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PROTECTION OF THE WATER ENVIRONMENT FROM CONTAMINATION WITH DOMESTIC SEWAGE

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✓ ***Resume***

The article is devoted to the study of the current state of the functioning of sewerage systems in Uzbekistan and the development of recommendations for the protection of the aquatic environment from pollution with domestic wastewater. It is established, that the provision of sewerage systems in the country as a whole in cities is 66.4%, in urban-type settlements 4.9% and in rural settlements 0.5%. The efficiency of the sewerage systems functioning in the whole country and in the context of regions is not satisfactory. Only 40.2% of domestic wastewater from the total amount entering the sewer network undergoes the cleaning process. A low level of coverage of the population with sewage systems, unsatisfactory efficiency of sewage treatment plants, disproportion in water consumption and wastewater disposal are noted.

Key words: protection of the aquatic environment, sewerage system, coverage of the population with sewerage, settlements, domestic wastewater, domestic wastewater treatment.

ОХРАНА ВОДНОЙ СРЕДЫ ОТ ЗАГРЯЗНЕНИЯ ХОЗЯЙСТВЕННО-БЫТОВЫМИ СТОКАМИ

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✓ ***Резюме,***

Статья посвящена изучению современного состояния функционирования систем канализации в Узбекистане и разработке рекомендаций по охране водной среды от загрязнения бытовыми сточными водами. Установлено, что обеспеченность системами канализации в целом по республике в городах составляет 66,4%, в посёлках городского типа 4,9% и в сельских населенных пунктах 0,5%. Эффективность функционирования систем канализации в целом по республике и в разрезе областей не удовлетворительная. Процессу очистки подвергается всего лишь 40,2% хозяйственно-бытовых сточных вод от общего их количества, поступающих в канализационную сеть. Отмечаются: низкий уровень охвата населения системами канализации, неудовлетворительная эффективность работы канализационных очистных сооружений, диспропорция потребления воды и отводом сточных вод.

Ключевые слова: охрана водной среды, система канализации, охват населения канализацией, населенные пункты, хозяйственно-бытовые сточные воды, очистка бытовых сточных вод.

SUV MUHITINI OQAVA SUVLARI BILAN IFLOSLANISHINI MUHOFAZA QILISH

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✓ ***Rezyume***

Maqola O'zbekistondagi kanalizatsiya tizimlari faoliyatining hozirgi holatini o'rganishga va suv muhitini oqava suv bilan ifloslanishidan himoya qilish bo'yicha tavsiyalar ishlab chiqishga bag'ishlangan. Kanalizatsiya tizimlari bilan ta'minlash mamlakatimiz bo'yicha umuman shaharlarda 66,4%, shahar tipidagi aholi punktlarida 4,9% va qishloq aholi punktlarida 0,5% tashkil etganligi aniqlandi. Umuman respublika va mintaqalar sharoitida kanalizatsiya tizimlarining ishlash samaradorligi qoniqarli emas. Kanalizatsiya tarmog'iga kiradigan umumiy miqdordan atigi 40,2% maishiy chiqindi suv tozalash jarayonidan o'tadi. Ta'kidlanganidek: aholini kanalizatsiya tizimlari bilan qamrab olishning past darajasi, kanalizatsiya tozalash inshootlarining qoniqarsiz samaradorligi, suv iste'molidagi nomutanosiblik va chiqindi suvlarni yo'q qilish.

Kalit so'zlar: suv muhitini muhofaza qilish, kanalizatsiya tizimi, aholini kanalizatsiya bilan qoplash, aholi punktlari, maishiy chiqindi suv, maishiy chiqindi suvlarni tozalash.

Introduction

Domestic wastewater is an important source of water pollution in the republic from an ecological point of view. They usually account for up to 30 percent of all wastewater discharged into water bodies [2, 3].

Literary sources indicate that the effectiveness of the currently used sewage treatment methods in terms of the total number of bacteria are: for sand traps 10-12%, for sedimentation tanks 25-75%, for biological filters 80-95%, for an aeration tank 90-98%, after chlorination up to 99% [4].

In Uzbekistan, the insufficient efficiency of sewage treatment plants is usually associated with technical defects made during construction or violations of the rules for their operation. In such cases, the absolute values of most biological contaminants after cleaning remain above the maximum permissible concentrations established for them [7]. With poor-quality disinfection, domestic wastewater is characterized by a high degree of microbiological contamination: coli-index 105-107, pathogenic enterobacteria and enteroviruses are found in the wastewater [1].

The provision of the population in rural areas with sewerage systems by 01/02/2017 is 5.1%, i.e. 94.9% of rural residents use yard cesspools for disposal of domestic wastewater (water from showers, kitchens, laundry and sewage). Wastewaters pollute surface and ground waters, which are sources of drinking water supply, contain organic, mineral substances, heavy metals, pathogenic intestinal microflora [5,6,9]. Pollution of the environment with household wastewater leads to the development of oncological and infectious diseases, the intensive rates of which in the rural population significantly exceed those of the urban population [8].

The purpose of the research was to assess the hygienic efficiency of the functioning of sewerage systems in Uzbekistan and develop recommendations for the protection of water bodies from pollution by domestic wastewater.

Material and research methods. The research included the study of materials for the sanitary and technical efficiency of the sewerage systems, carried out by the departments of the Ministry of Public Services of the Republic of Uzbekistan during the period 2014-2019, as well as the territorial bodies of sanitary and epidemiological supervision of the Ministry of Health of the Republic of Uzbekistan.

The evaluation of the sewerage systems was carried out in accordance with sanitary and epidemiological rules and norms (SanPiN)

2.04.03-97 "Sewerage, external networks and facilities"; SanPiN RUz No. 0129-02 "Hygienic requirements for sewerage systems in Uzbekistan."

Research results. It was established that in the Republic of Uzbekistan, by 01/02/2020, there are 12,216 settlements, of which 119 cities, 1085 urban-type settlements (UTS) and 11012 rural settlements (RS). Out of 119 cities, 79 have centralized sewerage systems, out of 1,085 urban-type settlements, 53 have sewerage systems, and out of 11012 rural settlements, 51 are sewerage. The provision with sewerage systems in the country as a whole in cities is 66.4 percent, in urban-type settlements 4.9 percent and in rural settlements 0.5 percent (Figure 1). In general, 17% of the population uses centralized sewage systems in the republic.

The population in the sewerage zones is 8,335 thousand people. Of these, 3990 thousand people are connected to sewerage systems, which is 47.9%.

It has been established that in the republic as a whole, only 132 out of 1204 cities and urban-type settlements are provided with sewerage systems.

In the best position are the Tashkent, Syrdarya, Namangan and Fergana regions. In the Tashkent region, 29 cities and urban-type settlements out of the total (113) are covered by centralized sewerage systems. In the Syrdarya region, this ratio is 13 out of 30, in the Namangan region 12 out of 128 and in the Fergana region 11 out of 206.

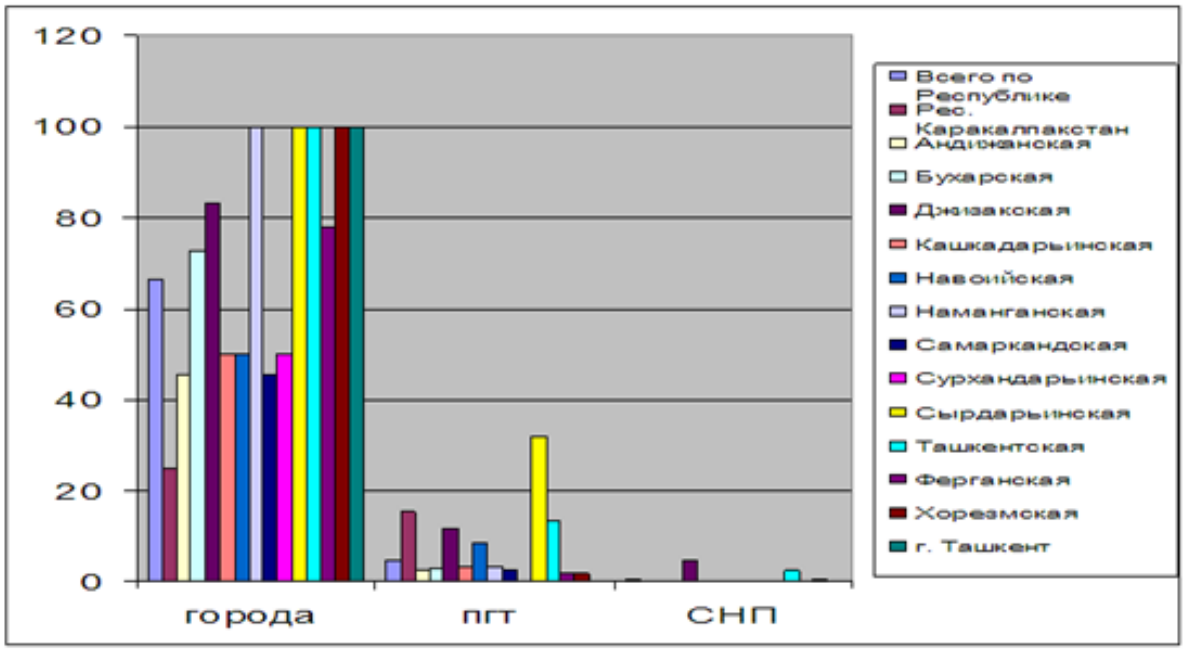

Figure 1 - Provision of cities, UTS and RS with sewerage, %

The Khorezm region is in the worst condition, where only 4 out of 61 cities and urban-type settlements have sewerage systems. The same situation is observed in the Surkhandarya region, where out of 122 cities and urban-type settlements, only four have sewerage systems.

Tashkent, the cities of the Tashkent region, Namangan, Syrdarya and Khorezm regions are fully covered by sewerage systems. The worst situation is in Karakalpakstan - 25% of the provision with sewerage, Andijan and Samarkand regions - 45.5%, Navoi region - 50% coverage.Rural settlements are in dire straits.Thus, the percentage of coverage of sewerage systems in rural areas throughout the republic is only 0.5%, including 4.6% in Jizzakh region, 2.5% in Tashkent region, 0.4% in Khorezm region, 0 in Kashkadarya region, 3%, and in other regions: Surkhandarya, Namangan, Andijan, Fergana, Navoi, Syrdarya, Bukhara, Samarkand and the Republic of Karakalpakstan, there are no sewerage systems.

It was established that in 2017, a total of 904.5 million m3 of wastewater was passed through the sewerage network in the republic, of which 897.6 million m3 in cities, 6.8 million m3 in villages (Table 1).

Table 1 - Operation of sewerage systems in Uzbekistan, (million cubic meters / year)

No	Region	Wastewater missed			From the population			Percentage	
		Total	City	Village	Total	City	Village	City	Village
	All over the Republic	**904,5**	**897,6**	**6,8**	**391,1**	**388,9**	**2,2**	**43,3**	**31,6**
1	Karakalpakstan	6	6	-	2,2	2,2	-	36,6	-
2	Andijan	15,2	15,2		0,1	0,1		0.5	
3	Bukhara	13,3	13,3	-	8,8	8,8	-	66,8	
4	Jizzakh	4,4	4,4	-	2,8	2,8	-	63	-
5	Kashkadarya	7,3	7,1	0,1	6,8	6,6	0,1	92,9	100
6	Navoi	44,4	44,4	-	16,6	16,6	-	37,4	-
7	Namangan	23,1	23,1	-	9,3	9,3	-	40,2	
8	Samarkand	29,6	29,6	-	18,6	18,6	-	62,8	-
9	Surkhandarya	8,7	8,7	-	3,7	3,7	-	42,4	-
10	Syrdarya	10,1	10,1	-	8,2	8,2	-	80,6	-
11	Tashkent	79,1	72,4	6,7	28,6	26,6	2	36,7	30,2
12	Fergana	95,4	95,4	-	46,3	46,3	-	48,6	-
13	Khorezm	4,7	4,7	-	2,8	2,7	-	59	67,5
14	Tashkent (city)	563,2	563,2	-	236,4	236,4	-	42	-

At the same time, only 391.1 million m³ are generated from the population, of which 388.9 million m³ from cities, and 2.2 million m³ from villages.As a percentage of the total volume of wastewater discharged by the sewerage system, urban wastewaters account for 43.2%, and rural ones - 31.6%. In terms of regions, sewerage systems are used to the greatest extent in regional cities, where almost complete coverage takes place. The capacity of the sewerage systems is used on average in the republic at the level of 59%, in the city of Tashkent 81%, and in other cities

34%.

The analysis of the data obtained indicates that the work of the sewerage systems in the republic is unsatisfactory. The amount of wastewater entering the sewerage network throughout the republic is 2,107.3 million m³ / year, of which 1,758.8 million m³ / year enter the urban network, 348.7 million m³ / year in the villages. In the context of regions, the largest volume of wastewater enters the sewerage network in the city of Tashkent 811.8 million m3 / year and the Navoi region - 219.5 million m³ / year.

It has been established that the efficiency of sewerage systems in the republic and in the context of regions does not meet the hygienic requirements (Figure 2).

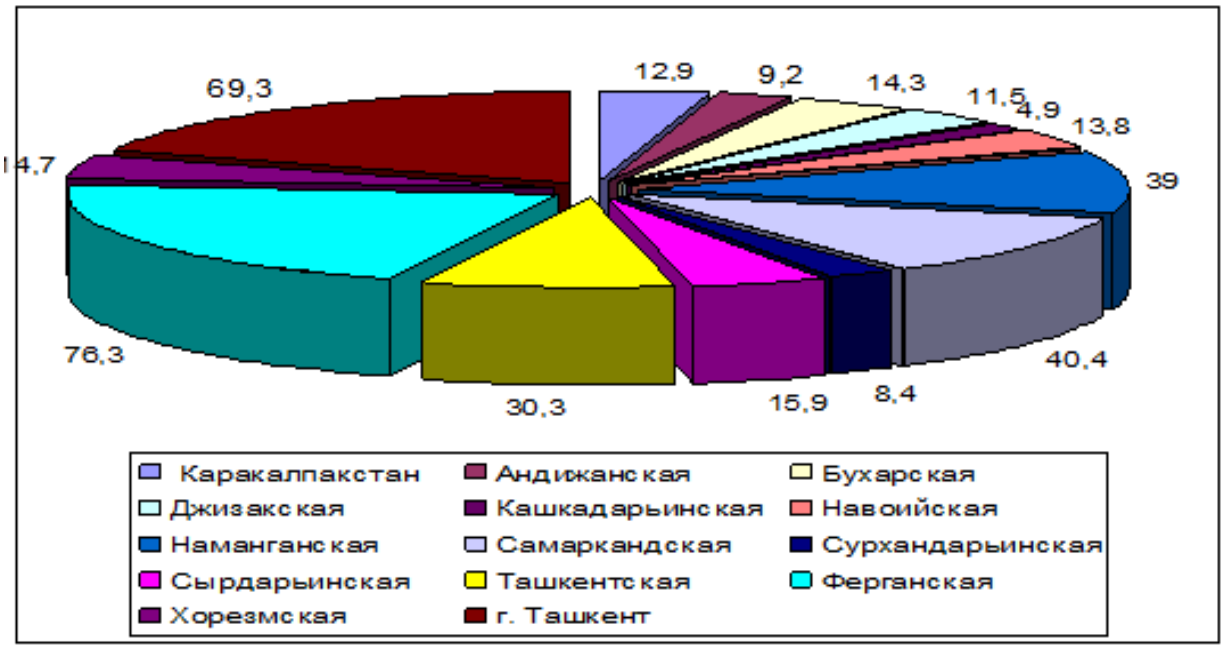

Figure 2 - The amount of treated effluents at the TF (treatment facilities)%

So, if the total volume of wastewater entering the sewerage network in the republic is 2107.3 million m³ / year, then only 846.9 million m³ / year is supplied to the treatment plant. A similar dynamics of a significant difference between the amount of wastewater entering the sewerage network and the volume of their treatment at treatment facilities of sewerage systems is observed in all regions, cities and especially villages of the republic. In general, in the republic, only 40.2% of wastewater from the total amount entering the sewer network undergoes the treatment process.

Analysis of materials on the drainage and discharge of wastewater from sewerage systems shows that only in the city of Tashkent there is a complete drainage of wastewater, while this indicator is unsatisfactory in other regions of the republic, especially in rural areas. The minimum level of wastewater disposal is set for the cities of Surkhandarya region and is 40.6%. In the Republic of Karakalpakstan, waste disposal is 93.5%.

The percentage of wastewater disposal in rural areas is 0.24% in the country as a whole, in the Kashkadarya region - 4.0% and in the Tashkent region - 26%. In rural settlements of other regions of the republic, wastewater is not diverted.

Based on the research results, recommendations were developed for assessing the conditions for the formation and treatment of domestic wastewater and the hygienic requirements for their disposal into environmental objects, sent for approval to the Ministry of Health of the Republic of Uzbekistan.

Conclusion

1. It is established that in the Republic of Uzbekistan by 01/02/2020 there are 12,216 settlements, of which 119 cities, 1085 urban-type settlements and 11012 rural settlements. Of these, 25% needs the introduction of innovative technologies of central sewerage technology.

2. The ecological and hygienic efficiency of sewerage systems in the republic and in the context of regions requires innovative approaches. Only 40.2% (846.9 million cubic meters / year) of wastewater from the total amount (2107.3 million cubic meters / year) entering the sewerage network undergoes the treatment process.

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