

THE IMPACT OF CLIMATE CHANGE ON THE HYDROLOGICAL REGIME OF RIVERS IN THE UKRAINIAN POLISSIA

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Studies by leading Ukrainian and international scientists indicate significant climate changes that affect the formation of river water regimes. There is considerable variability in the frequency and scale of river floods: in some regions, their number and intensity are increasing, while in others, on the contrary, they are decreasing. At the same time, the timing of their occurrence and the duration of their passage are changing. Additionally, a decline in river water levels is increasingly being recorded, leading to low-water conditions and, in some cases, the complete disappearance of small water courses.

Such changes in the hydrological regime have significant socio-economic consequences. They lead to an increase in economic losses associated with both floods and droughts, which negatively affect agriculture, industry, and residential infrastructure.

In recent years, in Ukraine, due to global climate changes, there has been a trend toward the redistribution of water resources. A decrease in spring runoff and a shortening of flood duration are observed, while the risk of catastrophic snowmelt-rainfall floods remains high, particularly on the rivers of Ukrainian Polissia.

The object of this study is the rivers of Ukrainian Polissia, which are characterized by a specific hydrological regime, where the maximum runoff is primarily formed due to the melting of the snow cover and the occurrence of intense rainfall during the winter-spring period. These processes often lead to a rise in water levels, resulting in the flooding of adjacent areas, including industrial facilities and settlements.

The hydrological regime of the rivers in this area is significantly influenced by climate changes, which manifest in the alteration of the frequency and intensity of water runoff. An important aspect of the study is the assessment of the factors that determine the nature of the formation of maximum snowmelt-rainfall runoff and the establishment of trends in its dynamics over a multi-year period and under current climate change conditions.

Analysis of recent studies. Recent research shows that climate change significantly affects the water regime of rivers, particularly the nature and frequency of floods in Europe. In Northwestern Europe, increased precipitation in autumn and winter has led to intensified flooding, while in Eastern Europe, particularly in the Pripyat River basin, their intensity has decreased due to the reduction in snow cover and its melting. Studies by Ukrainian and international

scientists indicate a shift towards earlier floods and a reduction in the scale of flood synchronization. In Ukraine, the impact of climate change has been especially noticeable since 1989, which has been reflected in hydrological calculations and forecasts of maximum spring flood levels.

Research results. The study of multi-year trends in the maximum snowmelt-rainfall runoff of rivers in Ukrainian Polissia was conducted using the hydrological-genetic method. To examine the homogeneity and stationarity of the maximum snowmelt-rainfall runoff of the rivers in Ukrainian Polissia, cumulative curves, differential integral curves, chronological graphs of runoff layers, and maximum water discharge were constructed.

The cumulative curves of the maximum snowmelt-rainfall runoff layers of the rivers in Ukrainian Polissia showed homogeneity, as deviations from the straight line were almost absent. However, the cumulative curves of maximum water discharge indicate heterogeneity, with an inflection point after which the trend of maximum runoff changes. The reasons for the disruption of the homogeneity of the time series of maximum water discharge in snowmelt-rainfall runoff are meteorological factors, anthropogenic activity, and climate change.

Chronological graphs of the maximum snowmelt-rainfall runoff of the rivers in Ukrainian Polissia show fluctuations in water flow with a pronounced tendency for decreasing runoff, especially the maximum water discharges. There is also a noticeable trend towards shifting the timing of maximum runoff formation to earlier dates in the context of current climate warming.

The analysis of the differential integral curves of the snowmelt-rainfall runoff of the rivers in Ukrainian Polissia indicates the presence of hydrological cycles. The high-water phase was observed from the beginning of observations and lasted nearly ten years, until 1971-1981, when high water levels in 1979 and 1980 occurred. The low-water phase began in 1972 or 1982 and continued until 2020. It is difficult to determine the exact start of the high-water phase due to insufficient data.

The coefficients of variation for maximum water discharge range from 0.52 to 1.41, while for runoff layers, they range from 0.47 to 1.27, with an average ratio of 2.0. For further justification of forecasting methods, the statistical characteristics are summarized based on average values and geographical features of the catchments.

Conclusion. The analysis of the chronological course of the maximum snowmelt-rainfall runoff of the rivers in Ukrainian Polissia showed that they are synchronous and exhibit hydrological cycles, which cause pronounced trends in the time series of maximum runoff. The direction of the runoff trends is decreasing, which is related to the impact of climate change on the hydrological regime of the rivers in Ukrainian Polissia — unstable winter temperature conditions, low snow reserves, and uneven snow accumulation.