CURRENT PROBLEMS OF WATER SUPPLY AND POLLUTION OF WATER RESOURCES OF UKRAINE

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АКТУАЛЬНІ ПРОБЛЕМИ ВОДОПОСТАЧАННЯ І ЗАБРУДНЕННЯ ВОДНИХ РЕСУРСІВ УКРАЇНИ

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АКТУАЛЬНЫЕ ПРОБЛЕМЫ ВОДОСНАБЖЕНИЯ И ЗАГРЯЗНЕНИЯ ВОДНЫХ РЕСУРСОВ УКРАИНЫ

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The current state of water supply in different regions of Ukraine was considered in the work. The river runoff of the basins of the largest rivers of the country and the total annual river runoff have been studied. The level of water pollution in different regions of the country is analyzed. Chemicals that are the basis of river pollution with multiple exceedances of the permissible norms were mentioned.

Key words: *water resources, river runoff, water supply, water pollution, biochemical oxygen consumption, maximum permissible concentration*

В роботі був розглянутий поточний стан із забезпечення водними ресурсами в різних регіонах України. Досліджений річковий стік басейнів найбільших річок країни та загально річний річковий стік. Проаналізований рівень забруднення водних ресурсів різних регіонів країни. Зазначені хімічні речовини, які становлять основу забруднення річок із багаторазовим перевищенням припустимих норм.

Ключові слова: *водні ресурси, річковий стік, забезпеченість водними ресурсами, забруднення водних ресурсів, біохімічне споживання кисню, гранично-допустима концентрація*

В работе было рассмотрено текущее состояние по обеспечению водными ресурсами в разных регионах Украины. Исследован речной сток бассейнов крупнейших рек страны и общегодовой речной сток. Проанализирован уровень загрязнения водных ресурсов различных регионов страны. Указаны химические вещества, которые составляют основу загрязнения рек с многократным превышением допустимых норм.

Ключевые слова: *водные ресурсы, речной сток, обеспеченность водными ресурсами, загрязнение водных ресурсов, биохимическое потребление кислорода, предельно допустимая концентрация*

INTRODUCTION

The quality of life of people, in addition to the socio-economic situation, largely depends on the level of health of the population and life expectancy at birth. Analysis of the quality of life indicator by regions of Ukraine shows a lower level in industrial regions [1].

This is due to both air pollution and water pollution. Access to water resources and the quality of drinking water directly affect the sanitary and hygienic living conditions and the level of health of the population.

ANALYSIS OF AVAILABLE RIVER RESOURCES OF UKRAINE

Ukraine is one of the countries with insufficient water resources. There are no large natural reservoirs in the country, and groundwater reserves are quite small. Thus, the main water supply is concentrated in rivers (Fig. 1). Water resources consist of local and tidal rivers that flow outside the country, groundwater and seawater. The natural regulation of rivers through swamps has been disrupted, as more than half of them are now drained.

The largest river in Ukraine is the Dnipro. It is the fourth longest river in Europe after the Volga, Danube and Urals. The Dnipro is the third largest river in Europe after the Volga and the Danube and is the longest river in Ukraine. The total length of the Dnipro is 2201 km, the area of the basin is 504 thousand km^2. Of these, 981 km and 294,5 thousand km^2 of the basin fall on the territory of Ukraine, which is 48,8% of the country's area. The annual flow rate of the Dnipro is 53,9 km^3, and in a low-water year it can decrease to 35 km^3 [2].

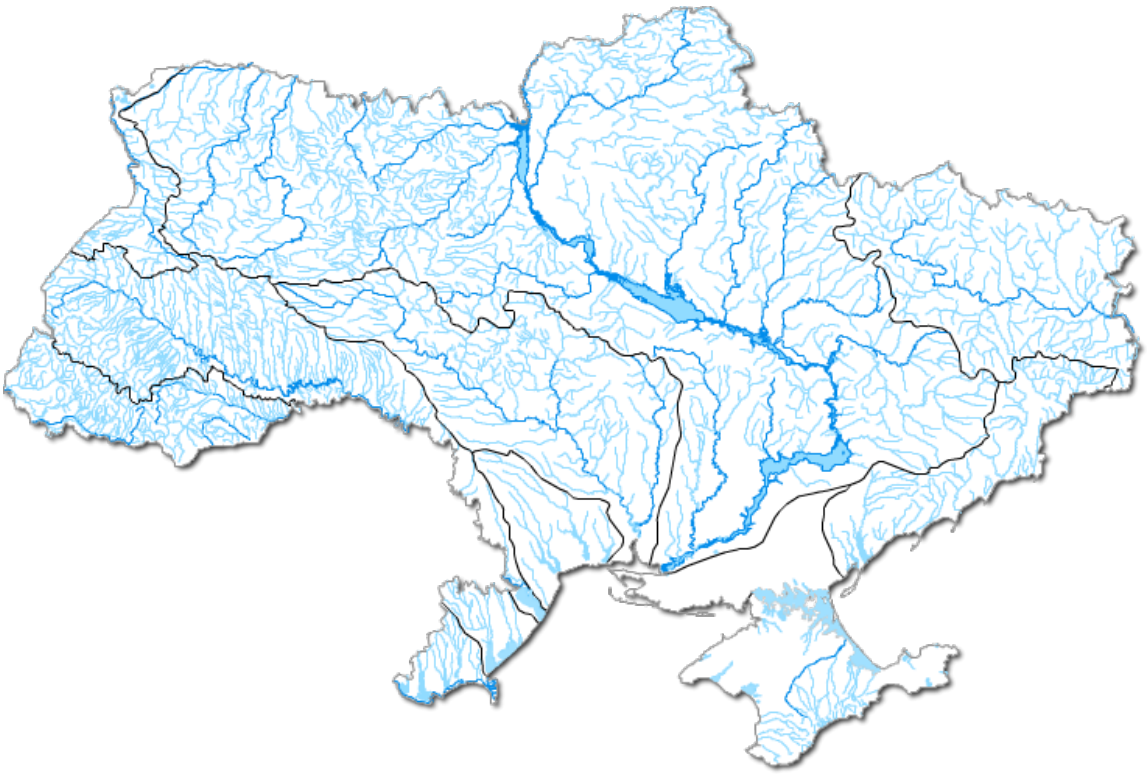

Figure 1. Map of rivers of Ukraine

The second largest river in Ukraine is the Dniester with an area of 53,5 thousand km^2, which is 8,86 % of the country. The water runoff rate is 10,7 km^3, but in a dry year it can drop to 6,56 km^3.

The third largest river in the country in terms of water runoff is the Seversky Donets. Its catchment area within Ukraine is 53,5 thousand km^2, which corresponds to 8,87 % of the country's territory. However, the annual runoff in a normal year has a volume of 5,08 km^3, and in a dry year it decreases to 2,08 km^3.

A total of 63,119 rivers and streams flow through the territory of Ukraine, the total length of which exceeds 206,000 km. But 93 % of all rivers are very small, less than 10 km long. Small rivers with a length of more than 10 km account for 5,1 % of the total. The total length of all small rivers is about 74 thousand km (Fig. 1).

There are 81 medium-sized rivers in Ukraine. The total length of medium-sized rivers is 15,488 km. Large rivers, in addition to the Dnipro, Dniester and Seversky Donets, also include the Desna, Danube, Western Bug, Southern Bug, Pripyat and Tisza [3].

ASSESSMENT OF THE LEVEL OF WATER SUPPLY IN THE REGIONS OF UKRAINE

However, the country's water resources are very unevenly distributed (Fig. 2), and Ukraine is one of the least water-rich countries in Europe. In Ukraine, in the middle-water year, the volume of own river runoff approaches 1,09 thousand m^3 per person, while in low-water years the volume of river runoff is only 0,52 thousand m^3 per year per person.

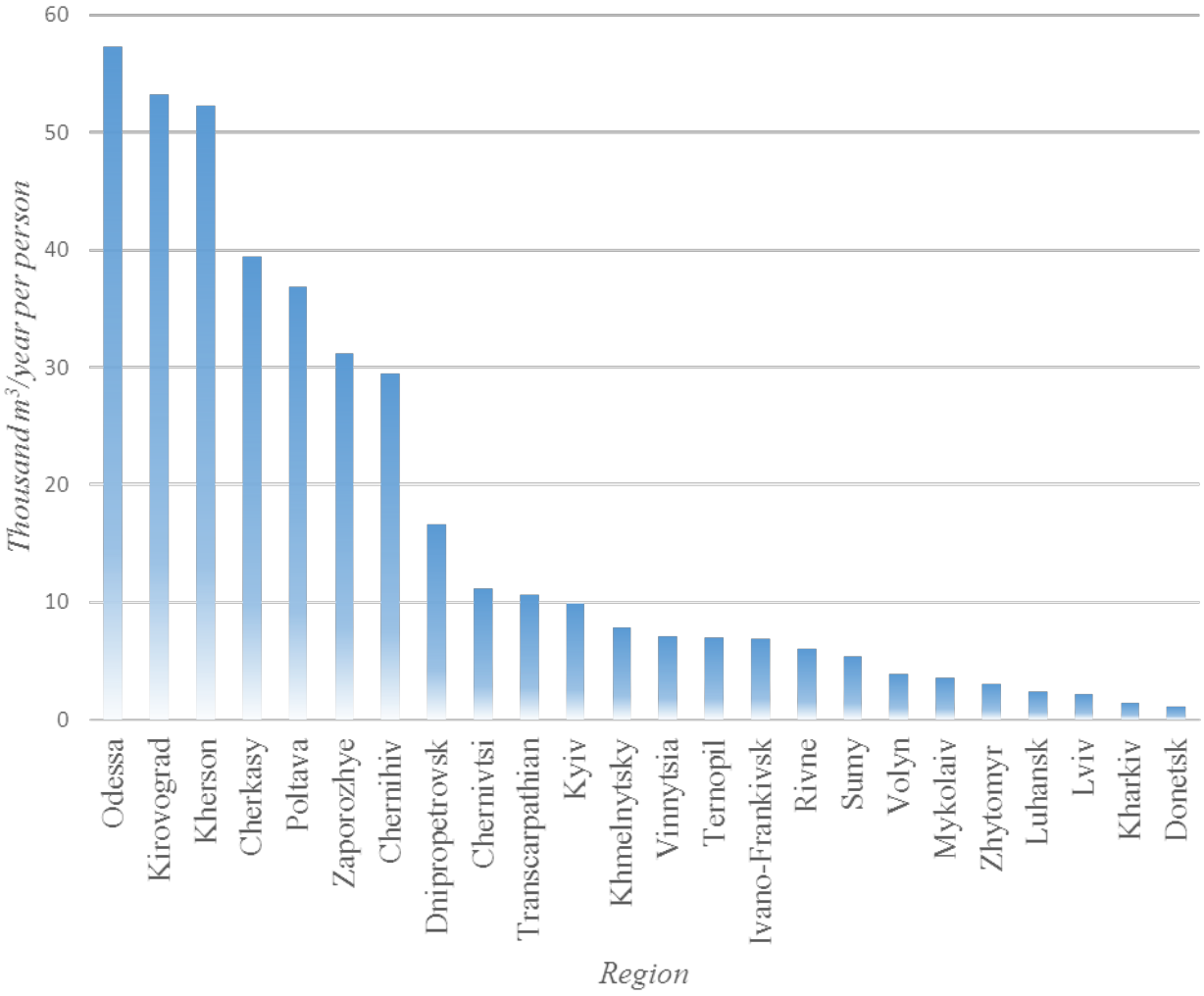

Figure 2. River runoff in the middle-water year by region

At the same time, according to the UN Commission on Environmental Protection, the volume of river runoff is less than 1,5 thousand m^3 per person is considered insufficient, and the state is considered insufficiently supplied with water resources. The problem of water supply in the country is complicated by the uneven territorial distribution of water

resources. 68 % of the population's water needs are covered by surface waters, and 32 % are provided by groundwater [3]. Provision of water resources per capita in the regions of Ukraine is given in table. 1 [4].

Table 1. Volume of water resources, thousand m^3/year per person

Region	***Underground operational stock***	***River runoff in the middle-water year***	***Total***
Odesa	0,052	57,310	57,362
Kirovograd	0,085	53,270	53,355
Kherson	0,325	52,260	52,585
Cherkasy	0,089	39,430	39,519
Poltava	0,211	36,850	37,061
Zaporizhzhia	0,067	31,160	31,227
Chernihiv	0,187	29,510	29,697
Dnipropetrivsk	0,079	16,570	16,649
Chernivtsi	0,069	11,180	11,249
Transcarpathian	0,098	10,590	10,688
Kyiv	0,150	9,820	9,970
Khmelnytsky	0,126	7,780	7,906
Vinnytsia	0,030	7,030	7,060
Ternopil	0,092	6,960	7,052
Ivano-Frankivsk	0,072	6,850	6,922
Rivne	0,142	6,050	6,192
Sumy	0,196	5,360	5,556
Volyn	0,121	3,910	4,031
Mykolaiv	0,025	3,550	3,575
Zhytomyr	0,062	3,050	3,112
Luhansk	0,304	2,360	2,664
Lviv	0,192	2,210	2,402
Kharkiv	0,141	1,380	1,521
Donetsk	0,093	1,050	1,143
Ukraine	***0,136***	***4,98***	***5,16***

1657 rivers and streams with a total length of 5996 km flow on the territory of the Autonomous Republic of Crimea. The total volume of river runoff of the peninsula is 910 million m^3, of which 85 % falls on the mountainous part and 15 % on the steppe part of the Crimea and the Kerch Peninsula. In dry years, the volume of river runoff on the peninsula decreases to 430 million m^3. River runoff provides 9,5 % of the water management needs of Crimea. Crimea is one of the poorest regions in Europe in terms of its own freshwater reserves (Figure 3).

To cover the needs of the peninsula in water resources until 2014, more than 1 billion m^3 of Dnipro water was supplied annually through the North Crimean Canal, which provided about 75…85 % of the total needs. In particular, in 2013, 1.134 billion m^3 were supplied, of which: 952 million m^3 were used for irrigation, which amounted to 83,95 % of the supplied water; 103 million m^3 were spent for the needs of the population, which corresponds to 9,08 %; 19 million m^3 were spent on fisheries, which amounted to 1,68 %; 60 million m^3 or 5,29 % went to other needs.

Figure 3. Map of the rivers of Crimea

With the cessation of water supply through the North Crimean Canal on the peninsula, the situation with water supply deteriorated sharply. In Crimea, groundwater use has risen sharply, but this cannot meet water demand. As can be seen from the above data, the cessation of water supply from the Dnieper has hit agriculture and industry in Crimea the hardest. Russian authorities have proposed a project to build a water pipeline from the Krasnodar Territory to the Crimea. But the project was rejected after a more detailed assessment due to the high cost and lack of sufficient resources in the Kuban itself. As a result, water supply problems are intensifying, and the warm and dry winters of 2019–2020 have exacerbated the situation and led to a record drought over the past 25 years, according to Russian sources.

According to the State Committee for Water Management of Crimea, as of June 2020, the reservoirs of the peninsula were filled by 32 % and their reserves amounted to 126,6 million m^3. Part of the cities of Crimea was transferred to a special water supply regime. Obviously, the Russian authorities are unable to solve the problems of water supply in Crimea and continue to worsen the general environmental situation on the peninsula.

Problems with water supply in the occupied Crimea continue to worsen. In particular, another river, the Sarysu, has dried up on the peninsula. The river flows through the city of Bilohirsk. Sarysu is a left tributary of the Biyuk-Karasu River (Velyka Karasivka) and is 27 km long.

Until recently, water in our country was not considered the basis of life and safety of natural systems and people, but was used exclusively as a state resource for industry and agriculture, electricity generation at hydroelectric power plants and wastewater discharge.

With Ukraine's integration into European structures and the implementation of European norms, especially after the signing of the Association Agreement with the EU, as well as after accession to the World Trade Organization (WTO), the formation and implementation of balanced water consumption policies is a condition for sustainable development.

WTO requirements include the reduction of negative anthropogenic impacts on the environment and human health. The national development strategy must be consistent with the EU and the WTO and international commitments to achieve the goals of sustainable development, in particular in the field of water use and water quality.

According to the World Health Organization (WHO), more than 60 % of the world's diseases are caused by poor water consumption. Added to this is inadequate sanitation, which is also associated with the availability of the required amount of water per capita. In this regard, water is recognized as one of the main indicators of sustainable development.

PROBLEMS OF WATER POLLUTION IN UKRAINE

Problems with water pollution are added to the problems with water supply in Ukraine. The most polluted water resources with multiple exceedances of the MPC on various indicators are in Odessa, Mykolaiv, Dnipropetrivsk, Donetsk and Kharkiv regions [5]. In particular, a very high level of pollution is observed in the Danube basin. For example, in the area of the Yeniki River: biochemical oxygen consumption for 5 days was 36,3 mgO/dm^3, which is 12,1 times higher than the MPC; the amount of suspended substances was 227,3 mg/dm^3, which exceeds the norm by 15,15 times; the amount of chloride ions was 1804,7 mg/dm^3, which exceeds the normative values by 6,02 times; the amount of ammonium ions was 3,74 mg/dm^3, which exceeds the MPC value by 7,48 times; the amount of sulfate ions was 4316,6 mg/dm^3, which exceeded the MPC by 43,17 times!

High levels of pollution are also observed in the Black Sea basin. For example, in the area of the Sarata River, the amount of sulfate ions was 2398,6 mg / dm^3, which exceeded the MPC by 23,99 times, and the amount of chloride ions – 6026,5 mg / dm^3, which exceeds the normative values by 20,09 times. In the area of the Khajider River, the permissible value for sulfate ions was exceeded 35,2 times, for chloride ions – 5,44 times, for nitrite ions – 5,87 times.

In the Dnipropetrivsk region, nitrite ion contamination has been recorded near Zhovti Vody. Thus, in the area of the Zhovta River above the discharge of Vostok-Ruda LLC, the amount of nitrite ions was 4,27 mg/dm^3, which is 53,37 times higher than the norm, and sulfate ions – 1992,48 mg/dm^3, which is higher than the norm is 19,92 times. In the area of the Zhovta River, under the discharge of Vostok-Ruda LLC, the amount of nitrite ions was already 6,43 mg/dm^3, which is 80,38 times higher than the MPC, and sulfate ions – 1668,22 mg/dm^3, which exceeds the norm by 16,68 times. In the area of the Ingulets River downstream from the confluence of the Zhovta River, the amount of nitrite ions was a record 8,27 mg/dm^3, which is 103,37 times higher than the allowable norm!

A record concentration of ammonium ions is observed near Khmelnytsky on the Southern Bug River. Thus, in the area of the village of Kopistin, which is located downstream from the city of Khmelnytsky, the concentration of ammonium ions was 25,77 mg/dm^3, which is 51,53 times higher than the MPC, and the number of nitrite ions exceeded the norm by 5,71 times. In the area of the village Medzhibizh in the Medzhibizh reservoir the concentration of ammonium ions was 27,84 mg/dm^3, which is 55,67 times higher than the allowable norm.

CONCLUSIONS

Without controlling the level of industrial emissions into the atmosphere and water resources, it is impossible to achieve an acceptable level of public health. Today, water resources are a strategic reserve of the country and should be used very sparingly. In some regions, the level of water pollution is critical and many times exceeds the permissible norms. A clear strategic state program for the country's water resources management is needed. Without the provision of quality drinking water, it is impossible to ensure a healthy life of the population, and accordingly it is not possible to achieve a high level of quality of

life, even in conditions of rapid economic development. The formation of a policy of smart and balanced water use is the key to sustainable development of the country.

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ANALYSIS OF INDICATORS AND FACTORS OF CHILDS MORTALITY IN THE ASPECT OF SUSTAINABLE DEVELOPMENT OF UKRAINE

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АНАЛІЗ ПОКАЗНИКІВ І ФАКТОРІВ СМЕРТНОСТІ ДІТЕЙ В АСПЕКТІ СТІЙКОГО РОЗВИТКУ УКРАЇНИ

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АНАЛИЗ ПОКАЗАТЕЛЕЙ И ФАКТОРОВ СМЕРТНОСТИ ДЕТЕЙ В АСПЕКТЕ УСТОЙЧИВОГО РАЗВИТИЯ УКРАИНЫ

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The paper analyzes the quality of life in Europe and in Central Asia. Infant mortality rates under 1 year of age and under 5 years of age were considered as indicators of health status in countries. The level of immunization of children from infectious diseases, as well as indicators of early birth rate are considered. These indicators for Ukraine were comparable with similar indicators of developed European countries and other European countries and Central Asian countries. These indicators were considered as an important component of the general health of the population. In turn, the health of the population is the key to a quality life.

Key words: *sustainable development, quality of life component, infant mortality rate, immunization, adolescent fertility rate*