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## ANALYSIS OF THE ENVIRONMENTAL CONDITIONS OF AKTOBE REGION IN THE CONTEXT OF ECONOMIC DEVELOPMENT

*The environmental conditions of the Aktobe region are examined in the context of economic development and natural resource use. It is noted that the Aktobe region is one of the major industrial regions of Kazakhstan and possesses significant mineral and hydrocarbon resources that provide a basis for the development of the mining, metallurgical, oil and gas, and energy sectors. It is established that intensive industrial activity is accompanied by increased anthropogenic pressure on the environment. The dynamics of pollutant emissions from stationary sources is analysed, and major air pollutants, are examined over the period 2022–2025. Wastewater discharges and the condition of water resources, are also considered. The relationship between economic development and environmental pressures in the region is analysed. It is shown that economic growth and increased expenditure on environmental protection do not necessarily result in uniform improvements in environmental conditions. The importance of continuous environmental monitoring, emissions control, wastewater treatment modernisation, resource-efficient technologies and the rational use of natural resources is emphasised to support the long-term sustainable development of the Aktobe region.*

**Keywords:** economic growth, environmental situation, sustainable development, natural resources, economy of the region, industry, economic development

**Кілт сөздер:** экономикалық өсім, экологиялық жағдай, тұрақты даму, табиғи ресурстар, өңір экономикасы, өнеркәсіп, экономикалық даму.

**Ключевые слова:** экономический рост, экологическая ситуация, устойчивое развитие, природные ресурсы, экономика региона, промышленность, экономическое развитие.

**JEL classification:** Q01, Q53, R11

**Introduction.** At present, the region's economic development and the state of the environment are two issues that are closely interconnected. The expansion of industry leads to increased exploitation of natural resources. On the one hand, this enables the development of production, the creation of jobs and the growth of the regional economy. On the other hand, the proliferation of industrial facilities intensifies the anthropogenic impact on the environment. This issue is of particular importance for Aktobe region, where industrial production is well-developed.

The Aktobe region is rich in natural resources and is one of the major industrial regions in Kazakhstan. It has significant deposits of minerals such as chromium, nickel, titanium, copper, zinc, and hydrocarbon resources. Based on these resources, the mining, metallurgy, oil and gas, and energy sectors have developed. Although the share of these sectors in the regional economy is high, their activities exert additional pressure on certain components of the environment.

Emissions from industrial enterprises and transport affect the quality of the atmospheric air, while industrial and domestic wastewater increases the load on water resources. Furthermore, the accumulation of waste generated during production can affect soil conditions. Therefore, when assessing the environmental situation in the Aktobe region, it is insufficient to consider only individual pollution indicators. Ecological changes must be considered alongside the region's production volume and economic development indicators.

The aim of the study is to assess the environmental conditions and their dynamics in the Aktobe region in the context of economic development and to identify the main trends in the relationship between

regional economic activity and environmental pressures during 2022–2025. The study employs methods of statistical analysis, comparison, systematisation and graphical analysis of economic and environmental indicators for the Aktobe region for 2022–2025. The analysis focuses on GRP, environmental protection expenditure, pollutant emissions and wastewater-related environmental pressures. In addition, domestic and foreign scientific literature was reviewed to provide a theoretical basis for examining the relationship between economic development and environmental sustainability.

**Literature review.** The issues of environmental protection and regional economic development are currently among the most closely interconnected fields. In this context, the concept of sustainable development is understood as an approach that ensures the link between the economy, ecology and the social well-being of the population.

In examining the theoretical foundations of this issue, the works of foreign scholars occupy an important place. For example, D. Meadows [1] and the research of the Club of Rome have shown that the overexploitation of resources can also have a detrimental effect on long-term economic development. Thus, the works of J. Stiglitz [2] and other researchers also consider the importance of taking environmental protection issues into account during economic development [3]. These studies show that it is insufficient to assess economic growth solely by increases in production volume.

In the field of ecological economics, the studies of R. Costanza and other scholars [4] examine the economic importance of natural resources and ecosystems for society, and the valuation of ecosystem services makes it possible to determine the contribution of the natural environment to the economy.

Overall, the literature reviewed indicates that economic development and environmental protection cannot be considered separately. While foreign studies provide a theoretical basis for this connection, domestic works focus on the specific ecological and economic issues in the regions of Kazakhstan. Therefore, we believe it is important to take ecological factors into account alongside economic indicators when assessing regional economic development.

**Main part.** The Aktobe region is one of the major industrial regions of Kazakhstan. The availability of natural resources and favorable conditions contributes significantly to the region's economic development. The abundance of natural resources provides a solid foundation for the development of the industrial sector, which plays a key role in the regional economy.

In 2022–2025, the Gross regional product (GRP) of the Aktobe region demonstrated a mixed trend. In 2022, its volume amounted to 4416 billion tenge, after which it decreased to 4187 billion tenge in 2023, representing a decline of approximately 5.2%. In 2024, however, GRP increased significantly to 4976 billion tenge, which was 18.8% higher than the 2023 level. In 2025, GRP continued to increase, reaching 5246 billion tenge, or approximately 5.4% more than in 2024. At the same time, the share of the Aktobe region in Kazakhstan's GDP declined. In 2022, it accounted for 4.3%, decreasing to 3.5% in 2023. In 2024, the share increased slightly to 3.7%, but declined again to 3.3% in 2025 [5].

Alongside economic development, the long-term neglect of the state of natural resources and environmental issues may subsequently affect various sectors of society [6]. In this regard, expenditure on environmental protection in the Aktobe region has also increased year by year. While 44.9 billion tenge was spent on environmental protection in 2022, expenditure increased to 51.3 billion tenge in 2023. In 2024, the figure rose to 63.5 billion tenge, reaching 146.5 billion tenge in 2025. Thus, in 2025, expenditure on environmental protection was approximately 3.3 times higher than in 2022 [7].

The efficient use of natural resources and compliance with environmental requirements must go hand in hand with ensuring economic growth. However, the operations of the large industrial enterprises operating in the region are affecting pollution levels. Among the major industrial enterprises of the region are «CNPC-Aktobemunaygaz» JSC, «Kazakhoil Aktobe» LLP, «Aktobe Plant of Chromium Compounds» JSC, «TNC Kazchrome» JSC, which operates the Aktobe Ferroalloy Plant and other enterprises

Between 2022 and 2025, the volume of pollutant emissions from stationary sources in the Aktobe region showed mixed trends.

Table – 1

**Emissions of pollutants in the Aktobe region\***

| Title           | 2022  | 2023  | 2024 | 2025  |
|-----------------|-------|-------|------|-------|
| thousand tonnes | 136.5 | 112.1 | 126  | 128.4 |
| share, %        | 5.9   | 5.0   | 5.5  | 5.6   |

\*compiled by the authors based on the source [8]

A comparison with the data in the table shows that, in the Aktobe region, the volumes of pollutants emitted from stationary sources have varied from year to year. In 2023, emissions across Kazakhstan fell by 2.5 %. In the Aktobe region, the reduction was even greater, at 17.9 %. In other words, this year the rate of reduction in emissions in the region was higher than that for the country as a whole.

In 2024, the situation changed. The volume of emissions across Kazakhstan rose by only 0.6 % compared with the previous year, whilst in the Aktobe region this figure reached 12.4 %. During this period, the rate of growth in emissions in the region was significantly higher than that for the country as a whole. In 2025, the growth slowed slightly: by 0.4 % across Kazakhstan, and by 1.9 % in the Aktobe region.

The development of industrial activity in the Aktobe region is closely associated with the use of natural resources and, consequently, with anthropogenic pressure on the environment. Therefore, the analysis of air pollutant emissions is an important component of assessing the environmental implications of regional economic development.

Another indicator of the region's ecological situation is the discharge of wastewater. It should be noted that the Aktobe region is home to major rivers such as the Zhem, Uil and Yrgyz. In addition, the Ilek, Sagyz, Kobda and Or rivers flow through the region. Wastewater is discharged by more than 30 commercial and public sector organisations. The discharge of wastewater is carried out by more than 30 commercial and state sector organisations. The only enterprise discharging wastewater directly into the Ilek river is «Aqtobe Su-Energy Group» JSC. The remaining approximately 30 enterprises direct their wastewater to collectors, including filtration fields and evaporation ponds. As a result, high levels of chromium contamination have been recorded in the Ilek river [9, 10]. Water bodies contaminated with chromium are classified as historically polluted sites.

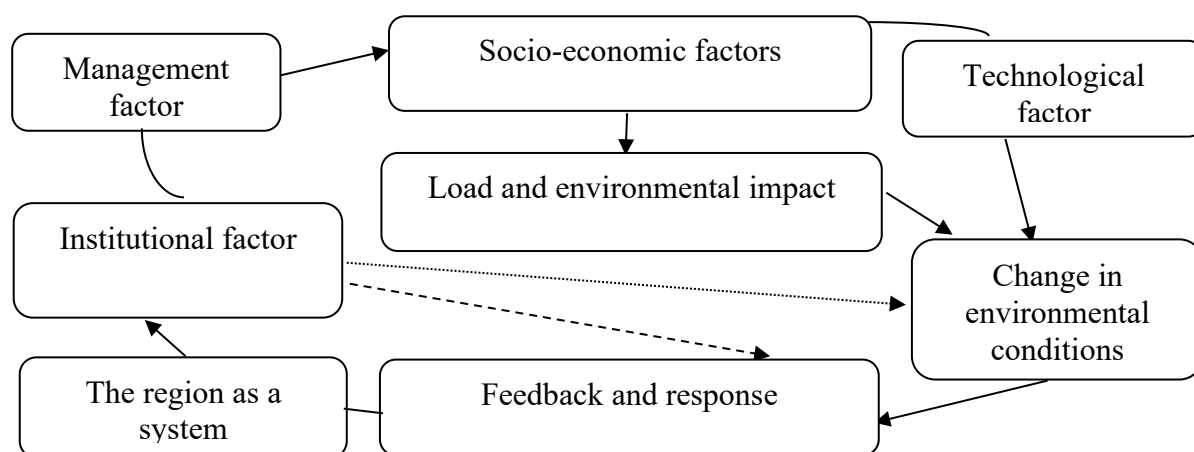
Thus, the reduction in emissions of some pollutants was not accompanied by a uniform improvement across all components. In particular, the increase in emissions of organic compounds warrants additional attention when assessing the environmental burden in the region.

The state of a region's natural resource potential is largely determined by the nature of society's activities aimed at meeting its economic and social needs. The use of natural resources, as well as the creation of a favourable environmental setting for the population's livelihood, plays a key role in this process.

Alongside the development of economic activity, factors arise that may hinder the region's sustainable development. The main problems include an increase in the consumption of natural resources, a reduction in their reserves, an intensification of anthropogenic pressure on the environment, and a disruption of the ecological balance of regional ecosystems. The cumulative impact of these processes may reduce the natural environment's capacity for recovery and have a negative effect on the territory's further socio-economic development.

In these circumstances, the environmental policy of regional authorities takes on particular significance. Its content must be linked to the regulation of natural resource use, the prevention of adverse changes to the state of the environment, and the preservation of the sustainability of regional ecosystems. At the same time, an important objective of environmental policy is to reconcile the economic interests of society with the need for the rational use of natural resources and the conservation of the natural environment.

The region's development is shaped by a complex interplay of interrelated factors. These include economic and socio-economic, technological, institutional and legal, managerial, scientific and educational, informational and other factors. Their influence is not felt in isolation but through their interrelationships, determining the specific ways in which resources are utilised, the nature of economic activity and the potential for the territory's further development (Figure 1).

Figure – 1. **Interrelationship model of external environmental factors\***

\*compiled by the authors based on the source [11]

In this model, feedback plays an important role. Society's impact on the natural environment should be directed towards reducing conditions that have adverse effects on the environment. Since human economic activity and its impact on nature are interconnected, any change in any part of this chain can influence the overall ecological situation.

Economic factors reflect economic activity related to the production, distribution, redistribution and consumption of material goods. The expansion of economic activity is, as a rule, accompanied by an increase in the demand for natural resources. Consequently, a conflict arises between society's desire for growth in production and consumption and the limited capacity of the natural environment. When the permissible load is exceeded, natural resource regeneration processes are disrupted and the ecological condition of the territory deteriorates [12].

Socio-economic factors have a significant influence on the region's development. These are linked to population dynamics, natural growth, migration processes, settlement patterns and the social structure of society. Changes in population size and geographical distribution have a direct impact on the levels of natural resource consumption, infrastructure development and the extent of human impact on the environment.

Institutional factors that determine the specific features of the organisation and regulation of the regional economy are of particular significance. Effective management of a region's development requires appropriate mechanisms for state and regional regulation. In the course of socio-economic development, there arises a need for structural reorganisation of the regional economy, improvement of the management system and the creation of conditions for its adaptation to changing economic, social and environmental conditions [13].

Thus, the sustainable development of a region requires a comprehensive consideration of economic, social, environmental, institutional and other factors. Their coordinated interaction makes it possible to improve the efficiency of natural resource utilisation, reduce anthropogenic pressure and create conditions for the long-term development of the region.

**Conclusion.** The study examined the key indicators affecting the economic development of the Aktobe region and the state of the environment. A comparison of data for 2022–2025 revealed an improvement in the region's economic indicators. In particular, over this period, GRP rose from 4416 billion tenge to 5246 billion tenge, representing an overall increase of approximately 18,8 %.

At the same time, the volume of pollutants from stationary sources fell from 136500 tonnes in 2022 to 128400 tonnes in 2025. However, this figure did not decrease at a consistent rate across all years. Although emissions fell to 112100 tonnes in 2023, they rose again to 126000 tonnes in 2024 and to 128400 tonnes in 2025. This situation highlights the need for continuous monitoring of the environmental impact of industrial activity in the region.

Expenditure on environmental protection also increased significantly over the period under review. In 2022, expenditure amounted to 44.9 billion tenge, rising to 146.5 billion tenge in 2025. In other words, alongside economic growth, there has been an increase in the funds allocated to environmental measures.

Considering the industrial nature of the Aktobe region, attention must be paid to the technological processes at industrial enterprises in order to address environmental issues. The introduction of resource-efficient and energy-efficient technologies will help to reduce the impact of industrial production on the environment. It is also important to carry out continuous monitoring of air quality and water resources.

Based on the research results, attention should be paid to improving environmental monitoring in the Aktobe region, strengthening controls on emissions from industrial enterprises and modernising wastewater treatment systems. At the same time, maintaining a balance between economic development and the use of natural resources is vital for the region's long-term development.

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**Баймукашева Ж., Жакыпова А., Тасмаганбетова С., Ахмедьяров Е.**

## **АҚТӨБЕ ОБЛЫСЫНЫҢ ҚОРШАҒАН ОРТАСЫНЫҢ ЖАҒДАЙЫН ЭКОНОМИКАЛЫҚ ДАМУ КОНТЕКСТІНДЕ ТАЛДАУ**

### **Аңдатпа**

Мақалада Ақтөбе облысының қоршаған ортасының жай-күйі экономикалық даму және табиғи ресурстарды пайдалану контекстінде қарастырылды. Ақтөбе облысының Қазақстанның ірі өнеркәсіптік өңірлерінің бірі болып табылатыны және тау-кен өндіру, металлургия, мұнай-газ және энергетика секторларын дамытуға негіз болатын елеулі минералдық және көмірсутектік ресурстарға ие екені атап өтілді. Қарқынды өнеркәсіптік қызметтің қоршаған ортаға түсетін антропогендік қысымның күшеюімен қатар жүретіні анықталды. 2022–2025 жылдар кезеңінде стационарлық көздерден шығатын ластаушы заттар шығарындыларының динамикасы талданды, сондай-ақ атмосфералық ауаның негізгі ластаушы заттары қарастырылды. Сонымен қатар, ағынды сулардың төгілуі және су ресурстарының жай-күйі қарастырылды. Өңірдегі экономикалық даму мен қоршаған ортаға түсетін қысым арасындағы өзара байланыс талданды. Экономикалық өсім мен қоршаған ортаны қорғауға жұмсалатын шығындардың артуы қоршаған ортаның жай-күйінің біркелкі жақсаруымен міндетті түрде қатар жүрмейтіні көрсетілді. Ақтөбе облысының ұзақ мерзімді тұрақты дамуын қамтамасыз ету үшін тұрақты экологиялық мониторинг жүргізудің, шығарындыларды бақылаудың, ағынды суларды тазарту жүйелерін жаңғыртудың, ресурстарды үнемдейтін технологияларды енгізудің және табиғи ресурстарды ұтымды пайдаланудың маңыздылығы негізделді.

Баймукашева Ж., Жакыпова А., Тасмаганбетова С., Ахмедьяров Е.

## АНАЛИЗ СОСТОЯНИЯ ОКРУЖАЮЩЕЙ СРЕДЫ АКТЮБИНСКОЙ ОБЛАСТИ В КОНТЕКСТЕ ЭКОНОМИЧЕСКОГО РАЗВИТИЯ

### Аннотация

Рассмотрено состояние окружающей среды Актюбинской области в контексте экономического развития и использования природных ресурсов. Отмечено, что Актюбинская область является одним из крупных промышленных регионов Казахстана и обладает значительными запасами минеральных и углеводородных ресурсов, обеспечивающими развитие горнодобывающего, металлургического, нефтегазового и энергетического секторов. Установлено, что интенсивная промышленная деятельность сопровождается усилением антропогенной нагрузки на окружающую среду. Проанализирована динамика выбросов загрязняющих веществ от стационарных источников, а также рассмотрены основные загрязняющие вещества атмосферного воздуха, за период 2022–2025 гг. Рассмотрены также сбросы сточных вод и состояние водных ресурсов. Проанализирована взаимосвязь между экономическим развитием и экологической нагрузкой в регионе. Показано, что экономический рост и увеличение расходов на охрану окружающей среды не обязательно сопровождаются равномерным улучшением состояния окружающей среды. Обоснована важность постоянного экологического мониторинга, контроля выбросов, модернизации систем очистки сточных вод, внедрения ресурсосберегающих технологий и рационального использования природных ресурсов для обеспечения долгосрочного устойчивого развития Актюбинской области.

