligations of manufacturers (importers) in 2019, “PromEcology” LLP, located in the city of Kulsary, received compensation in the amount of 13.1 mln. tenge for recycling tire waste in the amount of 3,300 tons.

In the Atyrau region, since the launch (November 2016) of the program for the acceptance of ramshackle vehicles (RV), 2,320 vehicles were accepted for the amount of 2,71 mln. tenge, of which 1,531 - for monetary compensation, 789 - for discount certificates for the purchase of a new domestic car production.

Within the framework of the EPR mechanism in the country, since 2016, infrastructure has been created in the field of waste management. Thus, 2,321 containers for collecting mercury lamps and batteries from the population were transferred to akimats, 8,905 containers for separate collection of solid household waste, 30 pieces of garbage trucks, 289 containers for electrical and electronic equipment were purchased, 104 points were created for receiving recyclable materials.

However, we note the lack of activity on the part of the akimat of the Atyrau region to interact with the EPR Operator to build capacities on the relevant infrastructure.

Considering the relevance of the issue of **waste** management, since 2012, in accordance with the instructions of the Head of State to the Government of the Republic of Kazakhstan, a project has been developed to justify investments in modernizing the solid household waste management system in the city of Atyrau.

On the basis of the developed project for the construction of a new landfill, a land plot of 50 hectares was allocated on the territory of the Almaly rural area of the Makhambet district. Design estimates have been developed for the construction of a new landfill for solid household waste and reclamation of the old landfill in Atyrau. In 2017, an expert opinion was received for the project of reclamation of the old landfill in Atyrau city. The cost of the project is 1,641.278 mln. tenge.

In September 2019, a modern complex for the reception, sorting and disposal of solid household waste was put into operation on the 6th kilometer of the Kulsary-Beineu highway, on a land plot with an area of 6.5 hectares, which has the capacity to receive 30 thousand tons per year.

Also, in the solid household waste landfill in the city of Atyrau, waste is regularly ignited. In this regard, as a result of the renewal of the material and technical base of Spetsavtobaza LLP, it was

possible to significantly reduce the impact of the landfill on the atmospheric air of Atyrau city. In 2015 – 2016 - 2 fires, in 2017 - 1 fire, which was promptly eliminated.

Medical waste accumulated in institutions that are part of the health care system (hospital, medical center, etc.) are registered to a certain extent. Most of mercury-containing fluorescent lamps and thermometers from medical institutions are handed over to “WestDala” LLP. In addition, only 28 incinerators operate in the region to dispose veterinary waste. Including, in the city of Atyrau - 2, Zhylyoi district - 5, Inder district - 2, Isatai district - 4, Kyzylkoga district - 5, Kurmangazy district - 6, Makat district - 1 and Makhambet district - 3.

There is no centralized system for the collection and special processing of waste batteries, accumulators, household waste of electrical and electronic equipment. However, a chaotic market for the collection of used batteries (lead) has formed.

Since 2015, “Pervomaysky” JV has been using an innovative method of **processing organic waste** (manure). The production capacity is 4 tons per day. In March, April and May 2018, 4 tons of biologically active, environmentally friendly and natural organic fertilizers were released for sale. In other seasons, 500 kg are offered for sale, and the remaining 3.5 tons are used for production needs.

For the first time in 2014, the “Almaly Kus” plant was launched, and now its capacity is 60 million eggs per year. By 2017, the production of eggs increased and reached 88 million eggs. At the same time, the construction of an innovative project for the disposal of chicken waste has begun, which will allow the production of 200 thousand tons of organic fertilizers per year, 1 MW of electricity and heat for production. Project name: production of biofertilizers using clean energy (biogas) by use of environmentally friendly products.

The state of biological resources and the development of forestry, fishing and hunting industries, specially protected natural areas and ecological tourism

In the region, the state forest fund is 52,446 hectares, of which 15.1 thousand hectares are covered with forest. The Atyrau, Makhambet, Inder and Kurmangazy communal state institutions for the protection of forests and wildlife are engaged in the keeping, protection of forests and afforestation. Forestry institutions carry out reforestation every year. In 2015 - 2017 reforestation work was carried out on an area of 225 hectares, and the tree-planted area has grown from 60 up to 65 hectares.

As part of the annual tree planting campaign "my personal tree", "Zhasyl zhapyrak-Green leaf", organized in the city of Atyrau, 10 thousand seedlings were planted.

81.2 million US dollars was allocated for the material and technical equipment of 4 forestry institutions in 2016-2018. For these purposes, funds in the amount of 1 bln. tenge have been allocated from the local budget, equipped with special equipment, equipment in accordance with the standards.

At the end of 2017, in the village of Makhambet of the Makhambet forestry, an office, a fire station and a complex of an motor and tractor park were built and put into operation. In 2018, similar facilities were commissioned in Inder and Kurmangazy forestry.

On the territory of the state forest fund, fire barrier lines with a length of 91 km were arranged.

The regional akimat approved an action plan for the prevention and elimination of forest fires in the territory of the Atyrau region in the fire season of 2018.

On the territory of the SFF:

- in 2015, 1 case of fire on the territory of 0.5 hectares (forested area);
- in 2016, 1 case of fire on the territory of 100.5 hectares (forested area 0.5 hectares, non-forest 100 hectares).
- in 2017 - 2019, no cases of fire were recorded.

There are three **specially protected natural areas** on the territory of the Atyrau region:

- State protected area of the northern part of the Caspian Sea with an area of 700 thousand hectares;
- Novinsky state natural (zoological) reserve with an area of 45 thousand hectares, located in the coastal zone of the Caspian Sea on the territory of the Kurmangazy district;
- Akzhaiyk State Natural Reserve with an area of 111.5 thousand hectares, located in the city of Atyrau and Makhambet district.

The total area of these territories is 7.2% of the entire territory of the region.

Since 2008, the Akimat of Atyrau region has been working to create specially protected natural areas for local purposes. In this regard, a scheme of specially protected natural areas has been developed, as well as science justification and feasibility study of the Balbulak and Tashagyl state wildlife refuge of local importance.

On the territory of the region, 4 historical and cultural monuments of republican significance and 313 monuments of local significance are registered.

The development of the tourism industry is one of the priorities of the region's economy.

The region has opportunities for the development of sports and amateur (hunting and fishing), ethnographic and cultural tourism (familiarization with the history and traditions of the region). Recreational facilities "Meken", "Altyn Sazan", "Saraishyk" located on the banks of the Ural River provide a variety of recreational activities such as "rock climbing", "horseback riding and horseback riding".

Hunting and fishing services are carried out at the recreational facilities of the Kurmangazy district. Tourists come here from Russia and France, who enjoy active leisure, and their number is growing every year.

At the same time, ecological tourism is developing here because of the unique species of rare birds included in the Red Book of Kazakhstan and of interest to ornithologists around the world on the coast of the Caspian Sea on the territory of the Akzhaiyk Natural Reserve.

The most important place for visitors is the village of Saraishyk, located in the northern part of the Great Silk Road. In order to promote the historical heritage and promote tourism, the issue of the implementation of the "Medieval Saraishyk" project is being considered. Experts from different sectors are involved in the implementation of this project. At present, draft designs, science justification and location of the ancient city have been developed.

In addition, the region's vast steppes are ideal for the development of adventure tourism, and cycling and hiking trails in the region have been identified. These trips are mainly carried out by expeditions from France, Italy and Germany.

There is no resort area in the region. There are favorable transport opportunities for the development of tourism in the region. Conditions have been created for the use of air transport and railway services for tourist organizations.

The lack of qualified personnel in tourism is felt in instructors, tour guides, guides-translators with knowledge of foreign languages, as well as the history of the region.

Attracting investments for the implementation of projects in the field of tourism infrastructure development remains one of the main problems that need to be addressed.

2.5. The East Kazakhstan region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

Territory of the region - 283.2 thousand sq. km (10.3% of the territory of Kazakhstan). More than 800 rivers with a total length of 10 thousand km flow through the region. The region has large lakes Zaysan, Markakol, Alakol, Sasykkol, as well as a number of reservoirs, including Bukhtarma. The region belongs to one of the most water-supplied regions of Kazakhstan. About 7% of the territory is covered with forests, steppe, desert and mountain-taiga landscapes coexist.

According to the Committee on Statistics, the population at the end of 2017 was 1,383,700 people, at the end of 2018 - 1,378,500 people, and at the end of 2019 - 1,369,600 people.

GRP of the region in 2017 amounted to 3,174.8 bln. tenge and 2,289.5 thousand tenge per person, in 2019 – 4,025.0 bln. tenge and 2,929.2 thousand tenge per person. The volume of **industrial production** in 2017 amounted to 1,581.5 bln. tenge or 6.9% of the republican level, in 2018 it reached the level of 1,860.1 bln. tenge, and in 2019 - 2,153.9 bln. tenge.

The main factors of economic growth were high consumer demand and the outlined revival of investment activity in the region¹³⁶.

The basis of the mining industry is the extraction of polymetallic ore containing copper, lead, zinc, gold, silver. The main producers are “Kazzinc” LLP and “Vostoktsvetmet” LLP. Industrial sites of “Kazzinc” LLP are city-forming for the cities of Ust-Kamenogorsk, Ridder and Zyryanovsk. Branches of Vostoktsvetmet LLP - for Glubokovsky, Shemonaikha, Borodulikha districts.

The volume of the **manufacturing industry in 2017** amounted to 1,283.5 bln. tenge, in 2018 - 1,417.1 bln. tenge, and in 2019 - 1,560.3 bln. tenge.

In 2019, the number of enterprises and industries in the manufacturing industry is 758 units. The leading enterprises in this industry are “Kazzinc” LLP, “Ust-Kamenogorsk Titanium and Magnesium Plant” JSC, “Ulba Metallurgical Plant” JSC. The industry's enterprises produce the main precious and non-ferrous metals: lead, zinc, copper, refined gold and silver, as well as titanium, magnesium, tantalum, fuel for nuclear power plants. In 2017, labor productivity in the manufacturing industry increased by 5.4% compared to the previous year, in 2018 by 12.1%, in 2019 by 9.6%.

Enterprises of the machine-building complex: “Asia Auto” JSC, “Kaztsinkmash” LLP, “Ust-Kamenogorsk Valve Plant” JSC, “Vostokmashzavod” JSC, “Ust-Kamenogorsk Condenser Plant” LLP, “KEMONT” JSC, “Semipalatinsk Machine-Building Plant” JSC, “Semey Engineering” JSC, “Hydrostal” LLP, “Kazelectromash” LLP, “Daewoo Bus Kazakhtsan” LLP, “SemAZ” LLP, “Mashzavod” LLP, “Ust-Kamenogorsk Industrial Valve Plant” LLP, “Ust-Kamenogorsk Plant” “KazRosPromArmatura” LLP, “Silumin-Vostok” LLP.

From 2010 to 2019, 50 projects of the East Kazakhstan Entrepreneurship Support Map were put into operation for 7,31.4 bln. tenge, 8.6 thousand jobs were created.

The most significant projects:

- construction of Aktogai mining and processing complex of “KAZ Minerals Aktogai” LLP - one of the largest plants in the world. In 2019, Aktogai reached a record level of copper production - 145.7 thousand tons (11% more compared to 2018), while exceeding the annual target of 130-140 thousand tons. The high level of production was achieved due to the combination of a high metal content in the ore, a stable throughput of the concentrator.

- construction of a mining and processing complex with a capacity of 2.0 mln. tonnes of ore per year by “Bakyrchik Mining Enterprise” LLP. The project united the Bakyrchik refractory ore deposits and the concentrating plant, where the production of gold concentrate began in Q2 2018. For the first 10 years, the Bakyrchik deposit will be mined in an open pit with a subsequent transition to underground mining.

- modernization of the production of the Ust-Kamenogorsk valve plant (a robotic welding complex was put into operation, it allows to increase labor productivity by 40%, and guarantees the quality of products for up to 36 years);

- construction of a plant for the processing of oilseeds (rapeseed) of “TAG-TIN” LLP - aimed at import substitution.

In 2020, it is planned to put into operation 3 projects for 35.2 bln. tenge and the creation of 361 jobs.

The share of **agriculture** in the region's GRP is 9.0%. Agriculture is the basic sector of the economy for 14 out of 15 districts (excluding the Altai district).

East Kazakhstan region occupies a leading position in the republic for the production of milk, sunflower oilseeds, honey and antlers - 1st place, for meat production - 2nd place, potatoes - 4th place.

In the structure of agriculture, more than 55.2% is accounted for by animal husbandry. In addition to such traditional industries as cattle, sheep, poultry breeding, maral breeding and beekeeping are well developed.

In terms of gross agricultural output among the regions of the republic, the region is in 4th place. The volume of gross agricultural output, according to the Statistics Committee of the Republic of Kazakhstan, reached 472 bln. tenge in 2017, 515 bln. tenge in 2018, and 592 bln. tenge in 2019.

Labor productivity in agriculture, according to the regional akimat, increased in relation to 2016 by 25.5% in 2017, by 51.4% in 2018 and by 71.6% in 2019.

In 2019, investments in fixed assets in agriculture reached 30.9 bln. tenge, or 110.7% by 2018. At the end of 2019, labor productivity in agriculture per 1 employed amounted to 3,487.2 thousand tenge, or 113.3% compared to 2018.

The gross harvest of grain and leguminous crops, with an average yield of 17 centner/ha, reached 930.3 thousand tons (114% by 2018), oilseeds, with a yield of 12.5 centner/ha, reached 596.3 thousand tons (108 % by 2018), potatoes with an average yield of 217.8 centner/ha - 425.3 thousand tons (99.4% by 2018), vegetables and melons - 422.5 thousand tons (112% by 2018.)

For the development of beef cattle breeding in 2019, it was planned to purchase 11,000 heads of imported pedigree breeding stock of cattle, 21,750 heads of small ruminants. At the end of 2019, 6.5 thousand heads of cattle were purchased and delivered to the region, or 60% of the plan. Small ruminants purchased 16,449 heads, or 76% of the plan. For 2019, it is envisaged to participate in the breed transformation of 172,100 heads of cattle, at the end of the year, 173,396 heads, or 101% of the plan, participated in the breed transformation.

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture

Work continues on the development of agricultural cooperation. At the end of 2019, 312 operating agricultural cooperatives with 3,581 members were registered. Further development of cooperation will be based on vertical-horizontal integration around anchor enterprises (processing enterprises, large feedlots, pedigree reproducers and dairy farms).

To enter the markets of high-quality finished products, "Eurasia AgroHolding" LLP jointly with the Australian company "CedarMeatsPty" in the Ayagoz district began work on the construction of a meat processing plant with a capacity of 11.5 thousand tons of meat per year, a feedlot for 50 thousand heads of sheep of one-time keeping, with an investment volume of 9.4 bln. tenge.

"AgroPortal" LLP with the participation of the Iranian engineering company Jahan Mana is planning to implement a project for the construction of a meat processing plant with subsequent deep processing of meat of cattle and small ruminants according to the Adal standard with a project cost of 20 mln. US dollars.

To promote natural food products "Made in Kazakhstan", the peasant farm "Paseka" in February last year registered in the PRC the brand of East Kazakhstan "Altai honey". The enterprise under this brand is planned to provide the export of 1000 tons of honey per year, with an annual increase of 20%.

Treatment with antler preparations has been introduced in all large maral breeding farms, in sanatoriums of the regional center. The production of more than 40 types of medical products based on antlers, blood, meat, endocrine glands of marals has been mastered.

The area of pastures on agricultural land amounted to 8,461.3 thousand hectares in 2017, and in 2018 – 8,710.5 thousand hectares, watered 5877.8 thousand hectares, or 69%.

In the structure of sown areas, grain and legumes occupy 42.7%, sunflower - 29.5%. The region produces 54.8% of the total volume of sunflower production in the republic.

In 2015-2017, the sown area increased from 1,277.9 thousand hectares to 1,316.4 thousand hectares in 2017 by 3%, while the areas using moisture-saving technology increased by 3.9%, their share in the total sown area grain crops is 43%.

The share of crop rotations in arable land (field crop rotation) in 2017 was 31.8%, and in 2018 - 48.6%.

The share of pasture rotation in the composition of natural pasture lands (fodder crop rotation) in 2017 was 6.9%, and in 2018 - 12.6%.

The region has 195.7 thousand hectares of irrigated land, of which 94.0 thousand hectares were used in 2019. Measures are planned to restore and bring into farming business 82.2 thousand hectares of unused irrigated land.

New progressive irrigation methods such as sprinkling and drip irrigation are used. Irrigation areas by sprinkler irrigation in 2019 amounted to 8,100 hectares, drip irrigation - 850 hectares.

The land fund of the East Kazakhstan region is 10.4% of the territory of the Republic of Kazakhstan, of which:

- 1) agricultural land - 10,848 thousand hectares (38.3% of the region's land fund);
 - 2) lands of settlements – 2,945 thousand hectares (10.4%);
 - 3) land for industry, transport, communications, for the needs of space activities, defense, national security and other non-agricultural purposes - 188.3 thousand hectares (0.7%);
 - 4) lands of specially protected natural areas, lands of health-improving, recreational and historical and cultural purposes – 1,542.1 thousand hectares (5.4%);
 - 5) lands of the forest fund - 2,152.5 thousand hectares (7.6%);
 - 6) land of the water fund - 571.2 thousand hectares (2.0%);
 - 7) reserve lands - 10,099.7 thousand hectares (35.6%).
- Composition of agricultural land in the region (table 2.5.1.).

Table 2.5.1. Agricultural land, thousand ha

Total area	Total farmland	Arable land	Perennial plantings	Fallow	Hayfields	Pastures	Gardens and service plots
10,848	10,691.6	1,452.2	2.3	60.9	465.4	8,710.5	0.3

The increase in the share of agricultural land involved in farming business in 2017 was 9%, and in 2018 - 11.5% (Table 2.5.2.).

Table 2.5.2. Involvement of agricultural land in farming business

Target indicators	Implementation by years			
	2017	2018	2019	2020 plan
Increase in the share of agricultural land involved in farming business, %	9,0	11,5	13,4	15,5
The share of crop rotations in arable land (field crop rotation), %	31,8	48,6	50,0	51,4
The share of pasture rotation in the composition of natural pasture lands (forage crop rotation), %	6,9	12,6	13,6	14,8

Development of energy, including renewable energy and energy supply to the population

Power supply. East Kazakhstan region has a great energy potential. There are 9 power plants in the region with a total installed capacity of 2,323 MW, which is 10.6% of all energy capacities in Kazakhstan. 3 HEPPs on the Irtysh River have the status of national importance and ensure reliable and stable operation of the entire energy complex of the Republic of Kazakhstan.

The main consumers of electricity are industry (71% of consumed electricity), the population (16.5%), as well as the budgetary and quasi-public sector (8.3%).

The region is supplied with electricity and heat. A significant share of electricity in the region (67.8%) is generated from hydro resources, another source is coal energy.

East Kazakhstan has a significant potential of renewable energy sources (RES) for 61.3 bln. kWh per year, it is technically feasible to use a potential of 20 bln. kWh.

In 2018, the share of electricity generated by **renewable energy sources** in the total electricity generated (including large hydroelectric power plants) was 74.3%, and in 2019 - 70.6% or 6,841,333.6 thousand kWh. per year from the total output of 9,688,045.2 thousand kWh. per year.

The operating renewable energy facilities are: Leninogorsk HEPP cascade (Tishinskaya HEPP, Khairuzovskaya HEPP), Ulbinskaya HEPP, Zaisanskaya HEPP.

This year, the construction of the Turgusunskaya HEPP-1 with an installed capacity of 24.9 MW is being completed. In general, the construction of a cascade of Turgusunskaya HEPP-1, HEPP-2 and HEPP-3 in the Zyryanovsk district will generate up to 328.0 mln. kWh per year of "green" electricity and create a reserve capacity of electricity in the region.

There is a certain potential for the development of wind energy in East Kazakhstan and there are areas suitable for the construction of wind farms and it is planned to build the following wind farms:

- Tayyntinskaya wind farm in Ulan district with a capacity of 24 MW, which will generate 65 mln. kWh of electricity per year;
- Zharminskaya wind farm in Zharma district with a capacity of 37.5 MW will generate 98 mln. kWh of electricity per year;
- "Construction of a wind power plant with a capacity of 40 MW with an expansion up to 200 MW by "Zharma Energy" LLP".

Also, it is planned to build a solar power plant with a total installed capacity of 132.5 MW with the prospect of expanding up to 292.5 MW.

283 solar panels have been installed in the region; in addition, it is planned to install 515 alternative energy sources by 2021.

Renewable energy sources for the period of 2015 - 2017 generated 159.4 mln. kWh of electricity (LC HEPP, Tishinskaya HEPP - 129.9 mln. kWh, Zaysanskaya HEPP - 29.5 mln. kWh).

In August 2019, a solar power plant with an installed capacity of 30 MW was successfully put into operation in the Zharma district. In 2021, it is planned to commission the Turgusun HEPP-1 in the Altai district, with an installed capacity of 24.9 MW and an average annual output of 79.8 mln. kW * h.

According to the results of the auction in 2018, 1 land plot in the Aktogai settlement of the Ayagoz district was identified for the construction of a 100 MW wind farm. The initiator of the project is "VES 100 MW "Abay 1" LLP. The wind power plant will generate up to 300 mln. kWh of electricity. At the moment, an anemometer tower has been installed to detect the wind speed. Construction of the administrative building and access roads has begun. The commissioning of the facility is planned for 2021.

Following the results of the auction in 2019, 6 projects with a total capacity of 29.7 MW were identified in the Zharma district of the East Kazakhstan region. To date, design and survey work is underway. According to the rules for organizing and holding the auction, the term for the implementation of projects for the construction of wind farm facilities is 36 months from the date of the contract. However, in accordance with the protocol decision of the state commission for ensuring the state of emergency dated April 17, 2020 No. 13, the deadline for submitting notifications of the start of construction and installation works and acts of acceptance into operation of facilities was extended for a period of not more than one year.

Since 2015, the Comprehensive Plan for Energy Saving and Energy Efficiency Improvement of the East Kazakhstan Region until 2020 has been implemented. The task of reducing the energy intensity of the gross domestic product by at least 25% by 2020 is being solved step by step. Over the past 3 years, the energy intensity of the regional enterprises has decreased by 235 thousand tons of oil equivalent, or by 22%.

Also, within the framework of cooperation with the European Bank for Reconstruction and Development, 4 projects are being implemented aimed at reducing the consumption of energy resources. According to the projects, it is planned to replace 56 thousand gas-discharge lamps with energy-efficient and infrastructure facilities with wear of more than 70%.

The implementation of these projects will reduce electricity consumption by up to 40% and reduce excess losses in networks. The task of reducing the energy intensity of the gross domestic product by at least 25% by 2020 is being solved step by step (Table 2.5.3.).

Table 2.5.3. Reducing the energy intensity of the domestic regional product and the introduction of renewable energy sources

Target indicators	Implementation by years
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Target indicators	Implementation by years			
	2017	2018	2019	2020 plan
Indicator of the energy intensity of the gross regional product, t.e. per thousand US dollars in 2000 prices (in 2013 - 0.82)	0.83	0.79	(data will be generated in December 2020)	0.61
The share of generated electricity by renewable energy sources in the total volume of generated electricity, in% (data including large hydroelectric power plants)	75.7	74.3	70.6	3.2

The industrial sector (including the electric power industry) consumes on average 70-80% of the total energy resources consumed in the region, the remaining volumes are consumed by the utilities sector, transport, construction, agriculture, etc.

Among the industrial enterprises, the most energy-intensive production belongs to “Kazzinc” LLP, where special attention is paid to the issues of energy saving and energy efficiency.

In accordance with the Decree of the Government of the Republic of Kazakhstan dated February 18, 2013 No. 143 "On approval of the Rules for the formation and maintenance of the State Energy Register (SER)", a list of facilities for conducting an energy audit was drawn up, both buildings of budgetary organizations, and industrial facilities, residential buildings. In the East Kazakhstan region, 1,348 facilities are included in the SER. To date, 20 large industrial enterprises of the region have completed energy audits and have taken measures to reduce energy consumption.

Within the framework of the Concept for the transition of the Republic of Kazakhstan to a "green economy", 17,418 incandescent lamps were replaced with energy-saving ones in all 655 schools of the region.

In cooperation with the European Bank for Reconstruction and Development work is underway to implement projects aimed at modernizing infrastructure and reducing the consumption of energy resources.

In particular, under the project “Within the framework of the project “Modernization of street lighting systems in the cities of Ust-Kamenogorsk and Semey” worth 4.8 bln. tenge, it is planned to replace 26,488 lamps with energy efficient street lamps. The implementation of these projects will reduce electricity consumption by up to 40% or save about 228 mln. tenge per year.

Work is underway to modernize heat supply and water supply networks for a total amount of 20.9 bln. tenge at the expense of EBRD borrowed funds. Reconstruction of 37.3 km of water supply networks and 54.6 km of heat supply networks in the cities of Semey and Ust-Kamenogorsk is planned. The funds have been disbursed since 2018 according to the delivery schedules within the framework of the concluded contracts. The implementation of projects is aimed at replacing infrastructure facilities with wear of more than 70%, which will reduce excess losses in networks and energy consumption through the use of new technologies.

In addition, energy-saving technologies are being introduced in the regional street lighting system. In all cities and districts of the region, work has begun on replacing street lamps with LED ones.

Heat supply. There are 4 thermal power plants on the territory of the region - Ust-Kamenogorsk CHPP, Sogrinsk CHPP, Ridder CHPP, CHPP-1 in Semey, which provide heat and hot water supply to consumers in the cities of Ust-Kamenogorsk, Semey and Ridder.

Thermal energy is generated by 111 heat supply sources and 385 installed boilers (power plants). There are 672 boiler houses with a capacity of up to 100 Gcal, of which 462 are on solid fuel, 26 are on liquid fuel and 184 boilers use electric boilers. The total length of heating networks in 2017 – 1,051.4 km (2019 – 1,075.1 km), including dilapidated - 274.6 km or 26.1% (in 2019 - 291.7 km or 27.1%), 374.8 km or 35.6% need replacement (in 2019 - 388.0 km or 36.1%), 23.3 km were replaced (in 2019 - 20.4%).

In 2017, 7,873.7 thousand Gcal of thermal energy were generated (in 2019 – 8,166.8 thousand Gcal). Heat energy losses amounted to 1,013.2 thousand Gcal (in 2019 – 1,104.4 thousand Gcal).

Gas supply. Liquefied petroleum gas (propane-butane) is consumed through 670 group tank installations (of which 204 are operating). Taking into account that gas distribution plants and vessels for providing centralized gas supply are in an unsatisfactory technical condition, a gradual conservation of gas facilities is being carried out.

Gasification of the Zaisan district with natural gas produced from the Sarybulak field is under way.

In accordance with the Law of the Republic of Kazakhstan "On Gas and Gas Supply", "KazTransGas Aimak" JSC is defined as the single operator.

In 2017, the construction of the facility "Construction of intra-quarter distribution networks of the second start-up complex of the first stage in the city of Zaisan, East Kazakhstan region" was completed, with a total length of gas networks of 105.351 km, of which the length of a medium-pressure gas pipeline is 9.517 km, the length of a low-pressure gas pipeline is 95.834 km. As of 01.01.2018, 1,640 residential buildings were connected to the centralized gas supply in the city of Zaisan.

In 2018, the construction of intra-settlement gas distribution networks was completed in 9 settlements of the Zaisan district (the villages of Karabulak, Kensai, Kainar, Ainabulak, Zhambyl, Kogeday, Shalkar, Karatal, Ulken-Karatal). Work on connecting residential buildings to the centralized gas supply system continues. As of October 5, 2020, 1,640 residential buildings have been connected. The total length of gas networks is 119 km.

Table 2.5.4. Providing the population with high-quality utilities

Target indicators	Implementation by years			
	2017	2018	2019	2020 plan
Decrease in the share of condominium objects requiring major repairs, %	18.3	16.4	13.9	11.0
Access in cities to centralized:				
water supply, %	97.3	97.8	98.2	98.6
single-industry towns	99.4	99.5	99.8	100.0
small towns	99.8	99.9	99.9	100.0
water disposal, %	70.0	71.0	72.0	73.0
single-industry towns	80.1	84.3	89.0	100.0
small towns	46.2	61.3	82.5	82.8
Access of rural settlements to centralized:				
water supply %	44.7	53.7	56.0	62.0
water disposal %	10.0	8.7	8.3	7.7
The share of modernized networks in the total length, %:				
heat supply	11.2	18.9	20.4	29.7
single-industry towns	7.3	14.3	23.8	27.9
small towns	0	0.4	0.6	0.3
gas supply	0	0	0	0
power supply	0	0.7	0.6	0.5
single-industry towns	12.1	1.7	26.1	14.8
small towns	0.1	0.2	0.2	0.3

In 2019, the implementation of a project for the construction of trunk supply networks to 8 settlements of the Zaisan district began. The cost of construction and installation work under the contract amounted to 852,515.8 thousand tenge. In 2019, 200,000.0 thousand tenge were allocated, in 2020 652,515.8 thousand tenge were allocated. The percentage of development is 98%. To date, 52 km of high-pressure gas pipelines (0.6 MPa) have been built, 8 gas-distributing plant have been installed. The planned completion date of the project is November 15, 2020.

At the current time, at the expense of the regional budget, a design and estimate documentation is being developed for the construction of gas supply pipelines to 8 settlements of the Zaisan district

and intra-settlement gas networks (Daiyr village, Kokzhyra village, Kuanysh village, Birzhan village, Sarterek village, Zharsu village, Bakasu village, Sarzhyra village) with a total cost of 89.6 mln. tenge.

In 2021, it is planned to implement a project for the construction of intra-settlement gas networks to the above-mentioned 8 settlements. The total cost of the project is 1,267,723.0 thousand tenge. When gas supply facilities are launched, 3,500 residential buildings will be connected to the centralized gas supply. The total length of gas pipelines is 71.0 km, 10 gas-distributing plant will also be installed.

According to preliminary calculations, the transition of boiler houses to natural gas as the main source of heat generation will reduce emissions of harmful substances (coal ash, sulfur dioxide, nitrogen and carbon monoxide) into the atmosphere by 9 times from 31 thousand tons to 3 thousand tons, which will significantly improve the environmental and the social situation in the region.

Condition of water supply and sewerage, provision of the population with centralized water supply and disposal

Water supply. East Kazakhstan region belongs to one of the most water-supplied regions of Kazakhstan. The volume of drinking-quality water supplied to consumers of the East Kazakhstan region in 2017 amounted to 129.8 mln. m³, and in 2019 - 189.1 mln. m³. The main consumers of water are: industrial and municipal enterprises and the population.

In the public water supply systems of the population, 4,745.1 km of water pipes operated in 2017 and 5,191.8 km in 2019, of which 2,172.2 km needed to be replaced in 2019. The unsatisfactory condition of water supply networks is the reason for an increase in the number of accidents on water supply networks, an irretrievable loss of water volumes and an increase in the specific norms of water consumption by the population. In total, 343 accidents on water supply networks were identified and eliminated in 2017. Repaired 29.7 km of networks. In 2019, 308 accidents were eliminated, 19 km were replaced, 28.3 km of networks were repaired, but the volume of repair and restoration work is clearly insufficient.

At the end of 2017, 21 water supply facilities were commissioned, which made it possible to increase the coverage of rural settlements with water supply up to 49.3%. Out of 711 settlements, centralized water supply is provided to 10 cities, 3 villages and 343 rural settlements. In three villages (station 41 crossing, crossing Dusaken of Borodulikha district and in Zhazyk village of Semey town) 256 people use imported water.

In 2018, 51 projects were implemented for 16.8 bln. tenge, 22 facilities were commissioned. The construction of water supply networks was carried out in 14 settlements, the reconstruction of water supply networks - 26 and water disposal - 4. As a result, the provision of the population of the region with centralized tap water in 2018 in cities was 94.7%, in rural settlements - 53.7% (Table 2.5. 4.), in 2019 - 98.2% and 56%, respectively.

Water disposal. Out of 711 settlements in the region, centralized water disposal functions in 43, including in 9 cities, 2 urban-type settlements and 32 villages. There are no sewage treatment facilities in Abai, Ayagoz, Kokpekti, Kurchum, Tarbagatai and Urdzhar districts. The provision of the population with centralized water disposal services in 2019 in cities was 72%, in rural settlements - 8.3%. In 3 regions (in Abai, Beskaragai and Katon-Karagai districts) the population does not use the services of centralized water disposal.

The treatment facilities, built in the 70s, have exhausted their operational resources, the design capacity of the facilities is not enough for processing, as a result of which untreated household, industrial, waste and storm water is discharged into the Irtysh River.

The situation is especially difficult in small towns and regional centers. Sewage treatment facilities in rural settlements fail due to low workload. As a result, the average level of standard technical losses in the regional water management systems is about 25-30%. In 2017, on sewer networks were registered 44 accidents, in 2019 - 27.

44 enterprises are operating, the total length of the sewerage system was 1,551.9 km in 2017 and 1,572.7 km in 2019, of which 612.3 km needs to be replaced in 2019.

Akimat of the East Kazakhstan region has developed a project “Reconstruction of the sewerage siphon across the Irtysh River in the area of the Tikhomirovskaya channel of the city of Semey.” The total cost of construction is 1.2 bln. tenge. The completion date is December 25, 2020.

State of the environment, reduction of air and water pollution

According to Kazhydromet, the **air pollution index (API) for 2017 - 2019 of the city of Ust-Kamenogorsk improved** slightly (APS decreased from 9 to 7), but remains high. The increased level of pollution includes: Semey (APS - 6). The pollution level in the village of Glubokoe changed from high to low (APS decreased from 7 to 4), from increased to low in Ridder city (APS decreased from 5 to 4), pollution level in Altai city changed from low to raised (APS raised from 1 to 5)¹³⁷.

A high and very high level of air pollution in settlements (by such as nitrogen dioxide, carbon monoxide, sulfur dioxide, formaldehyde, hydrogen sulfide, suspended particles, phenol, ammonia) is caused by:

1) the congestion of roads with urban transport (the number of vehicles in the region in 2017 is more than 364 thousand units, including in the city of Ust-Kamenogorsk - more than 107.8 thousand units). More than 90.4% of all cars run on gasoline, 78.3% of cars are over 10 years old).

2) dispersion of emissions from industrial enterprises (the main sources of emissions of pollutants in terms of nitrogen dioxide, sulfur dioxide, formaldehyde, benzopyrene, phenol, carbon monoxide and suspended solids are enterprises of the metallurgical and thermal industries);

3) low ventilation of the atmospheric space of settlements.

Also, the territory of the region was affected by the consequences of the tests of the Semipalatinsk nuclear test site.

There are 198 natural resource users in the region, belonging to the 1st hazard category. Of these, there are 9 large enterprises of the Republic: “Kazzinc” LLP, “KAZ Minerals Aktogai” LLP, “UK CHPP” JSC, “Ust-Kamenogorsk Titanium-Magnesium Plant” JSC, “Ulba Metallurgical Plant” JSC, “Bukhtarma Cement Company” LLP, “Semey Cement Plant Production Company” LLP, “Kazakhmys Corporation - Kusmurun-Akbastau Mine” LLP, “Vostoksvemet” LLP.

For reference: enterprises of the mining and processing industry - 78 (39.4%), the construction sector - 34 (17.1%), the heating sector - 21 (10.6%), utilities - 27 (13.6%), the agricultural sector - 13 (6.6%), metallurgy - 8 (4.0%), oil and gas sector - 2 (1.0%), other (transport, food, chemical) - 15 (7.7%).

The volume of standard emissions into the air in 2017 amounted to 0.191 mln. tons, and in 2018 - 0.195 mln. tons (Table 2.5.6.).

According to the regional akim, the total volume of pollutant emissions from 2012 to 2018 decreased by 10 thousand tons (from 140 to 130 thousand tons). Emissions in Ust-Kamenogorsk decreased by 7 thousand tons (by 11.5%, from 61 to 54 thousand tons).

In 2019, enterprises in the East Kazakhstan region emitted 128.7 thousand tons of harmful substances into the atmosphere, which amounted to 5.2% of the total volume of actual emissions in the republic and 12.5% lower than the average republican indicator (147.6 thousand tons). Discharges - 20.4 thousand tons, waste – 106,383.078 thousand tons.

The total volume of emissions over the past 6 years of pollutants in the region decreased by 10 thousand tons (*by 8%, from 140 to 128.7 thousand tons*).

Emissions in Ust-Kamenogorsk decreased by 7 thousand tons (*by 11.5%, from 61 to 54 thousand tons*).

The main share of pollution falls on 2 enterprises – “Kazzinc” LLP (*30.8 thousand tons, 23.8%*) and “Ust-Kamenogorsk CHPP” (*14.8 thousand tons, 11.4%*).

Over the past 5 years, large enterprises have invested 31.4 bln. tenge in environmental protection measures (“Kazzinc” - *18.1 bln. tenge*, “Ust-Kamenogorsk CHPP” - *4.5 bln. tenge*, “UMZ” JSC - *4.1 bln. tenge*, “TMK” JSC - *4.7 bln. tenge*).

137 Information bulletins on the state of the environment in the Republic of Kazakhstan for 2017-2019.

In the period from 2005-2020, 230 decisions of the East Kazakhstan Regional Akimat were issued on the establishment of **water protection zones and lines**, including in the Ust-Kamenogorsk, Semey, Zyryanovsk, Ridder, Shemonaikha cities, on the coast of Bukhtarma, Ust-Kamenogorsk and Shulbinsk reservoirs, Lake Alakol and others. The total length of the established water protection zones is 3,947.01 km, the area is 184,801.41 ha. The total length of the established water protection lines is 5225.46 km, the area is 33,538.70 ha.

In order to modernize the drinking water supply system and provide drinking water to settlements, in 2019, the previously begun prospecting and exploration of groundwater for 17 settlements of the region was completed and additional exploration of the Tavricheskoye field was carried out. Also in 2019, design estimates were drawn up for the implementation of prospecting and exploration in 61 rural settlements and for 2 additional exploration objects.

In order to prevent and eliminate flood threats, the Roadmap "Complex of measures for the prevention and elimination of flood threats for 2017-2020" (hereinafter referred to as the Roadmap) was developed and approved.

The Roadmap for the East Kazakhstan region includes 80 activities, including:

- for 2017 - 21 activities in 10 districts of the region (completed in full);
- for 2018 - 22 activities in 7 districts of the region (completed in full);

In 2019, out of 15 activities, 13 activities were carried out for a total amount of 79.5 mln. tenge. The remaining 2 activities are nearing completion.

In 2020, 19 activities were planned for a total amount of 1.913 bln. tenge, of which: 11 activities financed from the local budget in the amount of 182 mln. tenge were implemented in full.

Work continues on the activities financed from the Republican budget.

Work on preparations for the 2021 flood period continues and is under constant monitoring.

The state of water resources. East Kazakhstan region belongs to one of the most water-supplied regions of Kazakhstan. However, the Irtysh river basin is experiencing an intense environmental pressure - the development of industry, the growth of cities and other settlements have created tense conditions for the pollution of the river. The Irtysh River and its tributaries are intensively used for household and drinking water supply. Various industrial and municipal wastewaters are discharged into the river basin.

The pollution of the Breksa (Filippovka), Tikhaya, Ulba rivers (in the area of the Tishinsky mine) is caused by historical pollution from waste dumps, which are currently in state ownership, as well as from the discharges of "Kazzinc" LLP.

The rivers Krasnoyarka and Glubochanka (in the area of the Tishinsky mine, Ridder city), influenced by the operating enterprises of the mining complex "Vostoksvetmet" LLP.

The volume of standard discharges of pollutants into water bodies for regional enterprises amounted to 0.063 mln. tons in 2017 and 2019.

Table 2.5.5. Improving the quality of the environment favorable for the life of society

Target indicators	Implementation by years			
	2017	2018	2019	2020 plan
The amount of regulatory pollutants:				
- emissions into the air, mln. tons	0.191	0.194	0.191	0.191
- discharges into water bodies, mln. tons	0.063	0.046	0.063	0.063
The share of utilization of solid household waste to their generation, %	0.03	4.6	14.0	18.0
Coverage of the population of the region, city with services for the collection and transportation of waste, %	43.4	70	71	75.8
The share of solid household waste disposal facilities that meet environmental requirements and sanitary rules (of the total number of disposal sites), %	3.2	7.0	8.2	9.5

Historical pollution (rock dumps, tailing dumps, industrial waste accumulators) is a significant factor affecting the state of surface and groundwater.

The state of surface water quality in the Yertis river basin depends on the state of the quality of the tributaries. By improving the qualitative composition of the waters of Krasnoyarsk, Glubochanka, Breksa, Tikhaya, Ulba, one can count on improving the quality class of the entire basin.

Production and consumption waste management and waste processing

Utilization and burial of solid household waste. Annually, about 200 thousand tons of solid household waste (SHW) are generated in the region, and only a small part is recycled. The share of utilization of solid household waste to their formation in 2017 was 0.03%, while the plan was 3.2%.

In 2018, 183.6 thousand tons of solid household waste was generated, of which 4.84% was processed. The coverage of the region's population with services for the collection and transportation of waste in 2017 was 43.4%, and in 2018 - 70%.

The majority of consumer waste is stored at landfills that do not meet the requirements of the environmental legislation of the Republic of Kazakhstan. The share of solid household waste disposal facilities that meet environmental requirements and sanitary rules (of the total number of burial sites) in 2017 amounted to 3.3%. In 2018, out of 430 solid household waste disposal facilities, only 30 comply with environmental and sanitary requirements and standards, which is 6.98%.

In connection with ineffective methods of solid household waste burial at most landfills, they are quickly filled, despite the small volumes of incoming solid household waste and significant areas allocated for their burial.

Due to the high cost and low investment attractiveness, technologies for processing, recycling and disposal are poorly introduced.

The region has established a system for the collection of used mercury-containing devices and products (related to hazardous waste) and their subsequent processing. In connection with the amendments to the legislative acts on the transition of the Republic of Kazakhstan to a "green economy":

- requirements for the separate collection and disposal of certain types of hazardous waste (electronic and electrical equipment, mercury-containing waste, batteries, accumulators) have been established;

- approved tariffs for the collection, removal, disposal, processing and burial of solid household waste, as well as the procedure for distributing it among the entities performing these operations;

- from January 1, 2019, a ban is introduced on the disposal of solid household waste without their preliminary processing, in particular, plastic and full plastic waste, waste paper, mercury-containing lamps and devices, waste glass, non-ferrous and ferrous metal scrap, used automobile oils, office equipment, construction and food waste.

To fulfill the tasks set, a Roadmap has been developed for the modernization of infrastructure in the field of waste management until 2020 in the East Kazakhstan region, according to which it is planned following:

- introduction of separate waste collection in the cities of Ust-Kamenogorsk, Semey, Ayagoz, Zyryanovsk, Shemonaikha;

- construction of waste processing plants in the cities of Ust-Kamenogorsk and Semey.

In the city of Ust-Kamenogorsk, 3 companies ("EkoVostokLider" LLP, "Oskemenspetskommuntrans" LLP, "Clear Sky" PE) carry out separate collection (plastic, paper) with their further sale to processors outside the city, they have installed mesh containers for separate collection: 167 - at container sites; 24 - on school grounds; 6 - in the state organizations. There are also enterprises in the city that collect waste without installing containers for collecting solid household waste: VTS Oskemen IE (waste paper, cardboard), "Polygrand" LLP (plastic, full plastic), Turarov IE (PET containers). In total, in 2018, 20,400 tons of waste paper, 2,400 tons of plastic were collected, of which 1,600 tons of waste paper and 1,000 tons of plastic were processed in the city. The rest were taken out of the city for processing. In November 2018, "Oskemenspetskommuntrans" LLP together with "Oskemen-Tazalyk" LLP installed sorting lines with a capacity of up to 100 thousand tons / year on the territory of the operating solid household waste landfill.

In the city of Ridder, "Firma Etalon" LLP, within the framework of PPP, is building a solid household waste sorting workshop with a processing depth of 80%.

In the city of Shemonaikha, within the framework of timely disposal and processing of solid household waste, the “Shemonaikhinsky Kom-Khoz” LLP organization, which carries out the collection and removal of solid household waste in the Shemonaikha district, has developed a project for the construction and installation of sorting lines at the solid household waste landfill. The “Shemonaikhinsky Kom-Khoz” LLP is working on submitting the project for consideration by the state expertise. At present, the organization is working on manual sorting of waste; in the process of this sorting, the separated waste is divided into two groups: food waste and solid household waste. Food waste undergoes a burial process, the rest of the waste (plastic, paper, metal and cardboard), after passing through a hydraulic press, is stored for further shipment to recycling plants.

In general, in the cities and districts of the region, work has been intensified to agitate the population for separate waste collection (meetings in apartment owners' cooperative, propaganda materials in the form of brochures, leaflets, videos, various actions, etc.), as well as attracting enterprises to organize work on separate collection of solid household waste.

Akimats of the cities of Ust-Kamenogorsk and Semey, together with the European Bank for Reconstruction and Development, are working on projects for the modernization of solid household waste management systems, within the framework of which the issue of construction of complexes for mechanical and biological processing of solid household waste, construction of new sanitary landfills, closure of existing landfills, purchase of specialized equipment and machinery is being considered.

The state of biological resources and the development of forestry, fishing and hunting industries, specially protected natural areas and ecological tourism

The total area of land of the state forest fund of the region as of 01.01.2020 is 3,843,315 hectares, including 2,023,405 hectares of forest covered. The forest cover of the region is 7.14%.

There are 20 state forest owners in the region. On the balance of forestry institutions there are 2,154.5 thousand hectares (56.1%), including 1,283.9 thousand hectares covered with forest with a timber reserve of 128.2 mln. m³. The total average growth is 1.9 mln. m³ per year. Forests by the composition of forest species and due to the natural and climatic characteristics of the region are characterized by a high fire hazard.

In 2019, the planting of forest cultures was carried out on a total area of 4,636 hectares, of which 532 hectares by the akimat institutions, 4,076 hectares by the “Semey Ormani” State Forestry Enterprise. The interplanting was carried out on an area of 2,288 hectares. Sowing of forest seeds was carried out in nurseries on an area of 20.06 hectares. 73 cases of illegal felling and damage to trees and bushes were identified. The total volume of illegally felled timber amounted to 1,153.3 m³, the total damage to the state is 11 576.0 thousand tenge.

During the 2019 fire season, 144 cases of forest fires were registered on a total area of 200.4 hectares, including 129.68 hectares of forest, 55.3 hectares of forested, 0.5 hectares of crown and 70.7 hectares of non-forest area. The total damage from forest fires amounted to 12,880.2 thousand tenge.

Table 2.5.6. Restoration of forests in the territories of the state forest fund

Target indicators	Implementation by years			
	2017	2018	2019	2020 plan
The area of forest-covered lands on the territory of the state forest fund under the jurisdiction of local executive bodies, thousand hectares	1278.9	1280.3	1283.9	1277.7
Average area of one forest fire on the territory of the state forest fund under the jurisdiction of local executive bodies, thousand hectares	0.0017	0.003	0.004	0.013

The region is home to 379 species of birds and 110 species of mammals, as well as 50 species of rare and endangered species of plants and animals included in the Red Book of the Republic of Kazakhstan. There are 57 hunting farms in the region, the area of which is 15.9 mln. hectares. The percentage of assignment of the areas of **hunting grounds** in the East Kazakhstan region is 81.3%. Work is underway everywhere to promote the protection of wildlife and respect for the environment.

In general, as a result of the conducted biotechnical measures, it was possible to stabilize the state of the populations of the main hunting and commercial species of wild animals in the state forest fund and achieve a steady increase in their numbers. In total, there are 37 hunting and commercial species of **wild animals** in the region. Biotechnical measures are effectively carried out to reduce the pressure of predation of wolves, feral dogs in hunting grounds, and a hooded crow in nesting areas of upland and waterfowl.

In order to preserve the fish population, work is carried out annually to increase the stocking of water bodies from 4 mln. pieces (in 2016) up to 11.6 mln. pieces (in 2018). The fish catch limit for 2019 is 9.2 thousand tons. Implementation of the limit - 67%. On water bodies of international and republican significance - 60 sites, of which 25 are assigned. 35 sites remain non-assigned. Of the 96 water bodies of local importance, 27 are assigned. 69 water bodies remain non-assigned.

As of January 1, 2020, in the East Kazakhstan region, the area of environmental institutions amounted to 1,680,311 hectares:

- 3 state nature sanctuaries (West Altai, Markakol, Alakol);
- 2 state national natural parks (Katon-Karagay, Tarbagatai)
- 1 state forest nature reserve (Semey Ormany);
- 5 state nature refuges of republican significance (Nizhne-Turgusunsky, Karatal sands, Kuludzhun (zoological), Tarbagatai (zoological), Ontustik Altai (complex))
- 1 natural monument of republican significance "Sinegorian fir stand".

The creation of specially protected natural areas contributed to the conservation and increase in the number of rare and endangered species of animals. The region is inhabited and protected by such animals as the snow leopard, Pallas' cat, Altai argali, Kazakhstani argali, stone marten, Altai snowcock, black stork, golden eagle, Saker falcon, peregrine falcon, white-tailed eagle, bustard, endemic fish species - lenok, brachymystax savinovi, taimen. Each of these species is a precious gem in the treasures of the nature of the Western and Southern Altai.

East Kazakhstan, despite the peculiarities of climatic conditions, has the potential for **tourism** development: there are 24 nature protection zones of national importance with an area of 1.7 mln. hectares, over 600 historical monuments and over 100 tourism monuments in the region.

17 monuments of history and culture of republican significance and 592 monuments of local significance have been registered, a large-scale project in the field of archeology is being implemented with the participation of leading scientists of the world. According to the results of archaeological research in 3 years, 424 objects of historical and cultural heritage were identified, 226 monuments were certified. In 2016 - 2017, 5 outstanding archaeological sites with tourist potential were investigated. About 4,807 artifacts revealed during the work carried out in 2017 have replenished the fund of the regional history and local history museum. Reputable archaeologists from 9 foreign countries took part in archaeological research. One of the significant results is the creation of an open-air museum at the unique Berel complex in the Katon-Karagai region.

Key places of tourist interest are Belukha Mountain, Austrian road, Alakol and Markakol lakes, Bukhtarma reservoir, Kiin-Kerish canyon, Akbaur natural-historical monument, memorial complex of Abai Kunanbayev's house-museum in Zhidebay-Borili, mausoleums of Kozy Korpesh-Bayan Sulu, Yenlik-Kepek, Yrgyzbai-ata monument.

At the end of 2019, the region ranks first in the republic in terms of the number of accommodation places, fourth after the cities of Nur-Sultan, Almaty and Almaty region in terms of domestic tourism.

According to official statistics, last year the number of visitors to the region amounted to more than 600 thousand people (an increase of 8.4%).

The number of non-residents increased by 3.1% and amounted to 29,741 people.

The number of residents increased by 8.7% and amounted to 582,948 people.

Over the past three years, there has been a positive dynamics of growth in the tourist flow, which increased by 33%.

Table 2.5.7. Number of visitors of the region

	2017	2018	2019
East Kazakhstan	486,157	565,030	612,689

Today, there are 576 accommodation places in the region, with a one-time capacity of more than thirty-three thousand beds (33 thousand).

Tourist services are provided by 115 companies (51 tour operators and 64 travel agents), the number of registered accommodations in 2017 - 505 facilities (2016 - 455), with 8,958 rooms (2016 – 8,320) and a one-time capacity of 27,841 beds (2016 – 25,847). The volume of services rendered amounted to more than 6 bln. 338 mln. tenge (an increase of 7.6%).

In accordance with the Concept for the development of the tourism industry of the Republic of Kazakhstan until 2023, comprehensive work is being carried out in the East Kazakhstan region to form the tourism cluster "The Pearl of Altai". A tourist map of the sacred places of the region has been compiled, 23 thematic tourist routes have been developed. Steps are being taken to develop the tourist infrastructure to the sacred sites.

Within the framework of the "Roadmap for the development of the tourism industry of the East Kazakhstan region for 2017 - 2023", 25 projects are being implemented for 7.2 bln. tenge, in 2017, 4 projects were implemented for 242.8 mln. tenge.

In 2017, the tourist infrastructure in the Konyr-aulie cave in the Abai region was improved, a power transmission line was built and the territory around the Ygyzbay (Aulie) mausoleum in the Tarbagatai district was landscaped, the beach on the shores of Lake Shalkar (or the 3rd Sibin lake) was improved. The landscaping of the coast of Lake Alakol was carried out, a park was built, the facilities were brought into compliance with the requirements of fire and sanitary safety.

Over the past 2 years, roads have been repaired in the main tourist destinations (to the lakes Alakol, Sibiny, Markakol, ski resorts "Nurtau", "Altai Alps") for a total amount of 4.3 bln. tenge. In the coming years, 10 piers are planned to be built on Lake Alakol. It is planned to complete the repair of the road from the Zhalanashkol station to the Kabanbai village (Lake Alakol) and improvement of the coast of Lake Alakol.

Annually from July to September from the cities of Semey and Ust-Kamenogorsk to the Zhalanashkol station trains run. Air travel to the village of Urdzhar is provided by 3 routes, and there are 4 direct bus routes to Lake Alakol.

Together with the East Kazakhstan State Technical University named after D. Serikbayev conducted a study of the physical and chemical properties of water and mud of 8 lakes and 2 springs of the region to obtain a balneological conclusion and the development of health tourism in the region (lakes: Alakol, Markakol, Zaisan, Sibinskie, Dubygalinskoe (Okunki), Shybyndykol and Rakhmanovsky springs, Sanatorium "Barlyk-Arasan", spring Konyr-Aulie, spring Svyatoy klyuch).

Maps of recreation centers on the Bukhtarma reservoir, Lake Alakol have been developed, a map for the Sibinsky lakes is being prepared.

A single information resource has been formed with the function of online booking of accommodations along the coast of Lake Alakol.

Within the framework of the State Program for Tourism Development until 2025, it is planned to develop the main points of tourism growth in the region, first of all, this is Lake Alakol, which is recognized as one of the 10 priority tourist destinations of the republican scale and entered the TOP 10 of the Tourism Map.

In order to develop tourism on the coast, a phased, comprehensive work has been carried out, a Master Plan and a detailed development plan have been developed.

For the beautification and improvement of the infrastructure of Lake Alakol in 2016-2019, more than 6 bln. tenge was allocated from the regional budget, which were allocated to repair roads, subsidize rail and air transportation, purchase special equipment for servicing recreation centers, landscaping the coast, construction of the "Arbat" walking area, reconstruction of the house of culture and the museum in the village of Kabanbai. For the convenience of holidaymakers, high-speed Internet access was provided to the embankment, and a tourist information center was opened.

In the next 4 years, it is planned to implement 6 large infrastructure projects for a total amount of about 30 bln. tenge. Including: construction of a water supply and sewerage system, power lines;

coastal protection; reconstruction of a runway of the Urdzhar village's airport; drainage of the new zone of the lake shore.

Also, the infrastructure is developing at sacred sites. The territory around the Yrgyzbay ata mausoleum in the Tarbagatai district was landscaped for the amount of 50 mln. tenge.

The Konyr-Aulie Cave was landscaped for the amount of 25 mln. tenge. The road from Semey to the village of Karaul was repaired for 2.2 bln. tenge.

An open-air museum has been created on the Berel kurgans of the Katon-Karagai district.

Within the framework of the Rukhani Zhangyru Program, together with the regional tour operators, a tourist route "Literary East" has been developed, which passes through the sacred places of the region and is built on the names of famous writers and other prominent personalities of East Kazakhstan. The project was attended by 2,200 schoolchildren of the region, about 80 mln. tenge were allocated from the regional budget.

For reference: Project objects: Memorial complex of Abai-Shakarim, house-museum named after Abai Kunanbayev, museum named after Abai in Semey, a spring near the Kushikbay pass, the geographical center of the Eurasian continent, monument "Yenlik-Kebek", East Kazakhstan Regional Museum of Fine Arts named after the Nevzorov family, the house-museum named after F.M. Dostoevsky, the local history museum, the monument to A. Ivanov, the Maryin Utes complex.

The continuation of this project is the creation of complex tour routes within the framework of the initiative of the First President "Know your land!" which provides for the revival of mass and school tourism with the introduction of cultural, sacred, natural objects and industrial enterprises of the region.

An audio guide to the sacred places of "Tarihi Zhol" has been developed and posted on the website toureast.kz. An e-book for the children's audience "Legends and Tales of East Kazakhstan" has been released, which includes 15 sacred places of the region for publication (legend) in the book.

For reference: natural objects: the Irtysh River, Kiin-Kirish tract, Markakol, Rakhmanovskoye lakes, Belukha mountain; spiritual objects: Konyr-Aulie; Svyatoy Klyuch; Yrgyzbai ata; historical sites: Berel kurgans; Shilikty necropolis, Mazar Yenlik-Kebek, Kozy-Korpesh and Bayan Sulu, Kushikbay, Ablaykit, Ak Baur.

The book tells about the sacred places of the region, the exploits of heroes, ancient legends and the history of ancestors.

In order to promote information, the regional tourist portal Toureast.kz has been modernized, which provides all the information a tourist needs.

Also, 73 tourist routes are posted on the site, including 14 routes developed as part of the celebration of the 175th anniversary of Abai Kunanbayev, with a visit to the facilities of the Zhidabay-Borli complex.

In addition, maps of summer and winter recreation have been developed, in which all recreation centers, entertainment facilities, etc. are located.

Every year on the coast of the Lake Alakol for 2 days the festival "Alakol Alaulary" is held, the opening of the beach season is held on the Sibinsk Lakes, the opening of the winter season at the ski complexes of the region.

In order to promote domestic tourism, over the past 2 years, 10 info and press tours were held, including: visits of Kazakhstani tour operators, British BBC TV channel, international MIR TV channel and Kazakhstani TV channels. Also, 5 videos were released about the development of tourism in the region.

2.6. Zhambyl region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

The territory of the region is 144.3 thousand square km. According to the Committee on Statistics, the population of the Zhambyl region at the end of 2017 was 1,117.2 thousand people, and

at the end of 2019 – 1,130.1 thousand people¹³⁸. The gross regional product for 2017 in the region amounted to 1,350.7 bln. tenge, and per capita in 2017 – 1,210.0 thousand tenge, for 2018, respectively, 1,532.1 bln. tenge and 1,366.3 thousand per capita, for 2019 – 1,712.9 and 1,518.8.

According to the Committee on Statistics, in 2017, the region produced **industrial products** worth 374.0 bln. tenge, in 2018 - 421.1 bln. tenge, and in 2019 - 477.0 bln. tenge, including **manufactured goods** in 2017 - 257.6 bln. tenge, in 2018 - 301.6 bln. tenge, in 2019 - 52.1 bln. tenge. The volume of investments in fixed assets in 2019 amounted to 293.8 bln. tenge or 109.3% compared to 2018.

According to the Committee on Statistics, the gross output of **agricultural products** (services) for 2017 amounted to 251.3 bln. tenge. The gross harvest of grain crops (in weight after processing) amounted to 672.5 thousand tons, open field vegetables - 746.1 thousand tons, potatoes - 204.6 thousand tons.

In 2018, the volume of gross agricultural output amounted to 268.2 bln. tenge or 105.6% by 2017, including the volume of crop production - 146.7 bln. tenge (index of actual volume - 106.4%), livestock - 120, 8 bln. tenge (index of actual volume - 104.7%).

In 2018, agricultural crops were placed on an area of 669.1 thousand hectares, or 38.9 thousand hectares more than in 2017, including sugar beet - by 8.4 thousand hectares. The average grain yield in the region is 24.1 centner/ha. The volume of gross agricultural production in 2019 in the region amounted to 325.7 bln. tenge, executed by 104.9% compared to 2018. Including the volume of crop production amounted to 183.5 bln. tenge, compared to 2018, it was executed by 106.7%. The volume of livestock production amounted to 141.5 bln. tenge, compared to 2018, it was executed by 102.8%.

In 2019, the sown area of agricultural crops in the region amounted to 687.4 thousand hectares, which is compared to 2018 more by 18.6 thousand hectares 102.8%. The average yield of grain crops was 23.0 centners per hectare, a total of 763.2 thousand tons of products were harvested, which was performed by 122% compared to 2018 (the gross harvest of 2018 was 624.0 thousand tons), the gross harvest of vegetables and melons crops – 1,428.2 thousand tons.

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture

The area of the intensive garden is increasing every year. In 2019, the total area in the region as a whole was 1,064 hectares, an increase of 439 hectares. These gardens harvested 7.3 thousand tons of apples.

In 2019, moisture-saving technology was introduced on an area of 29.8 thousand hectares, compared to 2018, it was executed by 106.4% (2018 - 28.0 thousand hectares), water-saving technology was introduced on 20.4 thousand hectares and executed by 111.2%. Mineral fertilizers have been applied on an area of 150.6 thousand hectares, which is 22.4% of the total area under crops, or increased by 101.6%. At the beginning of 2020, 3,950 tons of vegetable crops were harvested from greenhouses with a total area of 32 hectares in the region.

Due to a loan from the European Bank for Reconstruction and Development in the Zhambyl region, restoration of irrigated lands in 5 districts with a total area of 55.3 thousand hectares is provided. The completion of all construction and installation work is scheduled for mid-2022.

In the region, new agricultural equipment was purchased in the amount of 6.0 bln. tenge, the renewal rate was 7.3%, or executed by 101.7% (in 2018 - 5.6%) (RK - 4.5%).

The **land fund** of the region at the end of 2019 is 14.4 mln. hectares. Of these, agricultural land - 4.6 mln. hectares. Of agricultural land, the area of arable land is 772.6 thousand hectares (177.4 thousand hectares of irrigated), perennial plantations - 3.8 thousand hectares, hayfields - 116.5 thousand hectares, pasture lands - 3.58 mln. hectares, watered - 3.10 mln. ha, or 86%. As a result of the measures taken, 104.1 thousand hectares of agricultural land (including 10.5 thousand hectares of arable land, 93.6 thousand hectares of pasture land) were returned to state ownership. For undeveloped 46.9 thousand hectares (arable land - 7.1 thousand hectares, pastures - 39.7 thousand hectares), measures have been taken to increase the land tax rates by 10 times. In order to involve the lands returned into state ownership into farming business, 18 tenders were held, as a result of which

138 Hereinafter, the Program for the Development of the Territory of the Zhambyl Region for 2016 - 2020 and reports on its implementation for 2018 and 2019.

199.1 thousand hectares (arable land 9.2 thousand hectares, pastures 189.9 thousand hectares) of land were leased.

Development of energy, including renewable energy and energy supply to the population

The development program of the Zhambyl region for 2016 - 2020 provides for the implementation of the following indicators corresponding to the Concept:

- The indicator of the energy intensity of the domestic regional product, toe per thousand US dollars in 2000 prices (plan - 0.0184, actual - 0.22 (for 2017);

- The share of generated electricity from renewable energy sources in the total volume of electricity generated (plan - 14%, actual in 2017 - 17.7%). According to the Committee on Statistics, the share of renewable energy sources in the Zhambyl region for 2019 is (including hydroelectric power plants) - 70.6%, taking into account small hydroelectric power plants is 0.1%.

Taking into account the natural and climatic conditions of the Zhambyl region, as well as the significant energy potential for the use of renewable energy sources, in recent years, work has been carried out in the region on the construction of solar power plants, wind turbines and small hydroelectric power plants.

In 2010, the installed capacity of all RES facilities was about 1.5 - 2.0 MW of capacity. At the beginning of 2020, 12 **renewable energy facilities** operate on the territory of the region, the total capacity of which is 268.7 MW. At the same time, the share of Zhambyl region in the republic is 26%:

- 1) the total capacity of 5 hydroelectric power plants with a total capacity of 15.1 MW ("Merkenskaya HEPP-1" - 1.1 MW, "Merkenskaya HEPP - 2" - 0.91 MW, "Merkenskaya HEPP-3" - 1.5 MW, "Karakystakskaya HEPP" - 2.3 MW, "Tasotkelskaya HEPP" - 9.2 MW);

- 2) 3 wind power plants with a total capacity of 53.1 MW ("Vista International" LLP - 21 MW, "Vetroinvest" LLP - 30.65 MW, "Kordai K-1" with a capacity of 1.5 MW);

- 3) 4 solar power plants with a total capacity of 100.5 MW (Otar SPP with a capacity of 0.5 MW of "KazEkoWatt" LLP, "Burnoe Solar-1" LLP 50 MW, "Burnoe Solar-2" LLP 50 MW, "M-KAT Green" LLP 100 MW).

The volume of electricity generated in the 12 months of 2019 (410.6 mln. kWh) compared to the same period in 2018 (376 mln. kWh) increased by 8.4%. By the end of the year, it is planned to increase the share of electricity generated from the total volume of renewable energy sources up to 15%.

In 2020, the implementation of 4 projects with a total capacity of 133.8 MW was started with completion in 2021.

Taking into account the development of the tourism industry in 2019, the Zhambyl region has begun to implement the "Eco-capsule buildings". The convenience of eco-capsules is that they are equipped with solar panels and are based on a smart home design. These premises are intended for placement in areas where it is not profitable to attract infrastructure. Eco-capsules are equipped with heating and cooling systems, multimedia technologies, and fire extinguishing systems. Negotiations have been held on these projects and preliminary agreements have been signed.

At the end of 2019, out of 377 settlements in the region, gasification was laid in 190 settlements (in 2019 - 9 settlements, population – 6,035 people), the level of gas supply will reach 50% or 841 thousand people (74.6%).

In addition, out of 35 residential areas connected to the city of Taraz, 8,102 out of 35,646 residents (Kumshagal - 760 houses, 2,892 people, Sholdala - 375 houses, 1,600 people, Kyzyl-abad - 461 houses, 711 people, Koltogan - 232 houses, 740 people, Leto - 374 houses, 1,254 people, Bereke - 200 houses, 492 people, Kazarma - 37 houses, 174 people, Dalnaya Karasu-1 - 12 houses, 61 people, Dalnaya Karasu-3 - 39 houses, 178 people) are connected to the central gas supply. These works are planned to be completed by the end of 2020.

In 2020, 6.6 bln. tenge was allocated from the republican budget for the construction of a gas pipeline to 86 settlements of the region (Shu district (18 settlements, 22,130 people), Zhambyl region (13 settlements, 12,631 people), Zhualyn district (15 settlements, 9,457 people), Sarysu district to the city of Zhanatas (14 settlements, 39,539 people), Talas district (5 settlements, 2,923 people), Bayzak district (21 settlements, 17,241 people), the corresponding work will be carried out.

Condition of water supply and sewerage, provision of the population with centralized water supply and disposal

Main rivers: Shu with tributaries (total length 1,186 km, within the republic 800 km), Talas (661 km, within the Republic of Kazakhstan - 453 km), Asa (253 km), etc.

Large freshwater lakes: Balkhash (western part -18.2 thousand km²), Biilikol (33 km²), Akkol (15.5 km²), Ulken Kamkaly (4.6 km²) and others; saline: Akzhar (7.2 km²), Ashchykol (88.5 km²) and others. The Tasotkel reservoir on the Shu river (area 78 km², water volume - 290 mln. m³), the Ashybulak reservoir on the Asy-Teris river (area 24 km², water volume 158 mln. m³) were built.

There are 120 reservoirs in the region, of which 106 reservoirs (total volume 140 mln. m³) are in the communal ownership of Zhambyl Su Koimalary Municipal Institution. Inspection of the technical condition of hydraulic structures, reservoirs and dams is carried out in stages. In 2019, to keep the reservoirs in a technically good condition, "Zhambyl Su Koimalary" Municipal Institution repaired 16 reservoirs in the amount of 50.2 million tenge. On the balance of the Kazvodkhoz Republican Institution there are 7 reservoirs, their total water fund is 840.86 mln. m³. In 2019, the Kazvodkhoz delivered 589 mln. m³ for 89.9 thousand hectares. The current repair work of 2 reservoirs was carried out, the total amount is 16.5 mln. m³ (Ters-Ashchybulak, Karakonyz). The remaining 7 reservoirs are private, their total water fund is 7.7 mln. m³.

In 4 cities of the region as of January 1, 2020, the provision of centralized water supply was 88.0%:

- Taraz city - covered 89.1% of 357,528 people;
- Karatau city - covered 100% of 30,214 people;
- Zhanatas city - 100% of 22,383 people covered;
- Shu city - covered 60.0% of 36,665 people.

In 2019, out of 373 rural settlements, 57.4% (214) (in 2018 - 53.3%) are provided with centralized water supply (with a population of 493,449 or 72.6%). The length of the water supply networks was 2,631.0 km, of which 1,771.1 km are in need of replacement, which led to 80 accidents.

In 2019, 5.3 bln. tenge was allocated for the construction of drinking water supply facilities, 10 facilities were commissioned, in particular Zhualy district - Karasaz village, Kordai district - Alzhan ana, Moyinkum district - Burylbaital station, Mirny-Kiyakty village, Sarysu district - Kyzildikhan village, Arystandy village, Talas district - Yeseikhan village, Kaskabulak village and Shu district - Moynkum village). Additionally, at the expense of the budget of the Merken district, current repairs were carried out in two settlements (Turlybai batyr village and Karasu village) in the amount of 44.7 mln. tenge, due to which these villages were provided with centralized water supply.

In 2019 - 2020, the Finnish company "Vilkinmaki" is conducting a corresponding analysis of the introduction of drinking water purification technology into the region's drinking water supply system, as a result of which the installation of this technology will be considered.

Together with the International Bank for Reconstruction and Development, the project "The Second Phase of the Irrigation and Drainage Improvement Project" (IDIP-2) (reconstruction and modernization) is being implemented.

The following facilities are included in the Project IDIP-2 in Zhambyl region:

- "Kapal" in the Zhambyl region with an area of 5,000 hectares.
- "Georgievsky Main Canal" in the Kordai region with an area of 5,000 hectares.
- "Right-bank main channel" in the Shu district with an area of 5,172 hectares.

Engineering surveys were carried out at all of these facilities, design estimates were prepared.

The total length of sewerage networks in the region in 2019 reached 489.5 km, of which 186.2 km need to be replaced, there were no accidents.

Due to the lack of a wastewater treatment complex in the city of Taraz, 17.5 mln. tenge was allocated to "Vodokanal-Consulting, Engineering" LLP for the development of a feasibility study in 2018. By the decision of the akimat of the city of Taraz, a land plot of 42.48 hectares was allocated and an act of permanent land use was received. Technical conditions for connection to existing communications have been obtained: water supply, electricity, gas supply, technical condition of telephone communications and the Internet. The capacity of the projected facility is 100 thousand m³ per day. According to the feasibility study, the option of discharging treated wastewater through the

“Talas-Asa” canal into the Asa River was adopted.

State of the environment, reduction of air and water pollution

For 2017 - 2019, according to the stationary observation network, the atmospheric air of the city of Taraz was characterized by an increased level of pollution. IPS was 6. SI = 4 - 4.3 and HR = 3 - 4%. Air pollution in the **city of Zhanatas** decreased from an increased level of pollution in 2017 (APS = 5) to a low level in 2018 - 2019 (APS = 4). SI decreased from 4 to 1.9, HR value decreased from 1% for PM10 suspended particles to 0%. Air pollution in the **city of Karatau** decreased from a high level of pollution in 2017 (APS = 8) to an raised level in 2018 (APS = 5). SI decreased from 8 (high level) to 3.6 (raised level), HR value = 1 - 2% (raised level) for PM10 suspended particles. The atmospheric air of the **city of Shu** was generally characterized by an increased level of pollution. APS is 5 - 6 (raised level). SI decreased from 8 - 9 in 2017-2018 (high) for ozone (ground level) to 2.3 in 2019, HR = 1 - 5% (raised level) for PM2.5 and PM10 suspended particles. Air pollution in the **village of Kordai** increased from a low level of pollution in 2017 (APS = 4) to an raised level in 2019, APS = 5). SI decreased from 5 (high) to 1.9 (low) and HR = 1% (increased).

The **limits on emissions** of pollutants into the air decreased from 148 thousand tons in 2016 to 120 thousand tons in 2019, and actual emissions from 44 thousand tons to 81 thousand tons.

Table 2.6.1. Dynamics of emissions into the environment in Zhambyl region for 2017 – 2019

Type of emissions	2017		2018		2019	
	Limit	Actual	Limit	Actual	Limit	Actual
Emissions thousand tons	116	70	115	81	119.93	81.4
Discharges thousand tons	23	17	24	17	22.9	16.27
Waste thousand tons	70,144	21,036	49,748	8,826	54,681.211	10,633.66

At present, emissions from large enterprises of the mining sector of the region are 13%, construction 14.9%, housing and communal sector 55.7% of the total volume of the region.

There are 286 nature users in the region, belonging to only 1 hazard category. Among them are large enterprises of the republic: “Taraz” Gas-Main Pipeline Management, Tarazkoye Linear Production Department of The Main Gas Pipeline, Zhambyl Branch of “Kazphosphate” LLP, Branch of “Corporation Kazakhmys” LLP, “Shatyrkul mine”, “Central Asia Gold Corp.” LLP. The decrease is due to environmental protection measures carried out by nature users of the region.

Table 2.6.2. Financing of environmental activities by nature users in the Zhambyl region, bln. tenge

2017		2018		2019	
Plan	Actual	Plan	Actual	Plan	Actual
0.9	0.8	0.44	0.29	0.7	0.6

To achieve the target environmental quality indicators of the Zhambyl region, the Action Plan was approved. This Plan provides for the introduction of high-tech industrial plants at the expense of enterprises' own funds for the utilization and decontamination of emissions into industrial air (“Kazphosphate” LLP, “Zhambyl State District Power Plant named after T.I.Baturov”, “Zhambylgips” JSC, “Fabrika POSH-Taraz” LLP).

Observations of **surface water pollution** in the Zhambyl region were carried out at 10 water bodies (Talas, Asa, Shu, Aksu, Karabalta, Toktash, Sarykau, Berikkara, Bilikol Lake and Tasotkel reservoir).

The **volume of standard discharges** of pollutants amounted to 0.023 mln. tons in 2018, while the plan was 0.028 mln. tons.

The volume of wastewater disposal in 2017 amounted to 22,837.14 thousand m³, and for the same period of the last year, the volume of discharge amounted to 22,585.98 thousand m³, the increase in the volume of wastewater discharge is 251.16 thousand m³. The increase in the volume of wastewater discharge is associated with the commissioning of sewage networks in the Arai and Baiterek residential districts.

Production and consumption waste management and waste processing

Industrial waste generated in 2017 amounts to 24,377.134 thousand tons (in 2016 – 26,223.445 thousand tons), of which 3,363.865 thousand tons were utilized, which is 13.7%. 183.345 thousand tons of granulated slag were shipped (sold) to ZhB of “Kazphosphate” LLP (Novodzhambul Phosphoric Plant) for cement production, “Knauf Gips Taraz” LLP used 595.66 thousand tons of overburden for filling in internal, “Vostochnoye rudoupravlenie” LLP used 1,183.249 thousand tons of overburden for filling technological roads, filling ramps, etc.

Solid household waste. According to the data provided by the akimat of the Zhambyl region, in 2018, 95.7 thousand tons of solid household waste were generated, of which 3.11% were processed. In 2017, the volume of generated solid household waste amounted to 74.96 thousand tons, of which 3.47% was processed.

In 2018, the coverage of the population of the region, the city of republican significance, the capital with services for the collection and transportation of waste was 89.3% against the plan of 92.4%. Out of 162 solid household waste disposal facilities, only 5 comply with environmental and sanitary requirements and standards, which is 3.11%.

In 2019, 80.94 thousand tons of solid household waste was generated, of which 6.9 tons (8.53%) were sorted and processed. 94% of the population is covered by services for the collection and removal of solid household waste. Out of 162 solid household waste disposal facilities, 11 comply with environmental and sanitary requirements and standards, which is 8.6%, including out of 159 municipal landfills, 9 meet environmental and sanitary requirements and standards, which is 5.6%. In the city of Taraz, the volume of solid household waste buried at the landfill exceeded the design capacity of the landfill, that is, overflowed.

In 2019, 346 objects of unauthorized dumps were identified on the territory of the Zhambyl region, of which 186 were utilized.

646 containers for separate collection have been installed in 2 regional centers (Zhualy, Sarysu) and the city of Taraz from 11 districts and cities.

With the support of the ERP Operator, 106 containers were installed in the region to collect used mercury-containing lamps and batteries.

Also, in the city of Taraz, Promotkhod Kazakhstan LLP, together with the EPR Operator, installed 5 containers for electronic and electrical waste.

In the city of Taraz, there are 15 organizations for the disposal of plastic, polyethylene waste, electronic devices, motor oils, glass and paper (“Shakhristan” LLP, “Khastal oglu P.M.”, “Bakyt”, “Tanibekov”, “Sanit MiB”, “HalalSauda” IE, “KazEcology”, “Dazhan”, “TarazTechnoResurs”, “TarazTeploStroy”, “YugShinTorg”, “TarazPoliKhim”, “Ainek-Tara”, “EcoTechStandard”, “AklerGrupYug”).

Within the state program of industrial and innovative development of Kazakhstan for 2015-2019 “Ekojer” LLP plans to build a plant for processing industrial and household waste. At the end of 2019, a preliminary business plan was developed, and by the resolution of the regional akimat, 20 hectares of land were allocated. Also, measures are being taken to develop schemes for connecting electrical networks. The implementation period for this project is 2018-2020. At present, an agreement has been reached with the “TorgTreid KZ” company on joint activities for the construction of a waste recycling plant.

The state of biological resources and the development of forestry, fishing and hunting industries, specially protected natural areas and ecological tourism

The total area of land of the state forest fund of the region as of 01.01.2020 is 4,443,063 hectares, of which forest land – 3,232,695 hectares, including forested land – 2,297,912 hectares and non-forest land – 1,210,368 hectares. The forest cover of the region is 16.0%. Saplings are planted and sowed with forest crops annually on the territory of the state forest fund on an area of 5000 hectares.

In 2019, forest reproduction by state forestry institutions of the Zhambyl region was carried out on an area of 5,116 hectares, including planting seedlings – 1,731 hectares and sowing forest seeds – 3,385 hectares (saxaul – 1,261 hectares, elm - 470 hectares).

During the 2019 fire hazard season, 15 cases of forest fires occurred on the territory of the state forest fund of the Zhambyl region on a total area of 40,913 hectares, of which the forest area is 30,653 hectares, including 28,190.7 hectares of forested area.

In 2019, 162 plots were provided for long-term forest use on an area of 148,844 hectares. On the territory of the state forest fund, 15 facts of illegal felling of timber were revealed with a total volume of 27.1 m³ with an amount of damage of 358.3 thousand tenge, and 186.7 thousand tenge were recovered.

The total area of hunting grounds is 11,422 hectares, the area of reserve hunting grounds is 269.9 hectares. The area of hunting grounds assigned to hunting users is 2,154.6 hectares. The number of assigned hunting farms is 44.

By the decree of the Akimat of the Zhambyl region, 118 fishery reservoirs were included in the list of fishery reservoirs of local importance, of which 86 were assigned to nature users.

In the Zhambyl region, there are **pecially protected natural areas** of republican significance:

- Zhusandala State Reserve Zone with a total area of 2,757.0 thousand hectares;
- Andasai State Nature Refuge (zoological) – 1,000.0 thousand hectares;
- State Nature Refuge (complex) "Berikkara tract" - 17.5 thousand hectares;
- State Nature Refuge (botanical) "Karakunuz tract" - 3.0 hectares.
- State Nature Refuge (zoological) "Umbet" - 298.4 thousand hectares.

In 2019, natural refuge of local importance "Kordai-Zhaisan" in the Kordai district with a total area of 369,970 hectares and "Zhualy-Karashat" in the Zhualy district with a total area of 148,300 hectares were created. In 2020, it is planned to create a regional park on the basis of the Merke state nature refuge of local importance on the territory of the "Merke" region and the creation of a state nature refuge of local importance in the mountainous areas of the district named after T. Ryskulov and Zhambyl region.

The total number of historical and cultural monuments in the region is 3,441. Of these: 741 historical and cultural monuments are included in the state list. 30 monuments of republican significance, 711 monuments of local significance, 5 of them are included in the list of UNESCO monuments "World Cultural Heritage" and have the status of International significance. The rest 2,700 are included in the preliminary list of historical and cultural monuments. There are 46 tourist firms, 1 yurt town, 11 children's health camps, 15 recreation areas, 6 health resorts with unique curative mud and mineral waters in the region.

In 2019, in honor of the celebration of the 80th anniversary of the formation of the Zhambyl region, important objects of the cultural and spiritual life of the region were commissioned, the unique historical and ethnographic complex "Tekturmas" was opened, the historical and ethnocultural complex "Kone Taraz" was supplemented with new objects. This complex includes the center "Rukhaniyat and Historical Studies", which promotes the ethnological and ethnographic values of our people, the regional museum of local lore, which contains the rich heritage of the region, a gallery of fine arts.

2.7. West-Kazakhstan region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

The territory of the region is 151.3 thousand square km. or 5.6% of the territory of the republic.

According to the Committee on Statistics, the population at the beginning of 2018 was 646.7 thousand people or 3.6% of the population of Kazakhstan, at the beginning of 2019 - 652.3 thousand people, and at the beginning of 2020 - 656.8 thousand. person. The volume of the gross regional product of the region in 2017 amounted to 2,337.5 bln. tenge, the index of actual volume - 103.1%, in 2018 – 2,790.7 bln. tenge, in 2019 - 2,946.4 bln. tenge, index of actual volume - 98.5%. GRP per

capita in 2017 was 3,628.4 thousand tenge (compared to the national average level of 120.4%), in 2018 – 4,295.8 thousand tenge, in 2019 – 4,501.2 thousand tenge.

In the structure of the region's GRP, the largest share is occupied by industry (47.5%). In 2019, the number of enterprises and industries amounted to 359 units. The volume of industrial production increased from 1,302.1 bln. tenge in 2015 up to 1,914.5 bln. tenge in 2017 and up to 2,480.5 in 2018, and in 2019 amounted to 2,392.1 bln. tenge.

In 2019, the share of the mining industry and quarrying in the regional volume of industrial production was 88.4%. The industry is represented by large enterprises of the oil and gas sector such as “Karachaganak Petroleum Operating B.V.”, “Zhaikmunai” LLP. The main share of the region's hydrocarbons is concentrated in the Karachaganak and Chinarevskoye oil and gas condensate fields.

The volume of **manufactured goods** from 2015 to 2017 increased from 107.1 bln. tenge up to 161.7 bln. tenge, up to 202.3 bln. tenge in 2018, and up to 215.4 bln. tenge in 2019. In 2017, labor productivity in the manufacturing industry amounted to 17.6 thousand US dollars per person, or 104.8% to the level of 2016. In 2019, labor productivity in the manufacturing industry amounted to 20.9 thousand US dollars per person.

The main problems faced by manufacturing enterprises include a high level of equipment wear and tear (60 - 70%), which prevents an increase in production efficiency, insufficient orders (dependence of enterprises on government orders, as well as orders from oil and gas companies, which, in turn, are connected with the conjuncture of world oil prices) and working capital, incomplete use of existing production capacities, insufficient competitiveness of certain sectors of the manufacturing sector, seasonality of products (for example, the construction industry) and high price competition from the Russian market¹³⁹.

Despite the insignificant share of **agriculture** in the regional economy (about 3.5%), the agricultural sector employs about 23% of the total employed population of the region. Half of the region's population lives in rural areas and the development of an efficient agricultural sector is the guarantee of social stability in the countryside.

The natural and climatic conditions of the region are favorable for the development of animal husbandry, especially for the southern regions. In the West Kazakhstan region, as of October 1, 2019, 198 agricultural cooperatives were registered, of which 150 are selective breeding agricultural cooperatives, 29 agricultural cooperatives for fattening, 13 agricultural cooperatives for crop production and 6 agricultural cooperatives for dairy production. In 2019, 2 agricultural cooperatives were created in the region in the direction of crop production and 4 in selection and breeding work.

According to the Committee on Statistics, gross agricultural output in 2017 amounted to 140 billion tenge, slightly decreased to 139.9 billion tenge in 2018 and increased to 171.1 billion tenge in 2019, with the predominant development of animal husbandry (63 %).

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture

In 2019, 313 farms in the region are engaged in breeding pedigree farm animals. Of these, 256 farms are engaged in breeding pedigree cattle, where 52,768 heads of pedigree cattle are kept. Including 178 farms with the Kazakh white-headed breed (42,031 heads), 31 farms with the whiteface breed (5,834 heads), 35 farms with the Aberdeen-Angus breed (3,066 heads), 6 farms with the Holstein breed (1,453 heads), 5 farms with the Simmental breed (286 heads), 1 farm with the Red steppe breed (98 heads). 27 farms are engaged in raising breeding sheep, in total 33,383 heads of breeding sheep are raised. 29 farms are engaged in breeding 10,697 heads of pedigree horses. 1 farm is engaged in breeding Kazakh Bactrian camels (280 heads). The share of breeding stock in the total livestock of farm animals is: cattle - 8.6%, small cattle - 3.5%, horses - 6.3%, camels 11.7%.

For the development of distant pasture cattle breeding, work is being carried out to water the pastures. The total area of pastures on agricultural land is 4,780.3 thousand hectares, watered 4,130.6 thousand hectares, or 86%.

¹³⁹ Hereinafter, the Program for the Development of the Territory of the West Kazakhstan Region for 2016 - 2020 and reports on its implementation for 2018 and 2019.

In the field of agriculture, in 2019, unmanned aerial vehicles and GPS trackers for grazing and monitoring livestock were purchased on the farms of the region. Also, 1,015 units of solar panels and wind generators were installed, thus covering 11% of all farms in the region.

The region's *crop production* is represented by the cultivation of cereals, oilseeds, forage crops, potatoes and vegetables and melons. In the region, plant growing is mainly engaged in agricultural formations of Borili, Zelenovsky, Syrym, Taskala, Terekti, Shyngarlaw districts and the city of Uralsk.

In the region, work is underway to diversify the production of crop products. The sowing area of all agricultural crops in 2017 amounted to 491.4 thousand hectares, which is 0.7% more than in 2015. In the structure of crops, the area of grain is 250.1 thousand hectares, which is 3.8% less than in 2015. Oilseeds are planted on 65.4 thousand hectares, which is 30.5% more than in 2015, including sunflower - 42.8 thousand hectares (22.3% more). The area of potatoes and vegetable and melon crops in 2017 amounted to 9.1 thousand hectares (potatoes - 3.9 thousand hectares, vegetables - 3.6 thousand hectares and melons - 1.6 thousand hectares) or by 21.5 % less than the level of 2015 (11.6 thousand ha).

In connection with the intensive development of animal husbandry in recent years, the need for feed has increased. To provide livestock with a fodder base, fodder crops were sown in 2017 on an area of 166.7 thousand hectares, which is 0.2% more than in 2015.

In 2017, the drip irrigation system applied on an area of 563.2 hectares compared to 2015 increased by 68.1% (335 hectares).

Severely continental weather conditions, that is, frequently recurring droughts, lack of precipitation during the growing season of agricultural crops, limit the expansion of production in the crop production sector.

In order to create systems that are resistant to climate change, in 2017, the reconstruction of the estuary irrigation systems Sorkol and Abdilman was completed on an area of 1,800 thousand hectares. The construction of a water withdrawal with a floating pumping station for water supply to the Ural-Shalkar canal with a length of 42 km has begun, work was completed in 2018. Reconstruction of the canals will provide watering for 145 thousand hectares of land, which makes it possible to develop animal husbandry.

In 2018, the area of irrigated land amounted to 4,232 hectares, of which by sprinkling – 1,399 hectares (in 2017 - 1111 hectares), by drip irrigation - 571 hectares (in 2017 - 563 hectares) and other methods – 2,262 hectares.

The regional akimat plans to transfer the irrigation and drainage systems of 16,050 hectares of regularly irrigated land to the republican property in order to restore it further at the expense of MFO funds. At the end of 2018, work was completed on transferring 2,450 hectares to republican ownership (Baiterek district - 1600 hectares, Syrym district - 850 hectares) of regular irrigated lands and work began on transferring 9,048 hectares of Terekti district.

In order to water the lands of settlements located on the left bank of the Ural River, the regional akimat plans to reconstruct the Solyanka-Aznabai-Taipak water canal (64.8 km) of the Akzhaik district and the Ural-Shalkar canal of the Terekti district, in 2019 the development of design estimates was completed.

In 2019, in the West Kazakhstan region, the introduction of elements of precision farming was applied the following technologies: modern sprinkler machines and equipment, drip irrigation systems are used on an area of 2,111 hectares; there are 834 units of solar panels and wind turbines; agricultural producers use 3 vegetable stores equipped with equipment to improve the quality of vegetable storage; agricultural producers use high-performance 69 harvesters and 49 seeding complexes equipped with GPS equipment for cultivation and harvesting of grain crops.

To provide the region's population with fresh vegetables, the region has 97 greenhouses with an area of 69.5 thousand m².

According to the Committee on Statistics, in 2017, the yield of grain crops was 15.1 centner/ha, 368.6 thousand tons of grain were obtained, or 3.9 times more than the level of 2015. The gross harvest of oilseeds amounted to 51.9 thousand tons, which is 4.4 times more than in 2015. The production of potatoes and vegetables and melons decreased by 15.2% and 3.4%, respectively. In an unfavorable 2019, the grain yield was 10.1 centner/ha.

Agricultural land in the region is 7,039.9 thousand hectares, (of which arable land - 541.8 thousand hectares, perennial plantations - 2.0 thousand hectares, fallow lands - 462.4 thousand hectares, hayfields - 450 thousand hectares, pastures – 5,527.2 thousand hectares, other lands - 56.5 thousand hectares); the lands of settlements are 2,323.3 thousand hectares; lands of industry, transport, communications, defense and other non-agricultural purposes are located on an area of 41.5 thousand hectares; lands of specially protected natural areas are 12.4 thousand hectares; forest lands are 216.9 thousand hectares; water fund lands - 81.5 thousand hectares; reserve land – 3,954.7 thousand hectares, (of which perennial plantations - 0.4 thousand hectares, fallow lands - 533.5 thousand hectares, hayfields - 491.1 thousand hectares, pastures – 2,466.8 thousand hectares, other lands are 462.9 thousand hectares).

Since 2012, 1,749 thousand hectares of unused agricultural land have been identified in the region. Currently, 1,140 thousand hectares or 65% of the revealed unused lands have been returned to state ownership. Of the returned lands, 940 thousand hectares or 82% are involved in agricultural use. At the beginning of 2020, lands with an area of 200 thousand hectares or 18% remain not involved in farming business. As a result of the work carried out by local executive bodies, land users on an area of 405 thousand hectares, or 23%, began to develop their land plots. Based on materials from land plots with an area of 204 thousand hectares or 12%, local executive bodies are working to return to state ownership (for land plots with an area of 159 thousand hectares, inspectors issued instructions to eliminate violations, for 24 thousand hectares issued notifications of inspections, for 21 thousand hectares notifications will be sent).

Development of energy, including renewable energy and energy supply to the population

Electricity production in the region is carried out by a gas turbine power plant (with a capacity of 30 MW) of the Uralskaya CHPP, a gas turbine unit of “Zhaykteploenergo” JSC (28 MW), a gas turbine power plant of “Karachaganak Petroleum Operating B.V.” (160 MW), gas turbine unit of “Zhaikmunai” LLP (26 MW), “Ural Gas Turbine Power Plant” LLP (54 MW), “Batys Power” LLP (100 MW). All generated electricity is used for the own needs of enterprises and the needs of consumers.

According to the Committee on Statistics, in 2017, electricity production amounted to 1,981.8 mln. kWh, consumption of the region – 2,017.3 mln. kWh, imports from Russia - 35.6 mln. kWh, in 2018 - import from RF - 37.1 mln. kWh. Compared to 2015, the growth in electricity production was 24.3%. In 2018, electricity production amounted to 2,068.7 mln. kWh.

The energy intensity indicator of the domestic regional product in 2017 is 5.54 toe per thousand US dollars in 2000 prices (according to data from the Statistics Committee of the Ministry of national economy of the Republic of Kazakhstan, the energy intensity of GRP for WKO in 2015 was 5.46 tonnes per thousand US dollars at 2000 prices).

Energy saving in the public sector plays an important role in view of its social significance and insufficient funding. Today in the budgetary organizations of the region there are 703,216 light points (bulbs), including energy-saving ones - 24% or 168,771 light points. There are 22,494 outdoor light points in street lighting, including energy-saving 35% or 7,872 light points.

Work is being carried out to save energy and improve energy efficiency in accordance with the Comprehensive Energy Saving Plan for 2015 - 2020, within the framework of which 109 measures are provided for a total amount of 2.2 bln. tenge, of which funds of enterprises - 1.9 bln. tenge.

The main problem in the industry is that the bulk of the existing electrical distribution networks and substations have been operating for over 30 years and require replacement and reconstruction. Depreciation of basic equipment averages 83.1%, in rural areas - 90%. The enterprise does not have sufficient financial resources to carry out repair and restoration work, and therefore the overhaul of electrical networks and equipment is carried out in a limited amount at the expense of funds provided for by the tariff for electricity transmission services.

There are no **renewable energy sources** connected to public networks in the region.

In total, in the region, in 151 farms that do not have a centralized electricity connection, 163 installations were installed at their own expense, 151 of them are solar batteries and 12 wind turbines.

To introduce renewable energy technologies in the region in 2018, a Memorandum of Cooperation was signed between the Akimat of the Borili district and the “Vetryanaya Energiya” LLP on the construction of a wind farm in the Borili district with a capacity of 50 MW.

For the implementation of this project, 100 hectares near the Borili district with the right of temporary paid land use for 49 years was transferred to “Vetryanaya Energetika” LLP, the project implementation period is 2019 - 2020.

In 2017, **heat production** amounted to 3.2 mln. Gcal, in 2018 - 3.1 mln. Gcal, in 2019 - 2.8 mln. Gcal.

The number of heat supply sources - 138 units. The installed capacity of thermal power plants to generate heat is 656.0 Gcal / h, the average operating capacity for the year is 127.0 Gcal / h. The installed capacity of the boiler houses is 626.9 Gcal / h, the average annual operating capacity is 486.0 Gcal / h.

District heating is used in Uralsk and Aksai cities. Heat supply for the city of Uralsk is provided from the city CHPP with an available capacity of 561 Gcal / hour and from 19 boiler houses, in the city of Aksai - from 8 boiler houses. The level of provision with district heating services is 99.8%, including in Uralsk - 99.8%, Aksai - 100%.

The total length of the networks was 345.8 km in 2019. Depreciation of networks was 52.7% in 2017 and about 20% in 2019, due to the ongoing activities, it tends to decrease. In 2017 - 2019, there were no accidents or outages on the main heat supply networks (2016 - 5 cases).

Gasification of rural settlements of the region continues. The provision of the population with natural gas increased from 92.0% in 2015 up to 94% in 2017, of the rural population - from 83.9% up to 87.7%.

Table 2.7.1. Natural gas supply

	2017	2018	2019
Gas supply of the region's population, %	94.0	95.4	96.1
Gas supply of the rural population, %	87.7	90.8	92

7.4 bln. tenge was allocated from the state budget for 2015-2017 for gasification of settlements in the region. At the expense of budgetary funds and own funds of the “KazTransGasAimak” JSC, 3,226.5 km of gas pipelines were built in 2015, 3,337.5 km in 2016, and 342.2 km in 2017. 290 rural settlements with a population of 602.9 thousand people were connected to natural gas.

In 2018, gasification laid in 24 settlements with a population of 9,700 inhabitants. At the end of 2018, as a result of the work carried out, the level of gasification of the region was increased from 94% up to 95.4%. Out of 434 rural settlements (hereinafter referred to as RAs) with a population of 312,935 people, 314 settlements (71.2%) or 284,144 residents (90.8%) are provided with natural gas.

By the end of 2019, it is planned to gasify 5 settlements, as a result of the work carried out, the level of gasification of the region will increase from 95.4% up to 96%.

In order to use **energy-saving technologies** in the region, there are currently a total of 39,698 pieces of light points. In the city of Uralsk, “KAZTEKHNIKAS” LLP renders services to 19,983 light points, of these 6,063 pieces or 31% have been replaced with energy-saving lamps, including 2,145 pieces have been replaced with LED lamps.

In 2017, “Zhayyk Zharygy” LLP in the city of Uralsk transferred from 100 W to 26 W 1,037 energy-saving lamps. These measures allowed to save up to 215,000 kWh of electricity or 2.8 mln. tenge.

As part of the Action Plan of the “Energy Efficiency – 2020” program, approved by the Government of the Republic of Kazakhstan No. 904 dated September 4, 2013, the Department of Energy and Housing and Communal Services of the West Kazakhstan region developed a comprehensive energy saving plan for the West Kazakhstan region for 2015-2020. In accordance with the Comprehensive Plan, systematic monitoring of energy-saving works in real time is carried out in accordance with plans to improve energy efficiency of enterprises and organizations in the industrial, energy and utilities sectors.

In addition, in order to develop digitalization of the housing and communal sector in the region, work is underway to install measuring devices in 10 residential buildings as part of a pilot project in 5 residential districts of the city of Uralsk. This work is carried out to reduce the cost of utilities by installing metering devices through data transmission systems in residential buildings.

Condition of water supply and sewerage, provision of the population with centralized water supply and disposal

Water supply. In 2017, regional enterprises supplied 25.4 mln. cubic meters of water to consumers, of which to the population - 13.7 mln. cubic meters or 53.9%, for utilities - 1.1 mln. cubic meters (4.3%). The volume of water supplied to the network amounted to 38.8 mln. cubic meters, while about 24% of the water volume passed through the treatment plant.

Access of the urban population to centralized water supply is 93.8%, including in the city of Uralsk - 93.8%, in the city of Aksai - 100%. The total length of municipal water supply networks is 603.6 km, including 429.7 km in Uralsk and 173.9 km in Aksai. 377.3 km of water supply networks are in a worn-out condition, including in the city of Uralsk - 273 km, in the city of Aksai - 104.3 km. In 2017, the number of accidents and outages was 103, and in 2019 - 35.

In 2017, access to centralized water supply for the rural population was 76.7%. As of 01.01.2018, out of 441 rural areas (RAs), 178 have access to centralized water supply, 259 rural settlements use decentralized water supply, 4 rural settlements use imported water.

The total length of water supply networks in rural areas is 2,422.9 km, which are in communal ownership. In a worn-out condition - 662.9 km of water supply networks (27.4%). In 2019, the total length of the networks was 4,074.4 km, including 561.9 km requiring replacement.

In 2017, 9.0 bln. tenge was allocated for the construction of 39 water supply facilities in 55 rural settlements. Of these, 29 facilities in 38 rural settlements (47 thousand people) were put into operation, 1,068 km of water pipelines were built.

In 2018, out of 434 rural areas, 206 rural settlements have access to centralized water supply, 227 rural settlements use decentralized water supply, 1 rural settlement use imported water. The indicator of centralized water supply is 47.5% or 206 out of 434 villages with a population of 270.822 thousand people.

In 2019, centralized water supply for urban residents is 95.9%. At the expense of the republican budget under the “Nurly Zhol” program, 888.8 mln. tenge were allocated in the city of Uralsk, 7.9 km of water supply networks were reconstructed. At the expense of “Batys su arnasy” LLP own funds, 103 mln. tenge was spent, 4.7 km of water supply networks were repaired. The total length of urban utilities is 639.8 km, including 442.2 km in the city of Uralsk and 197.6 km in the city of Aksai. Also, 217 rural areas (out of 433 rural settlements) were provided with centralized water supply, which is 50.1% of the total number of settlements or 86.5% of the population of all rural settlements.

Table 2.7.2. Centralized water supply

	2017	2018	2019
Water supply to rural settlements, %	40.4	47.5	50.1
Water supply of the rural population, %	76.7	81.0	86.5
Water supply of the urban population, %	93.8	94.8	95.9

Water disposal. In 2017, the urban population's access to centralized water disposal is 89.3%, including 89.3% in Uralsk, and 100% in Aksai. The length of the sewerage network is 414.2 km (in 2019 - 423.0 km). 266 km of sewerage networks need to be replaced (2019 - 183.5). Sewerage networks have been in operation for more than 30 years and, accordingly, the main **problem** is a high level of wear and tear of networks (67%), of sewage pumping stations (75%). There are 2 sewage treatment facilities in the region.

In 2018, 90.15% of the urban population is provided with centralized water disposal. In rural areas, there is no centralized water disposal.

State of the environment, reduction of air and water pollution

The target indicators of the environmental quality of the West Kazakhstan region for 2019-2025 were approved by the decision of the regional maslikhat dated March 6, 2019 No. 23-2,

For **2017 - 2019**, according to the stationary observation network, the **city of Uralsk** is characterized by a low level of **atmospheric air pollution**. APS is 2 (low level) in 2018 - increased (APS = 5). SI = 2 - 4 (high level), HR value = 0-3% (low and high level).

The atmospheric air of the city of Aksai was characterized by a low level of pollution in 2017 and 2019 (APS = 1 - 2), increased in 2018 (APS = 5). SI = 2 - 4 (high) in 2017 and 2019 and SI = 6 (high) in 2018, HR = 0% in 2017-2018 and HR = 1% in 2019.

The atmospheric air of the village of Berezovka in 2017 was characterized by a low level of pollution. APS is 0. SI = 1 and HR equal to 0%.

The atmospheric air of the village of Yavartsevo in 2017 - 2019 was characterized by a low level of pollution. APS is 1 - 4. SI equal to 1 - 1.1, HR = 0%.

The main air pollutants of the West Kazakhstan region are oil and gas enterprises, boiler houses, motor vehicles, elevators, asphalt concrete plants that emit nitrogen oxides, carbon, sulfur dioxide, hydrogen sulfide, volatile organic compounds and inorganic dust into the atmosphere. The standard volume of emissions of pollutants into the air in 2018 amounted to 0.06 mln. tons, while the plan was 0.179 mln. tons.

Dynamics of emissions of harmful substances into the atmosphere from stationary sources in the region: 2015 - 42.4 thousand tons, 2016 - 42.5 thousand tons, in 2017 - 41.5 thousand tons, 2018 - 48.2 thousand tons, 2019 - 41.2 thousand tons (data from the Committee on Statistics).

To reduce air pollution in the city of Uralsk (West Kazakhstan), the number of buses converted to gas fuel in 2017 was 155 units out of 661 buses involved in intracity and suburban transportation, as of December 31, 2018, the total number of vehicles (cars, trucks, buses), using natural gas as fuel, amounted to 10,201 units or 7.2% of the total.

Observations of **surface water pollution** in the territory of the West Kazakhstan region were carried out at 9 water bodies: the rivers Zhaiyk, Shagan, Derkol, Yelek, Shyngirlau, Saryozen, Karaozen, Koshimsky canal, Shalkar Lake.

There are enterprises in the region that have **wastewater** treatment facilities with subsequent discharge onto the terrain, waste traps and filtration fields: Karachaganak Petroleum Operating B.V., "Batys Su Arnasy" LLP, "Aksayzhylukuat" PSE, "Zhaiykteploenergo" JSC, "Condensat" JSC, Ural Oil Pipeline Administration.

The volume of industrial discharges in the region in 2017 compared to 2015 increased by 7.3%. There was a 26% increase in the volume of treated wastewater discharges from "Karachaganak Petroleum Operating B.V." due to an increase in the volume of associated wastewater due to an increased water cut of production wells.

The standard discharges of pollutants discharged with wastewater into water bodies amounted to 0.046 mln. tons in 2018, while the plan was 0.086 mln. tons. In general, in the region, the 7 largest water users discharge wastewater into the environment.

Compared to 2017, there is a slight increase in the volume of industrial discharges by enterprises (Karachaganak Petroleum Operating B.V., and "Zhaiykmunai" LLP) by 2.4% due to an increase in the volume of associated wastewater, which is due to the appearance of production wells with increased water cut.

Large natural resource users discharging wastewater include: Karachaganak Petroleum Operating B.V., "Batys Su Arnasy" LLP, "Aksayzhylukuat" PSE, "Zhaiykteploenergo" JSC, "Condensat" JSC, "KazTransOil" JSC Ural Oil Pipeline Department Western Branch, "Zhaiykmunai" LLP.

All enterprises that have a discharge have developed draft MPD standards, and waste water is discharged in accordance with the established limits. The main volume of wastewater is generated in Uralsk and Aksai cities.

Table 2.7.3. Information on the actual volumes of discharges

Information on the actual volumes of discharges		For 2017	For 2018	For 2019
Industrial	Water disposal volume thousand m ³	2,965.73	3,039.194	2,959.620

discharges	Volume of pollutants thousand tons	34.2	42.6	42.441
Domestic waste water	Volume of water disposal thousand m ³	8,585.94	7,311.112	8,213.78
	Volume of pollutants thousand tons	3.392	3.23	2.599
Emergency and unauthorized discharges	Volume of water disposal thousand m ³	-	-	-
	Volume of pollutants, thousand tons	-	-	-
Total (all of the above discharges)	Volume of water disposal thousand m ³	11,551.67	10,350.306	11,173.4
	Volume of pollutants thousand tons	37.592	45.8	45.04

Regional Akimat data

There are two outlets of conditionally clean waters in the Ural River: from the drinking water treatment plant of Batys Su Arnasy LLP and from the cooling system of turbine No. 2 PR-10/35 of the Ural CHPP.

There are three wastewater storage ponds, including 2 for the accumulation of wastewater from Uralsk city and 1 - wastewater from Aksai city.

Waste water from Uralsk city (domestic and industrial) is mechanically treated at sewage treatment facilities, natural biological treatment at artificial ponds and discharged into storage tank No. 2.

Production and consumption waste management and waste processing

Solid household waste. In 2018, 108 thousand tons of solid household waste was generated, of which 5.28% was processed. In 2017, the volume of generated solid household waste amounted to 105 thousand tons, of which 2.17% was processed. Out of 318 solid household waste disposal facilities, only 8 comply with environmental and sanitary requirements and standards, which is 2.52%.

In 2019, 8.6% of the total volume of existing solid household waste and 55% of industrial waste were processed.

A set of measures for modern utilization and processing of solid household waste with the wide involvement of small and medium-sized businesses for 2018 - 2022 in the West Kazakhstan region was approved. Also, 4 Roadmaps were approved for the introduction of separate collection, sorting, utilization and processing of solid household waste until 2020 (Borili, Zelenovsky, Terekti districts and Uralsk city).

There are 16 enterprises in the field of collection and processing of solid household waste. Among the large local processing enterprises one can note “Kama Center” LLP with a capacity of 2 thousand tons per year for the processing of automobile rubber, “Guber” PE with a capacity of 500 kg per hour and “Ussenova” PE for paper processing. The products of these enterprises are produced at affordable prices for the local market.

At the Ural solid household waste landfill, “ICM Recycling” company has launched a waste sorting network with a capacity of 100 thousand tons per year. The cost of the project is 1.7 bln. tenge (investor funds). Project implementation period: 2017 - 2023.

To resolve the issue of preliminary sorting and separate collection of waste in regional and district centers, reception points for cardboard, paper, plastic, tires have been organized. 1,306 containers have been installed in the region, including 767 in Uralsk and 539 units in the districts. To collect mercury-containing lamps, batteries and devices, 54 special containers have been installed, of which 27 are in Uralsk and 27 in the regions. In the region, these mercury-containing wastes are utilized by “Talap” JSC and “Mega-Zhazira” LLP.

In addition, on February 27, 2018, “Kama Center” LLP opened a tire and rubber processing plant. For this work, with the support of the Damu Fund, “Operator ROP” LLP is subsidized. Deep processing of used car tires is used at the enterprise, and then in the production of coatings for sports and playgrounds.

The state of biological resources and the development of forestry, fishing and hunting industries, specially protected natural areas and ecological tourism

The area of the state **forest fund** as of January 1, 2018 amounted to 216.8 thousand hectares (as of 01.01.2017 - 216.8 thousand hectares). In 2017, the total area of the state forest fund did not change, and the forested area decreased by 92 hectares due to forest fires in the territory of the state forest fund and as of 01.01.2018 amounted to 89,418 hectares (41% of the area of the state forest fund).

In order to increase the forested areas, in 2017, forest cultures were planted in the state forest fund on an area of 250 hectares, roadside forest belts were created along roads for 100 hectares, and sands were fixed by planting forests on an area of 150 hectares. The survival rate of forest cultures created in the one-year-old state forest fund is 47.6%. For the purpose of landscaping settlements and for carrying out reforestation activities, 3,377 thousand pieces of seedlings and propagulum were grown.

The material and technical base of state institutions for the protection of forests and wildlife is annually strengthened. For the period of 2015 - 2017, 1 fire truck, 8 MTZ tractors, 12 UAZ vehicles, 1 VAZ vehicle, 2 GAZ trucks were purchased.

To achieve the planned survival rate of forest crops, work is underway to improve the quality of soil preparation, increase the range of cultivated planting material, and select crops that are more adapted to local climatic conditions.

In 2017, 17 cases of forest fires were committed on the territory of the state forest fund on a total area of 557.5 hectares, including the forested area was 405.7 hectares (in 2016 - 2 cases of fire on an area of 3.6 thousand hectares).

In order to protect forests from fires, a total of 2,000 km of fire barrier line were arranged, and they were maintained at a distance of 7,300 km. Cutting of compartment lines was carried out at 97 km, and repair of forestry and fire-fighting roads was carried out at a length of 70 km.

Specially protected natural areas of the region are represented by four state natural zoological refuges of republican significance (Kirsanovskiy, Budarinskiy, Zhaltyrkulskiy) with a unique set of landscape complexes, as well as five state nature refuges of regional significance.

In 2017, compared to 2015, the number of visitors of inbound and domestic tourism increased by 18.9%.

In 2017, due to the increase in individual entrepreneurs engaged in the provision of accommodation, the number of facilities involved in the accommodation of visitors increased by 4 units and amounted to 72 units, in which there are 1,510 rooms, while the one-time capacity is 2,873 beds. They served 112.3 thousand people and rendered services in the amount of 3,121.0 mln. tenge. The volume of accommodation services (excluding restaurant services) increased 1.6 times compared to 2015.

2.8. Karaganda region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

Karaganda region is the largest industrial center of the country and is one of the leading four among other regions of the republic. Territory of the region - 428 thousand sq. km. However, according to the Committee on Statistics, the population is constantly decreasing: at the beginning of 2018 it was 1,380.5 thousand people, at the beginning of 2019 – 1,378.5 thousand people, and at the beginning of 2020 – 1,376.9 thousand people. The GRP of the region in 2017 amounted to 4,284.4 bln. tenge, the share of the region in the country's GDP - 7.9%. GRP per capita for 2015-2017 increased from 2,248.9 in 2015 up to 3,100.9 thousand tenge in 2017, or by 37.9%. In 2018, the GRP of the region amounted to 4,734.4 bln. tenge, and per capita – 3,431.9 thousand tenge, in 2019, respectively, 5,388.3 and 3,911.0.

Industry has the greatest impact on the change in GRP, the volume of which amounted to 2,447.5.0 bln. tenge in 2019.

In the **manufacturing industry** in 2017, the volume of production amounted to 1,802.3 bln. tenge and 1,935.0 bln. tenge in 2018, 1,991.4 bln. tenge in 2019. The labor productivity index in 2018 compared to the previous year was 102.4%.

The region is implementing 35 new large investment projects worth more than 1 tln. tenge with the creation of more than 9 thousand jobs, including those with foreign capital - 18 projects. The main areas of investment are metallurgy, alternative energy, mechanical engineering, chemistry. Of these, 8 projects were introduced in 2018¹⁴⁰:

- solar power plant of “SES “Saran” LLP with a capacity of 100 MW;
- plant for the production of cathode copper of “Sary-Arka Copper Processing” LLP;
- modernization of machine-building production of “Maker” LLP;
- increasing the productivity of the gold recovery plant of “AK Altyn Almas” JSC;
- reconstruction of ore-thermal furnace No.1 of Zhezkazgan Copper Plant of “Kazakhmys Corporation” LLP;
- launch of the 1st stage of construction of a wholesale distribution center of “Alfarukh” LLP;
- plant for smelting steel and iron of “Forever Flourishing (Middle Asia) Pty Ltd” LLP;
- reconstruction of the egg production workshop of “Karagandy Kus” LLP.

According to the Committee on Statistics, the gross **agricultural** output in 2017 amounted to 251 bln. tenge with an increase of 27.2% by 2015. In 2018, the gross agricultural output amounted to 277.7 bln. tenge, an increase of 8.0%. The labor productivity index in 2018 compared to the previous year was 105.5%. In 2019, the gross agricultural output amounted to 334.0 bln. tenge, with the advantage of animal husbandry (60.6%).

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture

The region is actively introducing new technologies for the cultivation of agricultural crops. Moisture-saving technologies are used on 668.9 thousand hectares, drip irrigation - on 1,069.5 hectares. As a result, grain production increased by 28.2% in 2017 compared to 2015. Potato production increased by 7.8%.

In 2019, thanks to the use of selective varieties of seeds, mineral fertilizers and the introduction of digital technologies, it was possible to collect 880.4 thousand tons of grain. 381.7 thousand tons of potatoes and 105.9 thousand tons of vegetables was received. The area of irrigated land was increased by 1.5 thousand hectares and brought up to 22 thousand hectares. The sowing area of grain and leguminous plants this year will be expanded by 32.5 thousand hectares and will amount to 895.5 thousand hectares.

The volume of livestock production is growing. Production of meat increased by 4.8%, milk - by 3.7%, eggs - by 3%. The number of cattle in relation to the previous year increased by 2.9%, horses - by 8.8% and birds - by 2%. The share of breeding animals increased to 6.2%. In 2020, it is planned to create 8 dairy farms and begin the construction of two feedlots.

The territory of the Karaganda region is 42,798.2 thousand hectares. The area of agricultural land in the Karaganda region in 2015 - 2017 increased by 1,247.2 thousand hectares. The increase was due to the provision of land from reserve lands, which decreased over 3 years by 1,284.5 thousand hectares.

For the rational use of agricultural land in the region, the Plan for the involvement of agricultural land in the farming business for 2016 - 2020 is being implemented. In 2018, with a plan of 560 thousand hectares, 671 thousand hectares of farmland were involved in farming business. These achievements, along with climatic conditions, were undoubtedly facilitated by the use of high-yielding seed varieties and IT technologies. For example, thanks to the elements of precision farming in two pilot farms in the region (“Naidorovskoe” LLP of the Osakarovsky district and the “Shakhterskoe” LLP of the Nurinsky district), the grain yield in the experimental fields amounted to 50 centners per hectare, and in general for these farms it is 66% higher than the average indicator. From this year, elements of precision farming will be introduced by other farms. In 2018, as part of the implementation of digitalization, more than 7 thousand sown fields were digitized, their electronic maps were compiled. Work is underway to digitize pastures and hayfields.

140 Hereinafter, the Program for the Development of the Territory of the Karaganda Region for 2016 - 2020 and reports on its implementation for 2018 and 2019.

The tasks for 2020 are to increase the land by 612.0 thousand hectares of reserve lands and carry out work to re-engage 216.3 thousand hectares of unused arable land into farming business.

In the composition of the region's land fund, 87.4% is occupied by agricultural land, among which pastures prevail (94.6%), arable land is 3.2%. In the Karaganda region, the area of pastures on agricultural land is 11,998.5 thousand hectares, watered 7,451.4 thousand hectares, or 62%. At 2014 - 2016 farms built and restored 135 units of mine wells and bores. In 2017, 40 wells (bores) were built - 100% of the plan.

Industrial development is accompanied by an increase in the areas of technogenically disturbed territories, a decrease in their regenerative capacity, and resistance to anthropogenic factors. Especially significant damage to natural landscapes is inflicted in mining regions with a predominance of coal and metallurgical industries. The area of disturbed lands is about 0.1% of the total area of the region. The share of worked-out land on which industrial work was completed in 2015 was 17.3% of the total area of disturbed land, in 2016 - 2017 - 23.5%.

Development of energy, including renewable energy and energy supply to the population

The energy complex of the region includes 9 thermal power plants with an installed capacity of 2,411 MW of electricity and 4,957 Gcal of thermal energy, 3 large power grid companies. In 2017, the volume of generated energy increased by 6.7% (13,417 mln. kWh) by 2015 (12,573 mln. kWh). For 3 years, electricity production increased by 12.4%. The existing energy deficit was covered by flows from the power plants of the UES of Kazakhstan through the transit lines of the 220/500 kV “North-South” overhead line.

In 2019, 9.8 bln. tenge was allocated for the reconstruction and modernization of power equipment, 5.5 thousand km of electrical networks and 931 substations were repaired and modernized.

In 2018, 4.4 mln. kWh of electricity was generated from installations for the use of **renewable energy sources**. The share of generated electricity from renewable energy sources in the total electricity generated in 2018 was 0% (100% to the plan).

In 2018, the construction of a solar power plant (SPP) in the city of Saran, Karaganda region with a capacity of 100 MW was completed.

Also, in the village of Kurminskoye, Abai district, a biogas plant with a capacity of 0.5 MW was commissioned in 2018.

Solar power plants in the village of Gulshat of the Aktogai district with a capacity of 40 MW and in the village of Agadyr with a capacity of 50 MW were launched in 2019. In addition, “Kazgrinenergy” LLP in the Kengir settlement has begun the construction of a 9 MW bioelectric station.

The total length of **heating networks** is 2,074.4 km, electric networks – 27,884.4 km. There are 63 boiler houses with an installed capacity of up to 100 Gcal / hour. The provision of residential multi-storey buildings in the region with heat metering devices amounted to 86.8% in 2018. In the cities of Zhezkazgan, Satpayev, Priozersk, Shakhtinsk, Balkhash and Abai, multi-storey buildings are 100% equipped with metering devices.

In 2019, 4.7 km of main heating networks were modernized. Their total length was 1,619 km, including dilapidated - 262.4 km (16.2%), in need of replacement - 250.1 km (15.4%).

8 accredited gas supplying organizations provide **gas supply** to consumers of the region with liquefied petroleum gas for domestic needs through the gas-distributing units, household cylinders and automobile gas filling stations (AGFS). The main suppliers of liquefied gas are Pavlodar, Zhanazhol petrochemical plants and “Tengizchevroil” LLP. The total gas sales in 2017 amounted to 64 thousand tons. In 2018, 4 filling stations were installed, the total number of filling stations is 141 units (15% growth in comparison with 2016, 2016 - 123 filling stations, 2017 - 137 filling stations).

In 2019, out of 1,061 km of the “Saryarka” gas pipeline, 765 km passed through the territory of the Karaganda region. Construction of gas distribution networks in the cities of Karaganda, Temirtau and Zhezkazgan is underway. The first 300 houses are connected to the central gas supply. Centralized gas supply will be provided to about 1 million people, 100 settlements, or 68 thousand houses, 200 boiler houses, 700 enterprises.

The successful implementation of **energy saving and energy efficiency** measures ensures energy and environmental security, as well as increasing the competitiveness of the economy of the Karaganda region. At the end of 2018, an economic effect (resource saving) is expected in the form of resource saving, namely: more than 34 mln. kWh of electricity, 1.3 mln. Gcal of thermal energy, 2.1 mln. m³ of water, 507.9 thousand tons of coal and 2.4 thousand tons of fuel oil, 110 mln. tenge of budget funds. In 2018, 110 mln. tenge of budget funds were allocated for energy saving. Measures were taken to install energy-saving lamps, street lighting fixtures, automated heat points (AHP), plastic double-glazed windows, overhaul of roofs and entrance spaces, replacement of the heat supply system with the installation of regulating equipment and utility metering devices. At industrial and energy facilities, it is planned to modernize the indoor and outdoor lighting equipment of workshops, heat supply systems, replace outdated technological ones with modern energy efficient ones to ensure optimal operation of production equipment.

At the same time, a positive effect from the installation of such energy-saving technologies as pyrolysis boilers has been introduced and obtained in the region. In particular, in 2017, pyrolysis boilers for a total amount of 14.43 mln. tenge were installed at educational facilities at the “Egindybulak Agrotechnical College” Municipal Institution and the “Saransk Technical College” Municipal Institution.

Condition of water supply and sewerage, provision of the population with centralized water supply and disposal

Water supply to cities and rural settlements of the region is carried out from underground sources, with the exception of the cities of Karaganda, Zhezkazgan, Priozersk and the Saryshagan village of Aktogai region, in which water supply is carried out from open sources, by purification through water treatment facilities. Large reservoirs of integrated use, Samarkand, Kengir and Sherubainura, are used for the needs of power engineering with an open technological cooling cycle and the use of the water area of these reservoirs with subsequent return. Also in the Karaganda region there are 111 registered groundwater deposits, of which there are mineral springs - 5, two of which (Zhosaly and Zhartas) are currently being exploited and 36 separately explored areas.

Since 1974, the Irtysh water supplied through the canal named after K. Satpayev has also been used for water supply to the Karaganda-Temirtau industrial area, with the technical productivity of the complex of structures - 816 mln. m³ per year.

Water withdrawal in the Nura-Sarysu basin in 2019 amounted to 1,458.1 mln. m³, of which 85.1 mln. m³ for municipal needs, 1179.7 mln. m³ for industrial needs, 84.2 mln. m³ for agricultural needs, fishery needs - 0.127 mln. m³, filling of off-channel reservoirs - 9.121 mln. m³ and other needs - 49.185 mln. m³, regulating releases - 50.5 mln. m³. The volume of recirculating and reused water supply in the basin in 2019 amounted to 2,366.996 mln. m³, including recirculating - 1,804.614 mln. m³, re-sequential - 562.382 mln. m³.

There are 22 operating organizations and enterprises functioning in the region, of which 2 are basic water utilities: “Karagandy Su” LLP and “Zhezkazgan Heat Water Supply Company” JSC. The total length of water supply networks according to the regional akimat as of 01.01.2018 is 7,702 km of water supply networks (in cities - 5,437 km, in villages - 2,265 km), which is 631.1 km. more than in 2015 (7,070.9 km).

In 2018, the total length of water supply networks, according to the Committee on Statistics, was 7,372 km, of which 2,641.6 km needs to be replaced, in 2019, respectively, 7,505.5 km and 2,666.8 km.

The total length of the **water disposal** system in 2017 was 2,526.8 km (in cities - 2,293.6 km with an average wear of 85%, in villages - 247.4 km with an average wear of 75%), wear and tear of water disposal networks - 80%. There are 27 sewage treatment facilities in the region.

In 2018, the total length of sewerage networks, according to the Committee on Statistics, was 2,516.3 km, of which 1,225.4 km needs to be replaced. In 2019, respectively - 2,548.2 km and 1,240.3 km.

In 2019, 303.1 km of water supply and sewerage networks were built and reconstructed, 4.7 km of main heating networks were modernized.

State of the environment, reduction of air and water pollution

Akimat of the Karaganda region together with the Ministry of Energy to solve environmental problems, in October 2018, approved the "Comprehensive plan on measures to improve the environmental situation in the Karaganda region". It includes environmental protection measures of industrial enterprises aimed at reducing emissions, takes into account measures for waste management, protection of water resources, environmental education, as well as public monitoring of the state of the environment.

In total, the Plan provides for the implementation of 57 activities, of which 22 (39%) have been completed, 35 (61%) measures are in progress, incl. with a deadline for implementation in 2020 - 31, and 2022 - 4 measures (gasification and construction of a sulfuric acid production at the ZhCM).

To involve the public in solving environmental problems, at the end of 2018, the Council on Environmental Protection was established, chaired by the Akim of the Karaganda region. It included mainly representatives of non-governmental organizations and independent environmentalists, as well as the management of large industrial enterprises and government agencies.

For 2017 - 2019, according to the stationary observation network, the level of **atmospheric air pollution** in the city of Karaganda was assessed as a high level of pollution. APS is 8 - 10 (high level). SI equal to 16 - 21 (> 10 very high level).

The level of atmospheric air pollution in the **city of Balkhash** was assessed by an increased level of pollution. APS is 6 - 7 (raised and high level). SI equal to 8.4 - 23 (> 10 very high level).

The level of atmospheric air pollution in the **city of Temirtau** was assessed as high. APS is 8 - 9 (high level). SI = 12 - 16.8 (> 10 very high level).

75% of **pollutant emissions** into the atmosphere are made by large enterprises. There are 247 nature users in the region, belonging to the 1st category of hazard. Of these, large enterprises: "Kazakhmys Corporation" LLP, "Kazakhmys Energy" LLP, "Zhezkazgan CHPP", "Kazakhmys Smelting" LLP (ZhMZ), "Kazakhmys Smelting" LLP (ZhMZ) (production of cathode copper), "Kazakhmys Energy" LLP Balkhash CHPP, "Kazakhmys Energy" LLP GRES (Electricity generation by thermal power plants), SD "Arcelor Mittal Temirtau" JSC, UD "Arcelor Mittal Temirtau" JSC, "Central Asia Cement" JSC, "Karcement" JSC, "Orken" LLP (Atasu), "Orken" LLP (Kentobe), "Kazmarganets Mining Department" (a branch of "TNK Kazchrome" JSC), "Karaganda Energocenter" LLP (CHPP-1, CHPP-3), "Bapy Mining" LLP, "Chemical and Metallurgical Plant of Temirtau Electro-Metallurgical Plant" JSC, "Zhairam Mining and Processing Plant" JSC. The dynamics of emissions is shown in Table 2.8.1.

Table 2.8.1. Dynamics of emissions into the environment in the Karaganda region for 2016 - 2019

Type of emissions	2017		2018		2019	
	Limit	Actual	Limit	Actual	Limit	Actual
Emissions thousand tons	831	590	822	587	945.6	641.3
Discharges thousand tons	1043	458	429	428	454.5	403.7
Waste thousand tons	513,764	121,786	483,458	129,669	344,499.7	149,354.24

The main volume of emissions in the Karaganda region falls on the metallurgical complex - 70%, up to 20% - on thermal power plants, up to 10% - on mining enterprises.

The industrial potential of the region continues to grow, having a technogenic impact on the environment. To stabilize the quality of the environment in the region, systematic work is being carried out in all areas of environmental protection.

On behalf of the Head of State, the Comprehensive Action Plan to improve the environmental situation was approved and is being implemented. In total, the plan provides for the implementation of 57 measures.

Table 2.8.2. Financing of environmental activities by nature users in the Karaganda region, bln. tenge

2017		2018		2019	
Plan	Actual	Plan	Actual	Plan	Actual
14.7	12.4	19.4	18.8	35.2	18.9

Dendrological plans of the cities of Temirtau and Karaganda have been developed. 10 gas analyzers operate in a pilot mode in the cities of Karaganda, Temirtau, Balkhash and Zhezkazgan to control the air condition.

As for the switching over of transport to ecological fuels, in 2018 the number of vehicles registered with the Department of Internal Affairs of the Karaganda region using gas engine fuel is 8,733 units. Since 2017, the increase is 74% (2017 – 5,012 vehicles). Accordingly, this entailed an increase in the number of autogas stations. In 2018, the number of filling stations is 167 units (an increase of 22% in comparison with 2017 (137 filling stations)).

The region includes the Nura-Sarysu, Balkhash-Alakol, Ishim, Irtysh and Tobol-Torgai river basins. These are 864 **water bodies**, including 107 rivers, 88 lakes, 220 hydraulic structures, 409 artificial reservoirs, dams with hydraulic structures, 40 reservoirs with a water volume of over 1 mln. m³. The main sources of water resources in the Karaganda region are the Nura River and Lake Balkhash.

Observations of **surface water pollution** in the territory of the Karaganda region were carried out at 15 water bodies - rivers: Nura, Sherubainura, Sokyr, Kokpekty, Kara Kengir, reservoirs: Samarkan, Kengir, Wastewater canal, Yertis-Karagandy canal, lakes of the Korgalzhin reserve: Sholak, Yessey, Sultankeldy, Kokai, Nura-Yessil canal, Lake Balkash.

The **volume of discharge** of normatively treated water is steadily decreasing (1,294.4 mln. m³ in 2015, 1,327.5 mln. m³ in 2017).

Wastewater discharges into surface water bodies are carried out through 17 outlets from 15 enterprises. The quality of water in reservoirs and streams depends on the volume and qualitative composition of wastewater. The slight increase in wastewater volume in 2018 is due to the large volume of flood waters. Accordingly, the mass of pollutants discharged has also increased. The mass of discharged pollutants also increased by 0.3% and amounted to 269.0 thousand tons (2017 - 259.0 thousand tons, 2016 - 249.09 thousand tons, 2015 - 239.3 thousand tons).

Production and consumption waste management and waste processing

In the Karaganda region, 7,430 mln. tons have been accumulated, of which: from the mining industry - 1,564 mln. tons, from non-ferrous metallurgy – 3,026 mln. tons, from ferrous metallurgy - 199 mln. tons, from the coal mining industry – 2,403 mln. tons, from heat and power industry - 111 mln. tons.

In 2019, the volume of generated solid household waste amounted to 530 thousand tons, of which 37.4% were sorted and processed (in 2018 - 16.3%).

Industrial wastes, such as rocks and mine rocks, enrichment waste, ash and slag, are used to carry out the technical stage of reclamation of waste land, for filling open pit roads, protective dams of embankments. An example is the overburden, formed at the enterprise “Shubarkol Komir” JSC, which is placed in internal dumps.

Also in the Karaganda region there are 183 containers with 5,946 capacitors and 3 containers with PCB-containing waste located on the territory of the former military facility Balkhash-9 (“Daryal-U” radar).

Until 2020, these capacitors were placed in 2 warehouses of the former military facility Balkhash-9, located 35 km from the city of Balkhash (population - 100,000 people) and 5 km from the village of Gulshad (population - 1,000 people).

In 2017, within the framework of the budget program 037 “Stabilization and improvement of the quality of the environment”, the environmental impact of PCB-containing capacitors located at the Daryal-U radar facility was determined. Within the framework of this program, the inspection of the integrity and tightness of the container was carried out at two warehouses of the “Daryal-U” facility. During the inspection, it was revealed that all containers have signs of corrosion and do not meet the

current requirements for packaging PCB-containing waste, and therefore are not suitable for further storage and transportation. Sampling of air, soil, flooring, water, bottom sediments and insulating liquid was also taken. All 7 water samples taken along the shoreline of Lake Balkhash showed traces of PCBs. At present, there is a round-the-clock security of this object by the Management of the specialized security service of the Karaganda region State Institution of the Ministry of Internal Affairs of the Republic of Kazakhstan. To date, the only possible option for the destruction of PCB-containing capacitors is the European POP-containing waste disposal plants.

The total volume of solid household waste increased from 546.8 thousand tons in 2015 up to 654.6 thousand tons in 2017. 13.96% of them were processed in 2017. In 2018, 651.3 thousand tons of solid household waste was generated, of which 16.39% was processed. The volume of solid household waste generated in 2019 amounted to 530 thousand tons, of which 198.4 thousand tons (37.4%) were processed.

In 2018, the Akimat of the Karaganda region approved the "Complex of measures for modern utilization and processing of solid household waste with the wide involvement of small and medium-sized businesses in the Karaganda region for 2018-2020". This Complex of measures is aimed at fulfilling specific tasks for the akimats of cities and districts on the implementation of target indicators in the field of solid household waste, attracting investments in waste processing.

Coverage of the population with waste collection and transportation services in 2018 was 80% (100% to the plan). In 2019, 74% of the region's population was provided with services for the removal of solid household waste, the urban population - 80%, the rural population - 53.9%. According to the Akimat of the Karaganda region, out of 202 solid household waste disposal facilities, only 50 meet environmental and sanitary requirements and standards, which is 25%. In the city of Karazhal, as well as in Zhanaarka, Nuri, Ulytau, Shetsky districts, there are no solid household waste landfills that meet environmental and sanitary requirements and standards.

Currently, there are 6 enterprises for the collection, sorting and processing of solid household waste, and a separate collection of solid household waste is being introduced.

On the territory of the region, waste sorting and processing is carried out mainly by three large garbage disposal organizations ("GorKomTrans of the city of Karaganda" LLP, "Recycling" LLP, "EcoAlem" LLP).

In general, more than 1,200 containers for separate waste collection have been installed in the region, as well as 66 containers for the collection of mercury-containing devices. However, containers for separate collection are installed only in the cities of Karaganda and Temirtau, in the remaining 16 districts and cities, separate collection has not been introduced.

To date, 19 containers have been installed for out-of-order small and medium-sized electronic household appliances (kettles, hair dryers, irons, telephones, etc.) (5 - in Karaganda, 3 containers each - in the cities of Satpayev, Zhezkazgan, 2 - in the cities of Saran, Shakhtinsk, Abai, 1 each in Balkhash city, Aktas village). Also, maintenance of these containers is carried out at the expense of "PROMOTKHODKAZAKHSTAN" LLP.

The capacity of the waste sorting line of "GorKomTrans of the city of Karaganda" LLP ("Kazvtorresursy") is 200 thousand tons / year. The incoming waste goes through a sorting line, where 10 fractions are removed (waste paper, cardboard, polyethylene, PET, aluminum cans, metal, plastic, etc.). 9 fractions are sold as recyclable materials, and PET bottles are processed to the state of PET flakes.

"TTK" LLP has been carrying out work on the collection, sorting and disposal of solid household waste in the cities of Karaganda and Temirtau since January 2017. The capacity of the waste sorting line is 90 thousand tons / year. Of the 60 thousand tons of sorted waste received, 50% are recycled to obtain finished products in the form of plastic hatches and well covers.

The capacity of the sorting line of "Recycling" LLP is 20 thousand tons / year. The company carries out recycling of recycled plastic with the subsequent production of granules and recycled plastics.

In 2017 (in June - the first stage, in December - the second stage), a full cycle plant for the disposal of ramshackle vehicles (RV) was put into operation. The plant carries out shredding and deep

(up to 98%) processing of ramshackle vehicles, while the plant's capacity is 50 thousand ramshackle vehicles per year.

Within the framework of the *Zhezkazgan* Development Plan for 2017-2019, it is planned to build a waste sorting point in the city of Zhezkazgan (development of the concession - 2018; construction of the plant - 2019).

“GorKomTrans of the city of Karaganda” LLP plans to build a waste recycling plant with a solid household waste landfill for disposal of waste from the cities of Karaganda, Abai, Saran, Shakhtinsk, Temirtau within the framework of a public-private partnership. Under this project, the "Modernization of the solid household waste management system in the Karaganda region" Concept was developed. At present, a detailed design for the construction of a new landfill is undergoing expert examination. It is planned to invest 882.3 mln. tenge on the project (own funds of “GorKomTrans of Karaganda city”). The processing volume is 120 thousand tons per year, the processing depth is 50%.

On the territory of the Karaganda region, 1,081 objects of unauthorized dumps were identified, the state environmental inspectors of the Department of Ecology of the Karaganda region sent 406 letters to eliminate unauthorized dumps, of which 78 objects were disposed of.

The Ministry of Ecology, Geology and Natural Resources together with the Akimat of the Karaganda region approved a schedule for the elimination of landfills. Work to eliminate unauthorized landfills continues.

The state of biological resources and the development of forestry, fishing and hunting industries, specially protected natural areas and ecological tourism

In 2018, the forested area of the forest fund amounted to 83,508 hectares, compared to 2017, increased by 111 hectares. In the state forest fund for 2015 - 2018, a forest was planted on an area of 1,520.6 hectares. Maintenance of forest crops was carried out on an area of 17,867 hectares.

As of 01.01.2020, the total area of the state forest fund of the region amounted to 614,689 hectares, of which forest lands – 181,695 hectares, including forested – 152,306 hectares and non-forest lands – 432,994 hectares. The forest cover of the region is 0.4%.

There are 9 state forest owners in the region, including:

- 6 state forestry institutions of the Department of Natural Resources and Environmental Management of the Regional Akimat on an area of 204,094 hectares,

- 2 state national natural parks (Karkaraly and Buiratau) on an area of 140,274 hectares,

- Korgalzhyn State Natural Reserve on the territory of the Karaganda region – 262,125 hectares.

4 plots on an area of 348.1 hectares were provided for long-term forest use for culture and health, recreational and sports purposes for a period of 10 up to 49 years on the plots of the forest fund of the region.

On the lands of the specially protected natural areas, 24 plots on an area of 36 hectares have been provided for long-term and short-term lease for culture and health, recreational and sports purposes.

The total area of **hunting grounds** is 36,478.718 thousand hectares.

The area of the reserve fund of hunting grounds is 14,383.22 thousand hectares.

The assigned area of hunting grounds - 22,095.497 thousand hectares

Assignment percentage - 60.5%

The total number of hunting farms - 138

Number of assigned hunting farms - 98

Number of hunting farms - 43

Number of ranger service in the hunting farms - 348 people

Received payments for the use of the animal world (for 2019) - 9.3 mln. tenge.

Number of registered hunters - 16,750 people

Number of hunting animal species - 23 species.

On **fishery reservoirs** of republican significance - 37 sites (Lake Balkhash - 21 sites, the K. Satpayev Canal - 10 sites, the Nura River - 6 sites), of which 23 are assigned (Lake Balkhash - 14, the K. Satpayev Canal - 8, the Nura River - 1) for 9 users. 14 sites remain non-assigned (Lake Balkhash -

7, K.Satpayev Canal - 2, Nura River - 5). Of the 127 local water bodies, 71 water bodies are assigned to 44 users. 56 water bodies remain non-assigned. The limit for 2019 is 1.0 thousand tons. The actual catch of fish is 833.4 tons (83%).

9 fish-breeding organizations are engaged in commercial fish farming. Within the framework of the developed program for the development of fisheries, the volume of farmed commercial fish is planned to be increased up to 1,500 tons by 2030.

The following **pecially protected natural areas** have been created in the region:

2 state national natural parks:

- Karkaraly State National Natural Park;
- “Buiratau” State National Natural Park.
- 7 state natural refuges (zoological) of republican significance;
- 2 state nature refuges (botanical) of republican significance;
- 10 state natural monuments of republican significance.

Table 2.8.3. Reserves and other specially protected objects of the Karaganda region

Name	Location	Territory, ha
Karkaraly State National Natural Park	Karkaraly district	90,323
Zhezkazgan Botanical Garden	Zhezkazgan city	62
State natural refuges:		
Belodymovsky (zoological)	Osakarovsky district	3,000
Belagash (zoological)	Bukhar-Zhyrau district	1,500
Kuvsky (zoological)	Karkaraly district	33,500
Bektauata (zoological)	Aktogai district	500
Karaagash (zoological)	Zhanaarka district	15,000
Kyzylarai (zoological)	Aktogai district	18,200
Ulytau (zoological)	Ulytau district	19,300
Turanga (botanical)	Aktogai district	48
Kogashinsky (botanical)	Zhanaarka district	6,800
Boldeutas SNR (zoological)	Karkaraly district (opened in 2009)	4,466

Karkaraly State National Natural Park is a specially protected natural area with an area of more than 90 thousand hectares, the main objectives of which, in addition to directly protecting the environment, is also the expansion of recreational activities. On the territory of the park there are 45 species of mammals, more than 120 species of birds, 6 species of reptiles, 2 species of amphibians and 15 species of fish, forest-forming species such as pine, birch, aspen, 18 species of mushrooms, etc. Also in the park there are 6 natural monuments: Lake Shaitankol, Lake Bassein, Three caves, Big plate, Siberian larch, Siberian spruce.

By order of the Committee for Forestry and Wildlife (No. 17-5-6/225 dated 29.08.2018), two state natural refuges (zoological) Bektauata, Beldeutas with a total area of 45,160 thousand hectares are assigned to the “Karkaralinsky SNPP” RSE.

There are 11 tourist routes on the territory of the Karkaralinsky SNPP.

“Buyratau” State National Natural Park

Buyratau State National Natural Park was created by the decree of the Government of the Republic of Kazakhstan dated March 11, 2011 No. 247. The total area of the Buyratau State National Natural Park is 88,968 hectares.

Buyratau SNPP is located on the territory of Ereymentau district of Akmola region (60,814 hectares) and on the territory of Osakarovsky district of Karaganda region (28,154 hectares).

“Buyratau” SNPP has 2 branches: Ereymentau, Belodymovsky.

On the territory of the Buyratau State National Natural Park there are 4 tourist routes, all routes by type of movement: automobile, by the time of operation: seasonal, by the form of organization: group and individual, their total length is 131.2 km.

They are equipped with 1 observation deck, 2 bivouac meadows, benches, picnic tables, signs, notices, route passports, etc.

The development of **tourism** infrastructure in the region is created by attracting private investment within the framework of the "Unified program for support and development of business "Business Roadmap – 2020". Key places of tourist interest are: the city of Karaganda, the shores of Lake Balkhash, Ulytau, Karkaraly and Aktogai districts.

In June 2018, was held a historical and informational tour "Elbasy joly", timed to coincide with the celebration of the 20th anniversary of the city of Astana (now Nur-Sultan). Within the framework of the "Zhez KiiK" International Music Festival in the Ulytau district, an information tour was held with the participation of 60 tourist operators and tourism associations, including foreign ones. Information work is being actively carried out to promote the tourist places of the region in the framework of various television programs, stories in print and electronic media.

2.9. Kostanay region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

The territory of the region is 196 thousand km². As of January 1, 2018, the population of the region was 875.6 thousand people, and as of January 1, 2019 - 872.8 thousand people.

The region in terms of GRP from 2015 to 2017 has strengthened in 12th place among the regions of Kazakhstan. In the country's gross domestic product, the region's share in 2015 - 2017 was 3.5 - 3.4%, respectively. In terms of GRP per capita - 11th place¹⁴¹.

Table 2.9.1. Gross regional product for 2015 - 2018

Name	Unit of measure	2017	2018	2019
GRP	Bln. tenge	1,850.3	2,069.3	2,451.7
IAV GRP	%	104.6	105.9	104.6
GRP per capita	thous. tenge	2,108.9	2,367.1	2,815.9

The main regional **industrial** products of the Kostanay region are iron ore products, bauxite, asbestos, engineering products, flour, and confectionery.

In the republican volume of industrial production, the region accounts for 100% of the production of iron ore pellets, bauxite, asbestos.

The enterprises of the mining, processing industry, for the production and distribution of electricity, gas and water operate. Modern diversified industry is represented by combines, factories, modern small enterprises.

About 700 enterprises employing more than 43 thousand people are engaged in the production of industrial products.

According to the Committee on Statistics, the volume of industrial production increased from 449.2 bln. tenge in 2015 up to 764.3 bln. tenge in 2017, up to 883.4 bln. tenge in 2018, and up to 1,207.0 bln. tenge in 2019, including the volume of manufacturing from 244.5 up to 412.6 bln. tenge in 2017, up to 459.0 bln. tenge in 2018 and up to 646.0 bln. tenge in 2019.

At the end of 2019, the index of actual volume of the manufacturing industry was 126.2%). The growth was mainly due to an increase in production in the machine-building industry (the share in the manufacturing industry - 37.5%), and metallurgy (the share in the manufacturing industry - 19.8%). The production of passenger cars increased by 2 times, trucks by 8.1 times, cars for transporting ten or more people by 5.3 times (SarkaAvtoProm LLP), harvesters - by 47.9% (Agromashholding KZ JSC), tractors - by 8.6 times (Agromashholding KZ JSC, Composite group LLP), unwrought and semi-

141 Hereinafter, the Program for the development of the territory of the Kostanay region for 2016 - 2020 and reports on its implementation for 2018 and 2019.

wrought gold or in the form of powder - by 9.7% (mainly due to Varvarinskoye JSC), hot-rolled rods and bars - by 65.0% (mainly due to EvrazCaspianStal LLP), non-alcoholic beverages - by 18.4% (mainly due to Firma Arasan LLP).

Agriculture is the second leading branch of material production in the region, the gross output of which, according to the Committee on Statistics, increased from 294.6 bln. tenge in 2015 up to 368.1 bln. tenge in 2017 and up to 397.8 bln. tenge in 2019, with the advantage of crop production (66.4%). In the nationwide gross grain harvest, Kostanay region takes 3rd place. On average, for the period from 2015 to 2017, the grain harvest amounted to more than 4.6 mln. tons per year. In 2017, grain was produced by 7% more than in 2015.

Grain production is a priority in the development of agriculture in the region; it accounts for 73.2% of the gross crop production. The sown area of grain crops in the region in 2017 amounted to 4,194.5 thousand hectares, in comparison with 2015 it increased by 191 thousand hectares. The entire sown area increased by 109 thousand hectares and amounted to 5,198.0 thousand hectares. In 2017, the area of wheat was 3,704.9 thousand hectares, the area under oilseeds was 351.3 thousand hectares. The wheat yield was 1.13 t / ha in 2017, and 1.25 t / ha in 2018.

In terms of the number of livestock and the production of basic livestock products, the region occupies one of the leading places among the regions of the country. The main producers of livestock products in the region are households - 68%, agricultural enterprises - 27.6%, peasant agricultures (farms) - 4.4%.

In the region, the area of pastures on agricultural land is 4,391 thousand hectares, watered 1,355 thousand hectares, or 31%. In 2014 - 2016 farms built and restored 101 units of mine wells and bores. In 2017, 31 wells (bores) were built against the plan of 30.

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture

In the Kostanay region there are 136.6 thousand hectares of irrigated land, including: estuary irrigation - 104.3 thousand hectares; regular irrigation - 32.3 thousand hectares. Of the lands assigned to agricultural producers, 4,442.2 hectares of arable land are irrigated, of which 3,738.1 hectares by sprinkling, 259.5 hectares by drip irrigation, 444.6 hectares along furrows. Sprinklers have traditionally been used directly for irrigating crops, but the most effective, economical way is the use of drip irrigation. The introduction of innovative moisture-saving technologies, an increase in herbicides and mineral fertilizers made it possible to grow and harvest 5,015 thousand tons of grain in 2018.

The area under grain fodder crops was increased, the area of which in 2017 amounted to 383 thousand hectares, which is more than the level of 2015 by 10.6 thousand hectares, under cereal crops the area was increased by 6 thousand hectares and amounted to 20.5 thousand hectares, under leguminous crops increased by 36.6 thousand hectares and amounted to 65.8 thousand hectares.

The area of agricultural land for the period of 2015 - 2017 increased by 240.2 thousand hectares and as of January 1, 2018 amounted to 10,671.4 thousand hectares, including arable land – 6,015.0 thousand hectares (99.8% to the level of 2015), hayfields - 113.6 thousand hectares (98.6% to the level of 2015), pastures – 4,238.8 thousand hectares (98.9% to the level of 2015).

In particular, in 2017 land plots with an area of 480.9 thousand hectares were returned to state ownership, including arable land - 48.4 thousand hectares, hayfields - 1.9 thousand hectares, pastures - 417.5 thousand hectares, due to the voluntary refusal of users.

Development of energy, including renewable energy and energy supply to the population

Power supply. Kostanay region is energy-deficient one. Electricity generation by power plants located in the region does not exceed 30% of the total consumption (total electricity consumption in the region in 2019 - 4.77 bln. kWh, in 2018 - 4.71 bln. kWh) and is 0.95 bln. kWh. Electricity deficit in the region is covered by external sources (Ekibastuzskaya GRES-1 LLP, Ekibastuzskaya GRES-2 LLP).

Electricity production in the region is carried out by: Rudnenskaya CHPP of SSGPO JSC with a capacity of 267 MW, Kostanay CHPP with a capacity of 12 MW, Arkalyk CHPP with a capacity of 4 MW. All generated electricity is used by energy sources for their own needs of enterprises.

The total length of electrical networks is 29.3 thousand km, including cable lines – 1,501.5 km. On the territory of the region there are 317 substations with a voltage of 35 kV and above and 4,140 substations, transformer substations, packaged transformer substations 6-10 / 0.4 kV.

The problem for the region's power engineers is the extremely high depreciation of power equipment, the depreciation of the operated electrical equipment is 73.4%.

In general, the density of networks in cities in the region is high. However, it should be noted the disproportions in the density of electricity and heating networks between urban and rural areas.

As of January 1, 2020, all settlements of the Kostanay region are connected to centralized power grids.

To increase the share of generation from 2018, the project "Construction of the Ybyrai wind farm with a capacity of 50 MW in the Kostanay district of the Kostanay region" is being implemented.

Also in the region, objects using renewable energy sources of low power are actively being introduced, so in 5 cities and 16 districts of the region there are more than 200 objects of small renewable energy sources (up to 10 kW).

Heat supply. In total, there are 3 CHPPs in Kostanay region, 6 units of boiler houses above 100 Gcal / hour, up to 100 Gcal / hour - 96 units. Depreciation of heat source equipment is 49% on average. District heating is used in the cities of Kostanay region. The level of provision with district heating services is 42%. The population using district heating as of January 1, 2018 is 362,553 thousand people.

The total length of heating networks is 810.2 km. The wear of the networks is 50%. For 2016 - 2018, 42.35 km of heating networks were modernized in the region as of January 1, 2019, in 2018 - 15.35 km, in 2017 - 12.2 km, in 2016 - 14.8 km.

In 2019, the total length of heating networks was 820.4 km, of which 95.5 km (11.6%) were dilapidated, 135.5 km (16.5%) needed to be replaced, 15.7 km were replaced.

Gas supply. As of January 1, 2020, 70 settlements of the region are provided with natural gas. Natural gas consumption in the region in 2019 amounted to 860.2 mln. m³ (for the same period in 2018 - 870.4 mln. m³). The total length of gas pipelines in the region is 3,602.17 km, including 819.69 km of main gas pipelines are in the republican ownership of the single gas operator of the region, KazTransGas Aimak JSC. The wear of the networks is 25%. The urban population using natural gas as of January 1, 2020 amounted to 417,000 people, the rural population - 70,185 people.

Energy saving. In the structure of electricity consumption in Kostanay region, 51% is accounted for by the industrial sector, including energy, 26% - by the transport sector, 14% - by the population, 6% - by agriculture, 3% - by other sectors of the economy. Ten large industrial enterprises of the region consume 42% of the energy resources consumed by the industrial sector. The residential sector consumes about 14% of electricity and 64% of heat supplied.

In order to implement the policy of energy saving, reduce energy consumption, energy intensity of production and introduce energy efficient technologies in construction, industry, as well as modernization of housing and communal services, the Regional Comprehensive Energy Saving Plan for the Kostanay region for 2015 - 2020 was approved and is being implemented.

One of the points of the Plan is the implementation of energy-saving measures in the public sector.

So, in 2019, repairs were carried out with elements of thermal modernization in 30 institutions. From 2015 to 2019, thermal modernization was carried out in 130 institutions (*2015 - 11 facilities, 2016 – 26 facilities, 2017 - 23 facilities, 2018 - 40 facilities*).

In addition, within the framework of the project "Improving Energy Efficiency in Kazakhstan" at the expense of grant funds provided by the International Bank for Reconstruction and Development for the period of 2018 - 2019 in the Kostanay region, 5 projects were implemented for a total of 184.1 mln. tenge: Tobolsk secondary school, Auliekol central district hospital, street lighting of the city of

Lisakovsk, nursery kindergarten No. 40 of Denisov district, children's village "Zhanuya", city of Kostanay.

Thermal modernization of institutions was carried out, namely the replacement of wooden windows, a pumping station, pipes, heating radiators, heat-reflecting screens, thermostats, automated heating points and others were installed.

Within the framework of the Regional Development Program for 2011-2019, 128 apartment buildings were repaired at the expense of budgetary and repayable funds for a total of 2 bln. tenge.

To control the heat consumption by the population, general building metering devices for heat energy are installed.

As of January 1, 2020, out of 3,448 apartment residential buildings in the region, general building heat energy meters were installed in 58% of houses (1,988), in the cities of the region in 80% of apartment residential buildings (1,945 out of 2,431 apartment residential buildings).

In 2018, 371 subjects were included in the state energy register in the Kostanay region. Of these, 209 are government agencies, 109 utilities, 46 limited liability partnerships and 7 joint stock companies.

Subjects of the quasi-public sector and private legal entities (162 units), with the exception of government agencies, are required to conduct an energy audit. Of these, 108 organizations, or 67% of the total number of entities, have conducted energy audits to date.

Out of 109 budget enterprises, 82 or 75% have conducted an energy audits. Out of 46 limited liability partnerships, 19 or 41% have conducted an energy audits. All 7 joint stock companies have conducted an energy audit.

For 2019, 1,268 entities are included in the SER register, of which 291 entities are required to conduct an energy audit, as of January 1, 2020, an energy audit was conducted by 142 entities (49%)

As of January 1, 2020, the total length of street and park lighting in the Kostanay region is 1,847, km, 35,397 light points, of which 27,737 are energy-saving.

In order to improve energy efficiency and reduce losses in residential buildings, houses are being modernized in accordance with the program "Modernization of housing and communal services for 2012-2020".

Condition of water supply and sewerage, provision of the population with centralized water supply and disposal

Water supply. In 2018, the provision of a centralized water supply system in urban settlements is 100%, in rural settlements is 97.6% (2017 - 97.6%) or 452.6 thousand people. The source of water supply in Kostanay is the Amangeldy reservoir and the Kostanay groundwater deposit, in Arkalyk town - Ashchy-Tasty reservoir, in Lisakovsk town - Verkhnetobolsk reservoir, in Zhitikara town - Zhelkuar reservoir, in Rudny town - Karatomar reservoir. The total length of water supply networks in the cities of the region is 1,585.1 km.

In 2018, 1 project was implemented under the program of Regional Development until 2020, Reconstruction of the water supply networks of the city of Lisakovsk (main networks), which has a population of 40.1 thousand people.

In 2018, out of 548 rural settlements of the region, 172 rural settlements have centralized water supply, or 31.4% (in 2017 - 30.8%). The population coverage is 59.4%. In 2018, for the first time, 3 villages were connected to the centralized water supply system (Arka village of Kamysty district, Agashtykol village of Amangeldy district, Sholaksay village of Naurzum district) with a population of more than 2.9 thousand people. To provide rural settlements with central water supply within the framework of the "Development of the regions until 2020" program, 10 projects have been implemented. 329.3 km of water supply and 8.7 km of water disposal networks were built and reconstructed.

In 2019, the total length of water supply networks was 4,082.3 km, of which 1,886 km need to be replaced. Of the total population of cities 480,238 people, 472,310 people are provided with central water supply, the actual achievement of the indicator was 98.3%.

In 2019, the actual access of rural settlements to centralized water supply was 33.6%. 27 villages with a population of up to 50 people were abolished. In total, 8 projects were implemented for

rural water supply in 2019 within the framework of the "Regional Development until 2020" program. For the first time, 4 villages in which 5,3 thousand people live were connected to the centralized water supply system (Zabelovka village of Zhitikara district, Zlatoust village of Sarykol district, Novoilinovka village of B. Mailin district and Vostochnoe village of Arkalyk city), and the quality of water supply services was improved in 6 villages, where 21.4 thousand people live.

Water disposal. Out of 183 settlements provided with water, 15 are provided with centralized water disposal), including: in cities - 100% (5 cities and 3 urban-type settlements), in rural areas - 4.0% (out of 175 villages provided with water, 7 villages are provided with centralized drainage). 511.9 thousand people or 59.3% of the region's residents have access to centralized sewerage systems, of which 465.8 thousand people or 97% are the city residents.

In 2018, the length of sewerage networks was 1,184.2 km, of which in urban areas – 1,033.2 km and in rural areas - 151.6 km (data of the Committee on Statistics). Depreciation of sewerage networks is 69.7%. In 2019, the length of the networks is 1,265.1 km, 332.6 km needs to be replaced.

In 2019, the coverage of the population with wastewater treatment was 58.8%, the indicator was fulfilled by 102.4%. A total of 8.7 km of water disposal networks were built and reconstructed.

State of the environment, reduction of air and water pollution

According to the air basin state, Kostanay region is the most prosperous. The quality of the atmospheric air over the past few years continues to remain relatively stable. The level of air pollution is assessed as low.

For 2017 - 2019, according to the stationary observation network, the level of atmospheric air pollution in the city of Kostanay was assessed as low - increased. APS is 2 - 5, SI = 3 - 4 (raised level) and HR = 0 - 6% (low level).

The level of air pollution in the city of Rudny was assessed as low. APS is 1 - 2 (low level). SI = 1 - 3.7 (high level) and HR = 0 - 1% (low level).

The level of air pollution in the village of Karabalyk was assessed as low.

Air pollution in the region is caused by emissions of pollutants from mining, heat and power industries, and automobile transport.

In 2017 - 2019, the total volume of emissions of pollutants into the atmosphere from stationary sources, according to the Committee on Statistics, has been constantly decreasing (2017 - 0.218 mln. tons per year, 2018 - 0.201 mln. tons, 2019 - 0.131 mln. tons).

The largest mining enterprise of the Kostanay region, SSGPO JSC, accounts for about 80% of the total industrial emissions of the region's enterprises. The favorable state of the atmospheric air is facilitated by the use of natural gas by large boiler houses of the Kostanay region. An exception is the Arkalyk CHPP, which uses fuel oil.

Akimat of Kostanay region signed a cooperation agreement with KazTransGazOnimderi LLP aimed at improving the environmental situation in Kostanay region by introducing natural gas instead of traditional types of fuel for vehicles (gasoline and diesel fuel). In the large cities of the Kostanay region (Kostanay and Rudny cities), most (90%) public transport uses diesel fuel and gasoline. There are four gas stations in Rudny and twelve in Kostanay (LPG).

Water bodies of Kostanay region are classified as Tobol-Turgay water basin. Within the region there are more than 300 rivers with a length of over 10 km. The largest rivers are the Tobol (682 km within the region) with tributaries and the Torgai (390 km). All rivers have a predominant snow supply. Within the basin, there are more than 8,000 lakes with an area from 0.01 km² to 100 km², the total area of which is 5,068 km², and reach lakes 877 with a total area of 15.81 km².

Observations of surface water pollution in the Kostanay region were carried out at 9 water bodies: the rivers Tobyl, Ayet, Togyzak, Uy, Zhelkuar, Obagan, reservoirs Amankeldy, Karatamar, Zhogargy Tobyl.

In the region there are four authorized discharge of conditionally clean waters into the Tobol River (2 units), Kushmurun Lake, Karakol-Koyandykopa lake system. Despite the absence of direct discharge of wastewater from industrial enterprises of the region, pollution of water bodies is observed both with heavy metals and organic pollutants.

In 2015, the limit on discharges into water bodies was 0.795 mln. tons, in 2016 - 0.399 mln. tons, in 2017 - 0.401 mln. tons. All outlets of the region to surface water bodies are under control. According to the monitoring results, discharges from industrial enterprises into water bodies are normatively clean, in the total mass they do not exceed the maximum permissible discharges and do not have a negative effect on the qualitative composition of water bodies.

Domestic waste water from cities in the amount of 30 mln. m³ is pre-treated at local treatment facilities. Treated effluents enter isolated storage tanks - evaporators, filtration fields.

One of the most significant environmental problems in the region is the absence of a biological treatment plant in the regional center. The currently applied technology of wastewater treatment in Kostanay is primitive and allows to purify partially only by mechanical impurities in earthen sedimentation tanks, operated since 1966. The volume of practically untreated wastewater discharge in Kostanay is about 13 mln. m³ per year.

Production and consumption waste management and waste processing

The total volume of accumulated **waste** in the Kostanay region as of January 1, 2018 amounted to 12.4 bln. tons, the bulk of waste (99%) falls on the industrial waste of mining enterprises: overburden (92%) and washery refuse (8%).

The predominant influence on the state of land resources in Kostanay region is exerted by enterprises of the mining industry, agriculture, and heat power engineering.

Technogenically disturbed and contaminated lands are common in industrial zones of cities, places of extraction and processing of minerals. When open pit mining in large areas, land is alienated for non-agricultural purposes: for quarries, dumps, tailings, mining and domestic water storage.

All mining enterprises have a waste management system that includes all stages of the waste technological cycle, such as prevention and minimization of waste generation, accounting and control, accumulation, as well as collection, processing, disposal, transportation, storage and removal of production waste.

Over the past three years, according to the Department of Ecology of Kostanay region RSE, the percentage of waste utilization exceeded 20% compared to previous years (it was 18% and less).

As of January 1, 2018, in the settlements of the Kostanay region, there are 310 landfills for solid household waste (SHW), all are assigned to specific individuals and legal entities who have issued the land use right.

In 2017, 350 thousand tons of solid household waste was generated, most of which was disposed of at landfills and rural dumps, and only about 2% was utilized and sent for further processing. The total volume of waste disposed at landfills in 2017 amounted to 300 thousand tons. The volume of recycled waste in 2017 compared to previous years increased and amounted to 1.8% (2016 - 0.1%).

In 2018, 250 thousand tons of solid household waste was generated, of which 9.65% was processed. Out of the 313 solid household waste disposal sites, 147 meet environmental and sanitary requirements and standards, which is 46.96%. Coverage of the region's population with waste collection and transportation services is 76.1%. The share of medical waste processing by an alternative incineration method is 26.75%, while the plan is 25%

In 2019, 259,587 tons of waste were generated in the region, the volume of utilized and recycled waste amounted to 26,254 tons (the share of recycling was 10.1%, with the plan being 10%). 111 out of 266 solid household waste landfills and rural dumpsites, or 41.7%, against the plan of 40%, were brought into line. The owners carried out the following activities: embankment and edging of landfills, arrangement of a concrete bath, installation of a barrier and mesh fencing around the perimeter of solid household waste landfills and rural dumps. Akimats of cities and districts, owners of solid household waste landfills during the year carried out measures to issue permits for emissions into the environment. As a result, 191 out of 266 solid household waste landfills and rural dumps were issued permits for emissions into the environment. Work was carried out to optimize 40 rural landfills (Kamysty district - 12, Kostanay district - 11, Denisov district - 7, Uzunkol district-7, Zhitikara district - 3).

In order to identify the accumulation of spontaneous dumps, the territory of settlements within a radius of 50 km from the regional center is monitored on an ongoing basis. The work is carried out on the basis of space imagery through the geoportal of NC Kazakhstan Garysh Sapary JSC. According to the monitoring results, the total number of liquidated natural landfills at the end of 2019 was 155.

In 2018, a number of companies in the field of solid household waste management organized a Consortium with the establishment of the enterprise ECO CITY KZ LLP. As a result, due to private investments of this enterprise, in December 2018, in the village of Zatobolsk, Kostanay region, a project was launched to build a waste sorting complex with a capacity of 40 thousand tons per year. Akimat of the district provided a land plot to the ECO CITY KZ LLP, the issues of connecting the necessary infrastructure are being resolved. Stage I launched conveyor control waste sorting, Stage II plans to introduce a line for sanitizing secondary resources (secondary polymers, PET, waste paper, textiles, scrap metal, glass) and Stage III - a polymer granulation line. The period of the project is 2018-2020. The project cost is 300 mln. tenge.

In 2019, in 9 settlements of the region (Kostanay city, Rudny city, Zhitikara city, Arkalyk city, Tobol city, Zarechnoye district, Michurinsky district, Denisovsky district, Uzunkol district), a system of separate collection of solid household waste is operating. The total number of installed specialized containers is 1,800 units (including 284 units installed in 2019), in 14 settlements solid household waste is sorted (1 waste sorting complex, 3 waste sorting lines, manual waste sorting). In 15 regions of the region, separate collection of waste mercury-containing lamps and chemical power sources from the population (145 special containers) is carried out.

In 26 settlements of the region, at specialized sites and landfills, solid household waste is sorted by mechanized and manual methods. So, in Kostanay and Tobyl cities there are 1 complex and 3 waste sorting lines (waste sorting complex of EcoCityKZ LLP (capacity 40 thousand tons per year), of Tazalyk 2012 LLP (capacity 100 thousand tons per year) and waste sorting lines of Atameken 4 plus LLP (capacity 70 thousand m³ per year), of Ecoprom LLP (capacity up to 80 thousand tons per year). Manual waste sorting is carried out at solid waste landfills in the cities of Rudny, Lisakovsk, Zhitikara, Arkalyk as well as in Auliekol, Amangeldy, Karasu, Kostanay, Mendykara, Sarykol, Fedorovsky districts, and in the district named after B. Mailin.

There are also 6 enterprises operating on the territory of the region (SMF system Nonwovens Factory LLP, Cardboard and Paper Mill 2015 LLP, Tazalyk 2012 LLP, Dastan IE and Agrotechmash LLP, Edil and Company LLP) that carry out recycling activities and produce more than 10 types of finished products (geogrid, geotextile, geocomposite, geoframes, polyethylene gas and water pipes, paving stones, manholes, rubber crumb, cable pipe, egg trays, cinder blocks).

The state of biological resources and the development of forestry, fishing and hunting industries, specially protected natural areas and ecological tourism

Forest plantations play an important role in environmental protection. As of January 1, 2018, the total area of the state forest fund of the Kostanay region is 1,144.222 thousand hectares, including 240.0 thousand hectares covered by forest (as of January 1, 2017 - 238.2 thousand hectares, as of January 1, 2016 - 236.4 thousand hectares). In 2018, the area of forest land on the territory of the state forest fund, which is under the jurisdiction of local executive bodies, amounted to 230.8 thousand hectares, while the plan was 225.90 thousand hectares.

In order to secure and protect forests, forestry institutions annually carry out preventive fire-fighting measures, including the installation of fire barrier line along the borders of forest plantations in the amount of 810 km, as well as the maintenance of the existing fire barrier line in the amount of 51,588 km.

In 2018, 785 km of fire barrier line were arranged along the boundaries of forest plantations, and the existing barrier lines in the amount of 54,699 km were cared for. On the plots of the state forest fund, forests were planted with seedlings and propagulum of the main forest-forming species (pine and birch) on a total area of 1,460 hectares.

Aerial surveillance of forests by helicopter is carried out annually on the total area of forest fund of 217.7 thousand hectares. A ground-based network of fire lookout towers (FLT) has been set up in the forest fund areas. There are 22 FLT operating in forestry institutions, which play an important role

in forest fire detection. To increase the number of water supply sources in recent years, 33 new pits and 5 wells have been built in the state forest fund. In the forest fund and adjacent territories, 294 reservoirs are used for fire-fighting purposes. In places where there are no natural reservoirs, on the lands of the state forest fund, 30 water tanks have been installed in order to quickly refuel fire-fighting equipment. As of July 1, 2018, 28 cases of forest fires occurred in the forest area of 649.2 hectares in the subordinate state forest fund (in 2015 - 40 cases in the forest area of 1,593.81 hectares, in 2016 - 25 cases in the forest area of 104.567 hectares, in 2017 - 13 cases in the forest area of 196.904 ha). The average area of one forest fire on the territory of the state forest fund, which is under the jurisdiction of local executive bodies, amounted to 0.0134 thousand hectares, while the plan was 0.009 thousand hectares.

On the territory of the Kostanay region there are 16 **specially protected natural areas** with a total area of 2,826,558.6 hectares, including: Naurzum State Nature Reserve, Altyn Dala State Natural Reserve, 3 state natural (zoological) refuges: Tounsor, Zharsor-Urkash and Mikhailovsky, Yrgyz-Torgai-Zhylanshyk ecological corridor, as well as 10 natural monuments of local importance.

The total area of wetlands is 864.1 thousand hectares, of which water - 506.8 thousand hectares. The overwhelming majority of the lakes are prone to winter suffocation phenomena. The fauna is represented by 430 species, including: mammals - 65, birds - 336, amphibians - 3, reptiles - 3 and fish - 23 species.

The wildlife users are assigned 99 hunting grounds with a total area of 16,178 thousand hectares in 2017, the reserve fund of the region is 1,085 thousand hectares. 177 water bodies with a total area of about 72 thousand hectares are assigned to water users.

2.10. Kyzylorda region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

Territory of the region - 226 thousand sq. km. According to the Committee on Statistics, the population of the region as of January 1, 2018 was 783.1 thousand people, as of January 1, 2019 - 794.3 thousand people, and as of January 1, 2020 - 803.5 thousand people.

The gross regional product for 2017 in the region amounted to 1,431.0 bln. tenge, per capita - 1,839.0 thousand tenge. The volume of the region's GRP produced in 2018 amounted to 1,647.0 bln. tenge (per capita - 2,088.1 thousand tenge), in 2019 - 1,828.9 bln. tenge (2,289.1 thousand tenge). Growth by ensuring growth in all basic sectors of the economy, except manufacturing, real estate transactions, professional, scientific and technical activities, public administration and defense; compulsory social security, provision of other types of services¹⁴².

The volume of **industrial production** in the region in 2017 amounted to 731.4 bln. tenge, in 2018 - 941.4 bln. tenge, and in 2019 - 852.1 bln. tenge. In 2018, oil production decreased by 420.9 thousand tons compared to 2017. This is due to a decrease in oil production due to the water cut of individual oil wells. **Manufacturing** volumes amounted to 110.5 bln. tenge in 2017, 119.4 bln. tenge in 2018 and 145.7 bln. tenge in 2019.

Within the framework of the second five-year plan of the industrialization program, 25 (7 were implemented in 2015-2018) projects worth 512 bln. tenge are being implemented in the region with the creation of 5.4 thousand jobs. Including in 2018, 2 production facilities were commissioned in the construction industry:

- lime plant with a capacity of 75 thousand tons per year in Zhanakorgan district, whose products are already in demand not only in the region, but also abroad;
- within the framework of the National Teleconference with the participation of the Head of State, the first plant in the region for the production of oil well cement in the Shieli district was launched ahead of schedule.

The main priority in the **agro-industrial complex** is to increase the processing and export of agricultural products, to increase the share of highly profitable, low moisture-consuming crops. So, at

142 Hereinafter, the Program for the Development of the Kyzylorda Region Territory for 2016 - 2020 and reports on its implementation for 2018 and 2019.

the end of 2019, labor productivity in agriculture amounted to 3,185.8 thousand tenge (39.0% more than the same period in 2018).

According to the Committee on Statistics, in 2017 agricultural products (services) were produced for 88.7 bln. tenge, in 2018 - 103.9 bln. tenge, and in 2019 - 128.6 bln. tenge, with the advantage of crop production (62.6%).

In 2018, 184.5 thousand hectares of agricultural crops were sown in the region. Including grain crops 94.8 thousand hectares, oilseeds 10.3 thousand hectares, fodder crops 61.5 thousand hectares, potatoes, vegetables and melons 17.4 thousand hectares. The area of the main rice crop was 86.8 thousand hectares. From the sown winter wheat, the harvest was 7,483 tons, spring wheat 2,695 tons, barley 368 tons, corn for grain 3,849 tons, millet 1,766 tons. The gross harvest of grain crops amounted to 489,583 tons.

In 2019, 183.1 thousand hectares were sown (including 87.9 thousand hectares of rice, 9.6 thousand hectares of grain crops except rice, 7.9 thousand hectares of oilseeds, 60.2 thousand hectares of forage crops, 17.4 thousand hectares of potatoes, vegetables, melons). The sown area of agricultural crops compared to 2018 increased by 5.8 thousand hectares.

In the plant growing industry, 4 rice processing plants have been implemented: in particular, in Shieli (Bagban Ashirov PA), Zhanakorgan (Nurbol I PA), Karmakshy (Zhanazhol LLP) and Zhalagash districts (Tan LTD LLP). In addition in the Zhalagash district, a project was implemented to demonstrate oasis irrigation (Manakh Baba PA). In addition, in December 2019, the regional center opened an automated greenhouse complex on an area of 2.2 hectares (KazAgroMir LLP).

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture

In general, according to the results of 2012 - 2019, 603.8 thousand hectares of land plots were put into farming business through tenders and through state programs. Of these, in 2019 - 57.1 thousand hectares of land.

In the region (land balance as of 01.11.2018), 249.8 thousand hectares of irrigated land were registered (including 178.6 thousand hectares of utilities). Of these, the area of clean irrigated lands in the region is 236.9 thousand hectares, of which in the category of agriculture - 214.7 thousand hectares, reserve lands - 20.1 thousand hectares, forest fund - 2.1 thousand hectares.

As part of the restoration of irrigated land in the region in 2017-2019, work was carried out to implement 3 projects to restore 158 thousand hectares of irrigated and put into farming business 29 thousand hectares of unused land with a total value of 161.0 bln. tenge. Including:

- 15 thousand hectares under the PUID-2 project (9.3 bln. tenge);
- 143 thousand hectares under the PUID-3 project (138.3 bln. tenge);
- to include in the farming business 29 thousand hectares of irrigated land (13.4 bln. tenge).

State expertise has been obtained for the design estimates for the PUID-2 project. The total cost of the project is 9.3 bln. tenge. In 2019, relevant work was carried out to finance the project from the republican budget (World Bank - 30%, RB - 70%).

In 2018, 410 mln. tenge were allocated from the regional budget for the certification of water facilities included in the PUID-3 project, work on the preparation of land acts was completed. To complete the work on certification in 2019, 362.3 mln. tenge were allocated. Works on certification of water facilities included in the project to put into farming business of 29 thousand hectares (Asian Development Bank) have been completed by 98 percent (28.4 hectares), transferred to the republican property.

To provide the settlements with irrigation water, work is being carried out in stages to clean up and repair water facilities. In 2018, works on cleaning 6 canals were completed and 3 pumps were purchased. In 2018, compared to 2017, 0.8 bln. cubic meters of water was saved during irrigation.

In the Kyzylorda region, vegetables are produced in greenhouses using drip irrigation methods. In particular, in the region there are only 90 greenhouses (with an area of 6.7004 hectares), in the middle of December this year it is planned to put into operation an automated greenhouse complex of KazAgroMir LLP, with an area of 2.2 hectares.

In the Kyzylorda region, the area of pastures on agricultural land is 1713.8 thousand hectares, watered 1,468 thousand hectares, or 86%. To ensure sustainable development of animal husbandry in the region, appropriate work is being carried out to develop distant pastures. Over the past 6 years, 366 wells and bores have been equipped on distant pasture lands, 253 agricultural enterprises have purchased solar panels, and conditions for grazing have been created for 74 thousand farm animals.

At the beginning of 2020, the total area of regularly irrigated land is 194.1 thousand hectares, of which 154.3 thousand hectares of irrigated land are used. Within the framework of the State program of the agro-industrial complex 2017-2021. rehabilitation of irrigation systems and structures is envisaged on an area of 28,974 hectares of irrigated land.

Kazvodkhoz RSE of the Committee for Water Resources of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan plans to implement with the attraction of borrowed funds from the Asian Development Bank for the restoration of irrigated lands. Under the ADB loan, the planned rehabilitation facilities are located in 8 eight districts, including Zhanakorgan 441 hectares, Shieli 1,772 hectares, Syrdarya 7,406 hectares, Zhalagash 4,221 hectares, Karmakshy 4,712 hectares, Kazaly 4,720, Aral 2,645 and Kyzylorda city 3,056 hectares for an approximate amount of 11.66 bln. tenge. The project provides for the provision of irrigated areas with external infrastructure facilities, construction of a well, distribution pipelines and electrical networks. Including:

- irrigation canals - 252 canals with a length of 1,117 km.
- structures on canals – 1,460 pcs.
- collector and drainage network (CDN) - 357.7 km.
- vertical drainage wells - 27 pcs.

In 2019, the volume of rice sown in the region on 87,933 hectares of land are seeds of 100% high reproduction, where the share of domestic varieties of seeds was 8%.

In 2019, for the purpose of varietal renewal and varietal exchange, 380 tons of elite seeds of Yantar, Leader rice varieties were imported from Krasnodar, which were distributed among the farms of Tan LTD, Tonkeris and on more than 1,500 hectares of land.

In order to obtain a high-quality crop from sowing, 55.8 thousand tons of mineral fertilizers and 63.6 thousand liters of herbicides were applied. In general, over the past 5 years, 1,049 units of new agricultural equipment were purchased for the amount of 25.5 bln. tenge (including 649 units for the amount of 22.2 bln. tenge through KazAgroFinance JSC and 400 units for the amount of 3,3 bln. tenge), the machine and tractor fleet was renewed by 23.7%.

As a result, the rice growers of the region have achieved a record harvest over the past 6 years. In particular, 60.3 centners of rice were harvested from each hectare of the main crop (in 2018 - 54.5 centners / ha), a total of 530.5 thousand tons of rice were harvested.

In 2019, for the first time in the region, rational soybean crops were sown on 50 hectares in 3 farms, the result justified expectations. In the coming years, it is planned to increase soybean crops to 500 hectares.

Over the past 3 years, two feedlots for 3,000 heads and two for 1,500 heads have been put into operation. Currently, work is underway to fatten bulls in order to provide meat products on the domestic and foreign markets.

In accordance with the Program for the development of beef cattle breeding for 2018-2027, breeding work was carried out in the region on breed transformation, where 56.1 thousand heads of broodstock took part out of 163.9 thousand heads of broodstock.

In 2018 - 2019, within the framework of financing, 15 breeding farms for meat and dairy production with a total number of 2,249 heads were created. In order to increase the productivity of the region's meat products, 5,244 head of bulls from the broodstock of cattle that participated in the breed transformation were sold to feedlots.

In order to digitize the agro-industrial complex in the region, work was carried out to introduce elements of "precision farming" in the farming industry and to create "smart farms" in the livestock industry. According to the plan for the development of electronic maps of pasture, hayfields and perennial plantations in 2019, a total of 1.9 mln. US dollars, of which: pastures 1,924 thousand hectares, hayfield 37.0 thousand hectares, perennial plantations 0.6 thousand hectares).

In accordance with the assignment, all districts compile an electronic map (1,425.4 thousand hectares of pasture 74.1%, 15.3 thousand hectares of hayfields 42.2%, perennial plantations 24.6%) and carry out explanatory work among agricultural producers.

Development of energy, including renewable energy and energy supply to the population

The total length of the region's power supply systems is more than 10 thousand km of power transmission lines and 1,837 substations of various voltages, the degree of wear is 69%.

Over the past five years, the "Aral", "Zhanakazaly" substations with a capacity of 110/35/10 kV in the Aral and Kazaly regions, the "Tasboget", "Arai", "Center", "Shymbay", "Zhanaaryk", "Kazandyk" substations with a capacity of 35/10 kV in the city of Kyzylorda have been reconstructed. In addition, the operational control point and transformer units at the 35/10 kV Terenozek substation in the Syrdarya region were modernized.

In 2018, construction and installation work was continued on the power supply of the left bank of the Syrdarya River in the city of Kyzylorda (stage 1), for which 650 mln. tenge were allocated from the regional budget.

Completed construction work on the reconstruction of power supply systems in Akzharma settlement of the Syrdarya region, for which 186.3 mln. tenge were allocated and spent from the regional budget. The object was accepted for operation.

A positive conclusion was received from a non-departmental examination of design and estimate documentation for the projects "Expansion and reconstruction of 6-10/0.4 kV electrical networks in the village of Toretam and the Akai aul district", "Reconstruction of PS-220/35/10 kV "Zhosaly" in the Zhosaly village of the Kyzylorda region", "Expansion and reconstruction of the PS 35/10 kV No. 22 of the Toretam village of Karmakshy district".

Completed the development of design estimates for the projects "Reconstruction of substation PS 35/ 10kV "GMZ" in the city of Kyzylorda", "Reconstruction of substation PS 35/10kV "Silikatnaya" in the city of Kyzylorda", "Reconstruction of the substation PS 35/10kV "Komsomol" in the city Kyzylorda", "Reconstruction of substation PS 35/10 kV "Zalineinaya" in the city of Kyzylorda", "Reconstruction of substation PS 35/10 kV "Promyshlennaya" in the city of Kyzylorda".

Within the framework of cooperation with the European Bank for Reconstruction and Development, a project with a total cost of 5.2 bln. tenge is being implemented to modernize electrical networks in the city of Kyzylorda and Shieli district. In accordance with the project, 70 substations and more than 300 km of electrical lines will be reconstructed. To date, 80% of the planned work has been completed. As a result, consumers of the outskirts of the city of Kyzylorda and Kent Shieli will be supplied with uninterrupted and high-quality power supply.

In the region, work continues on the construction of **renewable energy** sources.

In 2019, two solar power plants with a total capacity of 78 MW, built at the expense of investors, were commissioned in the Zhalagash and Shieli districts of the region.

Investor Hydroenergy Company JSC intends to build a solar power plant with a capacity of 10 MW in the Zhanakorgan district worth 3.2 bln. tenge by the end of 2020.

The implementation of the above works will make it possible to become non-volatile from external sources, as well as to achieve the goals set out in the concept of "transition to a green economy".

The indicator "the share of generated electricity by renewable energy sources in the total volume of electricity generated in the region" planned for 2018 has actually been achieved and amounted to 0.07%.

Heat supply. In 2017 - 2019, within the framework of the Nurly Zhol state program, 2.2 bln. tenge was allocated from the National Fund for the reconstruction of heat supply systems in the city of Kyzylorda, 7,046 meters of heat supply systems were reconstructed. Construction and installation work on the reconstruction of the Belkol boiler house of the KTEO SE in Kyzylorda was completed, the facilities were put into operation. As a result, 1,335 residents and 3 social facilities are provided with uninterrupted and high-quality heat supply.

In 2019, within the framework of a public-private partnership, boiler houses of 4 social facilities of the Aral and 9 facilities of the Shieli districts were switched over to gas heating; today, maintenance

work is underway. As a result, when 13 social facilities are switched over to gas heating, the amount of funds allocated for fuel will decrease by 3-4 times.

In 2019, the total length of heating networks in the region was 204.5 km, of which dilapidated - 39.2 km (16.1%), 38.5 km (15.8%) need to be replaced, 6.8 km were replaced.

Gas supply to the district centers and settlements of the Kyzylorda region is carried out through specially provided branches of the Beineu-Bozoi-Shymkent gas pipeline.

In 2015, at the expense of the republican and regional budgets, the villages of Tasboget and Kyzylzharma of Kyzylorda were fully gasified, as well as 4 regional centers (Aral, Aiteke bi, Shieli, Zhanakorgan) and the city of Baikonur were gasified under the investment program of KazTransGas Aimak JSC.

In these settlements, there are 25,803 residential buildings, of which more than 21 thousand today use blue fuel. In 2018-2019, on the basis of a public-private partnership, boilers were replaced with gas at 13 additional social facilities. As a result, budget expenditures for heating of social facilities will be reduced by 4 - 5 times.

In 2017-2019, to supply gas to 3 regional centers (Zhosaly, Zhalagash, Terenozek) in the villages of Zhosaly and Terenozek, gas pipelines were laid from the Beineu-Shymkent gas pipeline, an automated gas distribution station was installed. The project cost is 3.6 bln. tenge.

In addition, in 2018-2019, projects for gasification of the villages of Nauryz and Makhambet of the city of Kyzylorda, the city of Kazaly of the Kazaly district, the village of Zhalagash of the Zhalagash district were developed.

In 2019, intra-block gasification projects were launched in the remaining 3 regional centers of the region (Zhosaly, Zhalagash, Terenozek). For these purposes, 3.2 bln. tenge was allocated from the republican and regional budgets. Transitional projects until 2020.

At the end of 2019, the level of gasification of the population was 63%.

In 2018, the reconstruction and re-equipment of boiler houses for gas fuel was completed in 5 facilities: 2 healthcare facilities in the Shieli village, 1 facility of the Zhanakorgan central regional hospital, a branch of the Regional Medical Center of the city of Baikonur and secondary school No. 83 of the Aral district, and at the facility of the Kazaly maternity hospital, the acceptance of the facility was carried out in 2020.

In the Kyzylorda region in 2016, the Comprehensive Plan for **Energy Saving** for 2016 - 2020 was approved.

Currently, in the region 30% of streets with street lighting have been replaced with LED bulbs, which will save 12% of electricity.

Condition of water supply and sewerage, provision of the population with centralized water supply and disposal.

Currently, there are 233 settlements in the Kyzylorda region, of which 3 are urban (Kyzylorda, Aral, Kazaly) and 230 are rural (RA). The total population is 809.2 thousand people (including Baikonur – 39,498 people).

322 thousand people live in 3 urban settlements, including Kyzylorda (282.8 thousand people), Aral (33.7 thousand people), Kazaly (5.5 thousand people). The share of connection to centralized water supply is 315.6 thousand people or 98%.

Drinking water supply in 96 settlements of the region with a population of 234.8 thousand people is carried out by three group water supply systems: Aral-Sarybulak, Oktyabrsky and Zhideli:

- 42 settlements in the Aral district;
- 22 settlements in Kazaly district;
- 5 settlements in Karmakshy district;
- 19 settlements in Shieli district;
- 8 settlements in Zhanakorgan district.

Out of 230 rural settlements (*population 447.8 thousand people*):

- 193 or 84%, 435.7 thousand people or 97.1% of the population are connected to the centralized water supply system;
- 37 or 16%, 12.1 thousand people or 2.9% of the population are decentralized.

Share of connection to centralized sewerage:

152,726 people or 54% in the city of Kyzylorda;
in rural areas - 3 regional centers (Terenozek, Shieli, Aiteke bi), 0.4% of the population (including 1,644 people).

Within the framework of the programs "Regional Development until 2020", "Nurly Zhol", 10,750.8 mln. tenge was allocated from the regional budget for drinking water supply in 2018-2019 for 34 projects. As a result, 620.3 km of water supply and 19.1 km of sewerage were modernized. Including:

- in 2018, 3,456.5 mln. tenge was allocated for 21 projects (Kyzylorda - 17 projects, Kazaly district - 1, Zhalagash district - 2, Syrdarya district - 1), 99.9 km of drinking water supply networks and 16.6 km of sewage systems were modernized;

- in 2019, 7,294.3 mln. tenge were allocated for 13 projects (Kyzylorda - Birkazan, Dosan, Karaultobe, Nauryz, Sabalak, etc., Korkyt Ata, Yessenov Streets, Aral district - Saksaul, Kazaly district - Tuktibaev, Zhalagash district - Zhanadarya, Akkyr, Makpalkol, Zhanakorgan - 1) 520.4 km of drinking water supply networks and 2.5 km of sewage networks were modernized.

State of the environment, reduction of air and water pollution

For 2017 - 2019, according to the stationary observation network, the level of atmospheric air pollution in the city of Kyzylorda was assessed as low-increased. APS is 3 - 4 (low and high level), SI = 2 - 4.9 (high level) and HR = 0 - 1% (high level). The level of air pollution in **Akai city** was assessed as low. APS is 2-4, SI = 1-2, HR = 0-1%. The atmospheric air of the **Toretam village** is characterized by a low level of pollution. APS is 1. SI equal to 1 and HR = 0%.

As of the beginning of 2020, there are 129 enterprises of the 1st category in the Kyzylorda region, of which 80% of pollutant emissions are from the oil and gas sector, 15% - from the heat and power sector, 5% other enterprises. Regulatory and actual emissions are presented in Table 2.10.1

Table 2.10.1. Dynamics of permitted and actual emissions

Types of emissions	2017		2018		2019	
	limit	actual	limit	actual	limit	actual (Q2)
Emissions, thousand tons	68.781	28.359	70.054	26	68.245	13
Discharges, thousand tons	62 thou.tons	8.126	87.36	9.04	87.8	4.946
Waste, thousand tons	575.031	141.663	1,467.292	481.092	1,303.5	118.754

In order to **reduce emissions** of sulfur and nitrogen oxides into the environment, 663 units or 40% of 1,645 units of public transport operating in the Kyzylorda region were switched over to gas fuels. The number of gas filling stations in the region has reached 99. The number of cars using liquefied gas in the region is 2,725 units in 2015, 10,222 units in 2017, and 13,172 units in 2018.

Observations of **surface water pollution** in the territory of the Kyzylorda region were carried out at 2 water bodies in the Syrdarya river and the Aral Sea.

In 2017, the water quality of the Syrdarya River and the Aral Sea is assessed as "moderate level of pollution". Compared to 2016, the water quality of the Syrdarya River and the Aral Sea has improved¹⁴³.

In 2018, the water quality of the Syrdarya River and the Aral Sea in the Kyzylorda region is assessed as "moderate level of pollution". Compared to 2017, the water quality of the Syrdarya River and the Aral Sea has not changed significantly¹⁴⁴.

According to the Unified Classification, the water quality of the Syrdarya River and the Aral Sea in the territory of the Kyzylorda region for 2019 belongs to the 4th class¹⁴⁵.

143 Information bulletin on the state of the environment in the Republic of Kazakhstan for 2017.

144 Information bulletin on the state of the environment in the Republic of Kazakhstan for 2018.

145 Information bulletin on the state of the environment in the Republic of Kazakhstan for 2019.

Production and consumption waste management and waste processing

In 2017, the volume of generated solid household waste amounted to 148,000 tons, of which 5,200 tons were processed, the share of processing was 3.5%.

In 2018, 147,000 tons of solid household waste were generated, of which 4,700 tons were processed, the share of processing was 3.9%. In 2018, 60.87% of the population was covered by services for the collection and removal of solid household waste.

In 2019, 122,000 tons of solid household waste were generated, of which 17,000 tons were processed, the share of recycling is 14%. About 120-140 thousand tons of solid household waste is generated annually.

Today, there are 145 landfills in the region, of which 5 or 3.45% are brought in compliance with environmental requirements.

Separate collection by region is not implemented enough. To collect mercury-containing lamps from the population in the region, 874 containers were installed, purchased under the UNDP project in 2015 (24 units) and within the framework of the EPR in 2017 (850 units). Of these, 155 are installed in the city of Kyzylorda, and 720 in the regional centers.

In 2019, 222 illegal dumps were identified within a radius of 50 km around the city of Kyzylorda, of which 220 illegal dumps were cleared by local executive bodies.

There are the following individual entrepreneurs engaged in sorting and disposal of waste in the region:

- Ibraikhan and K LTD LLP in Kyzylorda carries out sorting of solid household waste with the extraction of glass, tires, plastic, fabrics, construction waste, recycles polymer waste with the production of paving slabs, tiles. The rest of the waste is taken to the landfill for disposal;
- Smart Rubber LLP manufactures drip irrigation hoses from worn-out car tires;
- Kyzylorda Paper, DaZhaEr LLP, August IE sort and collect waste paper, cardboard, paper, plastic, plastic waste. Eco-boxes are installed in institutions to collect waste paper and plastic waste;
- Eco-N Service LLP carries out utilization of used mercury-containing lamps.

In 2019, in order to increase the share of waste recycling within the framework of a public private partnership (PPP), a project is being implemented to build a complex for sorting 60.0 thousand tons of waste per year. 50% of the landfill construction will be carried out by a private investor at their own expense. The total cost of the project is 1.3 bln. tenge. The sorting complex will be located 3.7 km from the Belkul village.

According to the results of the above works, "The share of utilization of solid household waste to their generation" will be increased several times.

The state of biological resources and the development of forestry, fishing and hunting industries, specially protected natural areas and ecological tourism

Forestry. In 2017 and 2018, the total area of the state forest fund in the region was 6.5 mln. hectares, including 3.03 mln. hectares of forest-covered areas.

The total number of employees in the State Forestry Department in the region is 545 people. Forestry institutions carry out a number of works for the protection, security and reproduction of forests. Today, there are 8 state institutions of the forest and animal world under the Kyzylorda regional management of natural resources and environmental management. For 2017, in the state forest fund on an area of 10,709 hectares was planned planting, and was fully completed. For 2018, planting is planned in the state forest fund on an area of 10,334 hectares, and is fully completed. Of these, 5,000 hectares are located on the drained bottom of the Aral Sea.

In order to reproduce the forest, temporary nurseries on 17.8 hectares are organized for growing tree seedlings. In order to prevent and extinguish fires, forestry institutions have 13 units of fire fighting vehicles and 54 firefighters work.

In the fire hazardous season of 2018, in order to prevent and extinguish fires, new fire barrier line were made on 438 kilometers, and fire barrier line were renewed on 3,193 kilometers. Forestry institutions carried out 231 raids on the sites of the state forest fund, revealed 6 cases of illegal felling of forest trees, and took appropriate measures. Since the beginning of the year, a total of 256 tickets have been issued for the provision of public services, of which: forest usage permit - 243 pieces,

felling ticket - 13 pieces. For the provision of public services for the issuance of felling and forest usage permits, no complaints and statements with violations of the terms have been registered. At the same time, saxaul saplings were planted on the area of 5,000 hectares on the drained bottom of the Aral Sea, led by representatives from South Korea. Activities to promote natural regeneration of forests are being carried out everywhere.

During the 2019 fire season, 4 cases of forest fires were registered on an area of 2.86 hectares, of which non-forest lands were 2.86 hectares.

In 2019, 6 facts of illegal felling of timber with a total volume of 9.72 m³ with an amount of damage of 173.6 thousand tenge were revealed on the territory of the state forest fund. On all the facts, the materials were transferred to law enforcement agencies, 6 criminal cases were initiated on them.

Fish industry. In 2017, all 18 sites of the Small Aral Sea, as well as 142 out of 203 water bodies of local importance, were assigned for long-term use to nature users on a competitive basis. Of the remaining fishery reservoirs of local importance, 61 are in the reserve fund. There are 37 hunting grounds on the territory of the region, of which 32 are assigned for long-term use by nature users, on a competitive basis. In 2017, a permit for fishing was issued for 8,856.7 tons, 140 mln. tenge were received in the republican budget.

By the order of the Minister of Agriculture of the Republic of Kazakhstan, the approved fish catch quota for 2018 is 7,470.61 tons. In 2018, 8,477 tons of fish were caught in the region. In 2017, there are 8 fish processing plants operating in the region with an annual capacity of more than 11 thousand tons. In 2018, the volume of fish processing amounted to 4,071 tons.

As part of the regional **tourism development** in the region, work continues on the development of roadside service facilities on the international road corridor "Western Europe - Western China". In the Kyzylorda region there are 55 points for the construction of objects.

By the Decree of the Government of the Republic of Kazakhstan dated May 31, 2019 No. 360, the "State Program for the Development of Tourism of the Republic of Kazakhstan for 2019-2025" was approved.

The tourist map of the Republic of Kazakhstan includes 3 tourist sites in the region: Kamystybas recreation area, Zhanakorgan resort, Baikonur entertainment and tourist area. At the same time, the project to create an entertainment tourist zone "Baikonur" is included in the list of TOP-10 priority objects of the tourist map.

In order to further develop the tourist potential of the Baikonur cosmodrome according to the model of space tourism development at Cape Canaveral, Florida, USA, a feasibility study (hereinafter - FS) was developed for the project of creating an entertainment tourist zone "Baikonur". A land plot has been identified and registered on the territory of the Karmakshy region at 1,579 km of the Western Europe - Western China international highway.

As a result of work on the study, popularization and inclusion in the representative list of the intangible cultural heritage of UNESCO, the multinational application "Heritage of Korkyt ata" was included in the list of the intangible cultural heritage of UNESCO.

Within the framework of the program article "Looking into the future: Modernization of spiritual consciousness", a regional forum of historians and ethnographers was organized for the first time in the region, an association of young local historians was created in the regional museum and a hall "Kasietti Kazakhstan zhane Archeologiy" was opened.

Within the framework of the project "Geography of holy places in Kazakhstan" in order to preserve, study and develop tourism, archaeological excavations were carried out in the settlements of Syganak, Zhankent, Sortobe, Kyshkala, Babish mola. The Syganak stele was installed and the Syganak settlement was fenced.

The Kalzhan Akhun mosque-medrese, the monuments of Myrzabai Akhun and Maral Ishan were restored, the protection zones of the Ozgent settlement and the Tolegetai-Kylyshy ata mausoleum located in the Zhanakorgan district were determined.

1 building of the archive and 2 village clubs were put into operation in the Enbekshi villages of Shieli district, Madeniet village of Zhalagash district, as well as on the left bank of the Syrdarya river a museum of the history of the city and the center "Rukhani zhagyru" were opened.

Within the framework of the regional project office, an interactive map of objects of historical and cultural heritage of the region in 3D format was developed and QR codes were installed on 150 monuments of history and culture.

To form a positive image of the region, a tourist catalog "Tourist attractions" and a guide in 3 languages "Tourist objects of the Kyzylorda region" were prepared.

2.11. Mangystau region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

The territory of the region is 165.6 thousand square km. The population of the region as of 01.01.2018 is 660.3 thousand people, as of 01.01.2019 - 678.2 thousand people, and as of 01.01.2020 - 698.8 thousand people. The advantageous geographical location of the region on the shores of the Caspian Sea ensures proximity to the countries generating the main tourist flows. Transport logistics and tourism are determined by the region's important competitive advantages, the development of which will contribute to the diversification of the economy and the creation of new jobs.

According to the Committee on Statistics, the gross regional product grew from 1,764.8 bln. tenge in 2012 up to 3,296.1 bln. tenge in 2017. The volume of GRP per capita at the end of 2017 was 5,058.8 thousand tenge. In 2018, respectively – 3,803.1 bln. tenge and 5,682.5 thousand tenge, in 2019 – 3,685.4 and 5,352.8.

The volume of **industrial production** in 2017 amounted to 2,316.2 bln. tenge, in 2018 – 2,892.3 bln. tenge, and in 2019 – 2,908.8 bln. tenge, including the **manufacturing industry** in 2017 - 146.6 bln. tenge, in 2018 - 159.9 bln. tenge, in 2019 - 175.6 bln. tenge. Industrial production is represented mainly by the mining industry. The manufacturing industry is represented by metallurgy and the production of finished metal products, mechanical engineering and the chemical industry. Indicator "Labor productivity in the manufacturing industry" with a plan of 19.3 thousand US dollars / person actually was 17.5 thousand US dollars / person (2019 - 15.1 thousand US dollars / person).

The main enterprises of the mechanical engineering industry: Aktau Machine Building Plant LLP, Kaskor-Mashzavod JSC, AktauOilMash LLP, Saga-Atash LLP, etc. In 2018, a workshop for the production and complex maintenance of electric submersible pump installations (Schlumberger LLP) was commissioned)¹⁴⁶.

The main enterprises of the petrochemical industry: JV CASPI BITUM LLP, Kazakh Gas Processing Plant LLP (KazGPZ LLP). The main types of products: oxidized road bitumen, liquefied petroleum gases. At the end of 2017, the production volume of the industry increased by 40.6% compared to the previous year.

The main enterprise of the chemical industry - KazAzot JSC provides more than 90% of the total production of nitrogen fertilizers in the Republic of Kazakhstan. The main types of products: ammonium nitrate, liquid ammonia, nitric acid.

According to the Committee on Statistics, the gross **agricultural** output of the Mangystau region in 2017 amounted to 13.7 bln. tenge (index of actual volume - 107.7%), in 2018 - 15.7 bln. tenge, and in 2019 - 19.4 bln. tenge, with the advantage of animal husbandry (78.7%).

Lack of surface sources of fresh water, cultivated pastures, sharply continental, arid climate, direct dependence of the yield of natural pastures on weather conditions, harsh hydrological conditions, high mineralization of groundwater sources restrict the development of the agricultural sector.

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture

146 Hereinafter, the Program for the development of the Mangystau region territory for 2016 - 2020 and reports on its implementation for 2018 and 2019.

Agricultural land - 5.99 mln. hectares (36%), the sown area of major crops in 2017 – 1,028.9 thousand hectares (0.016%), including the sown area using advanced moisture-saving technology (drip irrigation) - 0.893 thousand hectares (an increase of 3.15 times by 2012). In terms of land, the territory of the region is represented mainly by pasture land, the total area of which is 12.7 mln. hectares. Watered pastures 2,788.7 thousand hectares. In 2017, 56 wells (bores) were built with a plan of 54. In 2019, 57 greenhouses are operating on 27.4 hectares, as in 2017, there were 27 greenhouses on 19.8 hectares. The increase is 111%.

The structure of agriculture is dominated by animal husbandry based on year-round grazing of animals (camels, sheep and horses) using slightly salted underground waters of mine and pipe wells.

Development of energy, including renewable energy and energy supply to the population

Power supply. MAEK-Kazatomprom LLP is the only energy producing enterprise and energy supplying organization for all consumers in the Mangystau region. Electricity is transported in cities and districts of the region through the electric grids of Mangystau Electricity Distribution Company JSC (MREK JSC), in the city of Aktau - by the AUES State Enterprise. Electricity supply in the cities and districts of the region is carried out by state utilities.

MAEK-Kazatomprom LLP includes two combined heat and power plants (CHPP-1 and CHPP-2), one condensing power plant at CTPP.

The installed electric capacity of the power plants of MAEK-Kazatomprom LLP is 1,330 MW, the working capacity is 735.8 MW. In addition, the enterprise provides the city of Aktau and its surrounding areas with drinking water and heat energy. The total length of power supply networks in the region is 11,349.27 km.

Due to the intensive development of the region, electricity consumption is growing every year and a deficit in its production may occur as early as 2020 - 2022.

In order to develop the energy sector in the region, feasibility studies (FSs) have been developed to determine the feasibility of reconstructing existing and building new generating sources in the Mangystau region. According to the studies of the FSs, the need to build a combined cycle power unit (CCPU) with a capacity of 250 MW was identified. There is an expert opinion of the Gosexpertiza RSE on the feasibility study "Construction of a combined cycle power unit (CCPU) with a capacity of 250 MW at the site of MAEK-Kazatomprom LLP". Variants of proposals for the construction of a 250 MW CCPU from potential investors-suppliers are being considered.

Another opportunity to cover the energy deficit in the region should be the use of **renewable energy sources**, primarily with the use of wind energy. A promising territory for the construction of wind power plants is the Tupkaragan region. Also, the city of Fort Shevchenko is located in an area of high wind loads, which makes it possible to use wind energy for generating electricity on a large scale.

In total, in 2017 - 2019, 3 projects with a total capacity of 50.6 MW were implemented:

- SPP in the area of Batyr village, 2 MW (Independent Group LLP);
- WPP in Fort-Shevchenko city, 43.6 MW, (Joint Venture KT Rare Metal Company LLP);
- WPP in the village of Akshukur, 5 MW (BEST-Group NS LLP).

At the stage of implementation:

- WPP in Karakiya region, 10 MW (WPP Zhangiz LLP);
- WPP in Karakiy district, 5 MW (WPP Service LLP).

Energy saving. 82% of the region's energy consumption falls on the industrial sector, including construction - 1.2%, the transport sector - 3.0%, losses in public networks - 8.4%, agriculture - 0.5%, released outside the region - 4.8%. 9 large industrial enterprises of the region consume 35% of the energy resources consumed by the industrial sector.

In order to resolve issues on energy saving and energy efficiency in the region, work is underway with large energy enterprises. Comprehensive energy saving plans have been developed, which include measures for the repair, modernization of equipment, the introduction of automated control and metering systems for electricity at the facilities of MREK JSC, AUES PSE, the use of energy-saving lamps in lighting networks.

In 2017, 1,706 pcs. of LED street lighting fixtures and 808 pcs. energy-saving lamps in the squares of the city of Aktau were installed to modernize the street lighting system. In addition, 191 pcs. of LED street lighting fixtures were installed in the city of Fort-Shevchenko and the Ushtagan village of Mangystau district. Also, together with the Chinese company Sourse Energy LLP, work was carried out to replace street lighting lamps with LED (82 pieces) in the city of Aktau.

In order to introduce energy saving technology, the following work was carried out: AUES PSE, engaged in the transmission and distribution of electric energy in Aktau, continues to work on the implementation of an automatic system for fiscal electricity metering (ASFEM). 918 kits were introduced, which led to energy savings of up to 20 - 30%. Currently, for the further continuation of this work on the mechanism of public-private partnership, negotiations are underway with the experienced Smart Guides LLP company. Also, ASFEM was introduced in MREK JSC, as a result of which regulatory losses were reduced from 9% to 6%.

Energy saving is being promoted among the population, stories are published on the rational and efficient use and saving of energy resources, the formation of a culture of energy saving.

Heat supply. According to the Committee on Statistics in 2019, the total length of heating networks in the region is 579.2 km, which are in communal ownership, of which dilapidated - 44.1 km (7.6%), 195.3 km need to be replaced (33.7%), replaced - 3.1 km.

In the cities of Aktau, Zhanaozen and Mangystau village uses district heating. Heat supply to the city of Aktau is provided from CHPP-1 and CHPP-2 of MAEK-Kazatomprom LLP. The level of provision with district heating services is 51%.

Heat supply to the city of Zhanaozen is provided by the central boiler house of the Ozenzhylu PSE.

In regional centers and rural settlements, autonomous boiler houses and gas boilers are used as heat sources. Transferring them to centralized heating is not economically feasible.

Gas supply. The general gas transportation system of the Mangystau region (hereinafter Mr) consists of trunk and distribution gas pipelines owned by Intergas Central Asia JSC (ICA), KazTransGas Aimak JSC (KTGA).

Gas supply in three cities of the region is 100%, and in villages - 91.4% (53 RAs).

The total length of gas pipeline networks in the region is 4,926 km, of which: main gas pipelines – 1,930.0 km; distribution pipelines – 2,995.9 km. Gas pipelines in the context of balance holders: main gas pipelines: belonging to ICA – 1,501.8 km; belonging to KTGA - 428.2 km; Distribution pipelines: owned by KTGA - 2,995.9 km.

In accordance with the Law of the Republic of Kazakhstan "On Gas and Gas Supply" and the Decree of the Government of the Republic of Kazakhstan dated 05.07.2012 No. 914, KazTransGas JSC is determined as a single national operator in the field of gas and gas supply. In the region, these functions are performed by the Mangystau production branch of KazTransGas Aimak JSC (MPB).

Condition of water supply and sewerage, provision of the population with centralized water supply and disposal

Water supply in urban areas. The region is located in a semi-desert zone, in this regard, water resources are extremely limited. Water supply of the region is carried out through 3 sources:

- 1) desalinated sea water (MAEK-Kazatomprom LLP);
- 2) Volga water supplied by the Astrakhan-Mangyshlak water conduit;
- 3) groundwater deposits.

The urban population's access to centralized water supply at the end of 2017 (taking into account the small town of Fort-Shevchenko) is 99.8%, in 2019 - 100%. The total length of water supply networks in cities was 1,455.3 km in 2017 and 2018, and 1,465.3 km in 2019. In 2018, 227 km of water supply networks were in a worn-out condition, in 2019 - 239.9 km (data of the Committee on Statistics). A large share of this indicator is the deterioration of Aktau city networks - 86%.

As a result of the implementation of the project, the construction of a drinking water supply and domestic sewerage system in Fort Shevchenko and the village of Bautino (stage 1) at the expense of the National Fund, the coverage of the urban population with centralized water supply by the end of 2018 was 100%.

Rural water supply. At the end of 2017, 39 rural settlements in the region have access to centralized water supply (MAEK-Kazatomprom LLP, Astrakhan-Mangyshlak water pipeline, Tuyesu, Sauyskan, Kuyulus, Tororpa, Onda, Shayir deposits), 14 rural settlements use decentralized water supply (Sam, Karagaily, Akkuduk, Akmysh, Sauskan, Ulanak, Tushchibek, Beki, Bozdak deposits). 8 rural settlements use imported water (Baskuduk, Tuyesu, Sauyskan deposits). In 2019, 44 rural settlements (75.8%) were provided with centralized water supply.

The total length of water supply networks in villages was 1,061.6 km in 2017 and 2018, and 1,140.6 km in 2019. In 2018, 227 km of water supply networks were in a worn-out condition, in 2019 - 63 km (data of the Committee on Statistics).

Coverage of rural settlements with centralized water supply as of October 1, 2018 amounted to 64%. At the end of 2018, access of the rural population to centralized water supply amounted to 69%.

In territorial terms, the degree of access to the centralized water supply system by districts (in terms of population) is as follows: Munaily district - 47.46%, Beineu district - 68.6%, Tupkaragan district - 86.9%, Karakiya district - 89.24 %, Mangystau district - 77.67%.

In rural settlements, the actual water losses amounted to 628.214 thousand m³.

The main problem in the field of water supply is the existing water shortage in the region with the constant growth of population and economy. This problem is aggravated by the deterioration of the infrastructure, in particular, the Astrakhan - Mangyshlak water conduit, which is one of the main sources of water for the region.

Water disposal. Only the cities of Aktau and Zhanaozen are equipped with drainage and wastewater treatment systems. There are 31 sewerage facilities in the region. The length of the sewerage network in 2018 was 539.6 km, of which 246.3 km need to be replaced, in 2019, respectively, 546.6 km and 511.2 km (data from the Committee on Statistics). Sewerage networks have been in operation for more than 30 years and have a wear rate of more than 80%, sewage pumping stations - 81%, sewage treatment plants - 91%.

Population access to centralized wastewater disposal in cities (including the small town of Fort-Shevchenko) at the end of 2017-2018 is 93.1%.

At the end of 2017, 6 villages or 17.1% have centralized water disposal out of 39 rural settlements, which are provided with centralized water supply. In rural settlements, septic tanks are mainly used. Access of the rural population to water disposal in 2017-2018 amounted to 3.8%.

In 2018, within the framework of the program "Development of the regions until 2020" for the implementation of projects "Construction of a sewerage system in the village of Shetpe. Phase 2" and "Construction of a sewage treatment plant in the village of Shetpe, Mangystau district", funds were allocated from the republican budget in the amount of 300 mln. tenge. Projects is going over to 2019.

To solve the problems of providing rural settlements with centralized water disposal, projects have been developed for the construction of sewerage networks in 2 villages (Kuryk, Mangystau).

In 2019, centralized water disposal was provided to 3.8% of the population of rural settlements from the total population of rural settlements in the region, or 15,405 people out of 404,735 people. In 2018 - 2019, 1.8 bln. tenge was allocated and spent from the republican budget for the construction of a WWTP and sewerage networks in the village of Shetpe of Mangystau district (the project cost is 2.9 bln. tenge). The project is going over to 2020.

State of the environment, reduction of air and water pollution

For 2017 - 2019, according to the stationary observation network, the level of atmospheric air pollution in the city of Aktau was estimated to be increased. APS is 5 - 7 (increased, high level). SI = 8 - 22.3 (high and very high level) for suspended particles PM10 and HR = 1 - 2% (raised level).

The level of air pollution in the city of Zhanaozen was assessed as low. APS is 1 - 5 (low and high (in 2018) level), SI = 3.6 - 4 (high level) and HR is 0 - 3% (low and high (in 2018) level).

The level of air pollution in **Beineu settlement** was assessed as low. APS is 2 - 7 (low and high (in 2018) level), SI = 4.2 - 9 (increased and high level), HR = 0 - 3% (raised level).

The **total amount of pollutant emissions** in 2019 was 64.5 thousand tons. To reduce emissions, all energy carriers of the region: MAEK-Kazatomprom LLP and other thermal power plants, boiler

houses of shift camps and all settlements of enterprises, boiler houses of social and individual residential facilities were switched over to natural gas.

In addition, as of January 1, 2018, 88,513 units of all registered 166,005 vehicles, or 53.3% of all vehicles in the region, are covered with gas-cylinder systems.

As a result of such works, Aktau becomes one of the cleanest cities in the republic.

In addition, in 2018, the Department signed a Memorandum of Cooperation with Caspian Bitumen LLP in order to implement a system for online monitoring emissions of harmful substances in industrial enterprises.

As a result, according to the environmental protection action plan agreed with the Department for the implementation of this system, Caspian Bitumen LLP allocated 45 mln. US dollars. Completion of the work is scheduled for 2020.

In accordance with paragraph 7 of Article 20 of the Environmental Code of the Republic of Kazakhstan and the "Rules for Determining Target Indicators of Environmental Quality" approved by Order of the Minister of Energy of the Republic of Kazakhstan dated February 26, 2015 No. 145, "Target Indicators of the Environmental Quality of the Mangystau Region" were developed.

A list of especially acute environmental problems was also approved for the development of environmental monitoring systems with free online access and the achievement of "target environmental quality indicators of the Mangystau region" and sent to the responsible authorities for implementation.

Observations of the **seawater quality** in the Middle Caspian were carried out at the following coastal stations and age stacks: Fort-Shevchenko, Fetisovo, Kalamkas, Kenderli-Divichi (3 points), Sandy-Derbent (3 points), Mangyshlak-Chechen (3 points), dam water area on the coast of MMG JSC (3 points), the area of Kuryk settlement (3 points), the border area of the Middle and South Caspian (3 points), Seaport Aktau SEZ (4 points), Karazhanbas, Arman fields.

In **2017**, the quality of water in the Middle Caspian according to the CWPI is characterized as "normatively clean". Compared to 2016, the water quality has not changed¹⁴⁷.

In **2018**, the water quality in the Middle Caspian according to the CWPI is characterized as "normatively clean". Compared to 2017, water quality has not changed¹⁴⁸.

In **2019**, according to the Unified Classification, the water quality of the Caspian Sea on the territory of the Mangystau region is not standardized (> class 5)¹⁴⁹.

Production and consumption waste management and waste processing

In 2018, 182,323 tons of solid household waste were collected at the landfill, of which 22,871 tons or 12.5% were utilized. In 2017, the volume of generated solid household waste amounted to 190.1 thousand tons, of which 6.49% was processed.

In 2018, the population was 649.1 mln. people, of which 84.6% were covered by services for the collection and removal of solid household waste. Of the 24 facilities for the disposal of solid household waste, 8 comply with environmental and sanitary requirements and standards, which is 33.33%.

In 2019, the share of solid household waste disposal to their generation was 33.8% (against the plan of 15%). There are 8 operating landfills that meet sanitary requirements, one of which is private and belongs to Ecoterra LLP. At the same time, 16 additional places were allocated for temporary disposal of waste that do not meet sanitary requirements.

In Aktau, 700 containers for the separate collection of solid household waste and 4 collection points for recyclable materials have been installed, in the Munayly region there is 1 collection point for recyclable materials.

According to the Department of Ecology, the survey of the National Company Kazakhstan Garysh Sapary JSC in the Mangystau region revealed unauthorized waste dumps at 151 points. Including:

- in the city of Aktau - 58;

147 Information bulletin on the state of the environment in the Republic of Kazakhstan for 2017.

148 Information bulletin on the state of the environment in the Republic of Kazakhstan for 2018.

149 Information bulletin on the state of the environment in the Republic of Kazakhstan for 2019.

- in Munaily district - 34 points, of which 20 have been liquidated;
- in the Tupkaragan district - 40 points, of which 9 have been liquidated;
- owned by individuals and legal entities - 19 points, completely liquidated.

In this regard, at present, in order to identify and eliminate the owner of the waste, a commission has been created, inspection and verification is being carried out. As a result, currently unauthorized dumpsites have been completely cleared in 48 points (Munayly district - 20, Tupkaragan district - 9, owned by individuals and legal entities - 19).

8 enterprises (IT ProfService, EcoWeste Aktau, ZherAnaGroup, Qala Zholdary, Caspiy Operating, Beyneumekh trans service, Kaspi kommunaldyk kyzmeti LLS, Yessimov IE) are engaged in separate collection of solid household waste.

Since 2014, a waste recycling plant has been operating in Zhanaozen with a capacity of 50 - 80 thousand tons / year.

Since April 2018, GLOBAL ECOSORT LLP, using its own funds, has installed and launched waste sorting lines for solid household waste with a capacity of 50 thousand tons / year in the city of Aktau and Munayly district at the Koktem PSE solid household waste landfill.

In 2019, near the village of Baskudyk, Munaily district, AktauTazaKala LLP launched a waste sorting station with a capacity of 50 thousand tons / year for 8 fractions prohibited for burial at solid household waste landfills.

In 2019, Aktauvtorsyrye LLP plans to open a mini-plant for sorting solid household waste in the Munayly district. Work is underway to obtain environmental permits.

In Karakiya district, Mangystau Tazalyk LLP was provided with special land plots and installed sorting plants. Now work is underway to lay power lines.

In addition, in the Tupkaragan district, it is planned to install manual sorting stations in the settlements of Akshukur, Saiyn Shapagatov.

Annually in the region in order to stabilize the liquid phase of the **Koshkar-Ata tailing dump**, 8.4 mln. m³ of treated water is poured into. Since 2015, a green protective zone has been created in the south of the Koshkar-Ata depression with a total area of 88.2 hectares, which contributes to the improvement of the ecological, sanitary and hygienic state and stabilization of the microclimate of the Baskudyk village. In November 2018, the Committee for Internal State Audit of the Ministry of Finance of the Republic of Kazakhstan in order to effectively spend public funds in the Ministry of Energy of the Republic of Kazakhstan, based on the results of an audit conducted by the Committee for Internal State Audit of the Ministry of Finance of the Republic of Kazakhstan, considers the issue of making adjustments and changes to the design and estimate documentation "Reclamation of the Koshkar-Ata tailing dump, I stage".

The region is dealing with issues related to ownerless hazardous waste. Table 2.11.1. presents the largest ownerless hazardous waste and the ways of their solution.

Table 2.11.1. Solving problems of ownerless waste

Name of ownerless hazardous waste	Ways to solve them
Waste pyrite and sulfur located on the territory of KazAzot LLP	In 2012, the inventory of waste in the territory of the former "sulfuric acid plant" revealed 96,852.9 tons of iron pyrite and 4,939.2 tons of sulfurous waste. The waste was transferred to the republican ownership by the decision of the Aktau City Court No. 2-4796 / 10-14 dated October 28, 2014. In 2018, laboratory studies were carried out, their impact on the environment was determined and the amount of hazardous waste located on the territory of the former "sulfuric acid plant" was established. Zhasyl Damu JSC holds tenders for the sale of hazardous waste in accordance with the "Rules for the management of ownerless hazardous waste, recognized by a court decision as received into the republican property" approved by Order of the Minister of Energy of the Republic of Kazakhstan dated March 20, 2015 No. 229.
Ownerless radioactive and toxic waste located at the	By the decision of the Munaily District Court dated 2015, the waste from the Koshkar-Ata tailing dump was transferred to the republican property. The waste was transferred to the

Koshkar-Ata tailing dump	republican property on 29.01.2016. (Ministry of Energy of the Republic of Kazakhstan).
Oil waste (sludge) located in the city of Zhanaozen, on the territory of MU-3, CPF, Albsenoman former technical water intake area	<p>In accordance with the decision of the Zhanaozen City Court No. 2-3129 / 15-05 dated December 23, 2015, the specified waste was recognized as ownerless and taken into the republican ownership of Zhasyl Damu JSC.</p> <p>Zhasyl Damu JSC sold these wastes to EcoOrienter LLP for extraction, processing and further reclamation of the territory.</p> <p>The total volume is about 304,136 tons, which are located on the territory of the CPP - 130.0748 hectares, MU-3 - 2.4296 hectares, the former Alybsenoman technical reservoir - 859.3 hectares.</p> <p>The work on the removal and processing of oil sludge at the MU-3 barn was fully completed and the territory was reclaimed.</p> <p>The barn of the CPF was cleaned by 60% (24.7 ha) and reclaimed by 46% (18.9 ha).</p> <p>The Alybsenoman technical water intake was cleaned by 20% (171 ha).</p>
11 unauthorized sludge collectors in the contract area of Ozenmunaigas JSC	<p>Based on the decision of the Karakiya District Court No. 2682 dated 03.03.2015 and the act of the commission dated 04.07.2015, waste in the amount of 1,288.35 thousand cubic meters or 1,765.0 tons, located at 11 warehouses of oil products, were transferred to Ozenmunaigas JSC for processing and disposal.</p> <p>In order to implement a memorandum on the removal of 1,288.35 thousand m3 of waste on its territory, Ozenmunaigas JSC planned to allocate funds in the amount of 1 billion tenge in 2015-2021</p> <p>In 2015, 102,676.712 tons of oily waste were treated. Due to the lack of funds, the work was stopped.</p> <p>Currently, on the contract territory of Ozenmunaigas JSC it is planned to clean up in 2019 - 150.0 thousand tons, in 2020 - 150.0 thousand tons out of the above 1,765.0 tons.</p>
Ownerless chemical waste, materials, reagents, raw materials located on the territory of AZPM LLP	<p>The total volume of ownerless chemical waste, materials, reagents and raw materials (211 types) located on the territory of the former AZPM LLP (now Industrial Park Mangystau LLP) is 2,142.130 tons.</p> <p>In 2018, in accordance with a court decision, the Department of Natural Resources and Environmental Management of the Mangystau region transferred 197 types of waste to the republican property of Zhasyl Damu JSC.</p>

The problem of combating **moving sands** is becoming urgent for many arid regions of Kazakhstan, especially in areas of active transformation, which include the Tuyesu sand massifs of the Karakiya district, Bostankum and Kyzylkum of the Mangystau district.

Since 2004, work has continued to restore the vegetation cover of the degraded Tuyesu sandy massifs near the Senek village and since 2007 Bostankum near the Ushtagan village. Since 2011, work has been carried out to combat moving sands in the Tushchykudyk village and since 2016 Shebir village of Mangystau district. At the end of 2018, a green protective belt with an area of 3,830 hectares appeared around 4 settlements. Work continues.

Also, in 2018, design documentation was developed to protect the Zharma, Sazdy, Sauyskan settlements of the Mangystau district from moving sand. Work in them will be carried out in the coming years.

The state of biological resources and the development of forestry, fishing and hunting industries, specially protected natural areas and ecological tourism

The total area of **forest lands** of the Beineu and Samsk state forest institutions, financed from the local budget of the region, is 253,299 thousand hectares, including forest cover – 125,161 hectares. 300 hectares of black saxaul seeds per year have been sown here. Over the past two years, 200 hectares (148 hectares in 2017, 52 hectares in 2018) of forest cover have joined the forest fund lands.

All documents have been prepared for the construction of a permanent forest nursery with a total area of 8.75 hectares in the amount of 98.0 mln. tenge per year, intended for the use of purified water from sewage treatment plants in the Beineu village, as well as the creation of a new Forestry institution on the Buzachi peninsula with an area of 76,305 hectares, worth 67.0 mln. tenge.

In 2018, the design estimate project for the construction of a forest nursery was transferred to the Department of Construction, Architecture and Urban Planning of the Mangystau region.

In addition, a "step-by-step plan to increase the volume of forest reproduction and afforestation of the akimat of the Mangystau region for 2019 - 2030" was agreed with the vice minister of the Ministry of Agriculture of the Republic of Kazakhstan and approved by the regional akim.

Every year, in the spring and autumn periods, by the resolution of the regional akimat, measures are taken for landscaping, sanitary cleaning and beautification of the territories of settlements.

In the cities and towns of the region, there are 18 parks with a total area of 45 hectares.

Landscaping of settlements continues. In order to improve the ecological state of the territories of settlements, in 2018, the akimat of the Mangystau region adopted a resolution No. 36 on carrying out measures for landscaping, beautification and sanitary cleaning of the territories of settlements of the region from March 15 to April 30. In 2019, 31,613 trees, 4,340 shrubs and 1,965 m² of flower beds were planted.

Fish industry. Commercial fish species are herring, mullet and mainstream fish species. Marine fishing is underdeveloped due to the seasonality and economic inexpediency of diadromous and semi-diadromous fish, which make long migratory transitions from the south of the Caspian Sea to the north and back, depending on the season.

15 economic entities are engaged in coastal fishing in the region. Fishing is carried out in the coastal zone of the Caspian Sea: in the area of the Karazhanbas, Kalamkas fields, Sarytash, Kochak bays, Kulaly, Podgorny and Dolgiy islands and on the western coast of the region.

In 2018, 2 fishery sites were assigned for cage fishery for sturgeon rearing. One of them, with an area of 3,500 hectares (with a length of 5.3 km, a width of 6.6 km), is located in Kenderli Bay and is assigned to Caspian Riviera LLP. The second, with an area of 324 hectares (with a length of 1.8 km, a width of 1.8 km), is located 20 km opposite the village of Akshukur and is assigned to the Caspian Sea Farm LLP. The planned fish productivity of this site, when used for fish breeding purposes, will be more than 6 tons / ha.

In 2018, the region allocated a fish catch quota in the amount of 1,859.1 tons. Basically, local fishermen fish for mullet, Caspian shad, carp, pike perch, bream and roach, sprat. In fact, 1,496 tons of fish were caught (data from the Committee on Statistics).

The region has 12 **specially protected natural areas** with an area of 2.8 mln. hectares. (makes up 16% of the region's territory).

During an aerial survey conducted by the Committee for Forestry and Hunting in 2017, there were more than 1,509 argali from the protected local zones, including: 1,374 argali were identified from the local specially protected zones. During the autumn 2018 census, there was an increase in the number of 3,700 saigas, 1,523 argali, 1,000 gazelles and other wild animals in protected areas compared to last year.

In accordance with the Law of the Republic of Kazakhstan dated July 9, 2004 No. 593 "On the Protection, Reproduction and Use of the Animal World" and the order of the Ministry of Agriculture of the Republic of Kazakhstan dated February 1, 2018 No. 58 "On Approval of Limits on the Withdrawal of Wildlife Objects from February 15, 2018 year to February 15, 2019", in the Mangystau region from August 1, 2018, summer and autumn hunting seasons are open.

In 2018, 1,900 hunters were issued 39,497 permits for shooting animals: duck – 21,538, sandpiper – 1,171, pigeon – 1,000, coot – 2,883, goose - 781, wild boar - 45, corsac fox - 160, fox - 200, hare – 10,000, chukar – 1,719.

For comparison, in 2017, 1,650 hunters were issued 31,835 permits for shooting animals.

In 2018, 10 facts of illegal hunting were registered, including 4 offenses were revealed on hunting grounds, 48,100 tenge of fines, 72,148 tenge of damage were fully recovered.

Every year, by a decree of the Government of the Republic of Kazakhstan, it is allowed to catch bustards for individuals arriving from the United Arab Emirates. The fee for catching one bustard is 260 MCI (625,300 tenge). In accordance with the law, fines are established for causing harm to the animal world. The fine for illegal hunting for bustard or falcon is 700 MCI (1,683,500 tenge.).

In accordance with an agreement between the Committee for Forestry and Wildlife of the Ministry of Agriculture of the Republic of Kazakhstan and the Abu Dhabi Ecology Agency, on May 23, 2018, 500 houbara bustards were flying out in the Kenderli-Kayasan nature reserve. In total, 150

/one hundred fifty/ pieces were flying out in the Kenderli-Kayasan nature reserve in 2013, 200 pieces in 2014, 55 pieces in 2015, and 500 houbara bustards in 2017 and 2018.

It is also planned to develop a natural and scientific justification for the creation of specially protected natural areas in the Kulaly Islands archipelago of the Mangyshlak Bay of the Caspian Sea. Main tasks: Comprehensive analysis of the state of ecological objects and systems of the study area in the state natural reserve fund, risks, threats of liquidation, measures for their protection, restoration and use.

Since the natural systems and biological resources on the islands of the Caspian Sea have not been studied in the Mangyshlak Bay. Expected results:

1) Assessment of the natural environment of the project area (Kulaly, Morskoy, Podgorny, Novy and Rybachy islands, total area is 130 km²);

2) Analysis and assessment of the socio-economic situation in the region;

3) Survey of the territory of the islands;

4) The regime of protection and use of the territory, functional zones, biological resources of specially protected natural areas is taken into account;

5) Creation of thematic (landscape and ecosystem) maps.

The availability of picturesque wildlife (**ecological tourism**), beach and cruise tourism in the Caspian Sea, sports tourism, extreme tourism.

The most developed tourist destinations are the cities of Aktau, Zhanaozen, Fort Shevchenko, Shetpe village. The largest number of architectural monuments, natural objects are located on the territory of Tupkaragan, Mangystau and Karakiya districts - this is the Ustyurt plateau, necropolises and underground mosques of Beket-ata, Shakpak-ata, Sultan-epe, etc., Mount Sherkala, Torysh valley, Saura, Tamshaly tracts, Karagiye depression, Kenderli bay. Recreation centers Kenderli, Tree of Life, Stigl, Saya, Dostar function.

During the implementation of the Territory Development Program for 2011 - 2015, certain results were achieved in the development of a tourist facility of national importance - the Kenderli resort zone, on the basis of which, according to the Concept for the Development of the Tourism Industry in the Mangystau and West Kazakhstan regions, the formation of the West Kazakhstan cluster began.

A website for the tourism department was created, an international forum on the development of tourism in the Caspian region, an international forum on the development of the hotel business, info tours for international tour operators and media representatives were held. A tourist map of the region has been developed and continues to be improved. Work has begun on the creation of the Mangystau Geopark. The book "Legends of Mangystau" was developed and published in 4 languages (Kazakh, Russian, English, Chinese).

2.12. Pavlodar region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

Territory - 124.8 thousand km². The population of the region is constantly decreasing slightly: 754.8 thousand people (as of January 1, 2018), as of January 1, 2019, the population was 753.9 thousand people, and at the beginning of 2020 - 752.2 thousand people.

According to the Committee on Statistics, the region provides 4.41% of the gross product and 7.8% of the industrial output of the Republic of Kazakhstan. The gross regional product in 2017 amounted to 2,369.3 bln. tenge and, compared to 2016, increased in real change by 4.0%. GRP per capita in 2017 amounted to 3,134.3 thousand tenge. In 2018, the GRP of the region amounted to 2,746.6 bln. tenge, per capita – 3,641.1 thousand tenge, in 2019, respectively, 3,029.6 and 4,023.3.

Industry takes the largest share in the structure of the GRP of Pavlodar region. At the end of 2017, its share in GRP amounted to 40.7%, the gross volume - 1,778.4 bln. tenge, in 2018 – 1,985 bln. tenge, and in 2019 – 1,991.0 bln. tenge.

The total volume of the manufacturing industry in 2017 was 1,136.1 bln. tenge, in 2018 – 1,264.7 bln. tenge, in 2019 – 1,293.0 bln. tenge.

In the industry there are 16 backbone enterprises of the region: (Bogatyr Komir LLP (coal mining), MaikubenVest LLP (coal and lignite mining), Eurasian Energy Corporation JSC (coal mining, production of electricity and heat), Aksu Ferroalloy Plant - branch of TNK Kazchrome JSC (production of ferroalloys), Aluminum of Kazakhstan JSC (production of alumina, electricity), Kazakhstan Electrolysis Plant JSC (production of unprocessed aluminum), Maykainzoloto JSC (mining and processing of non-ferrous metal ores), KSP Steel LLP (production of seamless pipes and steel), Pavlodar branch of Casting LLP (production of steel), Pavlodar machine-building plant of ERGService JSC (production of cranes and metal structures), Pavlodar petrochemical plant LLP (production of oil products, supply with steam and water), Kazenergokabel JSC (output of wire products), Pavlodarenergo JSC (production of electricity, heat), Station Ekibastuz GRES-2 JSC (production of electricity, heat energy), Ekibastuz GRES-1LLP (power generation), KAZ MINERALS BOZSHAKOL LLP (mining of copper concentrate, copper ore) provide about 80% of the total industrial production. The dominance of these enterprises in the structure of industrial production determines the resource and raw materials orientation of the region's exports¹⁵⁰.

The electric power industry is one of the basic sectors of the region's economy. Energy enterprises of the region generate about 42% of the republic's electricity. The energy complex of the region includes 7 thermal power plants with a total installed capacity of 8,275 MW, including: three block power plants of republican significance in the cities of Ekibastuz (Ekibastuz GRES-1 LLP, Station Ekibastuz GRES-2 JSC), Aksu (EEC JSC) and four combined heat and power plants in the cities of Pavlodar (CHPP of AK JSC, CHPP-2 and CHPP-3 of Pavlodarenergo JSC), Ekibastuz (Ekibastuz CHPP of Pavlodarenergo JSC). Heat supply to the city of Aksu is provided by ROK-2 (district heating boiler house) of Aksu Ferroalloy Plant of TNK Kazchrome JSC.

The share of agricultural products in the region's GRP is about 5.0%. The land fund of the region is 12,475.5 thousand hectares, including agricultural land – 11,167.5 thousand hectares, of which arable land – 1,331.3 thousand hectares.

The main directions of agricultural production are meat, milk, eggs, grain, potatoes and vegetables. In the structure of gross agricultural output, livestock products prevail, on average, the share is more than 50%.

According to the Committee on Statistics, the volume of gross agricultural output in 2017 amounted to 204.4 bln. tenge, and in 2018 - 228.5 bln. tenge, and in 2019 - 236.4 bln. tenge, with a slight advantage of animal husbandry (54.4%).

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture

With a view to stable production of crop products, measures are being taken to develop intensive moisture- and resource-saving and soil-protective technologies for cultivating crops, to restore areas of irrigated agriculture, and to use progressive sprinkler equipment. The area of irrigated agriculture is expanding annually. Over the past four years, 19.4 thousand hectares have been restored, of which 5.4 thousand hectares were commissioned in 2017. In Pavlodar region are expanding areas with the use of drip irrigation. This technology is used in 21 farms in the region, since 2012 the area has been increased from 15 hectares up to 561 hectares. In the context of districts: Pavlodar - 339.5 hectares; Uspensky - 100 hectares; Aksu city - 44 hectares; Terenkul - 66 hectares; Ekibastuz city - 11.5 hectares.

In Pavlodar region, the area of pastures on agricultural lands is 3,317.6 thousand hectares, including watered – 1,899.6 thousand hectares, or 57%. In 2017-2019, about 30 mine wells and bores were equipped annually.

Development of energy, including renewable energy and energy supply to the population

Power supply. The region is one of the most power-equipped territories of Kazakhstan. Power plants of the region provide electricity for the needs of the economic complex and the population of

150 Hereinafter, the Program for the Development of the Pavlodar Region Territory for 2016 - 2020 and reports on its implementation for 2018 and 2019.

the region, part of the electricity goes to other regions of the republic. Own regional consumption is about 45% of the production volume.

The total length of electrical networks is 17.5 thousand km, including: high voltage lines -220-110 kV - 2.7 thousand km, high voltage lines -35-10-0.4 kV - 13.6 thousand km, cable lines - 10-6-0.4 kV - 1.2 thousand km. Number of substations 4,349 pcs. including: substations 220-110 kV - 78 units, substations 35-10-0.4 kV - 128 units, transformer substations, unit transformer substations - 6-10 / 0.4 kV – 4,143 units. Average physical deterioration of electrical networks is 58.5% due to the average service life of 30 - 35 years.

Power lines with a voltage of 220-1150 kV are on the balance of KEGOC, which are operated by the Northern branch of intersystem power grids with a center in the city of Ekibastuz. Electric networks of 110 kV and below are operated by power grid companies Pavlodar Electric Distribution Grid Company JSC and Gorelektroset LLP and Ekibastuzenergo LLP. Every year the regional power companies carry out investment measures for reconstruction, modernization, overhaul and current repairs of electrical networks and electrical equipment of substations.

Heat supply of 3 cities is carried out by two enterprises: Pavlodar Heating Networks LLP and Teploservis RSE. The length of the regional heating networks in 2019 was - 839.2 km, including dilapidated - 316.8 km (37.8%), 325.2 km (38.7%) need to be replaced.

In order to reduce the length of worn-out networks, projects are implemented annually in the region within the framework of State programs, in addition, operating organizations under the investment program carry out repairs on networks.

In 2019, within the framework of the state programs "Regional Development until 2020" and "Nurly Zhol", construction and reconstruction of 4.8 km of heat supply networks and 4 central heating points were carried out.

At the expense of depreciation deductions and their own funds, utilities in 2019 completed overhaul and reconstruction of 24.1 km of heat supply networks.

In 2020, within the framework of the State Program "Regional Development until 2020" and at the expense of the local budget, 6 projects are planned to be implemented. Within the framework of the projects, it is planned to carry out the construction, overhaul and reconstruction of 19.4 km of heat supply networks. At the expense of depreciation deductions and own funds, utilities in the current year are planning to carry out overhaul and reconstruction of 2.5 km of heat supply networks.

Gas supply. There is no natural gas and gas distribution networks in Pavlodar region. For domestic and industrial needs, liquefied petroleum gas (hereinafter referred to as LPG) in cylinders is used, which is produced by Pavlodar Petrochemical Plant LLP. Gas supply to the population is carried out by individual gas cylinder devices.

Energy Saving and Energy Efficiency Improvement. The implementation of energy saving measures is one of the main tools for modernizing industry, housing and communal services and the transport sector. Industrial enterprises account for 90.2% of energy consumption. The main problems of the implementation of the policy of energy saving and energy efficiency in Pavlodar region are: deterioration of equipment at industrial enterprises, deterioration of utilities, low qualifications of specialists in the field of energy saving. In order to further develop energy saving in the Pavlodar region, the Comprehensive Energy Saving Plan for 2018-2021 is being implemented, which provides 7 main directions that provide for the energy efficiency of industrial enterprises, innovative energy, housing and communal services, transport, the public sector, lighting and society as a whole.

Condition of water supply and sewerage, provision of the population with centralized water supply and disposal

Water supply and water disposal. Pavlodar region is abundantly provided with fresh groundwater resources. The largest waterways are the Irtysh River and the Irtysh-Karaganda Canal named after K.I. Satpayev, whose water resources are widely used for drinking and household water supply. For the purposes of household and drinking water supply, 22 sites are operated with approved reserves in the amount of 649.85 thousand cubic meters per day. Consumers of water for household and drinking purposes are: permanent population, industrial and agricultural enterprises that consume

water from the networks of household drinking water supply. In the cities of the region, access to centralized water supply by the end of 2018 amounted to 92% and water disposal 86.5%.

The length of water supply networks in the region in 2018 is 2,748.3 km, and water disposal networks – 1,046.9 km, in 2019 – 3,200.5 and 1,047.4 (data of the Committee on Statistics), of which require replacement at the end of 2018, respectively – 1,127.1 km and 764.1 km, in 2019 - water supply networks – 1,148.6 km, water disposal networks - 761.3 km.

The water supply networks in the region are communally owned and transferred to rental services. In the city of Pavlodar, the water disposal networks were transferred to the lease service of Pavlodar-Vodokanal LLP, in the cities of Ekibastuz and Aksu the networks are served by state utilities.

In the period from 2011 to 2017, water supply facilities were put into operation in 25 rural settlements. The number of rural population covered by centralized water supply increased from 93.5 thousand up to 134.6 thousand people during the specified period. At the end of 2017, out of 365 rural settlements, 87 rural settlements or 23.8% have access to centralized water supply. There is no centralized water supply in 278 rural settlements, of which in 268 there is a decentralized water supply, in 10 - imported.

In 2018, work was carried out on the construction and reconstruction of 37 rural water supply projects (with a population of 59,247 people) for a total amount of 15.3 bln. tenge (13.1 bln. tenge of transfers from the republican budget and 2.2 bln. tenge from the regional budget). By the end of 2018, work on 21 objects was completed, as a result of which the rate of access of the rural settlements to centralized water supply increased from 23.8% up to 29.7% (providing additional 27.2 thousand people with high-quality drinking water).

At the beginning of 2019, out of 353 villages:

- 105 villages or 29.7% have access to centralized water supply;
- 52 rural settlements use water from water treatment plants of complex block of modules;
- 188 villages use water from local sources (tubular, shaft wells, bores);
- 8 villages use imported water.

In 2019, was carried out work on the construction and reconstruction of 52 rural water supply projects for a total amount of 13.0 bln. tenge (10.4 bln. tenge of transfers from the republican budget and 2.6 bln. tenge from the regional budget). By the end of 2019, work was completed on 39 facilities, as a result of which the rate of access of the rural settlements to centralized water supply increased from 29.7% up to 40.1% (providing additional 36.0 thousand people with high-quality drinking water).

At the end of 2019, out of 352 rural settlements:

- 141 rural settlements or 40.1% are provided with centralized water supply;
- 45 villages use purified water from complex block of modules;
- 161 villages use drinking water from tubular shaft wells; bores;
- 5 villages are provided with imported water.

In order to improve the condition of networks and facilities, 15 projects were implemented in 2019 within the framework of the "Regional Development until 2020" program. In total, within the framework of the projects, the construction and reconstruction of 33.5 km of water disposal networks, 34.9 km of water supply networks and 19 booster pumping stations were carried out. Due to depreciation deductions and own funds, utilities in 2019 completed overhaul and reconstruction of 13.7 km of water supply and 4 km of water disposal networks.

In 2020, within the framework of the "Regional Development until 2020" programs, 17 projects are planned to be implemented at water supply and water disposal facilities. The projects will include construction and reconstruction of 22.5 km of water disposal networks and 27.3 km of water supply networks. Due to depreciation deductions and own funds, utilities in the current year are planning to carry out overhaul and reconstruction of 22.2 km of water supply and 9 km of water disposal networks.

For sewerage in rural areas

By the Decree of the Government of the Republic of Kazakhstan No. 767 dated November 16, 2018, the State Program for the Regional Development until 2020 was approved. According to the

Program, the indicator “Access to centralized water disposal” was changed to “Coverage of the population with wastewater treatment”.

According to the methodology, the rate of coverage of the population with wastewater treatment is calculated from the total population in rural areas.

In the region, wastewater treatment covers 5 rural settlements, which in terms of population is 3.3% or 7.4 thousand people (the total population of villages is 221.9 thousand people):

- Moyildy village of Pavlodar city, built in 1970, length 0.7 km, there are filtration fields;
- Dostyk village of Aksu city, built in 1979, length 35 km. Sewerage pumping station - 1 pc.,
- Kalkaman village of Aksu city, built in 1968, length 12 km, sewerage pumping station - 2 pcs.,
- Maykain settlement of Bayanaul district, there is a storage pond;
- Sharbakty village of the Sherbakty district, built in 2014, length 8.2 km., There are sewerage pumping stations.

State of the environment, reduction of air and water pollution

For 2017 - 2019, according to the stationary observation network, the level of atmospheric air pollution in **Pavlodar city** was assessed as low. APS is 2 - 5 (low and raised (in 2018) level), SI = 2 - 5 (raised and high level) and HR = 1 - 4% (raised level).

The level of atmospheric air pollution in the **city of Ekibastuz** was assessed as low. APS is 3 in 2017 and 2019 (low level) and APS + 7 in 2018 (high level), SI = 1.4 - 6 (low and high (2018) level), HR value = 0 - 2% (raised level).

The level of air pollution in the **city of Aksu** was assessed as low. APS is 1 - 5 (low and raised (2018) level). SI = 1.8 - 4 (raised level), HR = 0% (low level).

In order to inform residents, current information about the state of atmospheric air is broadcast on LED screens in the cities of the region. 6 screens were installed in Pavlodar city (Yestai St. - N. Nazarbayev Ave., Ak. Satpayev St. - Krivenko St., Ak. Satpayev-Toraigyrov St., N. Nazarbayev Ave. - Lermontov St., at the Railway Station and at the airport) and 1 screen in the city of Ekibastuz (at the intersection of M. Zhusup-M. Auezov streets). The data from the posts is broadcast every 12 minutes and the broadcast duration is 1 minute. For each substance, it is possible to view the concentration level in mg / m³ and in relation to the maximum permissible concentration (on the color scale: 0-1 MPC - low level; 1-5 - raised level; 5-10 - high level; more than 10 MPC - very high level).

Of the total mass of **emissions** of pollutants into the environment, the share of thermal power engineering enterprises accounts for 64%, ferrous metallurgy 16%, non-ferrous metallurgy 7% and oil refining 4%.

The volume of gross emissions into the atmosphere for 12 months of 2018, according to the regional Akimat, amounted to 716.2 thousand tons with a limit of 980.2 thousand tons (Table 2.12.1).

Table 2.12.1. Emissions of harmful substances from stationary sources.

Name of regions	Emissions of harmful substances, thousand tons					
	2017		2018		2019	
	limit	actual	limit	actual	limit	actual
Pavlodar	968.511	618.14	980.2	716.2	986.4	721.5

According to the Akimat of Pavlodar region

Of these, the share of large enterprises of the region in the 1st category accounts for 85 - 86%, the rest of the objects of the II, III, IV categories account for about 14 - 15%.

Until 2016, there was a decrease in emissions, and then an increase due to an increase in electricity generation at the heat and power enterprises of the region, for example:

- Ekibastuz GRES-1 named after Bulat Nurzhanov LLP in 2018 generated electricity by 29.2% more than in the previous year (14.797 bln. kWh and 19.121 bln. kWh), respectively, the volume of emissions into the atmosphere increased by 56,2 thousand tons or by 37.3% (from 150.5 thousand tons up to 206.7 thousand tons);

- in Aluminum of Kazakhstan JSC, the increase in emissions of pollutants into the air amounted to 33.98 thousand tons, or by 60% (from 56.753 thousand tons to 90.74 thousand tons) due to the

deterioration of the quality of processed raw materials (bauxite). In addition, the production of alumina increased by 28,061 tons or 1.9% (from 1,480,991.0 tons up to 1,509,051.90 tons).

In 2018, large industrial enterprises of the region spent 9.5 bln. tenge to carry out environmental protection measures, while the plan was 6.3 bln. tenge, of which the most significant:

- Bogatyr Komir LLP spent 3.4 bln. tenge on the reclamation of worked-out areas by laying overburden at the Yekibastuzskoye field with the plan of 1.2 bln. tenge;

- The Aksu Ferroalloy Plant, a branch of TNK Kazchrome JSC, spent 2.8 bln. tenge against the plan of 2.6 bln. tenge, of which 2.3 bln. tenge was spent on processing of 981,802 tons of ferrochrome slag, which consists in crushing and obtaining metal, products for recycling and return to production and crushed stone of several fractions.

Also, work at the enterprises continued in 2019. For example, at the Pavlodar aluminum plant, work has begun on the phased replacement of existing electrostatic precipitators in the furnaces of the Sintering Shop with the planned environmental effect of reducing dust emissions by more than 13%. At the Aksu Ferroalloy Plant, work has begun on the reconstruction of the gas purification plant No. 4 (The project is designed for 5 years, the environmental effect is a decrease in dust emissions by 180 tons / year).

Large industrial enterprises, within the framework of the signed memorandum with the regional akimat, are working on the installation of automated air monitoring stations. The introduction of similar monitoring systems for other enterprises is planned in stages from 2020.

Partially air pollution is offset by greenery. So in 2019, about 5,000 compensation trees were planted along the road No. 1 of Pavlodar. In 2020, a compensation planting is planned in the amount of 650 pcs. trees and shrubs.

In 2020, 204 mln. tenge were allocated for the maintenance of the green fund, the frequency of watering the green spaces is 10 times per season.

Pavlodar Petrochemical Plant LLP has developed a project for landscaping the SPZ of the enterprise for 2020-2024, within the framework of which it is planned to gradually plant 17,000 tree seedlings on an area of 64.2 hectares. Of these, 3400 seedlings are planned to be planted in 2020.

Similar projects for the arrangement of the SPZ were developed by the Aksu Ferroalloy Plant (planting 3,000 trees from 2020 to 2025, with maintenance work until 2028), Caustic JSC (annual planting of 100 trees each), Maikainzoloto JSC (annual planting of 300-400 pcs. on an area of 14.71 hectares from 2021-2031), Station Ekibastuz GRES-2 JSC (2000 pcs. annually), Ekibastuz GRES-1 named after B. Nurzhanov LLP (500 pcs. annually).

Observations of surface water pollution in the territory of Pavlodar region were carried out at 4 water bodies (rivers Yertis and Usolka, lakes Dzhasybai, Sabyndykol).

The **actual volumes of discharges** of pollutants (the main enterprises - Vodokanal PSE, Aksu Su arnasu PSE, Ekibastuz vodokanal PSE) remain relatively stable (Table 2.12.2).

Table 2.12.2 - Actual volume of industrial and domestic wastewater discharge

Information on the actual volumes of discharges		2017	2018	2019
Industrial discharges	Water disposal volume, thousand m ³	1,956,656.7	1,999,503.3	1,846,975
	Volume of pollutants, thousand tons			
Domestic waste water	Water disposal volume, thousand m ³	4,285.5	4,258.7	4,067
	Volume of pollutants, thousand tons	18.486	28.23	29.7
Emergency and unauthorized discharges	Water disposal volume, thousand m ³	-	-	-
	Volume of pollutants, thousand tons			
Total (all of the above discharges)	Water disposal volume, thousand m ³	1,960,942.2	2,003,762.0	1,851,042
	Volume of pollutants, thousand tons	18.486	28.23	29.7

Note: The actual volume of discharge of heat-exchange conventionally clean waters of the Aksu power plant of EEC JSC into the Irtysh River in 2017 amounted to 1,879,855.0 thousand m³ / year, in 2018 - 1,918,911.0 thousand m³ / year, in 2019 - 1,764 025.545 thousand m³ / year.

Water disposal from large industrial enterprises of Pavlodar region is carried out to waste trap: Aksu su arnasy PSE to the Uzynbulak waste trap, Gorvodokanal PSE in Ekibastuz city - to the Atygai waste trap; Pavlodar Petrochemical Plant JSC - to the Sarymsak waste trap, Bogatyr Komir LLP - to the Akbidaik waste trap, Kaustik JSC and Kazenergokabel JSC - to the Bylkyldak waste trap.

Large metallurgical and energy enterprises of the region carry out wastewater disposal into ash dumps: Aluminum of Kazakhstan JSC, Kazakhstan Electrolysis Plant JSC, Aksu Ferroalloy Plant - a branch of TNK Kazchrome JSC, Pavlodarenergo JSC drain their industrial waste through the ash pipe network into special cards, excluding their placement in water bodies.

Wastewater is discharged into the Irtysh River within the Pavlodar region through two organized outlets:

- Aksu power plant of EEC JSC discharges conditionally clean heat exchange waters;
- Pavlodar-Vodokanal LLP discharges treated mixed wastewater after the city treatment facilities of the regional center.

Discharges of wash water classified as "conditionally clean" from two drinking-quality water treatment plants at the Aksu su arnasy PSE and Pavlodar-Vodnik LLP in the Terenkol village are produced accordingly - to the Karamyrza Lake and the Kachirka canal, which are connected to the Irtysh only during the spring flood. The volumes of the indicated wash water and the content of pollutants in them are insignificant and are approved in the draft MPD standards.

In total, there are 29 enterprises on the territory of Pavlodar region with 49 wastewater outlets, of which there are:

- into water bodies (Irtysh River, Karamyrza Lake, Kachirka canal) - 4,
- to all types of storage reservoirs -22,
- filtration fields (including evaporator fields) - 16,
- terrain relief (including bioplato) -7.

In accordance with paragraph 7 of Article 20 of the Environmental Code of the Republic of Kazakhstan, the management of subsoil use, the environment and water resources of the region within the framework of environmental measures in 2015 developed target environmental quality indicators for the Pavlodar region for 2015 - 2024 (approved by the decision of the Pavlodar regional maslikhat No. 403/46 dated December 10, 2015).

In order to achieve the adopted target indicators and solve acute problems of the region, Akimat, together with interested authorities and the public, has developed an Action Plan to improve the environmental situation in Pavlodar region for 2019 - 2023. The draft of this Plan was considered and approved by the Ecological Council on ecology and environmental protection of the region, the commission on ecology and environmental protection of the regional maslikhat, the regional public council during a meeting with the participation of the Association of Environmental Organizations of Kazakhstan and regional NGOs.

For more than 10 years, the **mercury monitoring** of the Northern industrial zone of Pavlodar has been carried out, which today is the main tool for monitoring the level of mercury concentration (sampling of air, soil, surface and ground waters is carried out, the total number of samples is 334). To update the previously developed program of mercury monitoring, the department carried out its correction, which provides for additional sampling of biological samples (fish, birds and hair of people working in the Northern Industrial Zone), as well as drilling of 41 new observation wells along the perimeter of the territory of the former Khimprom at a distance of 500 meters. This will make it possible to assess the state of groundwater beyond its boundaries, since the existing 125 wells give an assessment of the water condition only at the pollution centers.

The water in the Bylkyldak storage reservoir is not threatening to public health, but it is not provided for economic needs.

Production and consumption waste management and waste processing

In 2017, industrial waste was generated - 113.8 mln. tons, of which 31.7% (36.1 mln. tons) was used and recycled,

In 2018, industrial waste was generated - 196.5 mln. tons, of which 22% (43.4 mln. tons) was used and recycled.

In 2019, the regional enterprises generated 200 mln. tons of industrial waste, of which 45 mln. tons or 23% were recycled and reused.

Positive dynamics is observed at the Aksu Ferroalloy Plant, which annually recycles about 1 mln. tons of metallurgical slag to obtain marketable crushed stone, the Pavlodar Petrochemical Plant, which annually processes oil sludge in full. Large coal mining enterprises (Bogatyr Komir LLP, Maikuben-West LLP, Gamma LLP) carry out reclamation work using overburden.

However, there is practically no waste processing by the enterprises of the fuel and energy complex, where about 10 mln. tons of ash and slag are generated annually (GRES-1, GRES-2, EEC JSC, Pavlodarenergo JSC), metallurgical sludge (in the production of alumina at Aluminum of Kazakhstan JSC annually generates 2.6 mln. tons of bauxite sludge).

At the same time, when determining the scope of work on the average repair of roads in Pavlodar region, Recommendations on the use of cold recycling technology in the construction of road pavements using active man-made waste and by-products of the industry of the Republic of Kazakhstan are applied. In particular, bauxite sludge and ash slag are used in the cold recycling technology according to the technical documentation for the average repair of road sections of regional significance. So, during 2019 for the construction and repair of highways on the territory of the region Ekibastuz GRES-1 named after B. Nurzhanov LLP transferred to outside organizations more than 165 thousand tons of ash and slag, Aluminum of Kazakhstan JSC - 21 thousand tons of bauxite sludge.

Currently, under the leadership of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan, a special permanent commission on the disposal and processing of ash and slag waste (ASW) has been created with the participation of representatives of government agencies, construction and road companies, energy companies, public organizations to develop recommendations on the general policy of using ASW. As part of the commission's work, a set of measures will be put together to develop the sphere of ash and slag waste use, which will provide for legal and regulatory mechanisms for the extraction, turnover, sale and use of ash and slag waste, including the micro sphere.

General information on solid household waste. According to the data provided by the Akimat of Pavlodar region, 117.3 thousand tons of solid household waste were generated in 2018, of which 0.12% was processed. In 2017, the volume of generated solid household waste amounted to 426.6 thousand tons, of which 0.23% was processed. In 2019, the processing rate reached 15%. In 2018, the population was 760.5 thousand people, of which 85% was covered by services for the collection and removal of solid household waste. Out of 336 solid household waste disposal facilities, only 5 comply with environmental and sanitary requirements and standards, which is 1.5%.

In three cities, containers were installed for - collection of mercury-containing lamps - 200 pieces (Pavlodar - 160, Ekibastuz - 30, Aksu - 10); collection of plastic waste - 790 pieces (Pavlodar - 400, Ekibastuz - 350, Aksu - 40); collection of electronic waste - 20 pieces (Pavlodar). The sorted waste is sent for processing in Almaty by PromTechnoResursKZ LLP.

There are 10 enterprises in the region (Spetsmashin, Corrugated Plant Plant, ElectroTransReelto, InterRubberRecycling, Tandem-PV, SpetsPromService, Kazakhstantraktor, EcoGold LLPs, Popov IE, Sharipova Katira IE) carrying out utilization and processing of solid household waste.

In the city of Ekibastuz, Ekibastuzkommunservice LLP put into operation a sorting complex with a capacity of 40 thousand tons / year.

In the Aksu city, Aksu polygon company carries out sorting (paper, waste paper and plastic) waste, where it is planned to build power lines to the solid household waste landfill (the amount of sale is 25.0 mln. tenge).

In Pavlodar city, Spetsmashin LLP acquired a premise with an area of 3.5 thousand m² for a sorting center with a capacity of up to 100 thousand tons / year.

The state of biological resources and the development of forestry, fishing and hunting industries, specially protected natural areas and ecological tourism

The total area of the forest fund of the region is 478.7 thousand hectares, including those covered with forest - 267.5 thousand hectares.

12.0 mln. seedlings were planted on the territory of the State Forest Fund of republican state institutions (Bayanaul State National Natural Park - 268.0 thousand pieces on an area of 60.3 hectares, Yertis Ormany - 11.6 mln. pieces on an area of 2.6 thousand hectares).

On the ***territory of the State Forest Fund*** of institutions for the protection of forests and wildlife, a spring planting of forest cultures was carried out on an area of 30.4 hectares (135.1 thousand pieces):

- Pavlodar SE - 10.4 hectares, Chernoretskoe forestry, block 34 (along the road from Pavlodar city – Terenkul River);

- Maksimo-Gorkovskoe SE - 10 hectares, Kachirsky forestry, block 27 (along the Omsk-Pavlodar highway);

- Urlyutyubskoe SE - 10 hectares, Tastinskoe forestry, block No. 111,114 (Tasty forest dacha).

On the territory of settlements

In the spring of 2019, within the framework of environmental measures, the Department carried out work to organize the planting of ***pyramidal poplar*** seedlings in the city of Pavlodar (along the road from the side of the Sosnovy Bor summer cottage, starting from the road to the Petrochemical Plant to the Omsk highway) in the ***amount of 1,597 pieces***. An agreement was concluded with Dendro LLP, which provides for planting and caring for the seedlings.

In the fall of this year, on the initiative of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan, an Environmental Hour large-scale action was held throughout the republic.

In our region, this action started on October 3 of this year. In total, within the framework of the action, ***11.0 thousand pieces*** of green plantings were planted on the territory of Pavlodar region, more than 12.0 thousand people took part.

The planting took place at the general educational institutions of the region in order to attract the younger generation to the issues of respect and preservation of natural resources. The students planted more than 6,000.0 ***coniferous and deciduous seedlings*** on the school grounds. Also, a landing was carried out on the territory of the Kenzhekol village (Pavlodar-Semey highway). Akim of the region, as well as specialists of the subsoil use department, Pavlodar institution for the protection of forests and wildlife, students of the local school and school No. 25 in Pavlodar took part in the action. About 5.0 thousand 2-year-old ***pine seedlings*** were planted. The planting material was provided by the Yertis Ormany State Forest Natural Reserve RSE, private nurseries of the city.

On October 12 of this year, the action was continued, ***70.0 thousand pine seedlings*** (2 years old) were planted, including:

- 35.0 thousand pieces along the 20th highway (Pavlodar-Omsk highway, Neftekhim LTD LLP area);

- 35.0 thousand pieces on the site between Aluminum of Kazakhstan JSC and Kazakhstan Electrolysis Plant JSC.

The action was attended by akim of the region, akim of the city, the apparatus of akimat of the region and the city, the subsoil use department and subordinate state institutions for the protection of forests and wildlife, workers of factories, Zhas Otan youth groups. The planting material was provided by the Department of Subsoil Use (*within the framework of environmental programs, an agreement was concluded with Landscape Stone IE*).

In total, in 2019, the Department organized the planting of green spaces outside the territory of the SFF in the amount of 82,597 pieces.

Ecotourism. On the territory of Pavlodar region there are: Bayanaul State National Natural Park; health resort of Kazakhstan - Moyildy health resort; tourist recreation area on the Maraldy Lake in the Shcherbakty district; Tuzkala recreation area in the Akkuly district, numerous natural, historical, archaeological, cultural monuments.

At the end of 2017, the number of accommodation facilities for visitors is 97 units, which have 2,810 rooms, with a one-time capacity of 6,987 beds. They served 147,485 people and rendered services in the amount of 1,852,259.7 thousand tenge.

In 2017, the total number of serviced visitors for domestic and inbound tourism in accommodation places was 147,485 people, which is 33.5% more compared to 2015 (110,456 people). The number of room-nights provided increased by 112.8% or by 37,770 room-nights. The development of tourism in the region until 2020 will be carried out within the framework of the Tourism Development Concept, the Master Plan for the creation and development of the tourist cluster of Pavlodar region until 2020. The priorities for the development of tourism in the region will be: the cluster development model, infrastructure development, improving the efficiency of marketing measures, increasing labor productivity in the sector, and creating new jobs.

2.13. North-Kazakhstan region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

The region occupies 98 thousand km² in the north of the republic. The population of the region is constantly decreasing: as of January 1, 2018 - 558.6 thousand people, at the beginning of 2019 - 554.5 thousand people, and at the beginning of 2020 - 548.8 thousand people. The main directions of development are agriculture, mining and processing industries. The North Kazakhstan region is an agrarian-industrial region with a great potential for the development of agriculture, therefore, the most significant industry is the agricultural industry¹⁵¹.

According to the Committee on Statistics, the volume of the region's GRP in 2017 compared to 2015 increased in nominal terms by 33.1% and amounted to 1,114.0 bln. tenge. GRP per capita – 1,985.9 thousand tenge, which is more than the level of 2015 in nominal terms by 35.4%. In 2018, the GRP of the region was 1,212 bln. tenge, and per capita - 2,177.7 thousand tenge, in 2019, respectively, 1,382.3 and 2,505.9.

The volume of **industrial production** amounted to 240.5 bln. tenge in 2017, 243.0 bln. tenge in 2018 and 263.6 bln. tenge in 2019. In the structure of industrial production, the largest share is occupied by the **manufacturing industry** with volumes of 171.9 bln. tenge in 2017, 171.2 bln. tenge in 2018 and 195.5 bln. tenge in 2019.

The main industrial production is concentrated in the city of Petropavlovsk, district named after G. Musrepov, Tayinshy and Kyzylzhar districts. The least developed industry is in Akzhar, Mamlyut and Zhambyl districts.

In 2019, the number of enterprises and industries in the manufacturing industry amounted to 539 units.

The **agricultural complex** as an industry accounts for 25.3% in the structure of the gross regional product in the regional economy and 11% in the economy of the country's agro-industrial complex.

According to the Committee on Statistics, in 2017 the gross agricultural output amounted to 498.4 bln. tenge, in 2018 - 514.7 bln. tenge, and in 2019 - 610.7 bln. tenge, with the advantage of crop production (73, 7%).

In 2017, the gross harvest of grain amounted to 5,417.4 mln. tons in the originally capitalized weight, which is less than the harvest in 2015 by 130.0 thousand tons (2015 – 5,547.0 thousand tons). The grain yield increased by 0.2 centner/ha in relation to 2015 (2015 - 17.3 centner/ha) and amounted to 17.5 centner/ha in 2017. The highest yield for grain crops in 2017 was obtained in the following districts: M. Zhumabayev district - 21.7 centner/ha, Akkaiyn district - 21.2 centner/ha, Zhambyl and Kyzylzhar districts - 19.9 centner/ha. Indicators for 2018 and 2019 are shown in the table.

151 Hereinafter, the Program for the Development of the North Kazakhstan Region Territory for 2016 - 2020 and reports on its implementation for 2018 and 2019.

The region is one of the main grain-growing regions in the republic, providing up to 30% of grain production, up to 26% of oilseeds, up to 10% of milk, and up to 12% of eggs.

In crop production, as part of the diversification of sown areas in 2018 and 2019, the areas of oilseeds were increased by 261 thousand hectares or by 37% and brought to 976 thousand hectares (in 2017 - 715 thousand hectares), the area of potatoes by 9.6 thousand hectares, or 35%, to 37.4 thousand hectares (in 2017 - 27.8 thousand hectares), vegetables by 1.6 thousand hectares, or 32%, 6.6 thousand hectares (in 2017 - 5.0 thousand ha).

Table 2.13.1. Gross harvest of agricultural crops, thousand tons

Indicators	2018	2019
Cereals and legumes total (in weight after processing)	4,322.7	4,129.1
of which: wheat	2,982.2	2,874.3
Oilseeds - total	908	894.5
Potatoes	590	605.5
Vegetables	207.5	203.6
Yielding capacity, centner/ha		
cereals - total (in weight after processing)	15.5	14.4
including: wheat	15.4	14.2
oilseeds	9.6	9.9
Potatoes	167.6	179.8
Vegetables	333.2	330.8

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture

A total of 4,973.7 thousand hectares of arable land in the region, including irrigated land - 11.4 thousand hectares, of which 4,926.9 thousand hectares and 11.3 thousand hectares are in farming business. In 2019, about 120 thousand tons of mineral fertilizers were applied in the soil, which is 10 thousand tons more than the level of 2018. Herbicide treatment was carried out on an area of 3.4 mln. hectares.

There have been serious shifts in the region, in matters of technical re-equipment of the agro-industrial complex. In 2019, the technical park was replenished with 1,896 units of new high-performance equipment for 37.2 bln. tenge, including leasing of 474 units for 16.5 bln. tenge.

The area of pastures on agricultural land is 1,770 thousand hectares, watered - 691.3 thousand hectares, or 39%.

In 2019, 3 dairy complexes for 1,600 cows were put into operation (Mambetov KT, Shaimerdenov KT and Zagradoyskoe LLP), which will additionally produce 8 thousand tons of milk upon reaching the design capacity.

Development of energy, including renewable energy and energy supply to the population

The power complex of the North Kazakhstan region is represented by the SEVKAZENERGO group, Kokshetau Energo LLP companies.

SEVKAZENERGO JSC (CHPP-2) is the main source of heat energy in Petropavlovsk and electric energy in eight districts of the North Kazakhstan region and in Petropavlovsk city.

The installed electric capacity of the station as of January 1, 2019 is 541 MW, thermal capacity is 713 Gcal / h. The station operates on Ekibastuz coal. The annual demand for coal is 3.1 mln. tons, for fuel oil - 3 thousand tons.

In 2019, SEVKAZENERGO JSC allocated 5.4 bln. tenge for the repair, reconstruction and modernization of equipment at CHPP-2. Reconstruction of the heat power distribution scheme (purchase, installation and insulation of technical pipelines, pumping station equipment, central heating station equipment), modernization of fuel supply, purchased autotransformer No. 6. These

measures will save 1.2 mln. kWh of electricity and increase reliability and parameters of power supply.

Electricity generation by Petropavlovsk CHPP-2 in 2018 amounted to 3,211 mln. kWh, heat - 1,893 thousand Gcal.

North Kazakhstan REK JSC carries out transportation and distribution of electricity for the city of Petropavlovsk and eight northern districts of the region (Akkaiyn, Yesil, Zhambyl, Kyzylzhar, Mamlyutsky, M. Zhumabayev, Timiryazevsky, Shal akyn).

The length of power transmission lines of North-Kazakhstan REK JSC in the region is 13,299 km, the number of substations is 2,411 pcs. Losses of electrical energy in the networks of North-Kazakhstan REK JSC in 2018 amounted to 8.39% against 9.05% of the level of 2016. There are no excess losses. Depreciation of power grids in 2018 was reduced by 5% and amounted to 64.8% (69.8% in 2016).

In 2018, within the framework of the investment program, overhaul and reconstruction of 1.2 thousand power supply networks and 138 substations were carried out in North-Kazakhstan REK JSC, which will have a positive effect both on the reliability of power supply, and on increasing throughput and connecting new electricity consumers.

In 2019, 1.68 bln. tenge was allocated for the repair and reconstruction of power supply networks. Overhaul of 1,033 km of networks, 111 substations has been completed. At the same time, the reconstruction of the 0.4-10 kV power transmission line, substation No. 3 in Petropavlovsk was carried out, and the introduction of ASFEM was continued. Construction of a 110 kV overhead line Novomikhaylovka-Liteynaya is underway. This transmission line will connect the substations Sibir, Novomikhaylovka and Liteynaya, which will increase the reliability of the consumers of SKREK JSC and traction substations of the South Ural Railways, as well as reduce the shortage of electricity to consumers.

Kokshetau Energo LLP carries out transmission and distribution of electric energy in five southern districts of the North Kazakhstan region (Aiyrtau, Akzhar, named after G. Musrepov, Tayinshy, Ualikhanovsky). The balance of the enterprise includes 10.47 thousand km of overhead and cable power lines, 1,749 substations and transformer stations. Electricity losses in the networks of Kokshetau Energo LLP in 2018 amounted to 17.79%, which is 0.5% less than in 2016 (18.29%). There are no excess losses. Depreciation of electrical networks in 2018 was reduced by 4.1 percentage points and amounted to 52.3% (2016 - 56.4%). In 2019, 559.5 mln. tenge were allocated for repair and reconstruction. Overhaul of 730 km of networks, 97 substations was completed.

From **alternative sources** in the North Kazakhstan region there is the Sergeevskaya HEPP with a capacity of 2.26 MW. Kazakhtelecom JSC for backup power supply of production facilities in two districts of the region - Akzhar and Ualikhanovsky installed three wind-solar power complexes with a total capacity of 9.4 kW. In 2012, Zenchenko and K limited partnership in the Novonikolskoye village, using its own funds, installed two wind power plants with a total capacity of 1.5 MW (2×750 kW), and in the 1st quarter of 2015, two wind power plants of the NEG MICON German company with a capacity of 1 MW were launched. In 2017, the Millennium and Magzum peasant farms in the Aiyrtau district, the Baishagirov IE and the Aldongarov farm in the Akzhar district introduced solar panels for their own needs.

In 2018, 26 new facilities for the use of renewable energy sources were commissioned in the region, including 22 boilers operating on straw and 4 charging stations for mobile devices in Petropavlovsk, powered by solar panels.

In total, in 2018, electricity generation by renewable energy sources amounted to 20.7 mln. kWh, which is 1% more than in 2017 (20.5 mln. kWh). The share of electricity generation by renewable energy facilities in the total electricity generation was 0.65%.

In 2018, within the framework of the implemented system of auction tenders for renewable energy sources, the EnergoTrust LLP and Ivan Zenchenko LLP projects have been identified as winners in the North Kazakhstan region for the construction of wind power plants with a total capacity of 52 MW.

On October 8, 2019, Ivan Zenchenko LLP put into operation 2 wind generators with a total capacity of 2 MW. In total, at the end of 2019, the region has 151 facilities for the use of renewable

energy with a total capacity of 58 MW (Sergeevskaya HEPP - 2.26 MW, 4 wind generators of Zenchenko & C KT with a total capacity of 3.5 MW, 2 wind generators of Ivan Zenchenko LLP - 2 MW, 105 bio-boilers - 50 MW).

Heat supply. According to the Committee on Statistics, in 2019 the total length of heating networks in the region was 374.2 km, of which dilapidated - 194.5 km (52%), 130.4 km (34.9%) need to be replaced, replaced - 9.6 km.

The main activity of Petropavlovsk Heating Networks LLP is the transportation and distribution of heat energy to consumers in Petropavlovsk city. Depreciation of heating networks in Petropavlovsk in 2018 amounted to 69.9%.

Gas supply. In the North Kazakhstan region, only liquefied petroleum gas is used for industrial and domestic needs. The main suppliers of liquefied gas to the North Kazakhstan region are Roka LLP, Gorgaz-service LLP, Raigaz LLP, Alys Gaz LLP, Alnur Gaz LLP, Oblgaz LLP, Daniyar-Bidai LLP accredited organizations. The main gas supplies are carried out from CNPC-Aktobemunaigas LLP, Pavlodar Oil and Chemical Plant LLP. The supply of liquefied gas to the population and enterprises in the districts of the region is carried out through gas cylinders, auto gas filling stations and group tank units. The supply of liquefied gas in the city of Petropavlovsk to multi-storey buildings through group tank units is carried out by Gorgaz-service LLP. Gorgaz-service LLP enterprise is servicing 327 gas-distributing units, 460 km of gas pipelines. The enterprise supplies gas to 725 multi-storey buildings in Petropavlovsk city. The number of subscribers is 55 thousand.

In order to reduce the harmful impact on the environment, as well as to diversify fuel supplies to the region, a project is being implemented to build the Liquefied Natural Gas Regasification Complex in Petropavlovsk city. The complex with a capacity of 4 mln. cubic meters of gas per year by delivery from Yekaterinburg city and by conversion it to the gaseous state through regasification units will ensure uninterrupted gas supply through the newly built gas pipeline to Molprodukt LLP, which previously operated on diesel fuel. The project, totaling 300 mln. tenge, is being implemented by Global Gas Group LLP. The launch of the facility is scheduled for January 2020.

Decrease in GRP energy intensity. In 2017, the energy intensity of the region's GRP was 0.3 toe per thousand US dollars in 2000 prices and decreased by 28.6% compared to 2015.

The regional akimat has developed and by the decision of the maslikhat dated April 19, 2016 No. 2/3 has approved the Comprehensive Energy Saving Plan for the North Kazakhstan region for 2016-2020. In 2018, within the framework of this Comprehensive Plan, enterprises and organizations of the region carried out activities in the amount of 11.2 bln. tenge, the resulting effect amounted to 210 thousand tons of oil equivalent.

Enterprises in the energy sector have carried out such major activities as replacing the autotransformer, reconstructing the heat output scheme at CHPP-2, reconstructing main and distribution heating networks using pre-insulated pipelines, restoring the insulation of heating networks pipelines, modernizing and reconstructing the main and auxiliary equipment of power supply networks, including reconstruction of a 0.4 kV overhead line with the replacement of bare wire with SIW wire. The costs for these activities amounted to 8.76 bln. tenge, savings of 202 thousand tons of oil equivalent were obtained.

Industrial and transport enterprises allocated 1.46 bln. tenge for the implementation of energy saving measures. At the enterprises, old equipment was replaced with less energy-intensive ones, incandescent lamps were replaced with energy-saving ones, measures were taken to warm the premises. The economic effect from the implementation of these measures amounted to 5,116 toe.

In 2018, at the expense of the World Bank, energy-saving measures were carried out at 4 budget facilities, and at the expense of UNDP grants, 2 residential buildings were modernized.

3.7 thousand lamps were replaced with LED lamps (in Petropavlovsk city - 3.3 thousand pcs.) in the region for 2017 - 2018, which save up to 50%.

Condition of water supply and sewerage, provision of the population with centralized water supply and disposal

The water resources of the region are made up of the resources of the Yessil River with the Akkanburluk and Imanburluk tributaries, the Selety, Chaglinka, Kamysakty, Ashisu, Karasu rivers and

other watercourses, there are 2,395 water bodies, 491 water bodies are included in the list of fishery, of which 332 are leased. Surface runoff of the Yessil River is used for water supply of the city of Petropavlovsk, rural settlements of the North Kazakhstan region, irrigation of summer cottages, etc. Within the region, the river bed is regulated by the Petropavlovskoye and Sergeevskoye reservoirs. The total capacity of the two reservoirs under the project is 712.2 mln. m³, of which Sergeevskoye - 693 mln. m³, Petropavlovskoye - 19.2 mln. m³. On the territory of the region, there are about 2,148 lakes, which are an integral part of the landscape of the region. The total area of the water surface of the lakes reaches 275 thousand hectares. The largest lakes are: Siley-Teniz (area – 68,000 ha), Teke Lake (22,200 ha), Shagly-Teniz Lake (20,572 ha), Ulken Karoy Lake (19,700 ha), Imantau Lake (5,423 ha), Zhaksy Zhangiztau Lake (4,128 ha), Boshoy Tarangul Lake (3,475 ha).

Water supply. In the North Kazakhstan region there are two large water supply enterprises - the Yessil su branch of the Kazvodhoz RSE and the Kyzylzhar su LLP. Additionally, in each district of the region there are operating enterprises that provide water supply and disposal services.

At the beginning of 2019, 394 rural settlements (60.7%) with a rural population of 253.5 thousand people (81.6%) were provided with centralized water supply, 255 rural settlements (39.3%) with a population of 57.3 thousand people were not provided with centralized water supply (18.4%). In general, the provision of the population of the region with centralized water supply is 89.8% (rural - 81.6%). The 5 cities in the region are fully provided with centralized water supply.

Within the framework of the Program "Regional Development until 2020", in 2019, 2,691.6 mln. tenge were allocated for the construction and reconstruction of water supply and disposal facilities (RB – 2,637.5 mln. tenge, LB - 54.1 mln. tenge). Developed 100%.

Through the Committee on Water Resources of the Ministry of Ecology, Geology and Natural Resources, the implementation of 3 projects for the reconstruction of group water supply systems (Sokolovsky group water supply system (2nd stage), Presnovsky group water supply system (1,2 stage)) continued. Additionally, at the expense of the regional budget, water supply networks have been restored in 41 villages of the region. Thus, as a result of the work done in 2019, water was supplied and water supply improved in 48 villages with a population of 29 thousand people.

As of January 1, 2020, out of 635 villages in the region, 396 villages (or 62.4%) with a rural population of 253.9 thousand people (or 81.7%) were provided with centralized water supply, 239 (37.6%) rural settlements with a population of 56.9 thousand people (18.3%) were not provided.

In general, the provision of the region's population with centralized water supply is 89.9%. The total length of 4 group water supply systems is 3,092 km, of which Bulaevsky – 2,092 km, Ishimsky - 553 km, Presnovsky - 214 km, Sokolovsky - 233 km.

In 2020, 7.9 bln. tenge will be allocated for water supply. In total, it is planned to supply water and improve water supply in 59 settlements with a population of 51 thousand people. In general, it is expected that access of villages to centralized water supply by the end of 2020 will be 62.8%, rural population - 82.1%.

Water disposal is carried out in the cities of Petropavlovsk, Sergeevka, Bulaevo and in 5 rural settlements (Saumalkol, Yavlenka, Pokrovka, Beskol and Novoishimskoe). The water disposal system of the city of Petropavlovsk includes a complex consisting of collectors, sewage treatment facilities and waste water storage, allowing to regulate the accumulation.

Every year, due to the construction of new water supply facilities, the number of villages provided with centralized water supply increases. The construction of water supply facilities is carried out within the framework of the state program "Regional Development until 2020".

In 2017, within the framework of the Regional Development until 2020 program, 6.9 bln. tenge was allocated for water supply. At the end of 2017, water was supplied to 3 villages, access of villages to centralized water supply was 57.5%.

In 2018, 5.4 bln. tenge was allocated for the construction and reconstruction of water supply and disposal facilities from all sources. As a result of the measures taken in 2018, water was supplied and water supply improved in 38 villages with a population of 25 thousand people, access to centralized water supply in villages reached 59.6% (population access - 81.4%).

Reconstruction and construction of local water supply facilities, distribution networks and group water supply systems was carried out, the restoration of previously operating water supply networks in the districts of the region was carried out.

9.1 bln. tenge was allocated for the construction and reconstruction of water supply and water disposal facilities in 2019. The implementation of these projects will allow water supply and improve water supply in 32 villages with a population of 26.5 thousand people and 32 thousand residents of the regional center.

State of the environment, reduction of air and water pollution

For 2017 - 2019, according to the stationary observation network, the level of atmospheric air pollution in the city of Petropavlovsk was assessed as low in 2017 and 2019 (APS is 3-4) and as high in 2018 (APS = 7). SI = 28 in 2017 (> 10 very high level) and 6 (high level) in 2018-2019. HR = 1 - 4% (raised level).

In 2017, in the **Tayinsha, Saumalkol and Bulaevo** settlements, according to the data of expeditionary observations, the maximum concentrations of sulfur dioxide were observed, respectively: 1.08 MPC, 1.3 MPC, 1.6 MPC, in 2018 - in the **village of Beskol** sulfur dioxide was 2.44 MPC.

In 2019, the concentrations of all pollutants according to observation data in the villages of Tayinsha, Saumalkol, Bulaeva, Beskol were within the permissible norm.

In 2018, emissions of pollutants into the air from stationary sources amounted to 75,113 tons (data from the Committee on Statistics). The largest pollutant in the region is Sevkazenergo JSC, emissions of pollutants into the atmosphere from stationary sources amounted to 37,381 tons, which is 48% of the total volume of emissions in the region.

As a result of the joint work of the Department of Natural Resources and Environmental Management of the Akimat of the North Kazakhstan Region and the Department of Environmental Protection, it was possible to reduce the limits from 140 thousand tons of emissions into the air in 2016 (the set target indicator for 2017 is 141 thousand tons), to 116 thousand tons in 2017, the volume of the decrease was 24 thousand tons.

An action plan has been developed in the region and work is underway to reduce the permitted volume of emissions for objects of I, II, III and IV categories approved by state bodies in the field of environmental protection. So, the established target indicator for 2018 for emissions into the air was 129 thousand tons, the limit set by permits for emissions was 116.7 thousand tons.

The established target indicator for 2019 for air emissions is 126 thousand tons. The actual volume of emissions was 74.7 thousand tons.

Every year, natural resource users, within the framework of fulfilling their obligations under the terms of permits for emissions into the environment, take measures under the section "Air basin protection". Measures are being taken to prevent and reduce emissions of pollutants from stationary and mobile sources, commissioning, repair and reconstruction of dust and gas cleaning plants designed to capture, neutralize harmful substances from technological equipment and aspiration systems.

Also in the region, work is underway to switch over vehicles to gas fuel, which also reduces air emissions. As of January 1, 2019, the number of vehicles using NGV fuel is 10,507. Compared to 2017, the growth is 34.4% (in 2017 – 7,816 units). There are 114 gas filling stations in the region.

Observations of surface water pollution on the territory of the North-Kazakhstan region were carried out on the Yessil River and Sergeevskoe water reservoir.

The limits on discharges of pollutants into water bodies were reduced from 114 thousand tons in 2016 (the target indicator for 2017 was 114 thousand tons), to 96 thousand tons in 2017, the volume of the decrease was 18 thousand tons. The measures are to ensure the reduction of the permitted volume of emissions by 8-10% annually.

Production and consumption waste management and waste processing

In 2018, in the North Kazakhstan region, the share of solid household waste processing was 7.6%, in 2017 - 2.6%. 57% of the population is covered by services for the collection and removal of solid household waste.

Out of 468 solid household waste disposal facilities in 2018, only 14 met environmental and sanitary requirements and standards, which is 2.99%.

Developed and approved by the decree of the regional akimat dated September 4, 2018 No. 256 "A set of measures for modern utilization and processing of solid household waste with the wide involvement of small and medium-sized businesses for 2018 - 2022 in the North Kazakhstan region".

In Petropavlovsk city, a separate collection infrastructure is being developed:

- to collect plastic, waste paper, glass, cans - 500 containers are installed at container sites in the city, 100 - in private enterprises and state institutions;

- to collect waste paper, storage containers have been installed in 8 schools, in other institutions there have been installed about 800 eco boxes.

- 54 containers are installed to collect waste electronic and electrical equipment (40 of them are at container sites and 14 are near shopping centers);

- 30 special containers are installed to collect used fluorescent lamps.

Also there are 3 stationary points of reception of recyclable materials organized and functioning in the city.

In Saumalkol village of Aiyrtau district, an individual entrepreneur Gladkikh IE, organized a collection point for recyclable materials, in the Beskol village of Kyzylzhar district installed 16 containers at container sites and 20 containers in the Talshik village of Akzhar district.

Raduga LLP carries out the processing of secondary polymers with the release of popular consumer goods.

Petropack LLP processes secondary polymers with an annual volume of 200 - 250 tons, with the release of the final product (bags with a logo).

In December 2018, in Petropavlovsk city, Raduga LLP increased the capacity for processing secondary polymers. The modern plant is the only one in Kazakhstan that has a full cycle of plastic processing, starting from collection, sorting, processing and manufacturing of finished products. A wet wipes workshop was also launched. Secondary raw materials for processing are collected from all regions of Kazakhstan and neighboring regions of Russia. The volume of production of household goods made of plastics is up to – 2,000 tons per year, plastic film – 3,340.8 tons per year, stretch film - 111.28 tons per year, polyethylene pipe – 1,023.12 tons per year, bags – 1,722.96 tons per year, wet wipes - 55 kg per hour.

In the regional centers of Aiyrtau, Akzhar, Kyzylzhar, Mamlyutsk districts, collection points for recyclable materials have been organized.

In 2017, 6 actions and events were held aimed at attracting the attention of the population to problems in the field of waste management, the introduction of separate waste collection, in 2018 events were held 12.

The issue of construction of a waste sorting complex with a capacity of 70 thousand tons per year is being worked out within the framework of a public-private partnership. An investment proposal is being finalized, after an economic examination, a two-stage competition will be held to determine a private partner. The delivery of a waste sorting line for the complex is planned by Operator ROP LLP.

Agricultural enterprises that have accumulated pesticide containers transfer this waste to specialized waste disposal companies (waste disposal is paid by the pesticide supplier). Waste suppliers control the delivery of waste by agricultural enterprises to specialized organizations with the signing of acceptance act for the transfer of waste.

Within the framework of the budget program "neutralization of pesticides" in 2018, 6,041 pieces of containers from pesticides were disposed in the amount of 2,447.9 thousand tenge; and in 2019, 4,452 thousand tenge were allocated under this program for the disposal of 8,414 pcs. of containers.

The aim of the program is to prevent harmful effects on human health and the environment through the disposal of containers from pesticides.

The state of biological resources and the development of forestry, fishing and hunting industries, specially protected natural areas and ecological tourism

As of January 1, 2019, the state forest fund under the jurisdiction of the Akimat of the North Kazakhstan region is 549,577 hectares, of which the forested land is 435,829 hectares or 79%. The forest cover of the region is 5.5%.

The main forest-forming species are birch (87%), aspen (7%), of the total, about 11% is occupied by artificial plantations of pine, birch, larch, elm species, maple, ash. The total stock of wood of the main forest-forming species is 38 mln. 943 thousand cubic meters.

To achieve it, it is necessary to fulfill the main target indicator, namely, the areas covered with forest plantations and under the jurisdiction of the akimat by 2020 should be preserved and increased.

Every year, forestry enterprises carry out activities for the reproduction of forests on the territory of the state forest fund of the region.

In 2018, planting was carried out in forests on an area of 721 hectares against the plan of 580 hectares, in addition, measures were taken to promote natural reforestation on an area of 680 hectares. In total, forest reproduction was carried out on an area of 1,401 hectares, with a planned indicator of 1,065 hectares (131%).

The planned target for forest reproduction for 2019 is 1,185 hectares, of which planting forests - 700 hectares (372 hectares - in the spring, 328 hectares - in the autumn), measures to promote natural forest regeneration - 485 hectares (in the autumn).

In 2019, 2,800 thousand seedlings were planted in the region by forestries and forest users of long-term forest use on an area of 700 hectares. In order to protect forest areas, preventive fire-fighting measures were carried out in the following volumes: arrangement of fire barrier line was completed – 1,345 km; maintenance of fire barrier line – 26,560 km was completed.

In the forests of the region, in order to preserve and increase the stability of plantings, increase their productivity, reduce the infectious background of diseases, sanitary and recreational activities are carried out. At the beginning of 2018, foci of distribution of forest pests on a total area of 228 hectares were active in the region. In June 2019, new foci of forest pests - aspen corydalis on a total area of 62.2 hectares - were discovered by Burluk Forestry Municipal Institution. During 2018, state forest owners carried out ground-based extermination measures throughout the entire area. As a result of the measures taken, there is an annual and significant decrease in the area of distribution of forest pests.

In 2018, almost throughout the entire territory of the North Kazakhstan region, as a result of heavy rainfall in the period of 2014 - 2018, groundwater rose. As a result, wet spots formed on an area of more than 14 thousand hectares.

Forest institutions are taking the necessary measures to reduce wet spots, and first of all, this is the conduct of sanitary felling of dead plantations. In 2018, 2,481 hectares of wetted forests were cut down, timber in the amount of 240 thousand cubic meters was used to provide the population with fuel wood.

Forest resources are provided to forest users for long-term or short-term use, depending on the type of forest use. Annually about 450-500 thousand cubic meters are developed in the region, of which about 40% are developed by forest users of long-term forest use. For the period of forest use from 2004 to 2018, forest users contributed to the budget a payment for forest use in the amount of more than 950 mln. tenge, purchased 60 tractors, 74 cars, 3 fire trucks, 3 loaders. A material and technical base for wood processing has been created - 28 woodworking workshops have been organized, 35 sawmills, 3 lines for the production of technological chips, 114 woodworking machines and 5 crushing plants have been installed. More than 500 people are employed on a permanent basis.

Every year, forest users process 100 thousand cubic meters of local timber and every year the volume of deep processing is increasing. The range of products is about 40 items, and work on expanding the range is ongoing, depending on the demand of the population.

Development of fishing and hunting industry

The total number of reservoirs in the region is 2,393, of which 491 are included in the list of fisheries. 332 reservoirs have been transferred for use of the animal world.

The total quota for catching fish resources in the fishery reservoirs of the North Kazakhstan region from February 15, 2019 to February 15, 2020 is 1,070.06 tons. The following fish species live in the reservoirs: crucian carp, bream, carp, whitefish, pike, perch, tench, roach, pike perch, burbot.

The territory of the region is divided into 47 hunting grounds, 37 of them are transferred for use of the animal world.

The quota for the taking of wildlife objects from July 1, 2019 to July 1, 2020 in North Kazakhstan region: Siberian roe deer – 1,017, wild boar - 167, maral - 7, fox – 2,496, corsac - 144, beaver - 4, marmot - 379, muskrat - 459, hares – 7,984, badger - 290, raccoon dog - 15, geese – 5,457, ducks – 35,356, coot – 6,567, sandpiper - 318, black grouse - 672, partridge - 678, quail - 567, pigeons - 150.

In 2019, 4 foreign hunters from Germany and the Russian Federation visited the region. For them, a trophy hunt for a male Siberian roe deer and waterfowl is organized.

Specially protected natural areas. The total area of specially protected natural areas in the North Kazakhstan region is 601,772 hectares, including:

- 12 natural monuments of republican significance with an area of 181 hectares - “Zhanazhol forest” - 9 hectares, “Silver forest” - 83 hectares, “Pine forest” - 26 hectares, “Eagle Mountain and Spring” hill - 3 hectares, Island of Lake Imantau, “Kazachiy Island” - 34.4 hectares, “Obozrenie” hill - 3.9 hectares, “Kotelok” rock deposit - 3.3 hectares, relic massif - 2.0 hectares, Sharp hill - 3.0 hectares, “Two Brothers” - 10 hectares, “Waterfall with a cave” - 0.5 hectares, “Broken Hill” - 2.0 hectares.

- 6 nature refuges with an area of 467,140 hectares.

- 4 refuges of republican significance - with an area of 429,950 hectares.

- 2 nature refuges of local significance with an area of 37,190 hectares (Aksuat (zoological) – 10,508 hectares, Akzhan (zoological) – 26,682 hectares), including 1 botanical refuge of republican significance with an area of 3,450 hectares.

The predominant species in forests on the territory of state natural monuments, incl. Orlinogorsk botanical refuge are relict pine plantations, while on the territory of state natural refuges (zoological) are birches. Economic activity is limited. Forest protection and fire-prevention measures are allowed. The use of natural monuments is recommended for recreational purposes.

Specially protected natural areas under the jurisdiction of the Akimat of the North Kazakhstan region as of January 01, 2019:

- 6 nature refuges of republican and local significance (Sogorovsky, Smirnovsky, Mamlyutsky, Akzhan, Aksuat, Orlinogorsky);

- 4 state natural monuments (Pine forest, Silver forest, Zhanazhol, Eagle Mountain and Spring).

The main goal of forestry is the conservation and rational use of forest resources and the development of a system of specially protected natural areas.

Activities are being taken to increase the efficiency of protective measures in forests, as well as work on forest reproduction, increase their productivity and develop afforestation.

By the Decree of the Government of the Republic of Kazakhstan dated May 31, 2019 No. 360, the State Program for the Development of the Tourism Industry of the Republic of Kazakhstan for 2019-2025 was approved, within the framework of which TOP-10 projects of republican significance were identified, which included the Imantau-Shalkar resort zone of the North Kazakhstan region, as one from the priority tourist areas of republican significance.

In the Imantau-Shalkar resort area in 2019, the implementation of 5 investment projects for 1.4 bln. tenge was launched. 3 new recreation centers were put into operation: on the Shalkar Lake - "Emerald" (80 mln. tenge); on the Imantau lake - "Lake House" (150 mln. tenge), "Adel" (180 mln. tenge) with a year-round operation, one-time capacity of 130 beds. Reconstruction of the Shalkar Su sanatorium has begun.

Information about the tourist potential, facilities with geolocation, tour routes is gathered in a visit.sko single tourist portal visit.sko.

2.14. Turkestan (South Kazakhstan) region

Territory, population and GRP of the region. The share of industry and agriculture in the GRP. Diversification of the economy

On June 19, 2018, by Decree of the President of the Republic of Kazakhstan No. 702, the South Kazakhstan region was renamed Turkestan, and the city of Turkestan became its administrative center. The territory of the Turkestan region is 116.1 thousand square km. The population of the region is 1,963.4 thousand people, on average the population density per 1 sq. km of territory is 16.8 people. In 2019, the population was 2,016 thousand people.

According to the Committee on Statistics, the gross regional product of the South Kazakhstan region had the following indicators: in 2015, the volume amounted to 2,508.4 bln. tenge, and in 2017 it increased up to 3,187.7 bln. tenge.

The low GRP per capita in the South Kazakhstan region was due to the high population of the region. In 2013 - 2015 it grew by 13%, amounting to 1,097.7 thousand tenge in 2017.

In the Turkestan region in 2018, the GRP amounted to 1,660 bln. tenge, the main share is industry - 20.4%, agriculture - 15.0%, other services - 27%. In 2019 – 2,016.1 bln. tenge, per capita – 1,008.1 thousand tenge¹⁵².

Production sector plays an important role in the economy of the region. In the South Kazakhstan region in 2017, this industry employed 5.1% of the total employed population of the region, and the industry's share in the GRP structure was 24.4%, with a volume of 832.1 bln. tenge according to the Committee on Statistics.

In 2015, labor productivity in the manufacturing industry per person was 54.4 thousand US dollars per person employed, in 2017 - 44.2 thousand US dollars per person employed and the growth index by 2015 was 106.7% (data for the South Kazakhstan region). Within the framework of the Entrepreneurship Support Map in the South Kazakhstan region in 2015 - 2017, 60 investment projects were implemented in the amount of 81.8 bln. tenge (2.5 thousand jobs). Labor productivity in the manufacturing industry of the Turkestan region at the end of 2019 amounted to 26.9 thousand US dollars/person.

In 2018, industrial enterprises of the Turkestan region produced products for 438.6 bln. tenge, and in 2019 - 505.0 bln. tenge, including products of the manufacturing industry for 213.8 bln. tenge (2017 for South Kazakhstan region – 575,8 bln. tenge), for 2019 - 244.6 bln. tenge.

The development of the mining industry is associated with the export-oriented mining of minerals, primarily uranium. In addition, the construction of the international transport corridor "Western Europe-Western China" and the international M-39 "Almaty-Tashkent-Termez" highway influenced the development of the mining industry, which caused demand for the extraction of nonmetallic minerals.

The extraction of metal ores is carried out in the Sozak and Otyrar districts. And, in other districts and cities (except for Maktaaral, Zhetysay and Shardara districts) widespread minerals are mined.

The manufacturing industry in the region is based on food production, metallurgy, production of other non-metallic mineral products and mechanical engineering.

At the end of 2017, the share of **agriculture** in the gross regional product of the region was 9.5%, in 2018 in the Turkestan region it was 19.5%.

Labor productivity per employee in 2016 amounted to 1,430 thousand tenge, or an increase of 42.5%. In 2017, the number of employees in forestry, agriculture and fisheries amounted to 180.3 thousand people, labor productivity per employee amounted to 1,552 thousand tenge, an increase of 8.5%. In 2018, in the Turkestan region, the number of workers in forestry, agriculture and fisheries amounted to 172 thousand people, labor productivity per employee amounted to 1,726 thousand tenge, an increase of 11.2% (2019 - 2,077.8 thousand tenge).

According to the Committee on Statistics, in 2017 the volume of agricultural products amounted to 505.3 bln. tenge compared to the previous year, increased by 102%, in 2018 - 548.7 bln. tenge, and in 2019 it amounted to 614.0 bln. tenge, with the advantage of crop production (55.7%).

¹⁵² Hereinafter, the Program for the development of the Turkestan region territory for 2018 - 2023 and reports on its implementation for 2018 and 2019.

The transition of agriculture to highly productive methods. Reduced water costs and increased yields. Development of organic agriculture

The land fund of the region as of 01.01.2018 amounted to 11,725.8 thousand hectares. The area of agricultural land was 10,123.0 thousand hectares.

In 2018, the land fund of the Turkestan region amounted to 11,609.5 thousand hectares. In the general structure of the land fund of the region, agricultural lands make up 4,068.4 thousand hectares, land of settlements - 777.4 thousand hectares, industrial, transport and communications, defense and other non-agricultural lands - 98.1 thousand hectares, lands of specially protected natural areas - 430.9 thousand hectares, forest lands – 3,010.3 thousand hectares, water fund lands - 133.2 thousand hectares, reserve lands – 3,091.0 thousand hectares.

In 2017, the akimats of districts and cities carried out inventory work on agricultural land, as a result: unused land plots of 281 land users with a total area of 68.3 thousand hectares were revealed (including arable land - 18.4 thousand hectares, pastures - 49.9 thousand hectares).

Of these, at this time, the following measures have been taken on unused land plots:

- lands of land users on an area of 15.4 thousand hectares (of which arable land is 1.0 thousand hectares, pastures are 14.4 thousand hectares) returned to state ownership;
- after the adoption of response measures on an area of 1.5 thousand hectares (of which arable land is 0.4 thousand hectares, pastures are 1.1 thousand hectares), land users started using their lands;
- land on an area of 0.3 thousand hectares is registered as ownerless property;
- land materials on an area of 3.4 thousand hectares (of which arable land is 1.4 thousand hectares, pastures are 2.0 thousand hectares) subject to return to state ownership are in the work of authorized bodies for land relations of districts, cities;

For the rest, 47.7 thousand hectares of land plots remaining in the context of districts and cities (of which arable land 15.4 thousand hectares, pastures 32.3 thousand hectares), the regional land inspection department is taking measures to return land to state ownership in compliance with legislation.

In 2014 – 2016, 343 units of mine wells and bores were built and restored by farms to water pastures. In 2017, 263 wells (bores) were built, or 235% of the plan.

In crop production, work continues on the implementation of structural and technological diversification, expansion of the acreage of priority agricultural crops. With the aim of developing animal husbandry, preference is given to increasing the area of forage crops. So, in the period from 2012 to 2017 in South Kazakhstan region, the sown area of agricultural crops increased by 84.1 thousand hectares, thereby making up 826.3 thousand hectares (the share of the region in the total sown area of the country is 3.7%), this is 52 thousand ha more than in 2013.

In the Turkestan region, drip irrigation has been introduced on a total area of 64.4 thousand hectares (the region's share in the republic is 72%). Greenhouses are built on a total area of 1,286 hectares (the region's share in the republic is 80%). In order to increase the volume of agricultural production, in recent years, work has been actively carried out on the introduction of modern moisture and resource-saving technologies in crop production and the transition to progressive innovative methods. Deep loosening was introduced in 2017 on an area of 100.9 thousand hectares, which is 2.0 thousand hectares more than in 2014 and 52 times more than in 2012 (2012 - 2 thousand hectares).

In 2017, 3,022 units of small feedlots, a total of 12.2 thousand units, 793 units of family dairy farms, a total of 2.7 thousand units, 18 units of family poultry farms, a total of 38 units were created. Also, 655 agricultural cooperatives were created and operated. According to the state program, it was envisaged to create 75 cooperatives, in fact, 158 units were created, or the indicator was exceeded by 2.1 times.

Development of energy, including renewable energy and energy supply to the population

Power supply. Electricity production in 2017 in South Kazakhstan region amounted to 613.3 mln. kWh, and in 2018 in the Turkestan region - 393.7 mln. kWh. Electricity is generated by the following power plants: Shardarinskaya HEPP JSC, 3-Energoortalyk JSC, Kentau Service PSE, Kelesgidrostroy LLP, Aksuenergo LLP, Salem Consulting LLP. The total capacity of these stations is 268.74 MW.

Turkestan region is a deficit region in terms of electricity. Average daily consumption of electricity in the region in winter is 250 - 300 MW, in summer 200 - 250 MW. The deficit is covered by the transportation of electricity from the northern regions and Zhambyl SDPP. The main consumers are residents, who make up 70% of all consumed energy.

The regional electric grid company Ontustik Zharyk Transit LLP is responsible for the distribution of electricity in the region. The total length of overhead lines in the region is 23,245.5 km, the number of intermediate stations and transformers is 5,743 units. On the balance of Ontustik Zharyk Transit LLP, according to general calculations, there are 90.8% of electrical lines, equipment (21,120.5 km of electrical lines and 4909 units). Depreciation of electrical lines and equipment as of October 1, 2018 is 56%. In the region, out of 844 settlements, 828 are provided with centralized power supply networks, and 16 settlements are distant livestock breeding and are electrified from autonomous power plants (gasoline, diesel, wind power plants).

In the region, Ontustik Zharyk Transit LLP, at its own expense, is carrying out work on the implementation of the ASFEM system, in this direction, as of 01.01.2018, 19,648 electricity meters were installed (individuals – 18,777 meters, legal entities - 531 meters, technical accounting - 340 meters).

In 2017, 704.5 km of electric lines were modernized for 4.9 bln. tenge, and 128 equipment was reconstructed. As a result, the wear and tear of electrical lines decreased from 55% to 53%. For the construction of 59 power supply facilities, 13.9 bln. tenge was allocated from the budget. As a result, the number of settlements provided with low-quality power supply decreased from 198 to 113 settlements. 85 settlements or 87,100 residents were provided with high-quality electricity. This indicator is 11 times higher compared to 2016 (2016 - 9 settlements).

In 2017, construction work was carried out at the substations Bozaryk 220/110/10 kV and "Astana-1.2" 110 kV. They were commissioned in 2018. As a result, 430 thousand people and social facilities and objects of medium and small business will be provided with high-quality power supply. Also, in 2017, construction work of the Kyzylasker 220/100/10 kV substation began in the Saryagash district (the total estimated cost is 7 bln. 761 mln. tenge). As a result, consumers of the Maktaral district (305 thousand people), Shardara district (80 thousand people) and Saryagash district (320 thousand people) will have their electricity shortages eliminated, and the economy of these regions will be provided with high-quality and stable electricity.

In 2018, 3.9 bln. tenge was provided for the construction of 22 power supply facilities (of which: republican budget - 2.3 bln. tenge, regional budget - 1.6 bln. tenge).

In order to fully solve the provision of consumers with uninterrupted, high-quality electricity in the Maktaral, Zhetysai, Keles, Saryagash and Shardara districts, the construction of the 220/110/10 kV Kyzylasker substation in the Saryagash district began in 2018. The construction completion date is 2020. The total estimated cost is 7.76 bln. tenge. It is also planned to build 2 substations 220 kV (in Turkestan and Ordabasy districts) and 3 substations 110 kV (Turkestan and Zhetysai districts).

From **renewable energy sources** in the region there are 4 small hydroelectric power plants with a total capacity of 6.8 MW, 4 solar power plants with a total capacity of 3.2 MW. Memorandums of understanding and cooperation were signed with investors from China and Turkey for the construction of solar power plants (150, 200 and 250 MW).

Construction by EsoProTech-Astana LLP of a solar power plant with a capacity of 20 MW has begun in the Saryagash region. Also, the construction of a solar power plant with a capacity of 4.8 MW has begun by KaDi Company LLP in the Maktaral district. From 2019, it is planned to build a small hydroelectric power plant with a capacity of 2.5 MW in the Saryagash region. It is also planned to build 4 solar power plants with a capacity of 5, 10, 35 and 14 MW, respectively, in Maktaral, Tolebi, Otyrar districts and Arys city.

The solar power plant "SPP" Zhetysay" with a capacity of 4.8 MW, the construction of which began in 2019, was commissioned in the Zhetysay district in April 2020. During the construction of the power plant, bifunctional double-sided panels were used using a single-axis morning-evening tracker system with a fixed angle. The use of a tracker system will increase the power plant's output by up to 30%. The construction was carried out on the territory of a former landfill with an area of 10.7 hectares.

The region has a large wind energy potential. According to the UNDP international organization, there is a possibility of building wind power plants with a capacity of 250 MW on the territory of Baidibek, Tyulkubass and Kazygurt districts.

In the Baidibek district in the village of Zhuzimdik, Vetropark-Zhuzimdik LLP is developing a feasibility study for the construction of a wind power plant with a capacity of 40 MW, a 100 meter mast has been installed. The implementation of the project is planned for 2019 - 2022.

In 2017, the first in Central Asia "Biogas plant" for the processing of sewage waste with a capacity of 0.5 MW was launched. Construction of 3 small hydroelectric power plants with a capacity of 7.5 MW is underway in Tolebi and Saryagash districts. The launch is planned for 2019.

Heat supply. In the South Kazakhstan region, heat supply was carried out from 7 centralized heat sources: CHPP-3 and boiler house "160 Gcal" in Shymkent, CHPP-5 in Kentau, central boiler houses in the cities of Turkestan, Arys, Lenger, Saryagash. The total length of heating networks is 610.1 km, including: Shymkent - 421.7 km, Kentau - 155 km, Turkestan - 17.5 km, Arys - 9.9 km, Lenger - 2.8 km, Saryagash - 3.2 km. Provided with centralized heat 2,392 multi-storey residential buildings.

In 2017, 1,450.3 thousand Gcal of thermal energy was generated in the South Kazakhstan region and in 2018 - 324.2 thousand Gcal in the Turkestan region, in 2019 - 318.2 thousand Gcal. Heat losses in 2017 amounted to 288.4 thousand Gcal, in 2019 - 36.3 thousand Gcal.

At present, heat supply to the Turkestan region is carried out from 5 centralized heat sources: CHPP -5 in the city of Kentau, central boiler houses in the cities of Turkestan, Arys, Lenger of Tolebi district, Saryagash of Saryagash district. The total length of heating networks in the Turkestan region is 188.4 km, including: Kentau -155 km, Turkestan - 17.5 km, Arys - 7.9 km, Lenger - 4.8 km, Saryagash - 3.2 km. Heat is supplied to 544 multi-storey residential buildings. There are also 1,032 small heat supply sources in the region, of which 885 units with a capacity of up to 3 Gcal / h, from 3 up to 10 Gcal / h - 147 units.

The total length of heating networks in 2019 was 187.5 km, of which dilapidated - 42.0 km (22.4%), 19.9 km (10.6%) need to be replaced.

Gas supply. As of 01.01.2018 in the region out of 844 settlements 344 settlements (40.8%) or 1,819,681 (64.0%) residents are provided with natural gas. A comprehensive plan of measures for gasification of settlements in the region in the period of 2017 - 2020 was developed.

According to the plan, by 2021 it is planned to additionally gasify 383 settlements (960,195 inhabitants). As a result, as of 01.01.2021, the natural gas supply will reach 683 settlements (80.9%) or 2,715,501 inhabitants (95.6%).

For these purposes, in 2018, 16.1 bln. tenge was allocated from the regional budget for gasification of 66 settlements of the region.

In addition, it is planned to build 15 automatic gas distribution stations (AGDS) for a strategic solution to provide natural gas to all sectors of the region's economy until 2050.

By implementing a comprehensive plan-measure for gas supply to the region, all residents of districts and cities and more than 900 thousand residents in 8 districts of the region where there has never been gas will be fully provided with natural gas.

The Turkestan region is supplied with natural gas from the Gazli-Shymkent main gas pipeline of the Republic of Uzbekistan and the domestic Beineu-Bozay-Shymkent. The region's annual demand for natural gas is 1.0 bln. m³.

Energy saving. At the energy organizations (Shardara SES JSC, Ontustik Zharyk Tranzit LLP), work is underway to modernize the installed main technical equipment, at the expense of their own investments.

Energy saving measures taken in budgetary organizations:

- in all budgetary institutions, incandescent lamps are being changed to energy efficient (85.7%);

- plastic windows were installed on 46,002.9 square meters, 48 heating boilers were modernized;

- out of a total of more than 39,982 street lighting lamps, more than 21,449 lamps were replaced with energy-saving lamps (54%);

- mercury-containing lamps are disposed of and LED energy-saving lamps are installed instead;
- in the Turkestan region, 544 multi-storey buildings are provided with centralized heat supply, of which 300 multi-storey buildings are equipped with heat meters, and the remaining 244 buildings do not meet regulatory requirements;

- according to the mechanism of modernization of the housing stock of the program "Regional Development until 2020", since 2014, local executive authorities have allocated transfers for conducting an energy audit in those houses in which repair work will be carried out in the future. For the period of 2011 - 2017, 157 multi-storey residential buildings were repaired in the region for the amount of 1,739.0 mln. tenge.

In the districts and cities of the region, 34 banners promoting energy saving were posted.

In 2018, 108 out of 117 institutions conducted energy audits.

Condition of water supply and sewerage, provision of the population with centralized water supply and disposal

Water supply. In the region, water supply to settlements is carried out by 45 enterprises and their subdivisions. In total, there are 117 hydraulic structures on the territory of the Turkestan region and the city of Shymkent. Of these, reservoirs - 34, ponds - 10, dams - 1, dams - 1, waterworks - 15 and 56 other HS.

The total length of the region's water supply networks in 2018 was 9,840.5 km, in 2019 – 12,056.2 km, of which 2,206.9 km needs to be replaced (data from the Committee on Statistics).

For 2017 - 2020, an Action Plan for the provision of centralized water supply to settlements in the region has been developed. According to the Plan, it is planned to provide 84 settlements in 2020 (198,429 population) with drinking water. As a result, 702 settlements will be provided with centralized drinking water by 2021 (83.2%) or 2,769,360 of the population (95.5%) of the region.

In addition, by agreement of the Republic of Uzbekistan, a decision was made to use the water of the Ugam River. To date, in order to provide drinking water for the population of 700 thousand residents of Kazygurt, Saryagash and Maktaral districts, the necessary documents are being developed.

Water disposal. In 2017, the total length of sewerage networks in South Kazakhstan region was 927.4 km (according to the Committee on Statistics). All networks were in the municipal property of the city. The sewerage systems of the city with a total length of 525.3 km were transferred to the trust management of Vodnye Resursy - Marketing LLP.

In the Turkestan region in 2018, the length of the sewerage networks is 424.5 km., including in the city of Arys - 17.8 km, in the city of Kentau - 109.0 km, in the city of Turkestan - 127.5 km, in the Maktaral district - 9.5 km, in Sairam - 28.2 km, in Suzak - 61.4 km, in Tolebi - 36.0 km, in Shardara - 31.5 km (data of the Committee on Statistics). All networks are in communal ownership of cities and districts.

In 2019, the total length of sewerage networks is 424.5 km, of which 141.8 km need to be replaced.

State of the environment, reduction of air and water pollution

For 2017 - 2019, according to the stationary observation network, the level of atmospheric air pollution in the **city of Turkestan** was assessed as low in 2017 (APS is 2 and as raised in 2018 and 2019 (APS = 5), SI = 2 - 6.9 (raised and high (2019) level) and HR = 0 - 7% (low and raised (2018) level).

The level of air pollution in the **city of Kentau** was assessed as low and raised (2018). APS is 2 - 5, SI = 2.4 - 10 (raised (2019) and high level) and HR = 1 - 5% (raised level).

As of the beginning of 2020, there are 297 nature users in the region, belonging to the 1st hazard category. Of these, large enterprises of the Republic: SAS-Tobe Technologies LLP, SP KATKO LLP, SP INKAY LLP, Zarechnoye LLP, Karatau LLP, Akbastau LLP, Kazatomprom-Sauran LLP, South Mining and Chemical Company LLP, Stepnoye- RU Branch of Kazatomprom-Sauran LLP, DP Ortalyk LLP, APPAK LLP.

Table 2.14.1. Dynamics of emissions into the environment in the Turkestan region (until 2019 of South Kazakhstan region)

Type of emission	2017*		2018*		2019	
	Limit	Actual	Limit	Actual	Limit	Actual
Emissions thousand tons	135.1	72.8	143.04	74.2	76.1	28.8
Discharges thousand tons	159.3	30.1	157.9	30.3	142.4	18.2
Waste thousand tons	2,937.5	1,159.6	2,716.9	1,016.3	30,422.8	12,340.8

Note: * for 2017, 2018 data for the South Kazakhstan region.

At present, large enterprises of the mining sector of the Turkestan region account for 35% of the total volume of the region.

Compared to 2017, in 2018 there is an increase in the actual volume of emissions of pollutants into the atmosphere by 1.4 thousand tons. In 2019, emissions were reduced by excluding the city of Shymkent.

Enterprises in the South Kazakhstan region developed in 2016 - more than 4.7 bln. tenge, in 2017 - 4.2 bln. tenge, in 2018 - about 3 bln. tenge, in the Turkestan region in 2019 - 1.3 bln. tenge.

Table 2.14.2. Financing of environmental activities by nature users in the South Kazakhstan and Turkestan regions, bln. tenge

2017		2018		2019	
Plan	Actual	Plan	Actual	Plan	Actual
4.2	4.2	3.0	3.0	1.231	1.3

To reduce the pollution of settlements, over the past 8 years, 203 settlements were additionally supplied with gas, as a result, out of 844 settlements, 300 (35.5%) or 1,755,307 (61.8%) residents were supplied with gas.

According to the plan, by 2022, 383 settlements will be additionally supplied with gas. (960,195 thousand inhabitants) and the number of gasified settlements will reach 683 (80.9%) or 2,715,501 (95.65%) residents.

In the South Kazakhstan region, the number of buses and minibuses operating on interregional passenger routes was 2,750. Of these, it was switched over to gas: in 2015 - 397 pcs. (14.5%), in 2016 - 463 pcs. (17%), in 2017 – 630 pcs. (23%).

Observations of **surface water pollution** in the South Kazakhstan region were carried out at 7 water bodies (the Syrdarya, Keles, Badam, Arys, Bogen, Katta – Bugun rivers and Shardara reservoir).

In order to protect against pollution and depletion of water bodies, the regional akimat continues to work on the establishment of water protection zones and lines on water bodies of the region and the regime of their economic use. So, since 2005, water protection zones and lines have been established on 122 rivers with a length of 3991 km, 35 reservoirs and 2 natural lakes located in the Aral-Syrdarya basin.

In 2015, water protection zones and lines were established at the Koksaray counter-regulator. The coordinates of all water protection zones and lines have also been entered into the electronic database of the Land Cadastre to prevent the allocation of land plots in water protection zones and lines of water bodies.

In 2017, water protection zones and lines were established on 23 rivers located in the Suzak district of the Shu-Talas basin.

Production and consumption waste management and waste processing

In 2017, in the South Kazakhstan region, the volume of solid household waste generated amounted to 328.4 thousand tons, of which 6% was processed. 55% of the population was covered by services for the collection and removal of solid household waste. In 2018, 137.6 thousand tons of solid household waste was generated, of which 7.17% were processed, At the end of 2019, the total volume of accumulated solid household waste amounted to 128,081 tons, of which 14,390 tons or 11.2% were sent for processing.

In 2018, 81.24% of the population was covered by services for the collection and removal of solid household waste. Out of 159 solid household waste disposal facilities, 144 comply with environmental and sanitary requirements and standards, which is 91%.

At the beginning of 2020, 163 landfills of solid household waste were placed in the region, of which 150 received permits for emissions into the environment - 92%.

In the Turkestan region, 38 waste disposal organizations carry out the removal of solid household waste.

In Turkestan, Akmetov IE is engaged in the collection and processing of various polyethylene and paper-cardboard waste from the population, the landfill territory, as well as the production of raw materials for plastic pipes.

On the territory of the solid household waste landfill in the city of Kentau, Bulegenov IE sorts waste (full plastic, plastic, polyethylene waste and paper products) with subsequent transfer for processing to the Status Everest LLP plant with the production of plastic granules, that is, raw materials for plastic pipes.

In the region, the following enterprises are also engaged in sorting and separate collection: Shayakhmet Sarsen IE, Sakhova IE, Darbishev IE, Avtomelios LLP, Big Dale LLP, KazPromVtor LLP, Yntymak-2016 LLP, Kyzmet-Service-Arys LLP, FERRUM-LTD LLP, DELTA-MET LLP.

In order to utilize solid household waste, GREEN Technology Industries LLP is building a plant for processing PET waste with the production of granules and staple fiber in the industrial zone of Badam of Ordabasy district. In July 2018, the first stage of the plant was launched for washing, shredding PET waste and producing flakes from PET waste. At the end of 2019, 1,515 tons of PET flakes were produced. In June 2020, it is planned to launch the second stage of the plant (production of chemical fibers (sintepon, holofiber) from polyethylene waste). Products manufactured by GREEN Technology Industries LLP (PET-flex) are consumed in Kazakhstan and exported to Russia.

In addition, the Akimat of Turkestan city is negotiating with investors on the installation of a sorting line on the territory of the solid household waste landfill in Turkestan city.

In 2019, 303 objects of unauthorized dumps were identified on the territory of the Turkestan region, the state environmental inspectors of the Department of Ecology of the Turkestan region sent 250 letters to eliminate unauthorized dumps, of which 29 objects were disposed of. The Ministry of Ecology, Geology and Natural Resources, together with the Akimat of the Turkestan region, approved a schedule for the elimination of landfills. Work to eliminate unauthorized landfills continues.

The state of biological resources and the development of forestry, fishing and hunting industries, specially protected natural areas and ecological tourism

In 2019, the total area of the state forest fund of the Turkestan region is 3,439.1 thousand hectares, including 1,654.4 thousand hectares of forested land. Forest cover of the region is 14.1%.

In 2019, measures for reforestation and afforestation by state forestry institutions of the Turkestan region by sowing and planting forests were carried out on an area of 18,500 hectares (with a plan of 18,500 hectares). Including the Sairam-Ugam State National Natural Park, a forest was planted on an area of 20 hectares.

In 2017, 2 cases of forest fire were registered, covering a fire of 21.5 hectares. As a result, the average area of 1 forest fire was 0.011 thousand hectares (plan 0.013 hectares), where the indicator was 85%. In 2018, there were 8 cases of forest fires on an area of 3,939.6 hectares, including 502.1 hectares covered with forest. In 2019, there were 5 cases of forest fires on a total area of 63.1 hectares, including 22.3 hectares of forest, of which 13 hectares are forested, 40.8 hectares are non-forested area, damage from forest fires is 562.2 thousand tenge.

In 2019, state inspectors carried out 1,984 raids, while 38 facts of illegal felling of timber were revealed, the volume of which amounted to 61.8 cubic meters, the damage was 446.1 thousand tenge.

The area of hunting grounds in the Turkistan region is 2,440.178 thousand hectares. The area of hunting grounds assigned to game users is 449.277 thousand hectares, including the area of the reserve fund of 1,991.901. thousand hectares

In accordance with the landscaping project, in 2019 were planted 180 thousand seedlings. In 2020, it is planned to plant 250 thousand seedlings of various types in the city.

On reservoirs of international and republican significance - 8 sites, of which 8 sites are assigned. Of the 8 reservoirs of local importance, 8 reservoirs are assigned. The **catch limit** for 2019 is 2.6 thousand tons. The actual fish catch is 2.5 tons (96%).

As of January 1, 2020, there are 8 **pecially protected natural areas** on the territory of the Turkestan region, including: Aksu-Zhabagly State Natural Reserve, Karatau, Sairam-Ugam 1 State National Natural Park and 5 state nature refuges.

Aksu-Zhabagly Reserve - within the Tyulkubas and Tolebi administrative districts of the Turkestan region and the Zhuvaly district of the Zhambyl region - on the Talas Alatau ridge at altitudes from 1300 up to 4238 m above sea level. The area of the reserve is 132 thousand hectares. The oldest reserve in Kazakhstan and Central Asia, organized in 1926.

Karatau reserve - on the ridge of Syrdarya Karatau with an office in Kentau city. The highest point of the reserve is Mount Bessaz, 2,176 m above sea level. Organized in 2004

Sairam-Ugam National Park - on the ridges of Ugam, Karzhantau, Kazygurt and Boroldai. Located at an altitude of 1700 up to 4200 m above sea level. The total area of the park is 149 thousand hectares. Created in 2006.

There are 1,278 **historical and cultural monuments** in the region. On the territory of the region there is the mausoleum of Khoja Akhmet Yassavi, the mausoleum of Arystan Bab, Domalak Ana, as well as the ancient settlement "Otyrar", "Sauran" and many other historical objects. Also in the region there is a beautiful gorge "Aksu-Zhabagly", "Sairam-su", "Ugem", "Burguluk", "Kyrykkyz".

Also, in the region there are unique natural (the Ak Mosque cave in the Baidibek district, the Weeping cave in the Tulkubas district, the Burguluk gorge in the Tolebi district, etc.) and historical objects (the Keme Kalgan monument in the Kazygurt district, the Baidibek ata and Domalak ana mausoleums in the Baydibeks district, Karashash ana and Ibrahim ata, etc.).

The priority areas of tourism in the region are:

- pilgrim tourism, with centers in the city of Turkestan and Otrar district;
- ecological tourism, with centers in the "Aksu-Dzhabagly" and "Karatau" reserves, "Sairam-Ugam" State National Natural Park;
- medical and health tourism with a center in the Saryagash district.

At the end of 2017, the number of tourism facilities in the region is 44 sanatoriums, 17 guest houses, 224 accommodation places, and 104 tourist organizations are registered.

In 2017, the largest volume of services provided in the South Kazakhstan region was in Shymkent (72.2%), Tyulkubas district (8.45%), Turkestan city (4.3%) and Tolebi district (4.17 %).

At the end of the first quarter of 2018, the number of tourists visiting the Turkestan district amounted to 24,876 people and compared to the same period in 2017 (23,322 people) increased by 10.7%, including the number of domestic tourism tourists 23,948 people, an increase compared to the previous year is (21,901 people) 9.3%.

For the first quarter of 2018, according to the location data, the number of visitors to the city of Turkestan was 5,648 people, the Otrar district was 7,166 people, the Saryagash district was 2,733 people.

The region has developed 1, 2 and 3-day tourist routes for each region. The tourist routes include 84 historical and natural sites. In turn, for the purpose of a comfortable stay of tourists, an analysis was carried out on the necessary infrastructure (access roads, signs, toilets).

The activities of the TURKISTAN Special economic zone (SEZ) are aimed at the active development of tourism infrastructure, as well as the accelerated development of the infrastructure of the new administrative center of Turkestan city.

The priority areas of the SEZ will be:

- tourism;
- construction;
- industry.

The need to develop these areas is due to the primary tasks of promoting the city of Turkestan as an object of international tourism and pilgrimage, developing a new administrative center, as well as developing the production of building materials.

2.15. Nur-Sultan city (Astana)

Territory, population and GRP of the city. Diversification of the economy

The city of Nur-Sultan (until 2019 - Astana) - the capital of the Republic of Kazakhstan is one of the fastest growing megalopolises in the entire Eurasian space, the population in 2019 reached 1,136.2 thousand people¹⁵³.

According to the Committee on Statistics, the gross regional product of the city in 2018 amounted to 6,706.0 bln. tenge, or 117 % against the corresponding period of 2017. The share of the city in the country's GDP is 10.9%. GRP per capita amounted to 6,359.5 thousand tenge. In 2019, the GRP amounted to 7,834.8 bln. tenge, per capita – 7,075.8 thousand tenge.

According to the Committee on Statistics, **industrial enterprises** in 2019 produced products worth 884.3 bln. tenge, in 2018 - 646.7 bln., and in 2017 - 573.9 bln. tenge, including in the manufacturing industry in 2019 - 786.5 bln. tenge, in 2018 - 546.9 bln. tenge, in 2017 - 484.9 bln. tenge.

In 2019, the main **manufacturing industries** were: metallurgy (gold and silver production) (share in the manufacturing industry is 55.4%), mechanical engineering (share in the manufacturing industry is 16.8%), production of other non-metallic mineral products (share in the manufacturing industry is 9.0%) and food production (share in the manufacturing industry is 5.4%).

Within the framework of the Industrialization Map for the period from 2010 to 2018, 25 projects were implemented with an investment volume of 234.2 bln. tenge and the number of jobs - 3.5 thousand people. In January-December 2018, the volume of products manufactured within the framework of the Industrialization Map amounted to over 2,858.8 bln. tenge. The share of production in the total manufacturing industry is 50.4%. In 2018, on the territory of Industrial Park No. 1, 7 projects were commissioned for a total amount of 10.6 bln. tenge, with the creation of about 730 jobs.

In 2019, 10 projects worth 333 bln. tenge were registered on the territory of the Astana-Technopolis SEZ, of which 2 projects were launched in the IT field.

Development of energy, including renewable energy and energy supply to the population

Power supply. At CHPP-1, the available hot water capacity is 710 Gcal / hour. The available power capacity is 15.6 MW. At CHPP-2, the available hot water capacity is 1,800 Gcal / hour. Available power capacity is 460 MW. At energy sources, heat and power supply networks, failures of I and II degrees were not registered, 453 accidents were registered on power supply networks in 2018.

In 2019, CHPP-1 reconstructed boiler unit No. 2 with an increase in productivity and turbine unit No. 4 with complete replacement of physically obsolete equipment, which made it possible to increase the reliability and safety of power supply to the right-bank part of the city. The construction of a 110 kV cable line “Zapadnaya-Turan” with a length of **28.5** km was completed as part of the project “Reconstruction of the 110 kV overhead line”.

Heat supply. As of 01.01.2020 on the balance and servicing of Astana-Teplotranzit JSC there are 816.265 km of heating networks, including main ones - 262.192 km, distribution - 554.073 km; pumping stations - 14 units, heat distribution points - 2 units. At the beginning of 2020, the average depreciation in heat supply networks was 56.4%, heat losses - 12.4%. In order to reduce the length of worn-out networks, reconstruction of heating networks is carried out annually in the capital as part of the investment program. As well as current and major repairs.

In the period of 2017 – 2019 within the framework of the state program of infrastructure development “Nurly Zhol”, new construction of 28.652 km of heat supply networks was carried out. At its own expense (depreciation, profit), the utility company reconstructed 16,435 km of heat supply networks within the investment program in the period from 2017 to 2019, and replaced 14,883 km of heating mains within the framework of major and current repairs. From 2017 to 2019, the average depreciation rate decreased by 1.5% from 57.9% to 56.4%, heat losses decreased by 0.6% from 13% to 12.4%.

¹⁵³ Hereinafter, the Program for the development of the Nur-Sultan city territory for 2018 - 2023 and reports on its implementation for 2018 and 2019.

In 2019, according to the Committee on Statistics, the total length of heating networks in the city was 831.4 km, of which dilapidated - 210.0 km (25.3%), need to be replaced - 209.4 km (25.2%). replaced - 9.5 km.

In 2020, within the framework of the state program "Nurly Zhol", it is planned to implement 1.7 km of the heating main. As part of the investment program, it is planned to reconstruct 7,112 km of heat supply networks. It is also planned to carry out major and current repairs of 2,574 km of heat supply networks.

In preparation for the international exhibition EXPO-2017, the Akimat of the capital implemented a project to install small forms of **renewable energy sources** (RES) without burdening the city budget. This project includes the installation of various innovative inventions in the city.

In order to implement this project, work was carried out to study the best world experience (UAE, USA, China, Eastern European countries) for the installation of small forms of renewable energy sources in urban environments. The generated electricity is directed to street and park lighting, which made it possible to reduce the load on city networks and the budget.

Also, 5 pedestrian crossings were installed with illumination of pedestrian traffic areas, which made it possible to improve safety and reduce the number of accidents involving pedestrians.

The power supply of 5 closed stops was transferred to autonomous, by installing solar panels on their roofs. Solar panels made it possible to provide electricity, heating and lighting to the stop.

To ensure energy savings in the territories of parks and squares, lamps with solar panels and wind generators are installed. The lamp is equipped with CREE LED chip, which will ensure long life and energy saving.

At the exit from the international airport, a "flower" is installed to collect sunlight and generate electricity for transmission to the city grid. Near the central circus of the city, decorative lamps in the form of "UFO" are installed on supports that provide themselves with electricity to support the theme of the building of the city circus.

In the main recreation areas there are installed "trees" with wind generators, "sun flowers", of Kazakhstan production. These installations have a modern design, and allowed to convey the entire atmosphere of the EXPO-2017 exhibition.

Also, street lighting on Ryskulov and Uly Dala streets was switched over to work from renewable energy sources.

In the area of the Airport ring, a Bolotov installation is provided, with wind generators, which, even with a weak wind, generate a sufficient amount of electricity.

RES is actively used in the construction of residential complexes. In 2019, the total generation of renewable energy sources in the city is more than 700 kWh. This saves energy costs over 20 mln. tenge per year.

For effective monitoring and control over the implementation of the **energy saving** policy, the Akimat of the capital has developed a Comprehensive Plan for Energy Saving and Energy Efficiency for 2017 - 2020, which combines the activities of all industrial sectors of the capital. The comprehensive plan is aimed at ensuring an increase in competitiveness, financial sustainability, energy and environmental security, as well as an increase in the level and quality of life of the population by realizing the potential for energy saving and increasing energy efficiency through modernization, technological development and the transition to rational and environmentally responsible use of energy resources. This plan contains 189 energy saving and energy efficiency measures, of which more than 80% have already been implemented. The remaining 20% is planned to be completed by the end of 2020.

In particular, in 2019 it is planned to start implementing a public-private partnership project "Creation and operation of smart street lighting in Nur-Sultan city". It is planned to replace 30,877 pieces of street lighting lamps, 329 units of lighting control cabinets, as well as create a control center. The implementation of the project will allow to reduce electricity costs by more than 30% or 300 mln. tenge per year.

Memorandums were signed with three international companies - Siemens (Germany), WavysCoLtd (Korea), Planora (Finland). The implementation of these projects will reduce the loss of heat and power supply by 20-25%.

From 2011 to 2018, Orken Kala LLP completed the modernization of 63 multi-apartment residential buildings. This will save up to 15 - 20% of thermal energy from the total energy consumption.

In 2017, another Memorandum of Cooperation was signed between UNDP and the Akimat of Astana city (now Nur-Sultan), according to which the city of Nur-Sultan is one of the pilot cities for the Sustainable Cities for Low-Carbon Development project. In 2018, UNDP staff developed a Master Plan for the modernization of the urban residential area (5 buildings at the corner of Pushkin - Zhubanov streets). The annual savings of thermal energy in the sum for all five buildings of the block will be 2,238 Gcal. Annual energy savings from all five buildings of the residential block - 9,318 kWh. Saving money or energy savings more than - 40% of the previous level. Prevented emission of greenhouse gases (CO₂) into the atmosphere of the city, block, per year will amount to 1000 tons.

In 2018, was completed the implementation of the first energy service PPP project to replace lighting with LEDs in the Trasport Towers building at the expense of a private investor. The total amount of attracted investments for the replacement of lighting amounted to 34.5 mln. tenge. During the implementation of this project, lamps were replaced on all floors of this building to LED ones, motion sensors were installed. As a result of the project implementation, the energy consumption of this building was saved in the amount of 52% of the initial (pre-project) level. The expected savings in energy payments by the end of the year will be about 10 mln. tenge.

As a result of energy saving measures in 2017, per one kilowatt-hour of consumed electricity, 1,681.5 thousand tenge of GRP were produced, which is 1.3 times more than in 2013.

Also, within the framework of the state program "Digital Kazakhstan", 5 key areas of digitalization have been identified. This is the digitalization of security, healthcare, education, housing and communal services and transport.

The akimat of the capital, together with the IDC international agency (International Data Corporation), analyzed the sectoral departments of the akimat on education, healthcare, transport, housing and communal services, security and digitalization of public services.

As a result of the above work, the city of Nur-Sultan is included in the international rating of smart cities according to the IDC company. According to the results of the survey of the city of Nur-Sultan, the capital of Kazakhstan has reached a maturity level of 2.48 points. The level of maturity of some cities in the world: 4.4 - Singapore, 3.7 - New York, 3.6 - Dubai, 3.2 - Barcelona, 3.1 - Moscow.

Condition of water supply and sewerage, provision of the population with centralized water supply and disposal

Water supply and disposal. The issue of high-quality water supply and timely disposal and treatment of wastewater is urgent for the capital.

The length of the water supply networks is 1,343 km, the water disposal networks - 814 km (according to the Committee on Statistics). Average wear rate of water supply systems - 44%, water disposal systems - 40%.

In 2019, the total length of water pipelines was 1,377.4 km, of which 342.5 km need to be replaced, the length of water disposal networks is 862.6 km, and 176.3 km need to be replaced.

99.8% of the population have access to centralized water supply, of which 5.3% use drinking water through taps. Decentralized water supply (wells, bores) is used by 0.2% (or 1,286 people) of the population. A total of 204 taps, there is a plan to eliminate them by 2020, 110 will be eliminated.

In 2019, the reconstruction of the supply conduit with a length of 43.9 km in two lines of pump house of 1 lifting to the Zheleznodorozhnyi residential area was started. The main goal of the reconstruction of the main water pipeline is to increase the reliability of the water supply to the capital.

Also, the implementation of the project "Construction of water supply, sewerage, power supply engineering networks to the building located to the south of Tlendiev Avenue, within the boundaries of streets No. 20-2, No. 11 and Barshin St.", which will provide power supply, water supply and sewerage networks for the Asar housing complex (70 apartments and 204 cottage houses).

To date, the city's storm sewage system consists of 15 wastewater treatment facilities and 3 storage ponds, 390 km of main rainwater, drainage and trough-irrigation sewer network collectors provide surface runoff from an area of 13.5 thousand hectares.

In 2019, taking into account the allocated funding, a wastewater treatment facility was commissioned in the Ondiris district (WTP of the V-2 district), which made it possible to increase the catchment area by 605 hectares, ensured an increase in the total capacity of the treatment facility by 12.1 thousand m³/day. Also, the construction of treatment facilities in the Molodezhny residential district, reconstruction of a wastewater treatment facility in the area of the Mozhaisky bridge and construction of a supply collector in the Akbulak residential district was started.

In 2019, work continued on the construction of 9 facilities and 2 storm sewer collectors. In addition, work has begun on the construction of 2 treatment facilities (Wastewater treatment facility of I-5 (Molodezhny residential district), (reconstruction) Wastewater treatment facility of district VI-1 (Mozhaisky District) and the supply collector of district I-4 (Akbulak residential district).

In addition, work was carried out on the installation of engineering networks (water supply, utility and storm sewers) with a length of 24.4 km, including a water supply network to residential areas Internacionalnyi and Michurino of 11 km long.

92% of the population has access to centralized water disposal systems.

State of the environment, reduction of air and water pollution

In 2017, according to the stationary observation network, the level of air pollution in the city of Astana (now Nur-Sultan) was estimated to be increased. APS is 6 (raised level). SI = 9 (high level), HR = 27% (high level). Compared to 2016, the level of atmospheric air pollution decreased from "high" to "raised"¹⁵⁴.

For 2018, according to the stationary observation network, the level of atmospheric air pollution was assessed as high; it was determined by the value of APS = 7 (high level). SI = 17 (very high level <10).

For 2019, according to the stationary observation network, the level of atmospheric air pollution in Nur-Sultan city was assessed as a high level of pollution, it was determined by the value of APS = 7 (high level), SI equal to 19.7 (very high level).

Monitoring of emissions of pollutants by pollution sources on an annual basis is carried out only at stationary sources. Emissions from vehicles and individual residential buildings are not calculated and statistics are not collected on them. An indirect analysis of the ingredients in the ambient air indicates that the high level of pollution is associated with the congestion of roads by urban transport and the dispersion of emissions from industrial enterprises. The main sources of air pollution in the capital are both stationary (41.2% in 2018 and 44.4% in 2019) and mobile sources of pollution (54.2% in 2018 and 51.3% in 2019), their total share accounts for 95.7% of the total volume of gross emissions of pollutants. The dynamics of the volumes of pollutants emitted into the atmosphere from stationary sources demonstrates a slight decrease in air emissions from 60.5 thousand tons in 2013 to 59.2 thousand tons in 2017, and to 56.4 tons in 2018, but in 2019, there was an increase to 65.1 thousand tons.

The largest source of greenhouse gas emissions in the city are the operating CHPP-1 and CHPP-2, which account for over 60% of emissions. The share of fuel burned by the private sector is 5-6%.

To improve the state of the city's air basin and ensure comfortable living conditions for the population, in 2018 the city adopted a 5-year gasification program, which provides for the switch over of hot water boilers at CHPP-1, 2 and 3, boiler houses, industrial enterprises, and communal infrastructure facilities to natural gas.

As part of the implementation of the Concept for the transition of the Republic of Kazakhstan to a "green economy" in the transport sector, the "Comprehensive action plan for the improvement of the environment of the city of Nur-Sultan for 2018 - 2020" was approved. 854 vehicles of public utilities were switched over to gas, 738 buses of the EURO-5 and EURO-6 classes were purchased, work is underway to switch over private taxi fleets to gas motor fuel, 161 of them have already been switched over to gas, the rest 339 have been switched over by the end of 2018. In addition, 158 EcoTaxis are

¹⁵⁴ Information bulletin on the state of the environment in the Republic of Kazakhstan for 2017.

operating. In total, gas equipment has been installed on more than 16 thousand vehicles of legal entities and individuals.

At the end of 2019, the city akimat purchased 100 electric buses, which have been running on the line since the beginning of 2020. The advantages of silent electric buses are environmental friendliness (no harmful emissions into the atmosphere) and economy during their operation. "The operation of these buses has shown that vehicle fleets on fuel alone save about 80% in comparison with a diesel analogue. The savings on operating costs will also be about 80%, since there is no need to change oils, fluids, etc. If the cost of diesel per day is up to 22-25 thousand tenge, then the cost of electricity is 4-5 times less. The design itself allows you to charge the bus only once a day - at night, that is, there is no need to charge the bus during the day," said Bekmyrza Igenberdinov, Chairman of the Board of City Transportation Systems (CTS). In 2020, it is planned to purchase another 100 electric buses at the expense of a private investor.

In order to expand the infrastructure for an environmentally friendly mode of transport, the design and estimate documentation was developed for the object "The first stage of bicycle transport and infrastructure in the city of Nur-Sultan (1st phase)" (length 44 km), the development of design and estimate documentation for the object "Second stage of bicycle transport and infrastructure in Nur-Sultan (1st phase)". In addition, in the city of Nur-Sultan, they began to introduce electric vehicles, and 50 electric charging stations have already been installed.

In 2018, the area of green spaces per capita increased by 5.3% compared to the level of 2017 (i.e. from 15.2 m² / person in 2017 up to 16.0 m² / person in 2018), which is due to the constant increase in the number of trees and shrubs planted annually in the capital, as well as the construction of new parks and squares.

In 2019, the area of green spaces per capita increased by 4.9% compared to 2018 (i.e., from 16.2 m² / person in 2018 up to 17.0 m² / person in 2019), which is due to the constant increase in the number of trees and shrubs planted annually in the capital, as well as the construction of new parks and squares.

To give an aesthetic look to the capital, create environmentally friendly living conditions for citizens, resolve issues of family leisure time in a comfortable environment near their own houses in the places of demolished dilapidated houses, the construction of the following objects has been completed:

- square at the intersection of Respublika Avenue and Y. Dukenuly Street- 0.28 hectares;
- a public garden in the area of house No. 5 on Birzhan Sal Street - 0.27 hectares;
- a public garden on Saryarka Avenue, in the area of house No. 27 - 0.23 hectares;
- square on the street Pushkin, in the area of house No. 15B - 0.26 hectares;
- a public garden at the object "City Hospital No. 1", on Rakymzhan Koshkarbayev Street, 66 - 3.17 hectares;
- boulevard along Kenesary Street, on the section from Egemen Kazakhstan Gazeti Street to B. Beyskebaev street - 0.45 hectares;
- boulevard along Abai Avenue, on the section from Sembinov Street to Egemen Kazakhstan Gazeti Street - 1.19 hectares;

The total area of these facilities is 5.85 hectares, and according to the project, they are fully landscaped, planted with trees and shrubs, lighting is carried out, sports and children's playgrounds, small architectural forms are installed.

Production and consumption waste management and waste processing

Solid household waste. The waste management system in Nur-Sultan city includes collection, transportation, processing, utilization and disposal of waste at the landfill. Every day 1000 - 1200 tons of waste are removed from the city. According to the data provided by the akimat of the city of Nur-Sultan, in 2019 -318.58 thousand tons of solid household waste were taken out to the solid household waste landfill. In 2018, 307.6 thousand tons of solid household waste was generated, of which 12.25% was processed. In 2017, the volume of generated solid household waste amounted to 345.4 thousand tons, of which 8.33% was processed. 100% of the population was covered by services for the collection and removal of solid household waste. All waste generated on the territory of the city is

transported to the waste processing complex built in 2012 with a capacity of 300 thousand tons per year. The complex carries out sorting, processing and briquetting of waste. Up to 5 thousand tons of plastic waste and up to 2 thousand tons of paper are processed per year. Unprocessed waste is sent to landfill for burial.

On the territory of the city of Nur-Sultan, there is 1 solid household waste landfill that meets the requirements of the legislation of Kazakhstan dated April 5, 2018. The landfill consists of 2 cells. In August 2018, the first cell, which has been in operation since 2006, was mothballed. At present, the feasibility study "Reclamation of the 1st cell of the city landfill for the burial of solid household waste" has been developed. In April 2018, the second cell of the landfill was commissioned (area - 15.1 hectares, capacity - 2 million tons), which was transferred to the trust management of Eco-Polygon Nur-Sultan LLP for a period of 15 years.

As part of the modernization of the city's waste-processing industry, a project for the separate collection and recycling of waste has been implemented since 2018. For the disposal of mercury-containing lamps, special containers for collecting lamps have been installed in all districts of the city. In areas of individual housing, heated by coal, containers are installed to collect ash. Waste removal is carried out by a private organization with which the city has signed a 5-year contract. On the territory of the city of Nur-Sultan, there are 30 points (in 2018 - 16 points) for receiving secondary raw materials (polyethylene, plastic, cardboard, glass containers, waste paper, aluminum cans).

In 2018, the Akimat of the city of Nur-Sultan, in agreement with the Ministry of Energy of the Republic of Kazakhstan and Operator ROP LLP, approved the Roadmap for the implementation in the city of Nur-Sultan of a pilot project on organizing the separate collection of solid household waste, processing and disposal of organic (food) fraction of solid waste. Pursuant to the items of the Roadmap, Clean City NC LLP purchased 25 pcs. of garbage trucks for separate removal of solid waste and 6,275 yellow containers for separate collection of solid household waste, which are installed at container sites in the city of Nur-Sultan (Almaty district – 1,935, Baykonyr district – 1,016, Yessil district – 1,812, Saryarka district – 1,512). In 2019, the city's territory was divided into 24 sections, on which 2,815 container sites were equipped and more than 17 thousand containers were placed.

The "dry" fraction is transported to the waste processing complex (sorting, processing and briquetting) of KazRecycleService LLP with a capacity of 300 thousand tons / year. At the waste processing complex, waste is sorted, processed and briquetted. By the end of 2018, the waste processing depth was 15%. The resulting products are polymer granules, polyethylene flakes and ecowool. In 2018, the waste processing complex sorted and processed 44.1 thousand tons of solid household waste.

Also, as part of the implementation of the Roadmap, it is planned to introduce technology for the processing and utilization of the organic (food) fraction of solid household waste to obtain technical compost, according to the recommendations of the French waste management agency Siktom, which was a participant in the International specialized exhibition EXPO-2017. The introduction of these innovative technologies for waste processing makes it possible to recycle up to 75%.

Employees of the akimat of the city of Nur-Sultan in order to improve the environmental situation of the city since the beginning of 2019 identified and eliminated 283 unauthorized dumps.

Also, the akimat, based on the analysis of information systems of Kazakhstan Garysh Sapary JSC, is carrying out work to identify the places of unauthorized dumps using the method of space monitoring. At the beginning of 2020, 431 places of illegal waste dumping were identified in the city, of which 232 places were liquidated, the rest are in operation. It should be noted that the bulk of unauthorized landfills is construction waste. More than 40 "sergek" video surveillance cameras were installed at the systemic sites of illegal waste disposal, detours were carried out.

State of urban greening and ecological tourism

Since 1997, large-scale work has been carried out in the capital to create a "**Green Belt**" around the city and plant greenery on the territory of the city. The area of the green belt has exceeded 78 thousand hectares. The development of the "Green Belt" is planned to continue until 2030, alternately

in 6 stages. A set of measures for the reconstruction of plantings, planting new forest crops, the current maintenance of the green belt is planned to cost 2.3 billion tenge.

Greening of the city territory has a positive trend. The total area of general purpose green spaces over the past 4 years has grown by almost 35% (from 12,853 thousand m² in 2015 up to 17,347 thousand m² in 2018), however, the corresponding indicator per capita increased by only 1 square meter (from 15 up to 16). The cost of greening in 2017 amounted to 5.34 billion tenge. More than half of budget expenditures are directed to lawn maintenance and planting annual flower beds: 26% and 25% of the budget, respectively. Only 14% was spent on planting trees, shrubs and hedges.

Tourism. Astana (now Nur-Sultan) has already established itself as a center for business or MICE events (MICE - Meetings, Incentives, Conferences, Exhibitions - an area of the business tourism industry associated with organizing and holding various corporate events) in the Eurasian space, in particular, having received recently awards from the world's leading publication in the field of business travel "BusinessTraveller" as "The best city for business and event tourism in Russia in the CIS countries" and as "The best destination of the year for business travel".

In 2018, about 40 major international business events were held, including: "Week of Commercial Real Estate CREW-2018", National Cup of Student Entrepreneurship and Startups ENACTUS Kazakhstan EXPO-2018, International Convention of Retailers "World of Trade", 25th World Mining Congress, 15th Bond Congress of the CIS and Baltic States C-bonds and others.

In 2019, more than 600 events of various formats and scales were held, of which 180 were of an international level. The following events were held: an exhibition of domestic manufacturers "ULTTYK KIIM", Astana Economic Forum 2019, I Forum of Asian Writers, VII Forum of Kazakhstan Mechanical Engineers, 14th Conference of the International Association for Judicial Administration, Global Innovation Summit 2019, International Tourism Exhibition PATA Travel Mart 2019, IV Meeting of Speakers of Eurasian Countries' Parliaments, XII KAZENERGY Eurasian Forum, Digital Bridge 2019 Forum, Seedstars Summit CEE 2019, etc.

Nur-Sultan is the only member in the country of the International Congress and Convention Association (ICCA), which opens up opportunities for participation in competitions for applications for major international events (bidding).

Nur-Sultan also received affiliation with the United Nations World Tourism Organization (UNWTO), which provides access to the results of UNWTO studies, the opportunity to participate in them and exchange experiences.

One of the latest successes in the field of business tourism for Nur-Sultan is the choice of the capital as the venue for the 8th UNWTO World Summit on Urban Tourism (previously the forum was held in the cities: Istanbul, Moscow, Barcelona, Marrakech, Luxor, Kuala Lumpur, Seoul).

Medical tourism is a relatively new type of tourism, moreover, it has a fairly large range of specific characteristics. Nur-Sultan today has the right to be considered one of the most promising destinations in terms of the development of medical tourism among the countries of Central Asia. Of the 7 organizations in Kazakhstan accredited by JCI (Joint Commission International is a prestigious international certification in the field of healthcare), 6 are located in Nur-Sultan (National Scientific Center for Maternity and Childhood of the Republic of Kazakhstan, National Center for Children's Rehabilitation, Republican Diagnostic Center, National Center for Neurosurgery, National Center for Cardiac Surgery, Medical Center of the Presidential Administration).

2.16. Almaty city

Territory, population and GRP of the city. Diversification of the economy

The population at the beginning of 2018 was 1,882.0 thousand people, at the beginning of 2019 – 1,854.7 thousand people, and at the beginning of 2020 – 1,909.5 thousand people.

According to the Committee on Statistics, Almaty ranks 1st in the country in terms of GRP and is the center for the development of small and medium-sized businesses. GRP in 2017 amounted to 11,893.2 billion tenge, and per capita of the city – 6,694.2 thousand tenge, in 2018, respectively –

12,132.7 billion tenge and 6,636.1 thousand tenge, in 2019 – 14,429.1 billion tenge and 7,651.8 thousand tenge.

In 2017, the share of the city in the republic's GDP was 21.9%. Average annual rate of nominal growth of the city's GRP in 2015 - 2017 amounted to 12.4%. Trade and services are the main factors determining the development of the economy¹⁵⁵.

Labor productivity in the service sector of Almaty reaches 35 thousand US dollars per person employed, ahead of Moscow by 15%, but lagging behind Warsaw by 42%.

In 2017, the **industry** of the city of Almaty was represented by 1,520 enterprises, of which 8.3% are classified as large and medium-sized. They form the basis of the city's industry, producing 76.4% of the industrial output. The volume of industrial production according to the Committee on Statistics in 2017 reached 902.5 billion tenge, having increased from 663 billion tenge in 2015, in 2018 - 917.9 billion tenge, in 2019 - 957.1 billion tenge.

For the period of 2015 - 2017 there was also an increase in the volume of manufactured goods from 504.5 billion tenge up to 691.9 billion tenge, up to 695.9 billion tenge in 2018 and up to 758.5 billion tenge in 2019. Based on the results of 2017, the city achieved an indicator of productivity in the manufacturing industry of 23.8 thousand US dollars.

Development of energy, including renewable energy and energy supply to the population

Power engineering. The electricity market in the city of Almaty is formed from the supply of electricity from the energy sources of AIES JSC and by purchasing electricity from the Moinak HEPP, Zhambyl GRES and GRES of Pavlodar-Ekibastuz power center (about 40%). In 2017, the level of provision of centralized power supply services in the city is 100%. The structure of electricity consumption shows that the main share of consumption falls on industrial enterprises - 33%, population - 29%, others - 25%, budget organizations - 13%.

The existing power supply system is characterized by a high level of wear and tear. In the republican structure, the wear rate of the power grids in Almaty is one of the highest, yielding only to the Almaty and Pavlodar regions.

The share of overhauled networks increased significantly in 2015-2017. About 512.79 km of electrical networks (5.7%) were reconstructed. This led to a significant decrease in the level of losses of power grids (from 14.3% in 2015, to 13.4% in 2016 and 11.24% in 2017), despite the high depreciation of infrastructure (66.6 - 67% in 2015 - 2016 and 66% in 2017).

Analysis of the technical condition of the technological equipment showed that the equipment of CHPP-1 and CHPP-3 is close to the depletion of the economic life and needs modernization, at the same time, all measures are taken to maintain the technical condition as much as possible:

- all 6 boilers and 2 out of 3 turbines of CHPP-1, put into operation in 1960 – 72s, have worked over 275 thousand hours;

- 3 out of 6 turbines of CHPP-2, put into operation in 1980 – 82s also worked over 200 thousand hours;

- all 6 boilers and all 4 turbines of CHPP-3 were put into operation in 1962-1965s and have worked over 234 thousand hours;

- in 2016, boiler unit No. 8 was put into operation at CHPP-2.

Work is also underway to convert CHPP-2 to gas.

In order to reduce emissions of harmful substances into the atmosphere, an agreement was concluded for the development of a feasibility study "Modernization of CHPP-2 with minimization of environmental impact", where 4 options are considered, including:

Switching over of existing boilers to gas - 98 billion tenge.

Reconstruction of boilers Nos. 1-7 with installation of gas cleaning equipment - 159 billion tenge.

Construction of a gas turbine unit for hot water supply with the reconstruction of boilers and the installation of gas cleaning plant - 315 billion tenge.

Construction of a new station based on gas turbine unit - 274 billion tenge.

¹⁵⁵ Hereinafter, the Program for the development of the Almaty city territory for 2016 - 2020 and reports on its implementation for 2018 and 2019.

Completion of the feasibility study – 31.12.2020.

After the completion of the feasibility study, an option will be determined for the switch over of CHPP-2 to gas and the subsequent development of design and estimate documentation until 2022.

Due to the environmental situation in the city of Almaty, the akimat of the city of Almaty supports the option of switching over CHPP-2 completely to gas.

Heat supply. The heat supply system in Almaty is one of the most complex systems of the city's engineering infrastructure. Coal remains the main source of heat production in the city. Thus, the share of coal at CHPP-2 and CHPP-3 is 99.4%. Since 2017, CHPP-1 has been completely switched over to the combustion of natural gas and fuel oil. In general, according to the data for 2017, the production of heat on solid and liquid fuels is 70%.

In total, there are 149 boiler houses in the city of Almaty, of which 83 are served by Almatyteplokommunenergo LLP (*out of 83 boiler houses, 9 large, 74 small district ones. At 80 boiler houses, the main fuel is gas, 1 boiler house (Shelekhova) on coal, 1 (Sanatorium "Alatau") on fuel oil, 1 on electricity ("Medeo") and 66 - autonomous boiler houses at educational (50 pcs. - 1 on coal, 14 on diesel fuel, 35 on gas) and healthcare facilities (16 units - 2 on diesel fuel, 14 on gas).*

All boiler houses of the city are being switched over to gas heating systematically.

In 2017, the total length of heating networks in the city of Almaty was 1,192.7 km. For the period from 2015 to 2017, about 51.36 km of heating networks were reconstructed.

Today, the length of heating networks is 1,241.4 km, of which main heating networks are 282.43 km, distribution networks are 958.96 km. With a period of more than 25 years (standard service life) is 758 km or 61.1%. In 2019, the reconstruction and repair of heating networks with a length of 20.6 km was carried out at 5 objects.

The share of overhauled networks is at a low level, which leads to an increase in the deterioration of heating networks. To maintain the permissible level of wear and tear of heating networks, it is necessary to re-lay main heating networks with a length of at least 14 km per year, distribution heating networks with a length of at least 23 km per year, giving priority to main networks.

The number of accidents and losses on heating systems is reduced. If in 2015 there were about 2,070 cases of damage on heating networks, then in 2017 – 1,937. In 2019, there were no accidents. Losses in heating networks were 22.01% in 2017 and 16.9% in 2019.

Gas supply. There are 4 gas distribution companies in the city, the largest of which is Almaty Production Branch of KazTransGas - Aimak JSC. To date, the balance of the Almaty production branch of KazTransGas Aimak JSC includes 5,378 km of high, medium and low pressure gas pipelines. The gas pipelines are in satisfactory condition.

1. High pressure - 91.2 km;
2. Medium pressure - 796.0 km;
3. Low pressure – 4,490.8 km.

The wear rate of the engineering and communication gas infrastructure in 2020 is 36%.

Gas consumption by the city population in 2017 amounted to 495.3 million cubic meters or 34% of the total gas consumption in the city, 944.9 million cubic meters were used for production needs (66%).

The level of gas supply in Almaty is quite high. The gas supply indicator increased from 93% in 2015, 95% in 2016 and up to 97% in 2017. 99% of city residents have access to centralized gas supply (2019).

In addition to natural gas, the city's consumers use liquefied gas. In 2017, the population was supplied with 10.8 thousand tons of this fuel, out of 50.4 thousand tons of liquefied gas allocated by the Ministry of Energy of the Republic of Kazakhstan. The low consumption of liquefied gas by the population is associated with the transition of consumers to natural gas and a decrease in the number of houses that consume liquefied gas. In 2017, apartment buildings were completely switched from liquefied gas to natural gas.

Since 2014, the length of gas pipelines has been increasing annually. The increase occurred mainly in the following districts - Alatau, Turksib, Nauryzbay and Medeu. The wear rate of the engineering and communication gas infrastructure in 2017 was 37%, which is 1% lower than the same

indicator in the previous period. Natural gas losses in 2017 amounted to 53.8 million cubic meters (3.9% of the supplied gas) compared to 51.5 million cubic meters in 2016.

In 2016, 3.1 km of gas networks were reconstructed. In 2017, 18.7 km of gas networks were reconstructed, in 2018 the reconstruction was 23 km, in 2019 - 23 km.

In order to increase the capacity of the gas transfer system of the city of Almaty, the removal of the GDS-2 capacities was completed with the construction of a bypass gas pipeline. With the completion of this project, a gas circle has been created around the city, which, in turn, will help resolve issues related to heat supply of residential and non-residential buildings using natural gas.

As of today, the balance of the Almaty production branch of KazTransGas Aimak JSC includes 5,378 km of high, medium and low pressure gas pipelines. The gas pipelines are in satisfactory condition.

1. High pressure - 91.2 km;
2. Medium pressure - 796.0 km;
3. Low pressure – 4,490.8 km.

The wear rate of the engineering and communication gas infrastructure in 2020 is 36%.

99% of citizens have access to centralized gas supply.

The growth of the economy, in general, has a positive effect on the dynamics of the growth rates of energy resources consumption and regional domestic product, since economic growth is accompanied by an increase in production and resource consumption. Thus, **energy saving** is one of the urgent tasks of the city of Almaty.

The implementation of energy saving measures is currently one of the main tools for modernizing industry, housing and communal services and the transport sector. Successful implementation of energy saving and energy efficiency measures ensures energy and environmental security, as well as increasing the competitiveness of the Almaty city economy.

In the period from 2019 to 2026 it is planned to implement the project of public-private partnership "Modernization of outdoor lighting in Almaty city". To date, a competition for the PPP project "Modernization of outdoor lighting in Almaty" has been held. Within the project:

- in 2019 it was planned to replace about 9 thousand lamps with energy-saving and LED lighting (5.9 thousand lamps were replaced);

- from 2019 to 2026 it is planned to modernize 1,375 km of lines or 45,829 lamps, 42,052 supports, that is, 100% modernization;

- provision is made for the installation of 1,253 additional lamps to illuminate the sidewalk area.

As part of the Comprehensive Energy Saving Plan of the city of Almaty for 2015-2020 the modernization of outdoor lighting lines was carried out by replacing sodium energy-intensive lamps with modern LED lamps with the possibility of installing the SMART system. This system allows you to automate the control of outdoor lighting, reduce electricity consumption by up to 15%. In 2019, modernization was carried out along 7 main streets, including 5.9 thousand lamps were replaced, 148 km of cable laid, 4.8 thousand new supports were installed.

The condition of water supply and sewerage, provision of the population with centralized water supply and disposal

Water supply and disposal. The city of Almaty is supplied with water from 4 main sources: the Bolshaya and Malaya Almatinka rivers (after purification at filtering stations) and from underground (borehole) water intakes of the Almaty and Talgar fields. The level of water supply in the city corresponds to the world level and in 2016 - 2017 was 95-96%. However, these data do not include the adjoining Nauryzbay region, where the level of water supply is only 15%. The existing water supply system in the region uses raw water from small rivers (Kargaly, Aksai and their tributaries) for drinking needs, as well as shallow wells with ground water, part of the water pipelines are laid along the land plots of residents (which complicates their maintenance) and laying shallow (which often leads to freezing in winter). Water quality does not always meet the requirements of GOST. The distribution water supply network existing in the district was built by residents independently without observing the requirements of SNiP for construction.

The length of water supply networks exceeds 3.6 thousand km (*depreciation* - 58.9%). Access to centralized water supply is available to 97.7% of the citizens.

The increase in overhauls helps to reduce the number of accidents, wear and tear and losses of water supply infrastructure. However, due to the transfer of the networks of the adjoining settlements of the Nauryzbay, Alatau and Turksib districts to communal ownership, the total length of city water supply networks increased from 2,699.5 km in 2015 up to 3,325.4 km in 2017. Due to the significant deterioration of the transferred networks, the percentage of reconstructed networks in 2017 amounted to 0.8% against 1.16% in 2015.

Due to the performance of works on reconstruction and overhaul of networks, the number of accidents is reduced to 5% annually. So, in 2015, the level of depreciation was 66.5%, and losses in water supply were 22%. These indicators decreased by 2017 to 63.01% and 19.5%, respectively, but are still significant. The analysis of losses also shows that the main sources of losses are losses in subscriber networks (40%), losses in ownerless networks (20%) and under-accounting of water (20-40%).

If the current step of network replacement (1.1%) is maintained, the problem of network deterioration and losses will persist for the next 60 years, and the target level (50% of deterioration) will be achieved only by 2030. Decrease in wear is achieved only by accepting newly built networks on the balance of the enterprise; in the first half of 2018, the transfer is being prepared - about 120 kilometers of water supply networks.

Water consumption in 2016 amounted to 132.38 million cubic meters, in 2017 - 134.97 million cubic meters. By type of economic activity, the largest consumers are housing stock (61.14 million cubic meters), enterprises providing services to the population and industry (26.26 million cubic meters), heat supply organizations and enterprises specializing in electricity supply (44.97 million cubic meters). At the same time, active work is underway to install meters, which leads to more economical consumption of water. Equipping with general water metering devices is 100% or 9,094 of the required 9,094 units. Equipping with individual metering devices was 87.48%. It is necessary to additionally install 69.15 thousand devices.

In 2019, 153.5 km of networks were built (Aigerim residential district, Rabochiy settlement, Kurylysshy, Uzhet, Shanyrak-5, Kairat, Karasu, Shapagat (Zarya-Vostoka), Kokshoky and Raduga St., Kazybaev, Burundayskaya, Galilei. As well as in order to ensure uninterrupted and high-quality water supply to the residents of the city of Almaty, the reconstruction of the water intake facilities KUST-19, Zapadnaya-1, Balkhash and the sewage pumping stations Tastak, Bekmakhanova, Kok-Kainar, Trudovik are underway). Today, the length of water supply networks exceeds 3.6 thousand km, sewerage - 1.9 thousand km. Access to centralized water supply is available to 97.7% of the citizens.

The **city-wide sewerage system** receives, discharges and purifies wastewater from the city, adjacent recreation areas, a number of villages and towns of Talgar and Kaskelen. The level of provision with water disposal systems is growing rapidly: by 7% annually.

The length of the sewerage networks was 1,587.1 km in 2017, 1,619.8 km in 2018, and in 2019 the length of the sewerage networks was 1.8 thousand km (*depreciation* - 59.8%). The share of overhauled water disposal networks in Almaty is below the level of comparable cities. At the same time, the share of overhauled water disposal networks does not cover the increase in the deterioration of networks. The wear of the water disposal system decreased by 2% due to new construction. In Almaty, this level was 65% in 2016 and decreased by 63% in 2017. In general, the level of wear is 3 times higher than in the compared cities. From the above, we can conclude that the share of overhauled water disposal networks is insufficient.

If the current share of overhauls is maintained, in 20 years the level of deterioration will exceed 90%, which will lead to the failure of most water disposal networks. This situation may lead in the future to increased accidents and failure of significant volumes of water disposal networks.

According to statistics, the share of treated effluents in the total wastewater flow in 2018 was 99.6%.

State of the environment, reduction of air and water pollution

Almaty belongs to the cities of Kazakhstan with a high level of **air pollution** for many years. The high level of pollution is due to both the natural and climatic features of the area and the anthropogenic impact on the environment.

Observations of the state of atmospheric air were carried out at 16 stationary posts.

In 2017, according to the stationary observation network, the level of air pollution was assessed as raised. APS is 6 (raised level). SI = 4 (raised level), HR = 37% (high level). Average concentrations of suspended particles (dust) amounted to 1.1 MPC daily average, sulfur dioxide - 1.1 MPC daily average, nitrogen dioxide - 1.8 MPC daily average, formaldehyde - 1.2 MPC daily average, heavy metals and other pollutants did not exceed the MPC. The maximum one-time concentration of suspended particles (dust) amounted to 1.4 MPC one time concentration, suspended particles PM_{2.5} - 4.4 MPC one time concentration, suspended particles PM₁₀ - 3.5 MPC one time concentration, sulfur dioxide - 3.5 MPC one time concentration, carbon monoxide - 4.1 MPC one time concentration, nitrogen dioxide - 2.5 MPC one time concentration, nitric oxide - 1.8 MPC one time concentration, phenol - 1.4 MPC one time concentration, other pollutants did not exceed the MPC. The level of atmospheric air pollution compared to 2016 decreased from “high” to “raised”¹⁵⁶.

In 2018, according to the stationary observation network, the level of air pollution was assessed as high. APS is 7 (high level). SI is 9 (high level) and HR = 29%. Average concentrations of pollutants were as follows: nitrogen dioxide - 1.5 MPC daily average, formaldehyde - 1.2 MPC daily average, the content of heavy metals and other pollutants did not exceed MPCs. The maximum one-time concentrations of pollutants were: nitrogen dioxide - 9.1 MPC one time concentration, suspended particles PM_{2.5} - 5.2 MPC one time concentration, nitrogen oxide - 4.0 MPC one time concentration, sulfur dioxide - 4.0 MPC one time concentration, suspended particles PM₁₀ - 3.4 MPC one time concentration, carbon monoxide - 2.5 MPC one time concentration, suspended particles (dust) - 2.0 MPC one time concentration, phenol and formaldehyde - 1.0 MPC one time concentration. Cases of high pollution (HP) and extremely high pollution (EHP) of the atmospheric air were not detected¹⁵⁷.

In 2019, according to the stationary observation network, the level of air pollution in the city of Almaty was assessed as a high level of pollution. APS is 8 (high level). SI equals 9.5 (high level) in the area of air pollution observation station No. 1 (Bostandyk district, territory of the Al-Farabi Kazakh National University) and HR = 29% (high level) in the area of air pollution observation station No. 12 (Raiymbek Ave., corner of Nauryzbay batyr St.) for nitrogen dioxide. Average concentrations of pollutants were: suspended matter (dust) - 1.1 MPC daily average, sulfur dioxide - 2.6 MPC daily average, nitrogen dioxide - 1.6 MPC daily average, formaldehyde - 1.4 MPC daily average. Concentrations of heavy metals and other pollutants did not exceed MPC daily average. The maximum one-time concentration of pollutants was: nitrogen dioxide - 9.5 MPC one time concentration, suspended particles PM_{2.5} - 6.3 MPC one time concentration, sulfur dioxide 157 - 4.0 MPC one time concentration, suspended particles PM₁₀ - 3.5 MPC one time concentration, carbon monoxide - 3.2 MPC one time concentration, nitrogen oxide - 1.8 MPC one time concentration, suspended matters (dust) - 1.8 MPC one time concentration, phenol - 1.0 MPC one time concentration. Concentrations of other pollutants did not exceed MPC one time concentration. Cases of high pollution (HP) and extremely high pollution (EHP) of the atmospheric air were not detected¹⁵⁸.

It is noted that the current level of monitoring of atmospheric air pollution is not sufficient to reflect the actual situation on the level and sources of air pollution in the city of Almaty.

According to the Department of Statistics of the city of Almaty in 2017, the actual emissions of harmful substances into the air from stationary sources of pollution in the city of Almaty amounted to 41.1 thousand tons (with a volume of 66.011 tons permitted for 2017) and their level compared to 2016 increased by 5.9%.

In 2018, stationary sources of enterprises in Almaty city emitted 43 thousand tons of pollutants into the air, and in 2019 - 46.1 thousand tons, and their level compared to 2018 increased by 9.3%.

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The costs of business entities aimed at environmental protection in 2018 amounted to 4,984.6 million tenge against 4,444.3 million tenge in 2017.

A significant share of environmental costs (95.4%) is carried out by industrial enterprises, mainly at the expense of enterprises of the Alatau and Zhetysay districts.

The main source of air pollution in the city of Almaty is motor vehicles. The volume of pollution from transport is associated with its significant amount and the gradual aging of the city's car fleet (the share of cars in operation for more than 7 years is about 75%, or 400 thousand units). At the same time, according to the Committee on Statistics, the peak in the number of cars in Almaty was in 2011 - 525.7 thousand units. As of 01.12.2018, 509,610 units were registered in Almaty, including cars - 471,100 units, buses - 8,315 units, trucks - 30,195 units (in 2017 - 518 thousand units, as of 01.12.2016 - 529,295 units were registered in Almaty). According to the Ministry of Internal Affairs of the Republic of Kazakhstan as of 01.11.2019 - 516,066 units of vehicles are registered in Almaty, of which 1,460 units on gas fuel, 17,120 units - on mixed fuel, 263 units - have an electric drive).

At the same time, it should be noted that the number of cars meeting the modern requirements of Euro-5 class compliance is growing (table 2.16.1.).

Table 2.16.1. Compliance of vehicles with environmental standards

Compliance with motor vehicle class	2009	2017
Euro 0	38 - 40%	10 - 13%
Euro 4	15%	17%
Euro 5	0%	25%

The state of the city's atmosphere is influenced by emissions from CHPP-3 of the Almaty region, which were not previously taken into account in the city's balance.

Also, despite the high level of gasification of the city of Almaty, emissions from non-gasified regions in 5 border districts of the Almaty region, where the level is less than 40%, have a negative impact on the air condition.

Reducing the overall level of air pollution is one of the city's priorities. By 2017, the following projects have been implemented:

- Re-equipment of CHPP-1 and about 90% of boiler houses of Almatyteplokommunenergo JSC for seasonal or year-round operation on natural gas;

- At CHPP-2 (emissions amount to 37.1 thousand tons / year in 2019), a new boiler unit No. 8 with a new generation emulsifier with a purification degree of 99.5% and modernized burners to suppress nitrogen oxides was put into operation;

- Completed construction of the 2nd stage of the project for laying gas pipelines from the automated gas distribution station to the Western Thermal Complex;

- The implementation of the private sector gasification program continues, the private residential sector is 99% provided with natural gas. There is the question of further gasification of settlements and horticultural societies located in the suburban area;

- As part of the development of road infrastructure, 4 interchanges, more than 40.2 km of new roads, 13.5 km of traffic jams were built, 464.5 km of roads and 9 bridges were repaired. A small transport ring was formed: "Eastern bypass - Al-Farabi - Sain - Ryskulov". One-way traffic is organized on 10 streets, 33 km long. This allowed to reduce traffictime in the city center from 40 to 15-20 and increase the average speed on 10 one-way streets from 6 to 15 km / h;

- Construction of 4 more interchanges continues, which will increase the throughput by 15% in the north-eastern part of the city;

- Public transport infrastructure is being developed: a Bus Rapid Transit (BRT) corridor was built on 3 streets with a length of 7.7 km. BRT passenger traffic increased by 40% (from 100 to 140 thousand pass / day), traffic time decreased by 32%;

- A part of the 1st metro line (9 stations, 10.3 km) was put into operation. Construction of 2 new stations for 3.1 km is underway. To reduce waiting time and increase passenger traffic, 8 new trains (32 cars) are being purchased, which will enter the metro line already in 2020;

- Introduced "priority lanes" for public transport, today it is 122 km. of roads. The speed of public transport on 22 streets increased by 20%, passenger traffic increased by 30%, waiting time for passengers was reduced by twice, accidents by 40%;

- In 2019, 35,637 violations of environmental standards were revealed, of which 14,082 or 39.5% were committed by nonresident vehicles. Under article 334 of the Administrative Code (for exceeding the standards for the content of pollutants in emissions), fines were imposed in the amount of 54 million 858 thousand tenge, 21 million 468 thousand tenge or 39.1% were collected (*in 2018, 40 thousand fines were issued (in 2017 - 33,464; in 2016 - 33,556), fines were imposed in the amount of 107.5 million tenge, 45.5 million tenge were collected (in 2017 - 160.6 million tenge; in 2016 - 165 million tenge)*);

- Work continues on preserving the city's green fund: in 2017, over 28 thousand pieces of seedlings of various trees were planted in the city; in 2018 - over 29 thousand trees, in 2019 - over 135 thousand seedlings.

At the same time, there are a number of initiatives that were planned within the framework of previous programs, but were not implemented or were only partially implemented:

- Launch of the 2nd metro line;
- Removal of industrial enterprises outside the city;
- Completion of the construction of the BAKAD highway (the resolution of this issue is beyond the authority of the Akimat of Almaty and should be considered at the level of the Government of the Republic of Kazakhstan);
- Switch over of 60% of public transport to gas.

Work is underway to greening public passenger transport: over the past 3 years, 80% of the city's bus fleet has been updated. Instead of old and uncomfortable buses, 1,150 new ones (corresponding to Euro-5) were purchased, 135 of them on gas. The total passenger traffic has increased over 3 years from 158.5 million to 305.5 million. In 2019, another 450 buses were purchased, thereby updating the bus fleet by 82%.

The Kazakh-German-Hong Kong plant for the assembly of III generation electric buses was opened. Electric buses of the III generation (10 pcs.) have been put on the routes, the trolleybus fleet is being modernized. Due to the renewal of the public transport fleet, emissions of harmful substances decreased by 2.33 thousand tons, while 96.7 thousand tons of fuel were saved.

138 pcs. of vehicles of municipal enterprises were switched over to gas fuel.

As a stimulating measure for switch over vehicles to gas, NK SPK Almaty JSC, together with international commercial banks, developed a concept of preferential bank lending. The estimated volume of investments is 700 million tenge.

In pursuance of the instructions of the Head of State, by the resolution No. 2/122 of the Akimat of Almaty city, a bus and passenger route "Medeu-Shymbulak" was organized by taxi and minibuses running on gas fuel.

Also, together with the EBRD, the first stage of the PPP tender for the light rail tram project is being completed in the city. It involves Japanese, Turkish, French, Spanish and Chinese consortia. The best of them in terms of price and quality will become a long-term partner of the city with joint operation for 20 years (https://www.kt.kz/rus/ecology/v_almaty_gotovyatsya_vypustit_na_marshruty_pervye_10_13778844_75.html).

Allur Auto, together with the EPR Operator, is implementing a project for the installation of electric filling stations for electric vehicles (EFS). There are 19 points of electric filling stations in Almaty. At the moment there are 52 pcs. of EFS in Almaty, including at the Shymbulak ski resort and the Medeo sports complex, there are 7 pcs. of EFS. The preliminary list of EFS installation in Almaty includes: Shymbulak Ski Resort, Medeo Sports Complex, Park of the First President, Park 28 Panfilovtsev, SRC YessentaiMall, Mega, Dostyk Plaza, ADK, Atakent Mall, Sputnik, Magnum chain of stores and etc.

Also, until the end of this year an additional 18 EFS stations will be installed.

Observations of surface water pollution in the territory of Almaty were carried out at 4 water bodies (rivers Kishi Almaty, Yessentai, Ulken Almaty, Lake Ulken Almaty).

In 2017, the quality of surface waters of the rivers Kishi Almaty, Yessentai, Ulken Almaty, Lake Ulken Almaty is rated as "moderate pollution". Compared to 2016, water quality has not changed significantly¹⁵⁹.

In 2018, the surface water quality of the rivers Kishi Almaty, Yessentai, Ulken Almaty, Lake Ulken Almaty is rated as "moderate pollution". Compared to 2017, water quality has not changed significantly¹⁶⁰.

In 2019, according to the Unified Classification, the water quality of water bodies in the territory of the city of Almaty is assessed as follows: 3rd class - the rivers Kishi Almaty, Yessentai, Ulken Almaty; not standardized (> 3 class) - Lake Ulken Almaty¹⁶¹.

In 2017 - 2018, planned comprehensive work was carried out to reconstruct ditch networks with a length of 30 km, as well as to reconstruct individual sections of river beds and improve the water protection zones of the Yessentai River. In September 2017, emergency recovery work was completed on the Kargaly River. Funds in the amount of 136 million tenge were allocated from the local budget for the development of design and estimate documentation for stabilizing the bed of the Ulken Almaty River, with a length of 3.5 km.

Reconstruction of certain sections of water protection zones and river beds within the city is underway. So, on the rivers Ulken Karasu only 2.0 km and Kishi Karasu - 2.5 km of the work has been completed. Work was carried out to stabilize the channels with the fastening of the section of the Kerenkulak and Yermensai rivers - in total 2.9 km. Also, the reconstruction of individual sections of the Yessentai River with a length of 1.8 km has been made.

In 2019, work was completed on sections with a total length of 10.3 km and the following facilities were commissioned:

1) "Reconstruction of individual sections of water protection zones and channels of the Ulken and Kishi Karasu rivers within the city of Almaty", the length of the reconstructed section is 6.2 km (of which in 2019 work was performed on sections with a length of 1.61 km on the Ulken Karasu river, and Kishi Karasu - 0.05 km);

2) "Reconstruction of a section of a water protection line and a channel of the Yessentai River upstream of Al-Farabi Avenue to Zhamakayev Street of Medeu District of Almaty" - the length of the section to be reconstructed is 2.07 km (of which in 2019 work was performed on sections of 1.07 km long); Work on the Tastybulak River was carried out along the emergency line – 1.083 km; on the Terisbulak River - 2.45 km (of which clearance - 1.367 km). The total length of the work performed is 6.263 km, of which the channel was reinforced with gabions and the channel was stabilized with reinforced concrete – 4.896 km., clearing and widening of the channel - 1.367 km.

Mechanized cleaning of silt and sand was carried out on stabilized areas with a total length of 4 km.

In total, taking into account the previously carried out work on the reconstruction of channels and the improvement of water protection zones and lines, the total length of the reconstructed sections was 191 km.

3) "Engineering protection against flooding of the construction site of a mosque for 7000 places on the Momysuly street, as well as the construction of a waste collector with a diameter of 1000 mm, taking into account the prospective development of the territory north of Ryskulov Avenue, west of the Boraldai River in the Alatau district of Almaty city, the length of the collector and drainage network is 2.52 km.

4) "Water intake facilities from surface sources of the Kerenkulak River and supplying irrigation water pipeline for irrigation of the Botanical Garden of Almaty, stage 1", 2.9 km long.

Monitoring of work on water bodies: work was carried out to eliminate a natural emergency and emergency recovery hydraulic structures located on the Bukhtarminskaya street - about 700 m - stabilization of the Malaya Almatinka River bed and 150 m strengthening of the dam on the Airport Lake from the eastern side.

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In accordance with the Roadmap "A set of measures for the prevention and elimination of flood threats for 2017 - 2020" overhaul of 6 bridges on the Yessentai River was carried out.

As a result of surveys carried out by the Department together with Kazselezaschita, landslide areas were identified in the city. Based on these facts, the Department sent recommendations and petitions to district akims, Department of State Architectural and Construction Control and Land Relations Department, the city prosecutor's office was informed.

With the support of the Committee, the city akim's office carried out work to strengthen the rocky slopes of the GES-1-BAO and Medeu-Shymbulak motorways by means of transferring funds. The existing Mynzhylki dam was reconstructed.

Preventive work was carried out to empty the moraine lakes through natural discharge channels by clearing and deepening. At the same time, water was pumped out through siphon pipes with a diameter of 315 mm, with five pumps of increased productivity.

As a result of the work carried out, 4 lakes were completely emptied, on the rest of the lakes the water level was reduced from 2 to 9 meters. More than 7.7 million cubic meters of water were discharged in total, with the initial total volume of all lakes - 1.5 million cubic meters.

To assess the state of moraine lakes, since the beginning of the mudflow hazardous period, 28 aerovisual flights were carried out with the involvement of the aviation of the Committee for Emergency Situations of the Ministry of Internal Affairs of the Republic of Kazakhstan and the Akimat of the city.

As part of the implementation of the state program "Digital Kazakhstan" and the creation of a Smart City work was carried out to create an automated monitoring of mudflow hazard.

Together with the Institute of Geography, a "Methodology for the organization and functioning of automated monitoring of mudflow hazard in the basins of the Kishi and Ulken Almaty, Kargaly and Aksai rivers" was developed. Digital monitoring is planned to be implemented in three stages.

The number of HS in the city is 35. The state of all HS is satisfactory.

For the general certification of the city's facilities according to the seismological hazard, Kazakh Research and Design Institute of Construction and Architecture surveyed 7,027 facilities. All objects in 3D format are plotted on the city's giscard, which will also be integrated into the Smart-city system in the future.

The Institute of Seismology has developed a map of seismic microzoning of the territories of the city of Almaty, which will be a scientific and methodological basis for the further development and approval of new building codes and regulations of the Republic of Kazakhstan "Development of the city of Almaty taking into account microseismic zoning (seismic zoning) within the framework of international standards of Eurocode 8".

Production and consumption waste management and waste processing

According to the data provided by the Akimat of the city of Almaty, in 2018, 477 thousand tons of solid household waste were generated, of which 10.1% were processed. In 2017, the volume of generated solid household waste amounted to 467 thousand tons, of which 10.01% was processed. 100% of the population is covered by services for the collection and removal of solid household waste. There are no solid household waste landfills in the city of Almaty.

According to the Department of Statistics of Almaty city, in 2019, 489.9 thousand tons of municipal waste were generated in the city of Almaty, collected by specialized enterprises and individual entrepreneurs for the collection and transportation of waste, the number of which was 63 units. The main share (87%) is household waste, while 12.6% was industrial waste (equated to household waste), 0.3% - market waste, 0.1% - street waste.

Transferred for processing to third-party organizations and to the waste sorting complex - 433,712 tons, sent to landfills - 56,187 tons.

In 2018, in the city of Almaty, within the framework of a PPP, a project for the construction of a waste sorting complex with a capacity of 550 thousand tons per year was implemented, which will allow only safe inert and biodegradable materials to be sent for burial at the landfill. The sorted volumes of solid household waste by the private partner Green Recycle LLP are transferred under contracts to 15 converters (Kazakhstan Waste Recycling LLP - waste paper; Recycle Ecology LLP,

Atameken 4 Plus LLP, Kazvtorplast LLP - plastic waste; Mashat IE - metal, Murat IE - glass, KWGE LLP - metal and PET, etc.).

At the end of 2019, 373,134 tons of solid household waste were received at the waste sorting plant, and 27,439 tons of recyclable materials were sorted.

The enterprises will extract up to 50 thousand tons of secondary raw materials: cardboard, cellophane, glass, plastic and metal, for further processing. On the territory of waste sorting plant, a site for storing and processing wood waste has been organized, and it is planned to organize a site for storing construction waste. In the future, it is planned to create additional capacities on the territory of the complex for deep processing of secondary raw materials. All this, coupled with the introduction of an integrated waste management system, will reduce the environmental burden on the city's environment.

This waste sorting complex is a clear example of the EXPO-2017 legacy and is implemented according to the principle of public-private partnership. The investor, with whom a long-term contract was signed, invested 5.4 billion tenge. In turn, the city provided land and all engineering communications.

The introduction of an enterprise with advanced Italian equipment created 530 permanent jobs. The conclusion of a long-term contract between the city administration and a consortium of private investors allows to build an effective model of the enterprise. One of its points is the constant renewal of the vehicle fleet and automation of processes. 30 new cars were purchased and a route dispatching system was introduced.

Kazakhstan Waste Recycling LLP with the assistance of the Akimat of the city of Almaty and the Operator of EPR established 26 points for the reception of recyclable materials (waste paper and plastic waste).

Since 2016, a modern plant of Almaty Glass LLP has been operating in the city of Almaty for the production of glass containers with a capacity of 120 million bottles per year. In 2017, the plant entered into an agreement with Operator ROP LLP, thanks to which it began to purchase large volumes of waste glass, which led to an increase in production. Almaty Glass LLP sells its products not only in Kazakhstan, but also exports to a number of CIS countries. The company has a CT-KZ certificate.

Also, ECOWorld LLP (there is a Memorandum between the akimat and this organization on the implementation of separate collection of solid household waste) and TazaAlmaty LLP installed about 350 mesh containers, Tartyp JSC - 50 mesh containers, NSLabs LLP in government agencies and organizations of the city has installed more than 700 eco-boxes to collect plastic waste, waste paper and glass containers. Promtekhnosurs LLP together with the Operator ROP installed 100 special containers for the collection of electrical waste in educational institutions in the framework of the social project on environmental education and training.

In 2019, the akimat plans to implement a pilot project to introduce separate collection of municipal waste in two types “wet” and “dry”.

State of urban greening and ecological tourism

Work continues on preserving the **city's green fund**. The area of public green spaces is 3.5 sq m / person, this is an additional regional indicator for the city. In 2019, more than 135 thousand seedlings were planted on account of guarantee compensation obligations.

Reconstruction and improvement of 2 objects, a public garden in the Ainabulak-2 residential district, and the Yuzhny park were carried out. At the expense of the investor, Altyn-Taraz LLP - improvement of the territory of the Central Park of Culture and Rest.

In general, the area under flower beds in 2019 amounted to 110 755 sq. m of flower beds, of which:

- Bulbous flower beds - 18,953 sq m;
- carpet - 9 809 sq m;
- annual flower beds - 45 240 sq m;
- rose gardens - 10,084 sq m;
- Cannes - 7,216 sq. m;

- perennials - 2 263 sq m;
- lawns - 15,800 sq m;
- vertical gardening structure - 4 337 pcs.

Almaty is the center of the **tourism industry** in Kazakhstan, while the city has the potential for further development of this sector. This is due to the geographical, territorial and historical location of the city, as well as the presence of a sufficiently developed service infrastructure.

In 2017, a total of 969,861 people (internal and inbound visitors) were served by accommodations, this is almost a fifth of the republican indicator - 5,279,406 people (18.3%).

Almost every second foreign tourist visits the city of Almaty (in total, 891,911 people are served by accommodation places for inbound tourists throughout the Republic of Kazakhstan, of which 353,626 people are in Almaty, 39.6%).

The percentage of inbound and domestic tourists changed from 41.8% / 58.2% in 2015 to 36.5% / 63.5% in 2017. Most of the inbound tourists come from business tourism.

In terms of the volume of services rendered by accommodations (excluding restaurant services), it showed an increase in 2015-2016 from 18.6 billion tenge up to 19.7 billion tenge. In 2017, this indicator amounted to 22.5 billion tenge (the volume of the Republic of Kazakhstan - 108.4 billion tenge), almost a fifth of the republican volume of services rendered by accommodations (20.7%).

For the development of the tourism industry, a general marketing strategy for promoting the city of Almaty was developed, within the framework of which a redesign of the tourist site - VisitAlmaty.kz was carried out; pages on social networks Facebook, Instagram, Wechat, Twitter were launched.

In 2016-2017, a campaign was carried out to promote Almaty on the BBC TV channel, 4 videos were rotated.

Also, in 2017, an information tour was held for leading foreign tour operators from 9 countries, such as China, Poland, Turkey, Russia, India, Azerbaijan, Ukraine, Singapore and Uzbekistan.

Work was carried out with the Euronews television company, where videos on the topic "Almaty - the city of thousand colors" and the "Star of Asia" festival were rotated for the "Metropolitans", "Focus" and "Cult" programs.

The analysis of the main indicators of the development of the tourism industry shows the presence of positive dynamics and allows us to conclude that the city of Almaty has good growth prospects as a tourist center.

Statistics on the tourist flow of the Almaty city for 2018-2019

	Name / years	2018	2019
1	The number of served visitors at the accommodation (people)	1,084,991 (+11,8%)	1,334,230 (+22,9%)
2	The number of visitors served by accommodation places - residents (people)	719,854 (+16,8%)	898,531 (+24,8%)
3	The number of visitors served by accommodation places - non-residents (people)	365,137 (+3,2%)	435,699 (+19,3%)
4	The number of accommodations (pcs.)	286 (+55,4%)	339 (+18,5%)
5	Provided room-night by places of accommodation (r/n)	1,719,971 (+5,6%)	1,953,639 (+13,5%)
6	Scope of services provided by the accommodations (thousand tenge)	25,710,759.7 (+14,3%)	32,293,595.3 (+25,6%)

Source: Key indicators for 2018-2019 of the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan.

Marketing promotion

As part of marketing promotion in 2018, 2 info-tours were held for foreign tour operators, and they took part in 7 international tourism exhibitions.

Also, in 2018, the international professional continental "AppleTeam" cycling team, which

represents the city of Almaty, took part in 9 international races under the auspices of the World Cycling Federation (*in Turkey, Ukraine, Slovakia, Romania, Latvia, Lithuania, Estonia, Hungary*).

In order to develop innovative projects in tourism, the project "AlmatyTravelLab" was carried out. AlmatyTravelLab is a series of five hackathons aimed at developing tourism potential through digital tools. Thus, 5 hackathons were held within the AlmatyTravelLab series of exhibitions: Stopover, City walks, Mountain routes, TravelData, KokZhailauChallenge.

In addition, for the development of event tourism in 2018, the second season of the largest fashion week in Central Asia "AlmatySauvageFashionWeekend 2018" was held with the participation of international brands. As part of the event, the best brands in Europe presented their collections in Kazakhstan with the traditional appearance of designers.

In order to develop domestic tourism, an advertising campaign was carried out on the Internet "Me and you - for the weekend in Almaty!" in cities such as Nur-Sultan, Karaganda, Pavlodar, Shymkent, Ust-Kamenogorsk, Aktobe and Atyrau. The total audience coverage from this advertising campaign in social networks amounted to 9 million views.

To increase the level of informing tourists about the city of Almaty, printed products about the city of Almaty are developed and distributed annually, such as a checklist "Almaty 72", an information and tourist map of the city of Almaty, a brochure "WelcometoAlmaty", 100 impressions.

Also, for the convenience of tourists, the AlmatyPass card has been developed, which makes it possible to visit the main attractions, get discounts in 7 hotels and 2 hostels, 11 restaurants and 6 entertainment facilities, use public transport an unlimited number of times.

Tourism infrastructure development

In November 2018, a tourist hub was created at the Baluan Sholak sports complex, which houses tourist operators, real estate agencies, a craft center, recreation areas for tourists, etc.

Completed work on the improvement of **8 tourist sites** (Medeo, Kok-tobe, Park named after the First President, Baum Grove, Panfilov Street (corner of Aytekebi Street), State Circus, Museum named after Kasteev, Almaty Museum, Terrenkur, Green Bazaar, Museum named after Ykhlas, Central State Museum), benches with litter-boxes, bicycle parking, public toilets, information boards, flowerpots, bollards were installed.

In order to develop new tourist routes, the akimat completed work on the improvement of **9 tourist routes and trails**.

For the development of cultural and ethnographic tourism, the archaeological complex "**Borolday Saki Mounds**", organized within the framework of the program for the modernization of public consciousness "Bolashakka bagdar: RukhaniZhagyru", was presented.

In addition, for a comfortable stay of tourists, there are **1,560 memos** on payment methods on buses, as well as memos to attractions in the amount of **2,400 pcs**.

Social tourism

In order to develop social tourism, a sightseeing tour across the city of Almaty was organized for 30 children, the participants of the "Auyl Koshbashylary" project developed under "Rukhani Zhagyru". state program.

As part of the celebration of the 20th anniversary of the capital, a thematic excursion for children to the city of Nur-Sultan (Astana) was organized with a visit to its main attractions. The event was attended by 90 children from low-income and large families.

Also, as part of the implementation of the Roadmap "Active Longevity" 15 excursions to the sights of the city of Almaty were held for 225 people of retirement age.

Human resources

In order to develop human resources in tourism, trainings were held for 200 employees of the Sairan bus station, Almaty-1 and Almaty-2 railway stations and employees of the Ile-Alatau National Park.

Marketing promotion

To increase the influx of foreign tourists and mention the city at the international level,

systematic work continues to promote the city of Almaty.

So, in 2019, **2** info-tours for 40 foreign tour operators and **2** press tours for 40 representatives of foreign media, participation in **9** international tourism exhibitions and 3 conferences with a total coverage of more than 300 thousand participants were held.

To increase the level of recognition of the city in 2019, the "AppleTeam" Almaty cycling team, which took part in **11** international cycling races around the world with the application of the "VisitAlmaty" logo on the outfits of athletes was supported (*in Georgia, Turkey, Hungary, Russia, Slovakia, Romania, Poland and Kazakhstan*).

An advertising campaign "Winter's Tale of Almaty" was carried out by branding the outer part of the Aeroexpress on the route Domodedovo Airport - Moscow, reaching 3.6 million people.

In addition, in June 2019, the first wingsuit flight in Kazakhstan was organized with RedBull, within the framework of which an advertising video about the city of Almaty was shot, reaching more than 11 million people.

To increase the recognition of the city as a tourist destination on the Russian market of tourist services, since 2016, active work has been carried out with the Russian Internet platform Profi.Travel, on which more than 150 thousand professionals of the Russian tourist market are registered.

In order to promote the brand of the city of Almaty, more than 100 image videos and 3D postcards about the attractiveness of the tourist brand and life in Almaty were filmed in social networks.

At the same time, for the convenience of tourists, 30 tourist routes have been developed in the city and mountainous areas of Almaty and 19 standard tourist products have been prepared.

The developed routes cover the unique architectural buildings of the city and represent all the main types of tourism presented in the city's market, such as: ethno, eco, youth, cultural, agro, gastronomic, etc.

Also, a tourist package has been prepared for distribution to the guests of the city, including a city map, cards with routes, etc.

In September 2019, in order to create souvenirs that reflect the national identity of the Kazakh people, a competition of handicraft souvenirs under the Almaty brand was held with the participation of 50 craftsmans of the Republic of Kazakhstan.

Tourist infrastructure

To raise awareness among tourists, 2 visit centers were opened in 2019. So, today there are 8 points for informing tourists in the city, where in 2019 more than 32.9 thousand tourists received advice.

In order to develop mountain tourism in June 2019, the CSKA base was transferred from the balance of the Ministry of Defense of the Republic of Kazakhstan to the communal property of the Akimat.

In August 2019, an international mountain event - AlmatyMountFest was held with a total coverage of more than 15 thousand people.

In addition, 10 mountain trails have been landscaped and more than 1000 km of mountain routes have been digitized.

Together with the Federation of Mountaineering and Rock Climbing of the Republic of Kazakhstan, a guidebook "Alatau trails" has been developed for lovers of outdoor activities in the mountains.

Also, a private investor completed the improvement of the tourist trail in the Prokhnodnoye gorge and the thermal spring near the Alma-Arasan sanatorium. In 4 months, 6 crossing bridges were built, 1 staircase was restored, an observation deck and work-out platform were organized.

For the development of excursion services, buses from the Baluan Sholak sports complex to the Oi-QaragaiLesnayaSkazka and SkiParkPioneer Mountain resorts and an express route to the beginning of the hiking trail in the Prokhnodnoye gorge were launched in 2019.

Social tourism

In order to develop social tourism, an excursion was held in May 2019 for 250 disabled children and from low-income families in the city of Almaty.

Also in June, a similar excursion was conducted for disabled adults in the city of Almaty and the Almaty agglomeration with a total coverage of 100 people.

The excursion and educational program of the two above-mentioned events included a visit to the Spiritual and Cultural Center "Anagakurmet", the Museum of Mother Reverence, the Memorial Complex "Bатыр Babalar" and the historical and cultural complex "Atameken". For 350 people, transport, food, escort of an ambulance were provided, guides and volunteers were involved.

Development of human resources

In August 2019, in order to develop human resources in tourism, facilitation trainings were organized for 100 employees of the Almaty airport.

In March 2019, a seminar was held to train 40 instructors of adaptive skiing and snowboarding.

From April to May of 2019, visiting lectures on tourism development in the city of Almaty were held for 300 students of the faculties of "Tourism" of universities in the city of Almaty.

In June, the 4th International Hotel Forum was held for 130 hospitality professionals.

In August 2019, a training seminar was held to train 100 guides, tour guides, tourism instructors in the city of Almaty.

It should be noted that textbooks have also been developed for guides on the history of the city of Almaty in 7 directions: the Saka period, the Middle Ages, the Kazakh Khanate, the Vernensky period, the Soviet period, independent Kazakhstan, sacred Kazakhstan.

2.17. Shymkent city

Territory, population and GRP of the city. Diversification of the economy

The territory of the city of Shymkent is 116,280 hectares, the population of the city in 2018 – 1,009.2 thousand people, at the end of 2019 – 1,038.2 thousand people. The agglomeration includes Arys city, Baidibek, Tulkubas, Kazygurt, Tolebi, Ordabasy, Sairam and Saryagash districts. The agglomeration zone has about 1.6 mln. people. The GRP of the region in 2019 amounted to 2,203.0 bln. tenge, per capita - 2,152.1 thousand tenge. Index of actual volume - 103.8%.

The most important in the city's economy is the **industrial sector**. Of the city's working population, the share of workers in this area is 7.3%, and its share in the gross product is 20.0%.

According to the Committee on Statistics, the volume of industrial production in 2018 amounted to 492.3 bln. tenge, in 2019 - 579.6 bln. tenge. In the industry of the city of Shymkent, the main share is occupied by the manufacturing industry with a volume in 2018 - 422.3 bln. tenge, in 2019 - 497.4 bln. tenge.

There are 63 large and medium-sized enterprises in the city. Of these, 21 enterprises manufacture products for export¹⁶².

In 2015 - 2017, 25 projects were implemented in the amount of 119.5 bln. tenge, 1,925 jobs were created. In 2019, 26 projects were implemented, 375 jobs were created.

According to the Committee on Statistics, the gross **agricultural** output amounted to 25.7 bln. tenge in 2018, in 2019 - 31.2 bln. tenge, with the advantage of animal husbandry (61.5%).

Agricultural lands make up 63 thousand hectares or 54% of the total land fund. In the coming future, the rapid pace of urban construction will lead to an overall decrease in agricultural land. In this case, the development of processing of agricultural products and import substitution will be acceptable and effective for the city.

The city has 10 thousand hectares of irrigated land. In 2018, 95% of irrigated lands (9.5 thousand hectares) were developed. In 2018, an average of 11.9 thousand tons of grain crops, 40 thousand tons of vegetables, 1.5 thousand tons of cucurbits, 9.0 thousand tons of potatoes were harvested. In 2018, 115 hectares of intensive gardens were planted (Alma Bau Bakshalary Agro-Industrial Complex - 50.0 hectares, Ontustik Bau Bakshalary - 50.0 hectares, Keremet-Sapa LLP - 15.0 hectares). Drip irrigation was additionally introduced on 300 hectares, the total area was 1,680

¹⁶² Hereinafter, the Program for the development of the city of Shymkent for 2018 - 2022 and reports on its implementation for 2018 and 2019.

hectares. Greenhouses were additionally built on 9 hectares, with a total area of 168 hectares. These greenhouses have harvested about 15 thousand tons of vegetables. In addition, over the past three years, work has been carried out on the use of land by new technologies. In 2018, the technology of deep loosening was introduced on 4.5 thousand hectares.

In 2018, an additional 47 small feedlots and 37 family dairy farms were created. Under the Sybaga program 123 heads of breeding stock were purchased, 1,292 heads of breeding stock of cattle are involved in the breed transformation, the share of breeding stock in the total number was 3.7%. Under the Altyn Asyk program, 518 heads of small cattle were purchased, 2.5 thousand heads are involved in breed transformation, the share of breeding stock in the total number was 2.3%. 110 horses were purchased under the Kulan program. As of January 1, 2019, 58 new cooperatives have been created.

Development of energy, including renewable energy and energy supply to the population

Power supply. In order to provide high-quality power supply in 2018, 10 projects were built, 6 facilities were completed. As a result, the coverage rate was 91.2%.

58.3% of electricity is generated in the city through 3-Energoortalyk JSC, and the remaining 41.7% - from other sources or dependent on external sources. This, in turn, is reflected in the high cost of electricity supply, that is, it has a negative impact on the tariff policy.

As the analysis has shown, the daily level of electricity consumption in Shymkent in winter is 196 MWh. Of which, the consumption level of the population is 63.3%, of enterprises - 36.7%. In the summer, the level of electricity consumption is 146 MW / h, of which the level of consumption by the population is 61.7%, of enterprises - 38.3%.

The city has a total of 36 substations with different power levels, among them on the balance of KEGOC - 2 substations, on the balance of Ontustik Zharyk Transit - 30 substations, privately owned - 4 substations.

The length of power lines is 3,914 km, of which Ontustik Zharyk Transit has 1,795.1 km or 46%, communal ownership - 823.6 km or 21%, private ownership – 1,295.4 km or 33%. The wear rate of power lines is 53.8% or 2,105.0 km.

Currently, private transformers and electrical systems do not meet state standards. Along with this, in adverse weather conditions, emergencies are more frequent and poor quality of electricity is present. 26 residential districts (788.6 thousand people - 88.3% of the population) are provided with power lines corresponding to state standards, and the remaining 55 residential districts (107.5 thousand people - 11.7% of the population) are provided with low-quality power supply networks, in which it is necessary to conduct power lines corresponding to state standards.

In 2019, as a result of the implementation of 11 projects, about 6 thousand residential buildings will be provided with high-quality electricity, the coverage level will reach 92.3%, or 946 thousand people.

Renewable sources. A biogas plant has been installed, electricity generation is 400 kWh. The payback period is 7 years.

Geothermal heat pumps installed. The operational consumption of electricity in the water intake structure of Akbai-Karasu amounted to 500 kW * h. After the installation of these pumps, the power consumption dropped to 100 kWh. Payback period - 6 years.

A solar power plant (solar panels). The head building of Vodnye Resursy-Marketing LLP and the Akbai-Karasu water intake are equipped with solar electric batteries that generate electricity. Payback period - 5 years. The total power generation is 200 kW * h.

A small hydropower plant has been installed at the Waste Water Treatment Plant (WWTP). Electricity generation - 200 kW * h. Payback period - 6 years.

In addition, the Department of Energy and Utilities of the city will install a wastewater bio-access facility with a capacity of 500 m³/day in order to provide residents of the cross-residential area with a sewage system and prevent pollution of the Badam River in this area.

Heat supply. 373 budget institutions of the city and 1,848 multi-storey residential buildings are provided with heat. According to the schedule, capital and current repairs were carried out at 203

small boiler houses (up to 100 Gcal / hour). Current repairs have been carried out on 33.8 km of the city's heating networks.

The population of the city is supplied with heat from 7 heating boilers. 89% of the housing stock of multi-storey residential buildings in the city is heated through 3-Energoortalyk JSC, the remaining 11.0 percent - through private boiler houses.

Out of 346 social facilities in the city, 53.2% are supplied with centralized heating, the remaining 46.8% are small boilers. Small boilers are essentially liquid fuel or coal fired.

In 2019, as a result of the completion of the construction of 6 projects, the depreciation rate of heating networks will decrease from 42.7% to 37%, in particular, it is planned to reconstruct the main heating networks with a length of 4.062 km on the Gogol Street, 4,735 km long on the Adyrbekov Street and 7.318 km long in the northern part of the city of Shymkent.

According to the Committee on Statistics, the total length of heating networks was 208.1 km, of which 41.4 km (19.9%) are dilapidated, all of them need to be replaced.

In 2018, 3 projects were under construction for **gas supply**, the level of coverage was 92%.

Natural gas is supplied and distributed to residents of the city by South Kazakhstan Production Branch of KazTransGas Aimak JSC. The number of subscribers – 147,341, of which high-rise panel buildings – 74,992, the private sector – 72,349.

The length of gas transfer lines is 3,973.6 km. Of these, in the period from 2010 to 2015, 1,620.69 km or 40.79% of gas pipelines were modernized. In 2018, the wear rate of gas pipelines is 49.9%. The city is mainly supplied with gas from 2 sources and 2 sources are put into reserve. Consequently, the city has good opportunities to modernize gas pipelines.

Average annual gas consumption is 190 thousand m³ / hour. In winter, 57.9% of natural gas is used by city residents, 32.9% by CHPP-3, the remaining 9.2% - by enterprises, in summer 17.5% of natural gas is used by residents of the city, 61.9% by CHPP -3, the remaining 21.6% - by enterprises.

In 2019, as a result of the implementation of 11 projects, 11.2 thousand residential buildings will be provided with high-quality fuel, the coverage level will be 93.3%, or 974 thousand people.

Energy saving. There are 38,874 light sources in the city. In parks and squares there are 22,207 pieces of reflective sources, 14,009 pieces are installed on 175 streets and 2,658 multi-storey residential buildings. In 2017-2018, 11,565 pieces of LED energy-saving lamps were replaced on 89 streets, currently the number of LED lamps is 13,396.

Condition of water supply and sewerage, provision of the population with centralized water supply and disposal

Water supply. In order to provide drinking water, 9 projects were under construction in 2018. As a result, the number of population covered by centralized water supply increased from 92% to 93% (Table 2.17.1.).

The population of Shymkent is provided with drinking water from the following water sources:

1. Comeshebulak - 73 thousand m³/day.
 2. Akbai-Karasu - 206 thousand m³/day.
 3. Tassai-2 - 35 thousand m³/day.
 4. Tassai-1 - 30 thousand m³/day.
 5. Badam-Sairam water pipeline - 80 thousand m³/day.
- Total: 424 thousand m³/day.

Table 2.17.1. The level of provision by centralized drinking water in Shymkent city

City	Settlements		24-hour water supply			
			24 hours		Well	
	Number	Population (thousand people)	Number of residential districts	Population (thousand people)	Number of residential districts	Population (thousand people)
Shymkent	81	896.1	68	824.5 (92.0%)	13	71.6 (7.9%)

Source: information of local executive bodies

In 2017, the length of water supply systems, according to the city's Akimat, was 3,542.6 km. Of these, 1,827.47 km are on the balance of Water Resources Marketing LLP, 1,735.6 km are in the municipal ownership of the city akimat. The level of deterioration of water supply systems is 37.9%, all obsolete pipes are on the balance of Water Resources Marketing LLP (Table 2.17.2.).

Table 2.17.2. Analysis of the wear level of water pipes in the city

	Length, km	including:			
		On the balance of Water Resources Marketing LLP		On the balance of communal property	
		km	wear, %	km	wear, %
Main circuit	382.2	331	61.5	71.7	0
Intra-quarter networks	3,160.4	1,496.47	40	1,663.9	0
Total:	3,542.6	1,827.47	37.9	1,735.6	0

Source: information of local executive bodies

The total length of water supply networks in 2018, according to the city's Akimat, is 4,782.2 km, including 1,882.2 km owned by Vodnye Resursy-Marketing LLP, and 2,900 km in communal ownership.

In 2019, 8 water supply projects were implemented, 4 objects were completed and put into operation. As a result, 2,620 houses with a population of 18.6 thousand people are connected to water supply, the level of provision will be 94.7%, or 944 thousand people.

In 2019, according to the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan, the total length of water supply networks was 4,054.4 km, of which 1,045.8 km need to be replaced.

Wastewater disposal. On the territory of the city there is 1 waste water treatment plant (WWTP) with a capacity of 150 thousand m³/day (owned by Vodnye Resursy-Marketing LLP).

The total length of sewerage networks, according to the city's Akimat, is 838.98 km (including 453.4 km owned by Vodnye Resursy-Marketing LLP, and 385.58 km in communal ownership). All system manifolds are worn out.

Sewerage systems cover only the central part of the city. The sewerage system of 5 settlements adjoined to the city according to the General Plan was inactive in 2018 due to deterioration, wastewater flows into rivers.

In 2018, the central part of the city and 41% of consumers were provided with sewerage networks (Table 2.17.3.).

Table 2.17.3. Provision of the population with water disposal.

Name	Settlements		Sewerage			
	Number	Population (thousand people)	half		full	
			Number of settlements	Population (thousand people)	Number of settlements	Population (thousand people)
Shymkent	81	896.1	24	376.4 (41%)	57	519.8 (58.0%)

At the beginning of 2019, the level of provision with the sewerage system of the city of Shymkent is 49.1%, that is, 496.4 thousand people.

In accordance with the work plan for 2019, construction work is underway on 10 projects, as a result of the implementation of 9 of them, about 11 thousand residential buildings will be provided with centralized water supply, the level of coverage will reach 50.2%, or 540 thousand people.

According to the general plan, it is additionally provided for the construction of 2 waste water treatment plants (WWTP) (1 WWTP - with a capacity of 60 thousand m³/day, 2 WWTP - with a capacity of 150 thousand m³/day) on the territory of the city.

According to the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan, the total length of water disposal networks in 2019 was 882.5 km. of which 381.7 km need to be replaced.

The drainage of storm water in Shymkent is carried out in an open way towards rivers, canals and suburban ravines. The total length of the irrigation networks is 488 km. Of these, 23%, that is, 112.2 km, are worn out and require repair.

State of the environment, reduction of air and water pollution

Observations of the state of **atmospheric air** were carried out at 6 stationary posts.

For 2017, according to the stationary observation network, the level of air pollution in the city of Shymkent was assessed as high. APS is 10 (high level). SI = 10 (high level) and HR equal to 4% (raised level).

For 2018, according to the stationary observation network, the level of atmospheric air pollution in the city of **Shymkent** was assessed as raised, it was determined by the value of APS = 5 (raised level), SI = 4 (raised level) and HR = 11% (raised level.)

For 2019, according to the stationary observation network, the level of atmospheric air pollution in the city of **Shymkent** was assessed as a high level of pollution, it was determined by the value of APS = 7 (high level), SI = 4.2 (raised level) and HR = 1% (raised level).

In the industry of the city of Shymkent, oil, construction, textile, chemical spheres, the production of other mineral products, rubber and plastics, mechanical engineering, the production of metal products and energy are rapidly developing. This, in turn, leads to negative changes in the atmospheric air of the city.

In the city of Shymkent, the volume of all pollutants emitted into the atmosphere until 2012 increased annually by an average of 10.7%.

Since 2013, the volume of pollution has decreased, one of the reasons for this is the closure of the Yuzhpolymetal plant in 2012, which had a negative impact on the ecological state of the city and the health of the population.

However, in the industrial zone of the city, the number of industries is growing every year. Due to the increase in the city boundaries in 2014, large enterprises for the production of cement, cotton and fabric of the Sairam district moved to the city: Standard Cement LLP, Khlopkoprom Cellulose LLP, Oxy Textile LLP, that is, from 2015 the probability of a pollution raise has increased. In 2019, the total emissions of pollutants in the city amounted to 29.8 thousand tons.

One of the negative influences on air pollution is traffic flows, 60% of exhaust harmful substances into the atmosphere are accounted for by vehicles. The number of registered vehicles in the city of Shymkent annually grows by 25% on average. In addition, vehicles from other districts, regions and cities move around the city every day. This problem exists in all large cities, in this regard, today a lot of attention in the country is paid to the issue of introducing international Euro standards for transportation.

To reduce transport emissions in 2017, out of 372 minibuses, 218 were switched over to gas (propane). Greenbus LLP in Shymkent purchased 200 new buses (methane) in 2015 and serves city routes. In 2017, the company acquired an additional 100 units of gas-fueled vehicles. By 2020, it is planned to switch over 1000 (36.5%) of the 2650 buses to gas.

Production and consumption waste management and waste processing

General information on solid household waste. For the city of Shymkent, a set of measures for 2018-2022 was developed for the disposal and processing of solid household waste in accordance with modern requirements with the wide involvement of small and medium-sized businesses and approved by the resolution No. 112 dated 25.08.2018 of the Akimat of the city of Shymkent. A set of measures provides for activities to develop the infrastructure for separate collection, sorting, processing, utilization and disposal of solid household waste. In addition, the department has developed and approved a comprehensive program to reduce environmental pollution in the city of Shymkent for 2018-2022.

According to the data provided by the Akimat of the city of Shymkent, 216.2 thousand tons of solid household waste were generated in 2018, of which 18.1% were processed, in 2019 - 22.7%.

The solid household waste landfill and waste sorting complex Aktas-1 in Shymkent was launched in March 2015. The landfill receives 550-600 tons of solid household waste daily. The

complex was transferred to the ownership of Greenline LLP. In order to increase the amount of annually generated, utilized and recyclable waste, all types of waste that are subject to recycling are being sorted and processed.

Among the sorted waste, PET bottles and plastics are recycled to produce flexible raw materials.

95% of the population is covered by services for the collection and removal of solid household waste.

There are 470 container sites in the city, where 2,039 garbage containers are placed. 10 special institutions are engaged in the transportation of solid household waste:

1) 485 containers for solid household waste were placed in the Abai district at 112 container sites. Removal of solid household waste in comfortable and private houses of the district is carried out by SpetsAvtoTransport LLP.

2) 658 containers for solid household waste were placed in Al-Farabi district at 192 container sites. Removal of solid household waste in comfortable and detached houses is carried out by SpetsAvtoTransport LLP, OrionNovTech LLP, Bek Asyl Service LLP.

3) 680 containers for solid household waste were placed in Enbekshi district at 107 container sites. Removal of solid household waste in comfortable and detached houses is carried out by SpetsAvtoTransport LLP, Veisolidze L.N IE, Nur Olzha LLP.

4) 216 containers for solid household waste were placed in the Karatau district at 59 container sites. Removal of solid household waste in comfortable and detached houses is carried out by EcoSpecTrans LLP, ShymkentSpetsKompleks LLP, Zhan & Meyir LLP, Veysolidze L.N. IE, KainarBulak IE, Chisty Gorod IE.

Removal of solid household waste from container sites in well-maintained houses is carried out twice a day, and of individual houses - once a week.

Akims of districts and industry specialists carry out explanatory work with the population on garbage disposal in specially designated areas and according to the schedule.

Separate collection of secondary resources is being actively introduced. In the city of Shymkent, 70 mesh containers have been installed for the separate collection of plastic waste. 2,049 containers were placed to collect mercury-containing lamps and devices, and 100 containers were placed to collect plastic and polyethylene waste. Also Tuteev IE placed 100 additional containers for separate collection at waste sites.

In 2019, it is planned to additionally place 300 containers for separate waste collection, negotiations are underway with private investors.

Green Tehnology Industries LLP is engaged in the processing of PET waste with the production of staple fiber with a capacity of 100 thousand tons / year, the enterprise also placed 300 pcs. of containers for separate collection of solid household waste.

In 2018, a plant for the processing of used oils by the regeneration method was put into operation with the production of motor oils and lubricants by HillCorporation LLP with a capacity of 28 thousand tons / year.

State of urban greening and ecological tourism

Planting and maintenance of green spaces has been carried out in the city. 57,574 trees were planted on the streets (including coniferous – 17,327 pieces, deciduous - 40,247 pieces), in the gorges more than 80 thousand.

In the Shymkent State Dendrological Park State Municipal Management Organization in the fall of 2018, sowing work was carried out on an area of 0.87 hectares in compliance with agrotechnical requirements. In addition, 97 Scots pine seedlings, 570 pine seedlings, 850 brown larvae seedlings, 560 smaragd birch seedlings (columnar) and 242 Tien Shan juniper seedlings were planted in the nurseries. 500 saxaul bottoms delivered and filled in specially designated for sowing on the territory of the park. Joint work with the Institute of Botany and Phytointropy RSE of Almaty was carried out, with the aim of implementing scientific projects contracts were concluded. 28 species of woody shrubs were brought from the Botanical Garden. In October 2018, with the support of the TOYOTA CENTER company, 10 pine seedlings, 8 smaragd seedlings were planted in the park, and with the

support of SEKURITI LLP, 2 Stricta pines, 2 Smaragd pines, 2 Smaragd pines, as well as 30 pines seedlings were planted, sponsored by private citizens.

In the city of Shymkent, 97 tourist organizations and tourist agencies provide tourist services, including 10 are engaged in tour operator activities, 87 are travel agents. Tourism routes in the city cover cultural, historical, entertainment and event tourism. In addition, there are proposals in terms of tour routes to the neighboring regions of Kazakhstan and Uzbekistan.

The city has a high potential for further tourism development. The number of hotels of various categories, recreation sites, parks, entertainment centers and tourist places is growing. Along with the increase in the number of hotels, there was a significant improvement in hotel service through mutual competition.

Historical, educational and business tourism has been well developed in the city in recent years. And also there is an increase in excursion, environmental and entertainment areas.

Brief summary (conclusion)

Analysis of the implementation of the Concept for the transition of the Republic of Kazakhstan to a "green economy" in 2017-2019 confirmed the importance and correctness of the directions defined by the concept, the attainability of the established indicators and the possibility of accelerating the movement towards sustainable development of the Republic of Kazakhstan, in accordance with the Agenda for Sustainable Development for the period till 2030, adopted by the UN General Assembly on September 25, 2015. It is highly likely that all targets will be achieved within the specified time frame.

As a result, in 2017-2019 we achieved the following main indicators.

Taking into account the natural uneven distribution of water resources across the regions of the country and high dependence on water resources formed outside its borders, Kazakhstan pays great attention to the policy of water resources management. The main directions of such a policy are indicated at the highest political level and are subsequently reflected in strategic program documents and water legislation. The strategic documents set clear targets for the water sector in terms of improving water use efficiency, expanding water reuse and recycling, increasing storage capacity through the construction of new reservoirs and expanding the coverage of the population with water supply and sanitation systems.

The concept for the transition to a "green economy" sets **goals to ensure stable water supply** to the population (by 2020) and agriculture (by 2040), and by 2050, all problems with water resources must be resolved.

At the basin level, the problem of water scarcity as a whole should be solved by 2025, and for each basin separately - by 2030.

The share of water users with permanent access to the central water supply system changed in cities from 55% in 2013 up to 93.8% in 2017 and up to 97.0% in 2019; in rural areas it increased from 11% in 2013 up to 57.4% in 2017 and up to 62.0% in 2019. By the end of 2020, it is planned to provide access to water supply services: in cities - 97.5%, in villages - 86.4%.

The share of the population with access to water disposal systems increased in cities from less than 50% in 2013 up to 88.0% in 2017, but then decreased to 70.5% in 2019 (the decrease was due to the accession to Almaty and Shymkent cities of a number of settlements) in rural settlements increased from 11% in 2013 to over 20% in 2017, but then decreased to 8.8% in 2019.

The concept for the transition to a "green economy" sets ambitious goals for the agriculture of Kazakhstan until 2020 in achievement of a 3 times increase in labor productivity, increase wheat yield to 1.4 t / ha, and reduce water consumption for irrigation to 450 m³ / t.

The total labor productivity in agriculture increased in 2016 almost 2.3 times compared to 2012, in 2017 - 2.83 times, in 2018 - 3.39 times, and in 2019 - 4.03 times.

The wheat yield decreased in 2017 to 1.24 t / ha, in 2018 to 1.23 t / ha, and in an unfavorable year of 2019 decreased to 1.01 t / ha. The year turned out to be more productive for sugar beet (yield growth by 6.3%), cotton (by 1.3%), potatoes (by 2.8%), and open field vegetables (by 1.3%).

At the same time, labor productivity in agriculture lags far behind other sectors of the economy, and the yield of the main crops is not comparable to the indicators of developed countries (for

example, the wheat yield in 2015 was 1.33 t / ha, while the world average was 3.75 t / ha)¹⁶³. In addition, agriculture is the most water-intensive sector, besides with the largest losses of water during its transportation and use. As a result, agriculture in Kazakhstan is unattractive for investment and has difficulties in financing, which further exacerbate the existing problems.

Irrigation water consumption in 2018 amounted to 8,209 m³ per hectare, which is slightly lower than the planned values of 8,223 m³ per hectare. The solution to the problem of reducing the consumption of water and other resources is carried out through the introduction of water and resource saving technologies on most of the farmlands. Water consumption for irrigation in 2018 amounted to 1,377 m³ per hectare, in 2019 –

The total area of irrigated land in the Republic of Kazakhstan in 1991 was 2,379.5 thousand hectares, in 2000 – 2,228.3 thousand hectares, in 2017 – 2,181.0 thousand hectares, in 2018 – 2,203.1¹⁶⁴. Considering the dynamics of the areas of irrigated land for 1991 - 2017, there is a tendency to reduce the area of irrigated land to the greatest extent in Almaty, Atyrau, Zhambyl, Kyzylorda, Aktobe, East Kazakhstan, Pavlodar and North Kazakhstan regions. At the same time, there is an annual increase in irrigated land in the South Kazakhstan (now Turkestan) region.

"Kazakhstan-2050" strategy and the Concept for the transition of the Republic of Kazakhstan to a "green economy" set ambitious goals to achieve the share of **renewable energy sources** of 3% by 2020, 10% by 2030 and 50% by 2050 of total electricity production.

The share of renewable energy sources in the total electricity production amounted to 1.3% in 2018. This was provided by 67 operating renewable energy facilities with a total capacity of 531 MW (HEPP - 200.25; WPP - 121.45; SPP - 209; biogas plant - 0.35). Electricity generation by renewable energy facilities amounted to 1.35 billion kWh (115 % by 2017).

In 2019, 2.4 billion kWh of green energy were generated, with an increase of 77.8% compared to 2018. The share of renewable energy sources in the total electricity production is 2.3%. In 2019 were commissioned 21 renewable energy facilities. For renewable energy projects, the total volume of attracted investments amounted to 613 million US dollars, and the total number of renewable energy facilities amounted to 90 with a total capacity of 1,050.1 MW.

In 2018-2019 the first international auction for RES projects with a total capacity of 1,205 MW was successfully held. 138 companies from 12 countries took part in the auction: Kazakhstan, China, Russia, Turkey, Germany, France, Bulgaria, Italy, United Arab Emirates, Netherlands, Malaysia, Spain. Participants in the auction for the exposed 1,205 MW were offered applications for the implementation of projects with an installed capacity of 3,893.52 MW, which exceeded demand by 3.2 times. At these auctions, there was a decrease in tariffs for wind power plants (WPP), on average, at the bidding of the auction participants by 10.6%, small hydroelectric power plants (HEPP) by 14.5%, solar power plants (SPP) by 34.7%. Thus, when holding an auction to select an investor for the construction of a solar power plant with an installed capacity of 50 MW near the Shoulder village of the Turkestan region, Arm Wind LLP with a price of 12.49 tenge / kWh, which is approximately 3.2 US cents, became the winner of the auction. This tariff is a record low tariff in the solar energy market in Kazakhstan.

As a result of the auction, 30 companies signed contracts with a single purchaser of RES electricity (Settlement and Financial Center (SFC) for 15 years for a total capacity of 804.3 MW and 12 companies at the stage of signing contracts with SFC for a total capacity of 162.89 MW.

Gasification of the country is being actively pursued, so by the end of 2018 the level of gasification of the population reached 49.68% (about 9 million people), and by 2020 it was planned to cross 50% of the gasification level. In fact, the overall level of gasification of the country in 2019 amounted to 51.47% (9.5 million people) of the total population.

The Concept sets a task for gasification of Akmola and Karaganda regions in 2020, northern and eastern regions by 2030.

The highest level of gasification of the population was achieved in the Mangistau, Atyrau regions and Almaty city (almost 100%). North Kazakhstan, Karaganda, Akmola, Pavlodar regions and the city of Nur-Sultan remain completely non-gasified.

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164 SUMMARY ANALYTICAL REPORT ON THE STATE AND USE OF LANDS OF THE REPUBLIC OF KAZAKHSTAN FOR 2018. Ministry of Agriculture of the Republic of Kazakhstan. Land Administration Committee. 2019.

The Concept for the transition of the Republic of Kazakhstan to a "green economy" provides for bringing the share of waste recycling to 40% by 2030, 50% - by 2050, coverage of the population with the removal of solid household waste in 2030 - 100%, sanitary waste storage by 2030 - 95%.

Industrial enterprises in Kazakhstan are making significant efforts to increase the recycling and reuse of industrial waste. The share of recycled and disposed **industrial waste** is increasing annually and amounted to 30.9% in 2017, 32.2% in 2018, and 34% in 2019 to their generation, with a target of 40% by 2030, but the spread of figures for areas are very significant. For example, in the East Kazakhstan region, the share of industrial waste processing in 2019 amounted to 74.55%, in Atyrau - 62.41%, in West Kazakhstan - 33.45%, in Kyzylorda - 22.5%, in Zhambyl - 13.89%, in the Aktobe region - 13.35%. The rest of the volume is located at tailings and landfills.

The main sources of the generation and accumulation of industrial waste are the mining, metallurgical, oil and gas, heat and power industries. Industrial waste is represented by overburden, ore crushing and dressing tailings, metallurgical slags, ash and ash slag, oil production and oil refining waste (oil sludge, drill cuttings, acid tars, gas condensates). These types of waste are classified as main and large-scale industrial waste.

About 30-35% of the generated industrial waste is hazardous, with the main one being in the mining industry and quarrying. According to the Committee on Statistics, in 2017 the total amount of hazardous waste generated was 126.9 million tons, in 2018 - 149.96 million tons, in 2019 - 180.5 million tons.

The share of recycling and disposal of solid household waste to their generation in 2019 was 14.9% (in 2018 - 11.51%, in 2017 - 9.05%), 72% of the country's population is provided with services for the collection and removal of waste (in 2018 - 72%, in 2017 - 68%).

In 2019, 72% of the country's population was provided with services for the collection and removal of waste (in 2018 - 72%, and in 2017 - 68%).

At the end of 2019, 18.26% of the 3,292 operating landfills and dumpsites in the republic met environmental requirements, in 2018, out of 3,520 landfills and dumps, 623 (17.7%) were legalized, and in 2017 out of 3,817 - 611 (16%).

In 2019, the smallest share of landfills that meet environmental standards was noted in West Kazakhstan (0.96% of the total number of landfills and dumps - 208) Pavlodar (1.49% of the total number of landfills and dumps - 336), Kyzylorda (2.76 % of 145 landfills and dumps), Aktobe (3.28% of 366 landfills and dumps), North Kazakhstan (7.71% of 458 landfills and dumps) and Almaty (4.15% of 313 landfills and dumps) regions. Landfills in Nur-Sultan (1 landfill), Shymkent (1 landfill) and Zhambyl regions (162 landfills) comply with environmental standards. The management of medical and radioactive waste, as well as with waste containing POPs, is being improved. The introduction of extended producer (importers) responsibilities since 2016 contributed to the further development of the infrastructure for the separate collection and processing of solid household waste. In 2016-2019, within the framework of EPR, 2,321 containers for the collection of mercury lamps, 8,905 containers for separate collection, 150 containers for electrical equipment were installed in the regions, 104 points of reception of recyclable materials were created. Thus, at the end of 2019, in the republic out of 204 cities and districts, separate collection at different stages was introduced in 51, and sorting - in 30 settlements.

The Concept for the transition of the Republic of Kazakhstan to a "green economy" provides for the achievement by 2030 of the European level for emissions of sulfur and nitrogen oxides into the environment.

According to the Committee on Statistics, the number of emissions of these pollutants into the atmosphere is increasing annually in the republic, as follows:

solids - from 475.7 thousand tons in 2017 up to 507.7 thousand tons in 2019 (an increase of 7%);

sulfur dioxide - from 786.4 thousand tons in 2017 up to 885.7 thousand tons in 2019 (an increase of 12%);

nitrogen oxides - 264.7 thousand tons in 2017 up to 314 thousand tons in 2019 (an increase of 18%).

The volume of the issued limits (normative emissions) of pollutants into the air decreased from 4.5 million tons in 2016 to 4.2 million tons in 2017 and to 4.1 million tons in 2019. The volume of actual emissions of pollutants into the air from stationary sources in 2017 amounted to 2,352 thousand tons and their level compared to the previous year increased by 4.2%, in 2018 – 2,516 thousand tons (increased by 6.97%), in 2019 – 2,483.1 thousand tons (decreased by 2.76%). At the same time, the share of Karaganda and Pavlodar regions accounts for 52% of the total volume of gross emissions for 2019.

The volume of flared associated gas decreased from 4 billion m³ in the 90s to 900 million m³.

Since 2018, the import of cars below the Euro 4 standard has been banned in Kazakhstan. In order to prevent emissions from road transport, the Euro 5 standard has been introduced for motor fuel manufacturers, as a result of which vehicle emissions should be reduced by more than 50%.

Since 2018, the development of a new Environmental Code has been underway, the adoption is planned in 2021. The main directions of reforms include: introduction of environmental standards and economic mechanisms in the field of environmental regulation; revision of the current system of environmental impact assessment (EIA); implementation of strategic environmental assessment (SEA); improved regulation of implementation of the polluter pays principle; practical implementation of integrated environmental permits; and strengthening of the state environmental control procedure.

Kazakhstan is a party to the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol to it and the Paris Agreement, which replaces the Kyoto Protocol from 2021.

Within the framework of the Kyoto Protocol, Kazakhstan committed to keep greenhouse gas (GHG) emissions, excluding emissions and removals in the LULUCF¹⁶⁵ sector, at 95% of emissions of the base year 1990 by 2020.

In the framework of the Paris Agreement in 2015, Kazakhstan submitted to the UNFCCC Secretariat its intended NDC (nationally determined contributions), expressing its readiness to reduce GHG emissions by 15% from 1990 levels by 2030, and subject to receiving external assistance (in the form of transferring new technologies) and a favorable economic situation - to bring the indicator to "-25%".

Total national greenhouse gas emissions in 1990, excluding LULUCF, amounted to 401.9 million tons of CO₂-eq., in 2018 - 396.6 million tons of CO₂-eq. (that is, they were 1.3% below the 1990 level). Net GHG emissions (including LULUCF) in 1990 amounted to 386.3 million tons of CO₂-eq., and in 2018 - 401,885.9 thousand tons of CO₂-eq. (that is, they have already exceeded the 1990 level by 4.05%).

On January 1, 2018, a new stage in the functioning of the system of trading in greenhouse gas emissions quotas began. When developing the National Plan for 2018 - 2020, in addition to the historical method, the method of applying specific greenhouse gas emission factors was used. At the same time, the method of quotas is chosen by the enterprises themselves.

Within the framework of the grant project "Supporting the Green Economy in Kazakhstan and Central Asia for Low-Carbon Development of the Economy" of the Federal Ministry for the Environment, Nature Conservation, Construction and Safety of Nuclear Reactors of Germany, the Ministry of Energy of the Republic of Kazakhstan, in cooperation with the GIZ project (German Society for International Cooperation), planned the development of a Low-Carbon Development Strategy of the Republic of Kazakhstan until 2050.

The Concept for the transition of the Republic of Kazakhstan to a "green economy" as one of the main goals sets the goal of "Conservation, rational use and reproduction of fish, forest resources, wildlife resources, objects of the natural reserve fund".

The priority areas of forestry are: forest management on the territory of the state forest fund, aerial work on the protection and security of the forest fund, reforestation and afforestation, artificial cultivation of flora objects, forestry design.

The main target indicator in the field of forestry is to increase the forest cover of the republic up to 5%. At the end of 2019, the area of the forest fund amounted to 30.0 million hectares (4.8% of the

¹⁶⁵ LULUCF - land use, land-use change and forestry

country's territory), an increase in comparison with 2010 by 1.3 million hectares. In 2017, the area of the forest fund was 29.8 million hectares, and in 2018 - 30.04 million hectares.

The largest areas of forest land are concentrated in Kyzylorda (6.7 million ha), Almaty (5.4 million ha), Zhambyl (4.4 million ha), East Kazakhstan (3.8 million ha) and Turkestan (3.4 million ha) regions. At the same time, the positions of the indicator of forest cover of the territory are slightly shifted. In particular, the Zhambyl region has the highest forest cover of the territory - 15.9%, followed by Turkestan - 14.2%, Kyzylorda - 13.9%, Almaty - 9.4% regions.

In 2013-2018 in Kazakhstan, as a result of the implementation of effective measures, stabilization of the number of rare and endangered species of wild ungulates in their habitats (tugai red deer, kulan, gazelle, argali) and positive dynamics of the population of saigas and game species of animals were achieved, for example, in 2019, according to the results of aerial surveys, the total number of saigas in Kazakhstan amounted to 334,400 individuals, incl. the Ural population is 217,000 individuals, the Betpak-Dala population is 111,500 individuals and the Ustyurt population is 5,900 individuals.

An extensive network of specially protected natural areas has been created in Kazakhstan, the share of which is 9.6%. The goal is to develop a functional ecological network (including the recent creation of the first ecological corridors linking specially protected natural areas). Currently, there are already 10 specially protected natural areas of Kazakhstan in Kazakhstan that have the international status of a UNESCO biosphere reserve: Korgalzhyn reserve (2012), Alakol reserve (2013), Akzhaiyk State Natural Reserve (2014), Katon-Karagai State National Natural Park (2014), Aksu-Zhabagly Nature Reserve (2015), Barsakelmes Nature Reserve (2016), Karatau Nature Reserve (2017), Altyn-Emel State National Natural Park (2017), Charyn and Zhongar National Natural Parks (2018). In 2017, the first in Asia transboundary biosphere reserve Bolshoi Altai was created on the basis of two national biosphere reserves from Kazakhstan (Katon-Karagai BR) and Russia (Katunsky BR).

In 2019, Kazakhstan submitted applications to UNESCO to include two more specially protected natural areas in the UNESCO World Network of Biosphere Reserves - West Altai and Almaty Reserves (<http://www.kazmab.kz>). In 2020, work is underway to draw up a national application for the Kolsai Kolderi Biosphere Reserve.

At the same time, the existing network of specially protected natural areas does not provide sufficient coverage of either all the main types of natural ecosystems represented in Kazakhstan, or the habitats of all important endangered wild biological species.

In 2018, 2 environmental institutions were created in Kazakhstan: Tarbagatai State National Natural Park in the East Kazakhstan region on a total area of 143.5 thousand hectares and Ile-Balkhash State Nature Reserve in the Almaty region on a total area of 415.2 thousand hectares.

In the field of **preservation of fish resources**, the Concept outlines the preservation of fish resources and other aquatic animals, including: valuable species that are objects of fishing - 52 species of fish, as well as rare and endangered species - 18 species of fish¹⁶⁶.

Fish farming is developing dynamically in Kazakhstan - over the past 7 years the volume of fish raised has increased 9 times from 800 tons to more than 7 thousand tons. Fish farming in the country is carried out by 180 fish farms, which employ more than 1,000 people.

The basis of the country's **fisheries** is the fishery fund of reservoirs, which includes the waters of the Caspian and Aral seas, lakes Balkhash, Zaysan, reservoirs Bukhtarma, Kapshagay, Shardara, Alakol Lake system and other water bodies with a total area of over 3 million hectares and which are inhabited by more than 70 fish species, including the most commercially valuable (sturgeon, pike perch, carp, grass carp, silver carp, etc.). In addition, there are introduced fish species (peled, whitefish, etc.) in water bodies, which are also of high commercial value.

Commercial fishing in the Republic of Kazakhstan is carried out by more than 1 thousand facilities of fisheries, for which 1,646 fishery reservoirs and their sections are assigned. The industry employs 11 thousand people. The main fishing regions are Atyrau - 13.1 thousand tons (29.2%), East Kazakhstan - 8.2 thousand tons (18.3%), Kyzylorda - 7.4 thousand tons (16.4%), Almaty - 6.6

166 Concept for the transition of the Republic of Kazakhstan to a "green economy". Approved by the Decree of the President of the Republic of Kazakhstan dated May 30, 2013 No. 577.

thousand tons (14.6%), Mangystau - 2.3 thousand tons (5.2%) and Turkestan regions - 2 thousand tons (4.5%).

The implementation of the target indicators of the Concept for the transition to a "green economy" is planned in a strictly established timeframe and shows not only positive trends in Kazakhstan's progress towards sustainable development, but also the need to accelerate movement in this direction and adjust work in accordance with modern international realities and new international documents.

List of abbreviations

GIZ	Deutsche Gesellschaft fuer Internationale Zusammenarbeit GmbH
ADB	Asian Development Bank
ANPZ	Atyrau Refinery
JSC	Joint Stock Company
AIC	Agro-industrial complex
BS	Baltic system
WHO	World Health Organization
WPP	wind power plant
EAEU	Eurasian Economic Union
EBRD	Eurasian Bank for Reconstruction and Development
EU	European Union
UNECE	United Nations Economic Commission for Europe
UES	unified energy system
GDP	gross domestic product
GRP	gross regional product
WB	World Bank
RES	renewable energy sources
EKr	East Kazakhstan region
RV	ramshackle vehicles
SFF	State Forest Fund
HS	hydraulic structures
PPP	public-private partnership
SER	State Energy Register
HEPP	Hydroelectric power plant
HUI	Housing and utility infrastructure
LULUCF	land use, land-use change and forestry
WKr	West Kazakhstan region
APS	Air Pollution Source
PRC	People's Republic of China
IBRD	International Bank for Reconstruction and Development
MFA	Ministry of Foreign Affairs
MID	Ministry for Investment and Development
MNE	Ministry of National Economy
MA	Ministry of Agriculture
IFAS	International Fund for Saving the Aral Sea
MEGNR	Ministry of Ecology, Geology and Natural Resources
ME	Ministry of Energy
IEA	International Energy Agency
IFC	International Finance Corporation
RDC	research and development centre
HR	Highest repeatability
NGO	non-governmental organization
NCE	National Chamber of Entrepreneurs
IDB	Islamic Development Bank
CWR	Committee on Water Resources
NLP	National-level plan
EPR	Environmental Performance Review
OECD	Organization for Economic Co-operation and Development

EIA	environmental impact assessment
UN	United Nations
SPNA	specially protected natural areas
MPC	maximum permissible concentration
UNDP	United Nations Development Program
GBPP	Green Bridge Partnership Program
RB	Republican budget
RSE	Republican State Enterprise
RK	Republic of Kazakhstan
UN FCCC	United Nations Framework Convention on Climate Change
EPR	extended producer responsibility
RF	Russian Federation
FSC	Financial Settlement Center
SI	standard index
NKr	North Kazakhstan region
Media	mass communication media
RTS	rural-type settlements
CO ₂	carbon dioxide
POPs	persistent organic pollutants
USA	United States of America
SPP	solar power plant
SHW	solid household waste
LLP	limited liability partnership
FS	feasibility study
FEC	fuel and energy complex
FER	fuel and energy resources
SDGs	Sustainable Development Goals
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
SKr	South Kazakhstan region
UNEP	United Nations Environment Program Units
ha	hectare
km ² , m ²	square kilometer, square meter
km ³ , m ³	cubic kilometer, cubic meter
g	grams
kg	kilograms
t	tons
toe	tonnes of oil equivalent
TWh	terawatt hours of electricity
GWh	gigawatt hours of electricity
Gcal	gigacalories
MW	megawatt (power)
thou.	thousand
mln.	million
bln.	billion
tlb.	trillion

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