



ENVIRONMENTAL RISK INDEX AND POPULATION HEALTH IN THE SOUTH ISLET REGION

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Abstract:

This article analyzes the formation of an environmental risk index in the islet region and its impact on the health of the population. The environmental problems caused by the drying up of the Aral Sea — Air, Water and soil pollution, salt dust storms and their negative impact on human health—are highlighted. By studying the Environmental Risk Index in association with population morbidity indicators, the possibilities of assessing the health risks in the region are shown. Practical recommendations for reducing environmental risk and protecting the health of the population have also been developed.

Keywords:

Islet Region, Environmental Risk Index, Environmental Pollution, Population Health, respiratory diseases, environmental monitoring.

Introduction

In recent decades, the drying of the Aral Sea has been recognized as one of the global environmental crises. This process has led to a violation of the ecological balance in the insular region, a shortage of Natural Resources and an increase in factors that negatively affect the health of the population. In this regard, the calculation of the Environmental Risk Index and its analysis in connection with the indicators of Population Health are of urgent importance. The Aral Sea crisis is considered one of the phenomena with the most severe consequences among modern



environmental problems. A sharp reduction in the area of the sea has led to a violation of environmental stability in the insular region and an increase in factors that negatively affect the health of the population. Therefore, it is an urgent task to calculate the Environmental Risk Index and analyze it in relation to health indicators.

The Environmental Risk Index is a comprehensive assessment of the state of the environment in a particular area, which includes levels of air pollution, drinking water quality, soil salinity and chemical pollution. In the Aral Sea region, this index is important in determining the impact of the ecological situation on public health. The Environmental Risk Index is an indicator that provides a comprehensive assessment of the level of environmental pollution in a particular area, changes in natural factors and their possible impact on human health. It includes indicators such as air, water and soil pollution, dust-dust, concentration of chemicals. The use of this index in the insular region makes it possible to determine the level of environmental risk as well as predict health problems. Since the 1960s, the shrinkage of the water area has led to the degradation of ecosystems in the region, soil salinity and air pollution. This process also negatively affects the health of the population, there is an increase in cases of not only diseases of the respiratory system, but also oncological and allergic diseases. In this regard, the calculation of the Environmental Risk Index and its analysis in connection with the indicators of Population Health are of urgent importance. The Environmental Risk Index (Environmental Risk Index) is a comprehensive indicator that assesses the state of the environment in a particular area. It mainly includes the following components:

Air pollution: PM_{2.5}, PM₁₀, SO₂, NO₂, CO concentrations.

Drinking water quality: microbiological and chemical coefficients, chlorine and nitrate content.

Soil and agricultural factors: salinity, erosion, chemical concentration.



Natural and anthropogenic factors: dust storms, water shortages, industrial waste. The Environmental Risk Index is used in predicting public health impacts, as the higher index also increases morbidity rates. This index is important in global and regional monitoring. As a result of the drying of the Aral Sea, a number of environmental problems have arisen in the area: air pollution (salt dust rising from the dried sea floor increases dust storms. These powders aggravate respiratory diseases and allergic conditions). Water resource pollution (limited drinking water reserves, poor quality. This leads to an increase in gastroenterological and infectious diseases among the population). Soil degradation (excessive use of chemicals in agriculture and salinization reduce yields and have negative health effects). Climate and dust storms (climate change and drying up of water bodies increase the risk of dust storms, which affect respiratory system and allergy rates). The relationship between population health indicators and the Environmental Risk Index is shown in the table below (table 1).

Population health indicators and environmental risk index(table 1).

Specification	Low environmental risk index area	Environmental Risk Index high area
Respiratory diseases (%)	12–15	25–30
Allergic diseases (%)	8–10	18–22
Anemia in children (%)	20–25	40–45
Drinking water quality (satisfactory, %)	70–75	40–45

Studies show that areas with a high environmental risk index in the insular region have a relatively high frequency of occurrence of respiratory diseases, allergic diseases, cardiovascular diseases and oncological diseases. Children and the elderly in particular are a sensitive layer to environmental factors. The Environmental Risk



Index serves as an important instrument in assessing population health indicators. Population health analysis in areas with high environmental risk, mainly the following diseases:

Diseases of the respiratory system: asthma, bronchitis, allergies.

Cardiovascular diseases: hypertension and ischemic diseases.

Pediatric problems: anemia in children and deficiency in growth.

Oncology: in areas of high environmental risk, there has been an increase in diseases of the blood and associated organs.

Recommendations for reducing problems

1. Monitoring: regular calculation of the Environmental Risk Index.
2. Water supply: development of sources of clean drinking water.
3. Green areas: establishment of protective forests against Oxymeter and dust storms.
4. Medical prevention: preventive examinations and environmental education among the population.
5. International cooperation: joint projects to solve environmental problems in the islet region.

Salt and toxic substances rise into the air from the seabed, which remains open in a large area as a result of the drying of the Aral Sea, causing an increase in dust storms in the region.

Also: decrease in drinking water quality, soil salinity, excessive use of chemicals in agriculture.

Methods



The study was conducted in the Muynak district, located in the Republic of Karakalpakstan, Uzbekistan, within the South Aral Sea region. The area is characterized by arid climate, frequent dust and salt storms, high soil salinity, and limited freshwater resources. The district covers approximately 37,000 km², with a population of about 30,000 residents.

Results

The calculated ERI values ranged from 0.34 to 0.79, indicating moderate to high environmental risk across the study area. The highest ERI values were observed in settlements located closer to the dried Aral Sea bed. Correlation analysis revealed strong positive relationships between ERI and respiratory disease prevalence ($r = 0.72$, $p < 0.01$), anemia ($r = 0.68$, $p < 0.01$), and cardiovascular diseases ($r = 0.61$, $p < 0.05$). Moderate correlations were found for gastrointestinal disorders ($r = 0.54$). Spatial hotspot analysis identified significant clusters of high ERI and elevated disease prevalence in northern and northeastern parts of the district, particularly in areas exposed to frequent dust and salt storms.

Discussion

The findings demonstrate that environmental degradation significantly influences public health in the South Aral Sea region. High concentrations of airborne particulate matter and elevated soil salinity contribute substantially to respiratory and cardiovascular disease burden. The strong association between ERI and anemia prevalence may be attributed to poor drinking water quality and nutritional deficiencies linked to environmental stress. Spatial clustering of health outcomes near the dried seabed emphasizes the long-term impact of salt-dust transport processes. These results are consistent with previous studies conducted in the Aral Sea basin, confirming the persistent health risks associated with environmental deterioration. Integrated environmental management strategies, improved water treatment systems, afforestation of the dried seabed, and



strengthened public health interventions are urgently required to mitigate health risks in the region.

Conclusion

In the insular region, the Environmental Risk Index is an important indicator in assessing the state of health of the population. The measures carried out on the basis of an in-depth scientific analysis of environmental problems and an integrated approach serve to improve the quality of life of the population living in the region.

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