Natural and ecological factors for assessing the quality of life of the population in the Russian Far East

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Abstract. The study aims to assess the impact of environmental factors on the quality of life of the population in the Far Eastern regions of Russia. The paper analyzes two types of natural media: atmospheric air and surface water resources. The study was carried out for the regions of the Far East of Russia (FER) from 2010 to 2016. We have distinguished four types of regions according to the comfort degree of natural and climatic conditions as well as the environmental situation. The “high” level of quality of life is in the Jewish Autonomous Region, which is characterized by comfortable living conditions and low levels of natural and anthropogenic pollution in the territory. We conclude that environmental and climatic factors and environmental conditions, especially in regions with extreme and uncomfortable living conditions, in the presence of disturbances in the environment, do not affect the overall assessment of the quality of life of the population in the Far East.

1. Introduction
In April 1996, Decree No. 440 of the President of the Russian Federation approved the Concept for the Transition of the Russian Federation to Sustainable Development [1]. The essence of the concept was the search for balance between the evolving structures of the territorial system, including the economy, society, nature, politics, and culture.

In the Russian documents on sustainable development, the main indicators of quality of life are as follows: (1) human life expectancy; (2) state of health; (3) deviation of the environment from standards; (4) level of education; (5) income (measured by gross domestic product per capita); and (6) level of employment. Today, these values are recognized globally as absolute and used to assess the level and quality of life of the population in countries and regions [2, 3].

Assessing the impact of natural and environmental factors on the quality of life of the population is the main areas of medical, environmental, socio-geographical, sociological, and other research related to humans. In this study, we use several evaluations of different approaches to the study of quality of life among the vast majority of authors for assessing the impact of environmental factors on public health (as an integral indicator of the quality of life). These parameters include information on the concentrations of pollutants into the atmosphere, wastewater discharges, toxic waste accumulations, and the formation of vast geochemical anthropogenic provinces. The diversity of aspects of human life determines the diversity of the very category of “quality of life” and the criteria for its assessment.

The environment can be considered a combination of elements of natural and anthropogenic origins. The group of natural and environmental factors includes those environmental elements that are
related to the geographical location, climate, quality of the ecological niche, and other physical characteristics of the region that have a significant impact on human well-being.

2. Materials and methods
In this paper, we consider only two types of natural media, atmospheric air and surface water resources. We characterize the state of these environmental media as ecological living conditions of natural and ecological origin by evaluating the indicators of emissions of harmful substances into the atmospheric air and surface water in addition to the proportions of air and water samples exceeding the maximum permissible concentrations (MPC) in the total number of samples studied [4]. The information base was the data of the State Statistics Committee of the Russian Federation [5].

To differentiate the regions of the Far East by the comfort of the natural and climatic conditions, the results from typing studies on the degree of comfort of the natural and climatic conditions from the territories in the Asian part of Russia and the regions of the Far East were used [6, 7].

3. Results and discussion
Meteorological conditions have the greatest impact on human health among environmental factors. Climate is considered a general energy background of life, forming health and quality of life of the population [7-9].

Prokhorov B.B. identified five types of territories in the Asian part of Russia according to the comfort degree of natural and climatic conditions [6]. The subjects of the Far East of Russia (FER) include several types of territories that vary in degree of comfort.

Derkacheva L.N. identified five bioclimatic zones that differ in the level of the complex influence of climate on the thermal state of humans in the Russian Far East [7].

The “optimum” zone of the Far Eastern Region can be considered the main zone of the population distribution along the Trans-Siberian Railway, which concentrates up to 55% of the population of the Far East with the most comfortable living conditions. Only 45% of the population of the macro-region inhabit the remaining territory [10]. There is a deficit of territories that are suitable for human life in terms of climatic characteristics.

The most suitable territories for a living are characterized by a relatively high concentration of industrial enterprises. The danger of industrial pollution is well known and determined by the fact that most of these pollutants have toxic or pathogenic properties. Migrating through air, soil, surface and groundwater, these pollutants enter the human body through the air, water, and food thus causing a reduction in the quality of people’s lives. Ecological processes are very complex, and their detailed study requires complex interdisciplinary research.

It should be noted that samples to assess the degree of pollution of water and air are obtained from densely populated areas and places of water intake of open reservoirs. First, it follows that such samples determine real environmental living conditions. Second, in the indicated sampling locations, the quality of water and air must meet sanitary requirements, regardless of the development of harmful industries in the regions when one of the restrictions is a negative impact on the environment. Under these conditions, the presence of samples exceeding the MPC can be attributed to environmental violations that are allowable in spite of the available opportunities to prevent them; therefore, these samples can be considered as an environmental indicator in the structure of the quality of life of the population.

Distribution of natural and environmental indicators for assessing quality of life of the population in the Russian Far East for 2010 to 2016 with varying degrees of comfort in the territory has shown that almost all indicators of the ecological state in the studied natural environments varied in the regions of the Far Eastern Region, regardless of the climatic and geographical assessment of the comfort of the territory. In Kamchatka Territory, the Jewish Autonomous Region and the Sakhalin Oblast, the proportion of negative air samples changed over the period from 2010 to 2016 less than in 2.5 times, which indicates insignificant fluctuations in the volume of emissions of harmful substances into the atmosphere during these years. The maximum emissions of harmful substances into the air are
characteristic of the Republic of Sakha, the Khabarovsk and Primorsky Territories due to the development of polluting industries involved in mining and processing enterprises in these regions; in 2017, there were 1961, 3060 and 4092 enterprises, respectively.

The situation with water samples was similar, but these indicators varied by region over a wider range: from 2.5 times in the Sakhalin Oblast and the Republic of Sakha to 9 times in the Amur Oblast, and 12 times in Kamchatka Territory. An analysis of the data for the entire set of regions (except for the Chukotka Autonomous Okrug due to lack of data) indicated the presence of negative air and water samples, depending on the nature and scale of development of the regional economy.

Based on the assessment of FER regions by the comfort degree of the territory and the state of pollution in the living environment, we have identified four types of regions according to the “quality of life environment” for the period from 2010 to 2016, with differentiation from “high” to “low”, varying by the totality of environmental and climatic factors.

The Jewish Autonomous Region characterized by comfortable living conditions and a low level of natural and anthropogenic pollution of the territory is classified as a type with a “high” level of quality of life environment (2.6% of the district population). A significant regional lag in terms of economic development to a greater extent determines the relatively favorable environmental situation.

A “higher than average” type of quality of life environment is characteristic of both Khabarovsk and Primorsky territories (52.6% of the district population). These regions received the characteristic of a “regional optimum”, with a comfortable habitat (except for the northern mountainous and coastal regions of the Khabarovsk Territory) for the population. They occupy an intermediate position between regions with a “high” level of environmental quality and areas with uncomfortable natural conditions. These regions have a high concentration of industrial enterprises with a relatively high amount of emissions of harmful substances into the air.

Amur and Sakhalin oblasts and Kamchatka Krai with uncomfortable combined with locally hypo-comfortable living conditions and areas prone to technogenic environmental pollution (areas of “old” industrial development) belong to the type with an “average” level of environmental quality (26% of the district population).

4. Conclusion

Therefore, four types of FER regions can be distinguished by the quality of their living environments, which differ in varying degrees of territory comfort and environmental situation. The “high” level of quality of life is in the Jewish Autonomous Region and is characterized by comfortable living conditions and low levels of natural and anthropogenic pollution of the territory. The Chukotka, the Republic of Sakha, and the Magadan Region located in the zone of absolutely uncomfortable combined with uncomfortable conditions are classified as “low” types of environmental quality.

In FER, the territorial analysis of environmental and climatic factors on the quality of the living environment has shown that environmental conditions, especially in regions with extreme and uncomfortable living conditions in the presence of disturbances in the environment do not affect the overall assessment of the quality of life of the population.

According to the concept of sustainable development, the introduction of environmental and climatic indicators of vital activity of the population in the study of quality of life is necessary since nature, society and the economy are closely interconnected, and it is unacceptable to ignore these connections in socio-economic studies.

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