



## ENVIRONMENTAL IMPACT OF INDUSTRIAL ENTERPRISES IN NAVOI REGION (GEOGRAPHICAL ANALYSIS)

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**Abstract:** In this article, the impact of industrial enterprises located in Navoi region on the environment is analyzed based on a natural-geographical approach. The study identifies the industrial development characteristics of the region, the main industrial sectors, and their geographical distribution. The impact of industrial activities on atmospheric air, land, and water resources is assessed using statistical data, cartographic materials, and GIS technologies.

According to the results of the analysis, it was determined that mining, chemical, and energy industry enterprises in Navoi region create the highest anthropogenic load on the environment. In certain areas, negative changes were observed in the level of air pollution, land cover degradation, and water resource quality indicators. At the same time, the interaction of industrial enterprises with natural geographical conditions was revealed based on territorial differentiation.

The results of the study are of great importance for developing scientific and practical recommendations aimed at improving the ecological condition in Navoi region, optimizing the territorial placement of industrial enterprises, and ensuring the rational use of natural resources.

**Keywords:** Navoi region, industrial enterprises, environment, geographical analysis, ecological load, GIS technologies.

### Introduction

At the present time, the rapid development of industry, while being one of the important factors of economic growth, is also causing an increase in anthropogenic pressure on the environment. Especially in areas with a high concentration of



industrial enterprises, environmental problems such as air pollution, contamination of water and land resources, and degradation of landscapes are intensifying. In this regard, studying the impact of industrial activities on the environment based on geographical analysis is of great scientific and practical significance.

Navoi region is one of the major industrial centers of our republic, and mining, chemical, energy, and construction materials industry enterprises are concentrated in this area. In their scientific works, M.A. Jorayev and R.T. Qodirov highlighted the natural-geographical conditions of Navoi region and the development characteristics of industrial sectors [1]. Their studies emphasize that the territorial distribution of industrial enterprises is closely linked to natural resources.

Within the framework of ecological-geographical research, S.S. Saidov and N.J. Muxammedova studied the impact of industrial enterprises on land and water resources, soil degradation, and the processes of formation of technogenic landscapes [2]. These works demonstrate the necessity of analyzing the impact of industrial activities on natural components based on a comprehensive approach.

In recent years, special attention has also been paid to the use of GIS and remote sensing technologies in geographical research. In the scientific works of A.R. Rahmonov and Sh.N. Norov, the possibilities of digital maps and geoinformation systems in assessing the ecological condition of industrial areas are highlighted [3]. This approach makes it possible to determine the impact of industrial enterprises on the environment based on territorial differentiation.

The analysis of the above literature shows that studying the impact of industrial enterprises on the environment in Navoi region on the basis of comprehensive geographical analysis with the use of modern technologies remains a relevant issue. This article analyzes precisely these aspects on a scientific basis.

### Methods

In this study, a comprehensive geographical approach was applied to assess the impact of industrial enterprises located in Navoi region on the environment. The



research methodology was formed based on the ecological-geographical studies of national scientists. At the initial stage of the study, the method of literature analysis was used to examine scientific works devoted to industrial geography, anthropogenic landscapes, and ecological load issues. This method served to strengthen the theoretical foundations of the research.

Statistical and comparative methods were applied to identify territorial differentiation. The location of large industrial enterprises in Navoi region, production sectors, and environmental impact indicators were analyzed based on available official statistical data [1].

In addition, cartographic methods and GIS technologies were widely used in the study. The relationship between the territorial location of industrial objects, the level of ecological load, and natural-geographical conditions was assessed using digital maps [2]. This method made it possible to identify ecological hazard zones and conduct visual analysis. Moreover, based on a systematic and comprehensive approach, the impact of industrial activities on atmospheric air, land, and water resources was studied in interrelation. This method allowed assessing the impact of industrial enterprises on the natural environment as a single geographical system.

### Results

The results of the study showed that the impact of industrial enterprises on the environment in Navoi region is territorially uneven. In the region, the mining, chemical, and energy industry sectors are leading, and it was determined that these sectors are the main sources of ecological load [3].

Analyses of atmospheric air showed that emissions of harmful substances are high in areas where industrial enterprises are located. Natural-climatic conditions, particularly wind patterns and relief characteristics, have a significant effect on the territorial differentiation of pollution levels.

The analysis of the impact on land resources revealed that in areas with developed mining industries, soil cover degradation, formation of technogenic



landscapes, and a decrease in the economic value of lands were observed. In some areas, waste accumulation and mechanical damage to the land surface were recorded as environmental problems.

Studies of water resources showed a deterioration in the water quality indicators of water bodies located near industrial enterprises. This situation is primarily related to industrial wastewater and technogenic waste, indicating the need to strengthen ecological requirements in the use of water resources [4].

The results of territorial analysis based on GIS made it possible to identify industrial zones with a high level of ecological risk in Navoi region. These zones corresponded to areas with a high concentration of industrial enterprises and relatively unfavorable natural-geographical conditions [5].

Overall, the study results showed that the use of a comprehensive geographical approach and modern technologies is of great importance in assessing the impact of industrial enterprises on the environment in Navoi region and serves as a basis for developing scientific and practical recommendations aimed at addressing regional ecological problems.

### **Conclusion**

The results of the study showed that the impact of industrial enterprises on the environment in Navoi region is territorially unevenly distributed. The highest ecological load was identified in the areas of the mining, chemical, and energy industries.

The negative impact on atmospheric air, land, and water resources is observed at the highest level in areas with a high concentration of industrial enterprises. In these areas, effective systems of ecological monitoring and rational use of resources are necessary.

Using GIS technologies, territorial ecological hazard zones were identified, and the relationship between industrial enterprises and natural resources was



revealed. This approach serves as an important scientific basis for ecological sustainable development and territorial planning.

As a practical recommendation, the placement of industrial enterprises in accordance with natural conditions, the implementation of modern pollution-reducing technologies, and strict adherence to ecological requirements in the management of water and land resources will help improve the ecological condition of Navoi region. Overall, the study created a scientific basis for identifying the ecological consequences of industrial activities and ensuring territorial ecological sustainability in Navoi region.

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