EURASIAN JOURNAL OF ACADEMIC RESEARCH
Innovative Academy Research Support Center
IF = 9.3 www.in-academy.uz/index.php/ejar

ECOLOGICAL ASPECTS OF CLIMATE CHANGE IN UZBEKISTAN

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https://doi.org/10.5281/zenodo.18468412

ARTICLE INFO

Received: 24th January 2026
Accepted: 30th January 2026
Online: 31st January 2026

KEYWORDS

Climate change, public health, risk factors, public health, noncommunicable diseases, infectious pathology, environmental factors.

ABSTRACT

For the healthcare system in Uzbekistan, this review aims to strengthen its adaptive capacity given the projected impacts of climate change, ensure the efficient and effective use of resources, and promote policies to provide climate-resilient healthcare and sanitation services. It also focuses on identifying and mitigating climate-related health risks and on the ability to respond to climate change adaptation. Climate change is currently considered a significant risk factor for public health, influencing the structure and dynamics of disease incidence. The purpose of this review is to analyze current domestic and international research on the impact of climate factors on the health of the population of the Republic of Uzbekistan.

ЭКОЛОГИЧЕСКИЕ АСПЕКТЫ ИЗМЕНЕНИЯ КЛИМАТА В УЗБЕКИСТАНЕ

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https://doi.org/10.5281/zenodo.18468412

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Accepted: 30th January 2026
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ABSTRACT

Для системы здравоохранения в Узбекистане направлен на укрепление ее адаптационного потенциала с учетом прогнозируемых последствий изменения климата, обеспечение эффективного и действенного использования ресурсов и стимулирования политики по обеспечению услуг здравоохранения и санитарии, устойчивых к изменению климата. Он также фокусируется на выявлении и смягчении рисков для здоровья людей, связанных с изменением климата, а также на возможностях реагирования на адаптацию к изменению климата. Климатические изменения в настоящее время рассматриваются как значимый фактор риска нарушения здоровья населения,

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Климатические изменения, здоровье населения, факторы риска, общественное здоровье, неинфекционные заболевания, инфекционная патология, экологические факторы.

оказывающий влияние на структуру и динамику заболеваемости. Целью настоящего обзора явился анализ современных отечественных и зарубежных исследований, посвящённых влиянию климатических факторов на здоровье населения Республики Узбекистан.

Introduction. Climate change is currently considered a significant risk factor for public health, exerting a systemic impact on morbidity and mortality rates [1,9,14]. Data on the role of temperature anomalies, aridity, water shortages, and air pollution in the development of cardiovascular, respiratory, infectious, and psychosomatic pathologies are summarized. It is shown that climate-related risks are differentiated and most significantly affect vulnerable population groups.

Rising air temperatures, more frequent extreme weather events, and the degradation of natural ecosystems contribute to the transformation of traditional medical and environmental determinants and the development of new public health risks [11,17,20]. For Central Asian countries, including the Republic of Uzbekistan, climate change is particularly relevant due to the arid climate, limited water resources, and the high sensitivity of ecosystems to anthropogenic stress [2,7]. In these conditions, climatic factors should be considered not as a background influence, but as an independent modifying risk factor, capable of enhancing the adverse impact of environmental and social determinants of health [6,16]. The results of domestic and international studies indicate a link between climatic anomalies and an increase in cardiovascular and respiratory pathologies, an increase in the frequency of exacerbations of chronic non-communicable diseases, as well as changes in the epidemiological characteristics of infectious processes [5,8,20,21]. The most vulnerable groups are the rural population, women, and residents of ecologically disadvantaged regions, in particular the Aral Sea region [7,12].

Despite the growing body of publications, the Republic of Uzbekistan still lacks analytical reviews examining climate change as a systemic risk factor for public health. Therefore, the aim of this review is to summarize current data on the impact of climate change on public health, with an emphasis on the regional characteristics of the Republic of Uzbekistan.

Climate factors and mechanisms of impact on health. The impact of climate change on public health is realized through a combination of physical and environmentally mediated mechanisms, among which the leading roles are played by temperature anomalies, aridity and water shortages, as well as air pollution [1,6,14]. Temperature extremes are accompanied by the development of heat stress, increased

stress on the cardiovascular system, and destabilization of chronic diseases. Ibragimova and Berdieva (2024) indicate an increase in the frequency of exacerbations of cardiovascular pathology during periods of abnormal heat, which is confirmed by data from the analytical review by Revich (2024) [5,11]. Aridity and water shortages create unfavorable sanitary and hygienic conditions and contribute to water-salt imbalances. According to Ataniyazova and Bainazarova (2025), these factors are particularly significant for the rural population, where they are associated with an increase in infectious and metabolic pathologies [2]. Long-term exposure to water shortages is considered a factor in chronic climatic and environmental stress [12].

Air pollution in the context of climate change is particularly significant due to increased concentrations of suspended particles and the formation of dust storms. Chernykh et al. (2021) showed that unfavorable meteorological conditions increase the negative impact of atmospheric pollutants on the respiratory system [15]. Combined climatic and chemical effects are considered one of the key mechanisms in the development of chronic respiratory pathology [16,21]. A generalized description of the main climatic factors and the mechanisms of their impact on public health is presented in Table 1, which allows us to consider climate change as a cumulative risk factor with a multi-level impact on the body.

Key Climate Factors and Mechanisms of Impact on Health

Climate Factor Leading	Mechanisms	Impact Main Consequences
Temperature Anomalies	Heat Stress	Cardiovascular Complications
Aridity, Water Deficiency	Poor Sanitary Conditions	Infectious and Metabolic Pathology
Air Pollution Increased	Aerosol Load	Respiratory Diseases
Combined Impact	Cumulative Factors	Chronic NCDs

The Impact of Climate Change on the Morbidity Structure of the Population. Climate change affects not only the level but also the structure of morbidity in the population, altering the ratio of the main nosological groups. Current data indicate a shift in the disease burden towards cardiovascular, respiratory, infectious, and psychosomatic pathologies, which is considered a characteristic feature of climate-related risks [1,9,14]. The most stable associations have been identified for cardiovascular diseases, the proportion of which increases during periods of temperature anomalies. Ibragimova and Berdieva (2024), as well as Limon (2024) note an increase in the number of patients seeking medical attention and a deterioration in the course of cardiovascular pathology under conditions of unfavorable meteorological factors [5,8]. These data are confirmed by the results of analytical reviews considering temperature extremes as a factor in the destabilization of chronic non-communicable diseases [3, 11]. Climate change is accompanied by an increase in respiratory diseases, which is associated with increased air pollution and aerosol load. According to Chernykh et al. (2021), unfavorable climatic

conditions contribute to an increase in the share of respiratory diseases in the overall morbidity structure [15]. Similar conclusions are presented in international studies, emphasizing the role of the combined effects of climatic factors and air pollution [21]. With regard to infectious pathology, climate change is associated with a transformation of epidemiological characteristics, including a change in seasonality and an increase in morbidity associated with water scarcity. Semenza et al. (2022) consider these processes as cascading infectious risks that increase in conditions of climatic instability [20]. Additional importance is attached to the influence of climatic factors on the prevalence of socially significant infections, including tuberculosis [10, 18]. Along with somatic pathology, the proportion of psychosomatic and psychoemotional disorders in the morbidity structure is increasing, which is associated with chronic climatic and environmental stress. Padhy et al. (2015) and Dhimal et al. (2021) emphasize the contribution of climate change to the psychosomatic component of non-communicable diseases [17,19].

Regional and socio-demographic characteristics of climate-related risk. Climate change has a heterogeneous impact on population health, forming varying degrees of risk depending on regional and socio-demographic characteristics. Modern research emphasizes that vulnerability to climate impacts is determined not only by the intensity of environmental factors but also by living conditions, lifestyle, and biological characteristics of the population [1,9,14]. The most pronounced climate-related environmental risks are characteristic of the Aral Sea region, which is considered a zone of chronic disadvantage. Kudiyarova and Zhumamuratov (2025) found a stable relationship between health indicators of the population of Karakalpakstan and a complex of climatic and environmental factors [7]. Similar conclusions are presented in the works of Khaybullina et al. (2022), which emphasize the role of water resource scarcity and climatic instability in the formation of unfavorable medical and demographic indicators [4, 13]. The rural population is characterized by increased sensitivity to climate change due to high dependence on natural conditions and limited adaptive capacity. Ataniyazova and Bainazarova (2025) note that climatic factors in rural areas are associated with deteriorating sanitary and hygienic conditions and an increase in chronic pathology [2]. These features increase the cumulative impact of climate risks on health [12].

The vulnerability of women, caused by a combination of biological and social factors, deserves special attention. Tillakhodjaeva et al. (2024) point to the significant influence of climatic and environmental conditions on the health of rural women in the Republic of Uzbekistan [12]. Several studies emphasize that long-term exposure to climate stress is associated with an increase in psychosomatic disorders in women [17]. A generalized description of regional and socio-demographic groups at increased climate risk is presented.

Conclusion. Climate-related public health risks are differentiated and most affect specific regional and socio-demographic groups, confirming the need to consider them when analyzing the medical and environmental consequences of climate change [1,14].

Climate change should be considered as an independent risk factor with a systemic impact on the morbidity structure of the population. In the Republic of Uzbekistan, their

impact is associated with an increase in cardiovascular, respiratory, infectious and psychosomatic pathologies and is characterized by a pronounced differentiation of risk among vulnerable groups of the population.

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