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**VULNERABILITY OF ECOSYSTEMS OF CHERNIHIV POLISSYA TO  
CLIMATE CHANGES OF THE ENVIRONMENT**

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**Annotation.** The main features of ecosystems of Chernihiv Polissya are analyzed in the article. The problems and challenges on the way to overcoming the negative consequences of climate change, scientifically substantiated causes of climate change, the main possible ways and measures to overcome the negative trend of climate change are highlighted. The high level of biodiversity, the presence of natural and ecosystems of anthropogenic significance and the peculiarity of the climatic conditions of Chernihiv Polissya are argued.

**Key words:** climate, ecosystems, Chernihiv Polissya, climate change, temperature regime.

Global climate change has become one of the most pressing environmental issues facing human attention. Its consequences are dangerous weather cataclysms, sudden weather changes, floods, floods, strong winds, showers and rains, hail, droughts, which lead to significant environmental and economic damage around the world. According to the World Meteorological Organization, the last three years have been the three warmest years in the history of observation. Increasing unpredictability of weather conditions threatens food production, rising sea levels increases the risk of natural disasters [2].

According to a report by the Intergovernmental Panel on Climate Change, research shows that climate change as a result of anthropogenic impact since the late 19th century is only about one-third due to natural change and two-thirds due to human activities, including increasing greenhouse gas concentrations in the atmosphere.

Adaptation to global climate change is a process of adaptation in natural or human systems in response to actual or expected climatic influences, which will reduce their negative effects and take advantage of opportunities.

During the study, the Chernihiv Polissya zone was selected as the selected object for studying and forecasting the response to climate change. The argument for this choice is the high level of biodiversity, the presence of natural and ecosystems of anthropogenic importance and the peculiarity of climatic conditions [1].

Chernihiv Polissya includes the northern part of Kyiv-Sviatoshynskyi district, Brovarskyi district of Kyiv region, Kozeletskyi, Chernihivskyi, Ripkynskyi, Gorodnyanskyi, Snovskiy, Menskyi districts, northern parts of Bobrovytskyi, Nosivskiy, Nizhynskiy, Borznyi, Bakhmatskyi and eastern parts of Soshivskiy region (Fig. 1).



**Fig. 1. The borders of Chernihiv Polissya**

Chernihiv Polissya is located between Kyiv Polissya in the west and Novgorod-Siverskyi in the northeast. From the south and southeast it is limited by the forest-steppe zone, in the northwest it borders with Belarus. The area of Chernihiv

Polissya is 18,160 km<sup>2</sup>. Chernihiv Polissya is a plain, gently covered with hills, with a pronounced slope from NO to SW.

In the territory of Chernihiv Polissya, the main sources of pollution of surface water bodies of the Desna basin are public utilities, which is 97.7% of the total amount of wastewater pollution. Contaminated wastewater is also discharged by meat and dairy companies, processing industries, etc [4].

Another, no less important, source of surface water pollution in Chernihiv Polissya is overloaded sewage treatment plants and networks, which are in unsatisfactory technical condition and need major repairs and reconstruction.

Due to insufficient funding, construction and reconstruction of most water supply and sanitation facilities planned by local water management, water protection and drinking water quality programs are virtually non-existent.

The most dangerous and common are air pollution by nitrogen oxides, lead compounds and some other substances entering the air with automotive gases. As a part of the substances thrown out by stationary sources of the enterprises:

- methane has the largest specific weight – 34.0%,
- dioxide and other sulfur compounds – 28,3%,
- nitrogen compounds – 15.6%,
- substances in the form of suspended solid particles – 11.6%,
- carbon monoxide – 6.3%,
- non-methane volatile organic compounds – 4.1%,
- others – 0.1%.

In addition, the atmosphere received 1861.9 thousand tons of carbon dioxide. The most polluted environment of the region was produced by electricity, gas and water producers (46.4% of the total emissions from stationary sources) and agricultural enterprises (28.3%). Atmospheric droughts, late spring and early autumn frosts have become commonplace in Polissya today. Instead, the climate-regulating function of natural bogs is due to their ability to mitigate fluctuations in temperature and humidity both in swamps and in neighboring areas [3, 5].

Over the last decade, the hydrological and hydrochemical regime of small



rivers of Chernihiv Polissya has been significantly disrupted due to the discharge of untreated or insufficiently treated wastewater. Some sections of rivers are characterized by high-quality poverty of cenoses, which are vulnerable to anthropogenic impact.

Quarries and ditches, during the development of which the hydrological regime is violated, large areas are alienated, lead to the destruction of forests (within which extraction is carried out), pollution of the environment with oil products and gas and dust emissions. In addition, forest fires have become more frequent recently. The exact scale and consequences of such activities, the damage from these factors to the environment are unknown today [7].

Many natural systems may be particularly vulnerable to climate change, as they have limited adaptability, and some of these systems may suffer significant and irreversible damage. To a large extent, this applies to many species of living organisms that live in the natural environment under normal living conditions. Individual species may increase their numbers or habitats in the new environment, but climate change will increase the existing risks of extinction of some of the more vulnerable species and significantly increase the threat of biodiversity loss.

Climate change on biodiversity is characterized by:

- phenological changes – when the average temperature rises by 20° C, the plants begin to bloom 5-30 days earlier, when there is a threat of frost and there are no pollinating insects, which causes a negative effect;
- change in the settlement of species – change in habitat due to changes in conditions causes the rapid emergence and settlement of invasive species, including many dangerous weeds, allergens, poisonous, etc. Invasive species are usually more resilient and gradually completely replace local ones [6].

Three types of biota responses to climate change are identified: migration, adaptation, and extinction. Migration under normal conditions is an ecologically balanced process, but due to the increasing rate of change in the environment and the presence of anthropogenic obstacles (ecological holes), the balance is disturbed. Invasive species displace aborigines and occupy their economies, breaking

coevolutionary ties. Accordingly, the most common migrants are not the species we would like to see in our nature.

According to the conducted research and analyzed sources of literature, it can be concluded that Chernihiv Polissya is a unique zone in terms of ecological properties. The uniqueness is the high level of biodiversity, climatic conditions, distribution and use of Polissya as separate ecosystems. Due to the above parameters, ecosystems of Chernihiv Polissya are the most sensitive to high anthropogenic pressure and changes in the environment, especially with regard to climate change.

Thus, given the large number and territory of objects of the nature reserve fund within the study area, the main biological components of the ecosystems of Chernihiv Polissya need more study and protection [2]. This is especially true of the flora and fauna of the area, which are localized only within protected areas. After all, within the zone there are mostly more Red Book species than in other regions.

Chernihiv Polissya has been particularly affected by the development of the agricultural sector and the industrial sector, especially activities related to the extraction and processing of natural minerals. Such actions lead to land degradation, pollution of surface water bodies and groundwater by industrial emissions and runoff of agricultural land, threat to biodiversity, air pollution.

The effect of the above factors is also enhanced by changing weather conditions due to global climate change. It should be noted that anomalous meteorological phenomena play an important role in the adaptation of Polissya ecosystems to global climate change. Their number is growing, both around the world and within the territory of Ukraine.

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