

# ANALYSIS OF THE STATE OF DRINKING WATER IN UKRAINE

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**Abstract.** This article analyzes the factors affecting the quality of drinking water in Ukraine. The main regulatory documents regulating the quality of drinking water are considered.

**Keywords:** water, drinking water, environmental safety, hygienic requirements, water quality.

**Анотація.** В даній статті проаналізовано фактори, що впливають на якість питної води в Україні. Розглянуто основні нормативні документи, що регламентують якість питної води.

**Ключові слова:** вода, питна вода, екологічна безпека, гігієнічні вимоги, якість води.

**Introduction.** Drinking water is a key resource on which human life depends. In Ukraine, the provision of the population with high-quality water is regulated by state standards that determine the requirements for the physicochemical and microbiological characteristics of water. However, even with the presence of a regulatory framework, the problem of drinking water quality continues to remain acute due to outdated water supply systems, pollution of water sources, and, of course, war factors.

**Analysis of the state of the issue.** Drinking water must be safe for consumption in order to ensure the preservation of the health of the population. Requirements for its quality should include compliance with epidemic and radiation safety, favorable organoleptic properties, as well as a chemical composition that does not harm the body. According to reports of the State Ecological Inspectorate of Ukraine, the concentration of toxic compounds in Ukrainian freshwater bodies is 35-45 times higher than the maximum permissible standards.

**The purpose of the article** is to analyze the state of drinking water in Ukraine.

**Methods, materials and research results.** In Ukraine, the requirements for the quality of drinking water are regulated by DSTU 7525:2014 and DSanPiN 2.2.4-171-10. The procedure for developing and approving drinking water supply standards is established by the Cabinet of Ministers of Ukraine [1]. According to this regulatory document, water must meet the established sanitary and hygienic requirements, ensuring a neutral smell, taste and high transparency. The intensity of the smell at a temperature of 20°C should not exceed 2 points for tap water, 3 points for water from wells and springs, and for packaged water this indicator is limited to 1 point. Similar standards apply to a temperature of 60°C. As for color, the permissible level is up to 20 degrees for tap water, up to 35 degrees for spring water and up to 10 degrees for packaged products [2].

Turbidity is an important indicator of water quality. Turbidity of water is usually caused by finely dispersed impurities, in particular, sand and scale. The presence of these impurities in drinking water is not allowed. According to the requirements of the current legislation of Ukraine, water turbidity should not exceed 1 NTU (nephelometric turbidity unit), which is equal to  $0.58 \text{ mg/dm}^3$  [3].

The turbidity index should not exceed 1.0 NTU for water from centralized water supply, 2.6 NTU for well water and 0.5 NTU for packaged water. Similarly, the organoleptic characteristics of taste and aftertaste are regulated: up to 2 points for tap water, up to 3 points for spring water and no more than 1 point in the case of packaged water.

To ensure proper drinking water quality, strict standards for the concentration of inorganic components have been introduced. In particular, the pH value must remain within 6.5-8.5, regardless of the category of drinking water.

Total hardness is limited to 7.0 mmol/L for tap and bottled water, while for well water the upper permissible limit is 10.0 mmol/L.

Iron levels are also regulated: the permissible norm for tap and packaged water does not exceed 0.2 mg/l, while for well water this indicator can reach 1.0 mg/l. In packaged drinking water, additional restrictions are provided: the maximum permissible concentration of calcium is set at a level of no more than 130 mg/l, magnesium – up to 80 mg/l, and manganese – up to 0.05 mg/l. Sulfates in tap and packaged water must not exceed 250 mg/l; for well water, a concentration of up to 500 mg/l is allowed.

The maximum permissible level of chlorides is 250 mg/l for tap and packaged water, while in spring water up to 350 mg/l is allowed. As for residual free chlorine, its content in tap and well water should not exceed 0.5 mg/l, and in packaged water – only 0.05 mg/l. Controlling the content of toxic substances in drinking water is extremely important for ensuring public health. The maximum permissible levels of ammonium are 0.5 mg/l for tap water, 2.6 mg/l for well water and 0.1 mg/l for packaged water. The content of aluminum is limited to 0.2 mg/l in tap water and 0.1 mg/l in packaged water.

The norm for the presence of cadmium in drinking water is set at a level of no more than 0.001 mg/l, while arsenic and lead have a limit of 0.01 mg/l. The concentration of mercury should not exceed the threshold of 0.0005 mg/l. The level of nitrates ( $\text{NO}_3$ ) in tap and well water should not exceed 50 mg/l, while for packaged water it is limited to 10 mg/l. The maximum permissible concentration of nitrites is 0.5 mg/l in tap water, 3.3 mg/l in well water and 0.5 mg/l in packaged water. The ozone content in tap water is determined in the range from 0.1 to 0.3 mg/l. Strict restrictions are provided to prevent the negative impact of organic pollutants on the health of citizens. For example, in packaged water, chloroform should not exceed 6  $\mu\text{g/l}$ , polyacrylamide – 2.0 mg/l, and formaldehyde - 0.05 mg/l. Permanganate oxidation should remain within 5.0 mg/l for tap and well water, and for packaged water – no more than 2.0 mg/l.

It should be noted that during the development of DSanPiN 2.2.4-171-10, WHO recommendations and the provisions of Directive 98/83/EC were taken into account [4].

Compliance with these standards is a fundamental condition for maintaining ecological balance and ensuring public health safety.

According to the National Report on the State of Drinking Water Supply in Ukraine for 2022, about 25% of drinking water samples taken from centralized water supply systems do not meet the established regulatory requirements. In addition, the results obtained within the framework of the “Water Quality Map” project indicate that due to significant wear and tear of water supply networks, the country loses up to 40% of drinking water. This situation not only reduces the volume of the available resource, but also significantly worsens its quality during transportation to the end consumer.

Also, Ukraine has adopted a nationwide targeted social program “Drinking Water of Ukraine” for the period 2022–2026. The main goal of this program is to provide the population with high-quality drinking water in accordance with current regulatory and legal standards. The implementation of this initiative is aimed at improving the standard of living of citizens and ensuring environmental safety, which corresponds to the constitutional rights of every resident of the country. The program plans to modernize and reconstruct centralized water supply and wastewater systems in the country's settlements.

The document also outlines key approaches to overcoming existing problems in the water supply sector, proposes a set of measures to achieve the set goals, assesses expected results, and identifies sources of financing. The program is being implemented under the coordination of the program's financial plan provides for a total expenditure of UAH 28.6 billion. Of this amount, UAH 16.95 billion will be allocated from the state budget, while UAH 11.64 billion will come from alternative sources of financing.

Unfortunately, numerous economic and technical problems significantly slow down the process of implementing European standards into the legislative framework for drinking water supply. First of all, this concerns Council Directive 98/83/EC [5].

**Conclusions.** Unfortunately, the quality of drinking water is deteriorating not only in Ukraine, but also throughout the world. The reason for this is the consequences of human activity, irrational water consumption, violation of environmental safety requirements, military operations, etc. All this, first of all, concerns the quality of available reserves of fresh drinking water. In Ukraine, this problem is significantly exacerbated by outdated water purification technologies, unauthorized discharges of spent reagents into rivers, and the unsatisfactory condition of water supply networks.

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