Received on: 04 March 2023 Revised on: 19 May 2023 Accepted: 30 June 2023

RESEARCH ARTICLE
DOI: 10.47703/ejebs.v2i67.282

Analysis of Environmental Factors in the Development of the Regions of Kazakhstan

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For citation: Kenzhegulova, G.K., Bekturganova, M.S. & Imangali, Zh. (2023). Analysis of Environmental Factors in the Development of the Regions of Kazakhstan. Eurasian Journal of Economic and Business Studies, 67(2), 94-107.

Conflict of interest: author(s) declare that there is no conflict of interest.

EJEBS

Abstract

This paper examines theoretical, methodological and analytical studies to improve the environmental monitoring of air pollution and water resources, as well as to facilitate the collection of data for the determination of assessment indicators for future research work and reports on the environment. A literature review has shown the importance of understanding the impact of environmental issues such as air and water pollution on various aspects of human life and regional development. In the paper, it was decided to use methodological generalization and system analysis. The theoretical significance of this study is to generalize and expand classical and modern theories of sustainable development of regions, theoretical developments of domestic and foreign scientists in the field of environmental monitoring, and increasing the competitiveness and sustainability of regions in the context of globalization and Industry 4.0. Additionally, statistical data on strategic planning and reforms of the Republic of Kazakhstan 2005-2020 were used. Based on these results, it can be recommended that the neediness implement the priority of improving the welfare of society in regions with minimal environmental impact. To maintain the overall balance, prevent the depletion of natural resources, and reduce the generation of hazardous waste, it is essential to rationalize the production and consumption of energy. The study results can be used by international intergovernmental organizations, local, regional and republican government bodies, universities and colleges.

Keywords: Region, Regional Development, Economics, Environmental Factors, Sustainable Development, Climate Change

SCSTI: 06.61.33
JEL Code*:* Q01, Q25, R11, R23

Acknowledgement: This research has been/was/is funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant "Development Strategy of Kazakhstan Regional Potential: Assessment of Socio-Cultural and Economic Potentials, Roadmap, Models and Scenarios Planning" No. BR18574240).

1. INTRODUCTION

Kazakhstan has developed a predominant model for the use of natural resources, based on a raw material approach, which is accompanied by excessively high man-made environmental pressures. The problem of interconnection and economy in Kazakhstan is relevant since environmental factors are of great importance for the population's quality of life and the development of interregional relations on the electoral campaign of the development of a society based on the preferences of a broad public policy.

The issue of environmental impact on regional economic development is a question of various studies. Some studies emphasize the relation of environmental degradation to the decrease in the socio-economic indicators which affect the health state of the population (Russel et al., 2018; Makarova et al., 2023). Other studies underline the significance of the public sector interference in the question of environmental issues solution. Furthermore, countries with developed and rapidly developing industrial sectors such as coal, gas and oil mining; countries with high migration rates and increase in the number of populations show an increase in greenhouse gases emission (Wei et al., 2018; Leung et al., 2020; Almetwally et al., 2020; Dong et al., 2021)

The primary sources of negative environmental impact are emissions of pollution as a result of exposure to stationary sources, emissions of pollution of water bodies with wastewater, disposal of production and consumption waste, pollution of subsoil and soil, ionizing and other physical phenomena (Madon et al., 2019). In recent years, a tense situation has continued in Kazakhstan regarding the loss of metals, transportation, and consumption. This is a dangerous pollution of the environment and a real danger to public health. Environmental factors significantly impact people's lives, ranging from environmental pollution to access to clean water and safe food sources. It is essential to understand these factors and how they affect the population, as they have implications for public health, economic development and overall quality of life (Lioubimtseva & Henebry, 2009; Gomez et al., 2018; Balakrishnan et al., 2019; Dell'Angelo et al., 2018; Liu et al., 2019; de Mello et al., 2020; Seitz, 2021).

Air pollution is a serious environmental problem in many countries, including Kazakhstan. Industrial activities, transport and heating systems contribute to the high content of particulate matter and other pollutants in the air, which can have serious health consequences. For example, a study conducted in Almaty showed that air pollution is associated with an increased risk of respiratory diseases, cardiovascular diseases and premature death. Air pollution from harmful emissions and climate change severely affects health, the environment and regional development. This leads to increased mortality, morbidity and economic costs and worsens regions' stability and economic development. In Kazakhstan, industrial and transport emissions exacerbate air pollution, leading to significant economic losses and threats to air quality and the environment (Zhang et al., 2010; Perera, 2018; Glaeser & Kahn, 2010; Pan et al., 2018; Fratocchi et al., 2019; Assanov et al., 2020; Juginović et al., 2021).

The regulatory system for environmental protection in Kazakhstan appears ineffective, with small fines for pollution and economic constraints hindering compliance. As a result, many industrial enterprises operate with outdated equipment and inadequate purification systems. The enforcement mechanism could be more robust, characterized by interdepartmental rivalry, frequent government reorganizations, and corruption. Historical legacies, a lack of environmental expertise, and a low ecological education further contribute to the challenges. Additionally, public engagement is passive due to social instability, inflation, wealth decline, and unemployment, which have diminished the priority placed on environmental issues (Dahl & Kuralbayeva, 2001).

Summarizing, it can be noted that on the basis of the studied domestic and foreign scientific literature, there are different theoretical views on the importance of the effects of environmental

factors. At the same time, the consequences of economic development in the form of various kinds of pollution remained out of consideration, especially in Kazakhstan from the point of view of the regional approach. The purpose of this study is to assess the current state of the environment, consider the permissible changes and pressures on the environment in the regions and analyze the environmental problems of the regions of Kazakhstan.

2. LITERATURE REVIEW

Regional development is a complex process involving various social, economic and environmental factors. Among these factors, the environment plays a crucial role in shaping the trajectory of the region's development. Environmental factors, including access to water, air pollution and emissions of pollutants into the atmosphere, can be essential for regional development, sustainability and the general well-being of the population.

In some countries, environmental pollution has reached crisis levels. Some studies highlight increasing number of the population as the main indicator for air pollution, especially in Asian regions. They state that increase in the number of the population increases greenhouse gases emission. However, there must be done some remarks as to the industry type development in the country (Leung et al., 2020). Moreover, countries with increasing population and industrial development are characterized as at high risk of severe air pollution. For instance, China has faced severe air pollution due to its dependence on coal for energy production and a rapidly growing industrial sector (Wei et al., 2018). This has led to widespread public health concerns and calls for government action to address the problem. Similarly, in India, air pollution has become a serious public health crisis. Even more, Balakrishnan et al. (2019) stated that air pollution is in the second place as the indicator for highest death rates after suicide. In addition, it was estimated that about two million people in India died because of air pollution.

Kazakhstan's population and GDP have been growing steadily, but health indicators are lagging due to environmental degradation. The key issues include air and water pollution, radioactive contamination, the shrinking Aral Sea, climate change, and soil contamination. These issues must be urgently addressed to sustain development without harming public health. It is crucial to understand the impacts of each problem to allocate resources efficiently and effectively (Russel et al., 2018). This is necessary to achieve society's economic and social goals and requires large-scale measures to protect and sustainably use natural resources (Makarova et al., 2023).

Industrial emissions, vehicle emissions and other anthropogenic activities contribute to air pollution, which can have detrimental effects on human health, the environment and the economy. Exposure to air pollution is associated with respiratory and cardiovascular diseases, decreased labor productivity, increased healthcare costs and environmental degradation (Almetwally et al., 2020). Air pollution can also negatively affect the region’s attractiveness for investment and tourism, affecting economic growth and regional development (Dong et al., 2021).

The quality of atmospheric air is another important environmental factor that can be affected by access to water in the regions (Zhang et al., 2010). Air pollution caused by emissions of pollutants into the atmosphere can have harmful consequences for human health, the environment and regional development. Studies have shown that air pollution is associated with increased mortality and morbidity, as well as higher healthcare costs (Juginović et al., 2021). The economic costs of air pollution in Europe are significant, including healthcare costs, reduced labor productivity, and damage to buildings and crops. Air pollution costs can burden regions, affecting their economic development and sustainability (Perera, 2018).

Emissions of pollutants into the atmospheric air can also affect regional development. Greenhouse gas emissions from various human activities contribute to climate change, which can affect, among other things, natural resources, agriculture and infrastructure (Glaeser & Kahn, 2010; Madon et al., 2019). The effects of climate change can exacerbate existing vulnerabilities

and inequalities in the regions, leading to social, economic and environmental consequences. In addition, sources of air pollution, such as industrial and transport activities, may be spatially concentrated in certain regions, leading to environmental injustice and inequality (Pan et al., 2018; Fratocchi et al., 2019).

Access to water environmental factor affects regional development as well. Water resources are essential for agriculture, industry and human consumption, and water availability and quality can affect economic activity and social well-being in the region. Insufficient access to clean water can hinder agricultural production, industrial growth and human health, leading to a reduction in economic opportunities and social security (Dell'Angelo et al., 2018).

Gomez et al. (2018) underlined that access to safe drinking water is crucial for human health and development. Particularly in rural areas of developing countries people still lack access to drinking water. Moreover, socioeconomic factors play a role in improving water access, they include factors for water access in rural areas such as gross national income, women's education, agriculture's contribution to GDP, and rural population growth as determinants for water access in rural areas. Women's education is particularly important for increasing water access, especially in lower-middle and low-income countries. Investment alone is insufficient to improve water access, as shown by the lack of association between development assistance and water access. Understanding these factors can guide policymakers in making evidence-based decisions for improving water access (Gomez et al., 2018).

In addition, access to water in the regions and its quality can also influence regional development policies and strategies. Water availability and quality can be important factors when making decisions related, in particular, to land use, farming methods and infrastructure development. In addition, declining water quality and increasing water demand pose significant challenges globally. Land use and land cover patterns, particularly in urban and agricultural areas, significantly impact water quality. For example, regions with abundant water resources may prioritize agricultural or industrial development, while regions with water scarcity may focus on water conservation and management strategies. For instance, despite having abundant freshwater resources, Brazil faces water scarcity due to pollution from agricultural runoff, industrial effluents, and domestic sewage. The conversion of forested areas for agriculture and urbanization exacerbates water quality degradation (de Mello et al., 2020). Regional water policy may affect economic growth, social well-being and environmental sustainability especially in regions where there is given preference to agricultural industry development, rather that water conservation solutions development (Liu et al., 2019; Seitz, 2021).

Access to water in Kazakhstan, especially in rural areas, is a constant problem that many localities have not completely solved. The lack of reliable and safe drinking water sources in these regions can seriously affect public health, including an increased risk of water-borne diseases and other health risks, especially for vulnerable populations. Industrial and agricultural activities, as well as inadequate waste management methods, also contribute to water pollution in Kazakhstan, further affecting water quality and safety (Dahl & Kuralbayeva, 2001). In addition, the water supply in Kazakhstan is affected by regional differences with differences in access and quality of water supply in different regions. The northern regions generally have a better water supply infrastructure compared to other regions due to their proximity to water sources and a higher level of economic development. However, Kazakhstan's southern and eastern regions face more serious water supply problems due to the arid climate and limited access to water sources (Lioubimtseva & Henebry, 2009).

Air pollution is also a concern in Kazakhstan, as industrial and transport emissions exacerbate this problem. The economic costs associated with air pollution, including those related to health, premature mortality and loss of productivity, are estimated to be significant, reaching billions of dollars annually. Emissions of pollutants into the atmospheric air due to anthropogenic activities

also threaten air quality, human health and the environment in Kazakhstan (Assanov et al., 2021).

Thus, access to water in the regions plays a significant role in the quality of life, the costs of pollutants in the atmospheric air, emissions of pollutants into the atmospheric air and regional development. Insufficient access to water resources can lead to health risks, increased economic costs and social upheavals. Poor air quality caused by emissions of pollutants into the atmosphere can also adversely affect human health, economic development and environmental sustainability. The effects of climate change and environmental injustices associated with air pollution may further exacerbate regional disparities. In addition, access to water resources and their quality can influence regional development policies and strategies.

This literature review highlights the importance of understanding the relationship between access to water in regions and its impact on various aspects of human life and regional development. It emphasizes the need for effective water management strategies, including policies promoting equal access to clean and safe water resources, air pollution mitigation and sustainable development practices. This literature review highlights the importance of understanding the relationship between access to water in regions and its impact on various aspects of human life and regional development. It emphasizes the need for effective water management strategies, including policies promoting equal access to clean and safe water resources, air pollution mitigation and sustainable development practices.

3. METHODOLOGY

The sustainable development of the regions of Kazakhstan is one of the priorities today, since dynamically developing and competitive regions represent a source of growth for the whole country, a support for the implementation of a national policy to reduce regional imbalances, promote a more balanced and sustainable development of the country. In order to enhance sustainable environmental management and support sustainable development, the UN has contributed to enhancing the capacity of scientists and government officials to reduce water-related risks; expand interaction and cooperation in weather and climate monitoring; increase the scale of climate-optimized agricultural technologies and approaches to sustainable land management; and data collection, related to sustainable management and monitoring of energy and water resources.

The UN supported the development of the project «Zhasyl Kazakhstan» (Green Kazakhstan), a section on adaptation to updated nationally determined contributions and legislative proposals to compensate for the loss of biodiversity and supported Kazakhstan in creating national systems of strategic environmental assessment (SEA) and environmental impact assessment (EIA) in accordance with the requirements for the introduction of a new Environmental the codex.708 civil servants were trained on the topic «Sustainable Recovery: Opportunities for a green, low-carbon and closed (multi-turn) economy after COVID-19» within the framework of the Partnership for Green Economy Action program (PAGE). The UN also supported the revision of the Green Economy Concept and the adoption of a Low-carbon Development Strategy until 2060.In addition, the UN has undertaken studies to identify policy options to support energy system productivity improvement and industrial decarbonization; analysis of the development of sustainable and clean energy; and analysis of national legislation and stakeholders in disaster risk reduction systems in Kazakhstan. In April 2021, the UN launched a five-year regional project «Reducing the vulnerability of the population in the Central Asian region from the breakthrough of glacial lakes (PLO) in the face of climate change», which aims to strengthen adaptation to climate change.

This research is considered from the standpoint of methodological generalization and system analysis. The methodological basis of the study was a generalization of classical and modern

theories of sustainable development of regions, theoretical developments of domestic and foreign scientists in the field of environmental monitoring, and increasing the competitiveness and sustainability of regions in the context of Industry 4.0.

The dynamics of current costs for environmental protection in 2020 were analyzed by regions, and regions with low, medium and high current costs for environmental protection were identified. In accordance with the methodology of the Committee of the Bureau of National Statistics of the Republic of Kazakhstan MNE, environmental protection costs include investments in fixed assets aimed at environmental protection and rational use of natural resources, as well as current environmental protection costs. Unlike general costs, current costs are the costs of enterprises and organizations for carrying out activities, ensuring the current operation of technological processes and industries, as well as for the maintenance and operation of machinery and equipment that are designed and operate in order to prevent, reduce, clean (recycle) and /or elimination of contaminants (products).

The issue of water resources analysis in the national economy is currently reflected in a number of scientific studies (Dahl & Kuralbayeva, 2001; Lioubimtseva & Henebry, 2009; Assanov et al., 2022). It should be noted that today, in the national economy, certain methods and approaches to the analysis and assessment of water resources have been established. But none of these can be universally accepted for studying this process.

This study used statistical data on strategic planning and reforms of the Republic of Kazakhstan 2005-2020. This study presents statistical data from environmental statistics such as «The volume of current costs for environmental protection in the Republic of Kazakhstan for 2005-2020», «Emissions of pollutants into the atmosphere by regions from stationary sources in 2020», «Water supply of the Republic of Kazakhstan by regions for 2015-2020», «Provision of infrastructure for water resources of the Republic of Kazakhstan by regions for 2020».

4. FINDINGS AND DISCUSSION

The costs of economic entities aimed at protecting the environment in 2020 amounted to 384 billion tenge, respectively, 420.4 billion tenge in 2019. The total costs are formed from investments in fixed assets (173.6 billion tenge) and operating costs (210.4 billion tenge). A significant share of environmental costs (91.1%) is carried out by industrial enterprises.

Akmola (16.7%), Atyrau (11.4%), Pavlodar (10.5%) and East Kazakhstan (10.3%) regions are leading in the regional structure in terms of costs. The largest volume in the structure of total costs by types of environmental activities falls on activities in the field of renewable energy sources - 30.1%, protection of atmospheric air - 23%, and waste management - 19.1%.

Analyzing the dynamics of current cost indicators in 2020 by regions, certain regions with low, medium and high levels of current costs were identified (see Table 1).

TABLE 1. Indicators of current costs in 2020 by region

Low volume - 1-5 billion tenge	**Average volume - 7-14 billion tenge**	**High volume - 25-40 billion tenge**
1. Akmola	1. West Kazakhstan	1. Aktobe
2. Almaty	2. Kostanay	2. Atyrau
3. Zhambyl	3. Mangistau	3. Karaganda
4. Kyzylorda	4. Shymkent city	4. Pavlodar
5. North Kazakhstan		5. East Kazakhstan
6. Turkestan		
7. Astana city		
8. Almaty city		

Note: complied by authors

In 2020, the largest amounts of money for environmental protection activities were spent in such regions as Aktobe, Atyrau, Karaganda, Pavlodar and East Kazakhstan. The average volume of expenses of enterprises on the environment was directed to the following regions: West Kazakhstan, Kostanay, Mangistau and Shymkent. The smallest volume in the structure of current costs was allocated in Akmola, Almaty, Zhambyl, Kyzylorda, North Kazakhstan, Turkestan, Astana and Almaty. In 2020, stationary sources of pollution emitted 2,441 thousand tons of pollutants into the air, which is 1.7% less than in 2019.

In the volume of current costs, material costs amounted to 77.5 billion tenge (36.9%), paid to other enterprises (organizations) for the provision of environmental services - 85.5 billion tenge (40.6%). The most priority areas in the total current costs are traditionally the following areas: air protection (34.7%), waste management (29.5%), wastewater treatment (26.2%). 73.3% of the total environmental protection costs are financed from the own funds of economic entities [12].

For the period 2005-2020 in general, in Kazakhstan, there is a positive trend in investment in environmental protection. Thus, the volume of current costs for environmental protection in Kazakhstan in 2015 amounted to 43,558,237.5 thousand tenge, compared to 2020 increased by 4.8 times to 210,397,122 thousand tenge (see Figure 1).

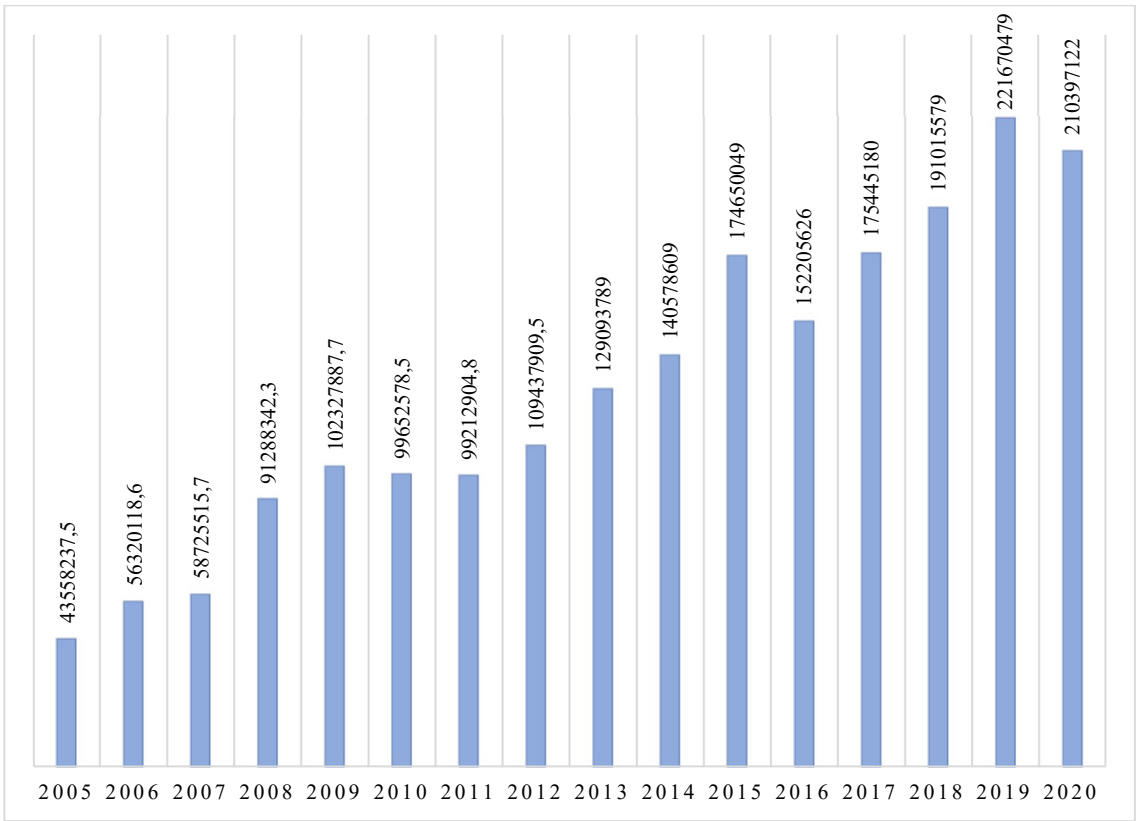

FIGURE 1. The volume of current costs for environmental protection in Kazakhstan for 2005-2020, thousand KZT

Note: compiled by authors

The treatment facilities of stationary sources captured and neutralized 93.1% of the total volume of pollutants received (93.2% in 2019). The largest volumes of pollutant emissions fall on sulfur dioxide 868.1 thousand tons, carbon monoxide - 486.5 thousand tons and nitrogen oxides (in terms of NO2) - 311.4 thousand tons. Of the total volume of pollutants emitted into the atmospheric air, 79.5% were gaseous and liquid substances, 20.5% - solid.

The main emissions of pollutants into the atmospheric air were carried out by industrial enterprises, which accounted for 86.6% of all emissions (85.8% in 2019). For example, Karaganda, Pavlodar - 627.7 and 723.0 thousand tons; West Kazakhstan, Almaty, Kyzylorda, Turkestan, Almaty, Shymkent - up to 50 thousand tons; Akmola, Aktobe, Atyrau, Kostanay, North Kazakhstan, East Kazakhstan - 50 thousand tons to 153.9 thousand tons.

Figure 2 presents emissions of pollutants into the atmosphere by region in 2020.

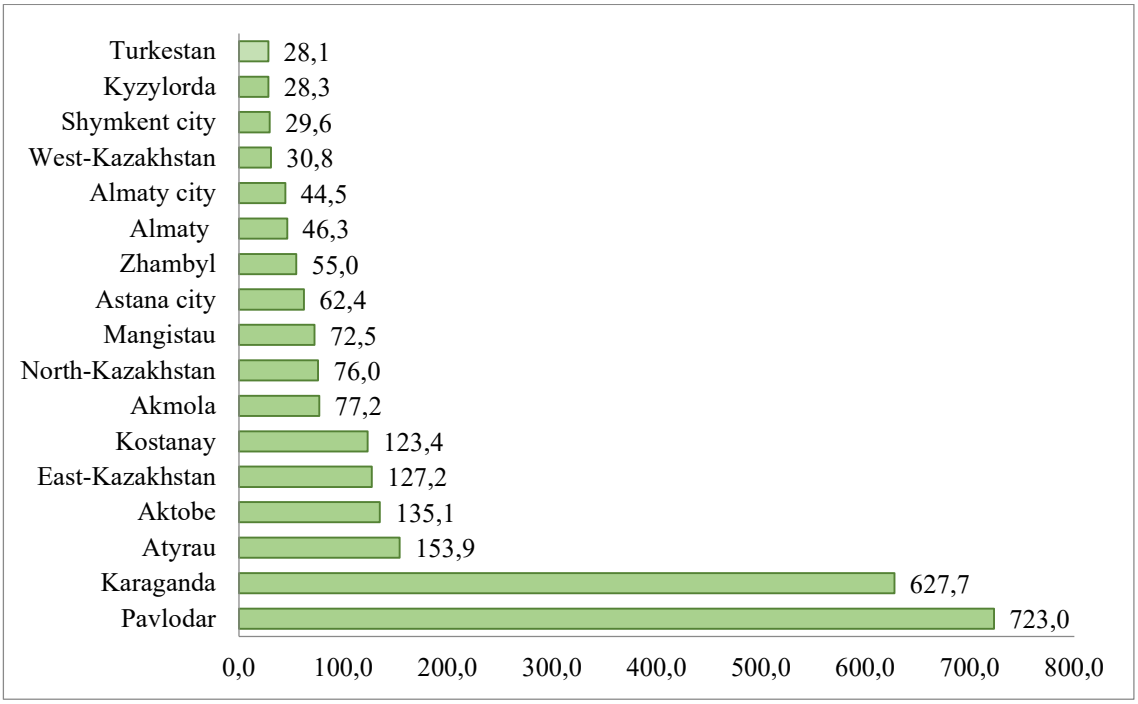

FIGURE 2. Emissions of pollutants into the atmosphere by regions from stationary sources in 2020, thousand tons

Note: compiled by authors

One of the most important aspects of this general challenge is the problem of providing the country's population with drinking water, which has not yet been fully resolved in many settlements. The problem is not new and to a certain extent has a historical character. But still, the issue was never set as a priority, which, of course, affected the health and life expectancy of the population.

According to the average indicator per capita of Kazakhstan, the republic cannot be classified as a country with an acute shortage of water resources. But, the uneven distribution of water sources throughout the country, as well as their irrational use, depreciation of the infrastructure of water resources significantly complicate the solution of problems of providing the population and the economic complex with water.

Due to the geographical location of Kazakhstan, the flows of 7 out of 8 river basins are formed in neighboring states (PRC, Central Asian countries, Russia) and are of a transboundary nature.

Given that 44% of the water fund is replenished from external sources, the issue of transboundary cooperation in the context of water security in Kazakhstan is very important and requires a strategic and integrated approach.

In accordance with international approaches, one of the most important criteria for the physical availability of food is the availability of drinking water. As of January 1, 2019, the problem of access to drinking water in rural areas has not been fully resolved. According to the information of local executive bodies (hereinafter - LEBs), 3461 rural settlements with a total population of 6.2 million people or 51.5% of the entire rural population of Kazakhstan are provided with access to centralized water supply. 61 settlements use imported water, 3,099 settlements have a decentralized water supply system. Access to centralized water supply in cities is 87%.

More detailed information on water supply is provided in Table 2.

TABLE 2. Water supply of Kazakhstan by regions for 2015-2020, thousand cubic meters

Region	2015	2016	2017	2018	2019	2020
Kazakhstan	22 852	24 623	25 279	25 096	25 104	27 752
Akmola	57	54	71	58	55	56
Aktobe	327	442	731	270	222	232
Almaty	3 473	3 181	3 259	3 656	3 342	3 350
Atyrau	272	279	279	272	288	290
West Kazakhstan	420	595	715	633	287	295
Zhambyl	1 805	1 338	2 287	1 587	1 603	1 650
Karaganda	1 812	1 672	1 449	1 477	1 625	1 700
Kostanay	135	134	123	119	120	122
Kyzylorda	5 030	4 786	5 197	5 062	5 305	5 350
Mangistau	1 216	1 295	1 225	1 357	1 475	1 400
Pavlodar	3 136	3 116	3 253	3 273	3045	3 005
North Kazakhstan	61	61	198	181	258	255
Turkestan	5 886	5 885	5 880	5 645	5 986	6 070
East Kazakhstan	644	643	694	678	665	660
Astana city	100	98	103	104	108	102
Almaty city	239	245	238	248	258	255
Shymkent city	-	-	-	238	231	230
Note: compiled by authors						

In normal climatic years, water bodies do not cause any particular problems for the life of the population and the economy of the country. In extreme years or years close to them, according to the conditions of formation of water flow, even watercourses that completely dry up in summer carry a threat of emergency situations.

In Kazakhstan, there are 1,732 hydraulic structures with different departmental affiliation and form of ownership, which can potentially be sources of emergency situations. The city of Almaty is not 100% provided with water, although the city of republican significance, the situation is the same as the city of Astana. The main problem in the water supply is the shortage of specialists.

The range of connections to the sewerage infrastructure in cities is very wide - from 12% in the city of Ayagoz to 98% in the city of Satpayev. In the regional centers and cities of Astana and Almaty, 60-94% of the population is connected to sewerage systems. Many industrial cities, such as Ridder, Zyryanovsk, Karatau, Satpayev, Zhezkazgan, Zhanatas, have a high level of connections to the sewerage system - more than 90%.

More detailed information of provision of infrastructure for water resources is provided in Table 3.

TABLE 3. Provision of infrastructure for water resources of Kazakhstan by region in 2020

Region	Numberofenterprises (units)	Waterpipelines, total (km)	Sewerage, total (km)	Number of pumping stations (units)	Volume of supplied and treated water (thousand cubic meters)	PWater consumption and average daily water supply (thousand cubic meters)	Design capacity of pumping stations, (thousand cubic meters) per day
Kazakhstan	865	83 909,7	16 593,0	32 669,0	1 546 104,7	937 990,8	8 365,7
Akmola	89	5 904,2	1 058,1	810,9	37 901,9	2 127,5	422,1
Aktobe	42	5 017,2	936,1	1 129,4	48 788,0	12 736,9	889,6
Almaty	96	6 924,6	1 463,3	1 177,0	43 231,7	2 340,3	318,4
Atyrau	25	4 212,2	415,7	2 326,8	59 270,9	3 267,9	43,6
West Kazakhstan	42	4 074,4	423,0	238,5	33 792,2	11 126,2	585,7
Zhambyl	17	2 631,0	489,5	1 031,8	37 772,2	1 023,7	138,7
Karaganda	117	7 505,5	2 548,2	8 839,4	428 389,6	238 562,9	1 749,8
Kostanay	34	4 144,1	1 185,2	1 388,0	55 754,0	2 395,6	697,5
Kyzylorda	15	6 318,2	499,3	752,4	26 100,9	2 469,6	92,4
Mangistau	23	2 605,9	546,6	152,8	56 260,0	760,3	196,8
Pavlodar	160	3 200,5	1 047,4	3 291,8	135 563,8	14 627,8	886,3
North Kazakhstan	52	5 015,9	469,3	891,0	32 999,9	5 529,2	366,2
Turkestan	39	12 056,2	424,5	653,2	47 723,7	258,0	55,3
East Kazakhstan	82	5 191,8	1 572,7	2 707,4	189 137,2	633 705,8	1 264,9
Astana city	1	1 377,4	862,6	1 042,8	102 140,0	5 114,0	387,4
Almaty city	25	3 676,3	1 769,1	5 779,3	154 587,6	1 941,5	70,9
Shymkent city	6	4 054,4	882,5	456,5	56 691,3	1 654,9	200,2
Note: compiled by the authors							

In 39 cities and towns, there are no treatment facilities at all, respectively, wastewater is discharged without treatment, it is discharged directly to filtration fields, as in the city of Taraz, to storage tanks in the cities of Kokshetau, Uralsk, Petropavlovsk, Kostanay.

Many existing treatment facilities have already exhausted their operational resources and require repair, others are operating with overload, which leads to a mismatch between wastewater treatment technology and design data.

So, in the cities of such regions as Kyzylorda, Mangystau, North Kazakhstan, East Kazakhstan, the percentage of insufficiently purified water is from 39 to 72%. Also, a consequence of the depreciation of fixed assets of sewerage networks is a high level of accidents, so in 2019 the accident rate of sewerage networks on average in the republic ranged from 0.2 to 29.5 accidents per 1 kilometer.

Basically, water supply networks were put into operation 25 - 40 years ago and have an unprotected inner surface (mainly steel and cast-iron pipes). Therefore, due to the ongoing corrosion, water conduits and water networks are subject to rapid wear and overgrowth, which leads to a decrease in the throughput of water pipes, an increase in the number of accidents, water losses and a deterioration in the quality of drinking water. In general, the depreciation of fixed assets of sewerage systems in most settlements of the republic is 40-70%, and in some, it reaches 100%.

In the medium term, the population of Kazakhstan is projected to grow to 20.8 million people, which will lead to an increase in water consumption by 35%, while the share of the urban population will increase from the current 53% to 73% due to the formation of agglomeration centers based on the largest cities Kazakhstan - Astana, Almaty and Shymkent with a population of at least two million people, as well as Aktobe and Aktau, which have a high proportion of the working population and where small and medium-sized businesses are most actively developing. As the country develops, other large cities of Kazakhstan may become agglomeration centers, which will require the construction of a new water management infrastructure to meet the needs of the growing population of agglomerations in water supply and sanitation systems.

5. CONCLUSIONS

This study examined assessing the current state of the environment, considering the permissible changes and pressures on the environment in the regions, and analyzing the environmental problems of the regions of Kazakhstan. As a result of this study, several important conclusions were made. Certain regions with low, medium and high levels of current costs for environmental protection were identified. As a result of the analysis of statistical indicators, regions were identified that need to be reduced emissions of pollutants into the atmosphere from stationary sources.

In general, the results of the study demonstrate the deterioration of the environmental situation in the regions of Kazakhstan. As a result of the activities of industrial enterprises, and factories, the intensification of agriculture, and the overpopulation of large cities, a large amount of garbage is generated, and emissions of harmful substances enter the atmosphere and water bodies. It has been determined that cities of republican significance, such as Almaty and Astana, are not 100% provided with water infrastructures. The main problem is the lack of professional water supply specialists. It was revealed that in 39 cities and towns, there are no treatment facilities at all, and associated wastewater is discharged without treatment. However, a rational approach to environmental management at the national level has not yet been fully presented, which would help to significantly reduce environmental pollution from industrial and economic human activities. Therefore, it seems very important to carry out strategic reforms and expand international cooperation in order to reduce environmental risks and deficits and to create reserves in economic and ecological systems.

At the present stage, the existing distribution and processes of population movement in the regions do not always contribute to solving the problems of economic development, improving the level and quality of life of the population, and maintaining a favorable environmental situation. Therefore, it is proposed to increase the potential for a balanced and rational use of the territories of the regions of Kazakhstan. There are also gaps in state regulation, in the field of ecology, soviet regulatory documents are still used, which do not provide an objective assessment of the quality of the environment in the design of activities. Also, in the regulatory legal acts and in the procedures for allocating a land plot for the placement of a production facility, the presence of a positive conclusion of the state environmental review is not considered. Local executive bodies allocate land plots regardless of the presence or absence of a positive conclusion of the state environmental expertise, and local akimats do not implement state environmental policy.

The main condition for the proposed measures to be effective is to improve environmental legislation as a whole and to introduce environmental standards into all other legislation, i.e.it is not possible to green the economy and society without greening legislation.

The subject of further research is a comprehensive study of economic and social processes and their impact on the ecological situation in the regions, the development on this basis of practical grounds and mechanisms for the sustainable development of the regions of Kazakhstan.

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