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Modern features of water supply to the population of the Aral Sea region

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Abstract: Supplying the housing stock with drinking water is a strategic task of the state to ensure the vital and sanitary safety of the population. When selling water supply and sewerage products to the population, it is important not to not only to solve the problems of profitability of water supply and sanitation enterprises, but also to satisfy social needs.

Keywords: water supply, Aral Sea region, Khorezm, Khiva, Artesian wells, wells, GOST, Amu Darya.

1. Introduction

Speaking about the peculiarities of water supply in the Aral Sea region, one cannot fail to mention the environmental problem of this region, and unfortunately it is not getting better.
Currently, the population of the Khorezm region receives water from several sources.
1. Tap water
2. Water from tube wells
3. Water from mine wells
4. Water from artesian wells.

In our previous works, we noted that the population of this region uses mainly centralized sources of water supply in urban conditions, that is, tap water, and among the rural population, tap water is combined with water from tube and shaft wells
It should be noted that in recent years the number of shaft wells has become much larger, this is due to the fact that the population has begun to use more water from tube wells for domestic needs.
With the help of mini-pumps, water is supplied to bathrooms and toilets; this is very important in the Aral Sea region, especially in the summer when the water supply
water is supplied at certain hours. And at the same time, we cannot help but note that this water does not meet the requirements of GOST. Drinking water-950 -2000
Speaking about the water supply of the population with drinking water, we can note the positive work on sanitation. By educating the population, they began to understand the impact of the quality of drinking water on their health. A certain part of the population began to use water from artesian wells and water from tube wells purified using various filtrates.
Currently, in the city of Khiva with a population of 92,156 people, there are about 30 wells that supply the population with approximately 30,000 liters. Purified water, that is 3.071 liters per person. Quantitative indicators that are sufficient in late autumn and in the winter months are, of course, not sufficient in spring and summer, so the population of this region, especially in the summer months, is forced to use water that does not meet the requirements of GOST drinking water. and this affects the incidence of infectious and non-infectious nasologies in the population; this adversely affects the health of the younger generation. The issues of ensuring economic and drinking water supply to the population of the Aral Sea region are becoming relevant and require in-depth study and a correct scientific approach at the current stage of development of our society.
All people consume approximately the same amount of water as food. The rest of the water used is simply polluted. Consequently, the more tap water is used in a household, the more it becomes polluted, which leads to an increase in the load on sewage treatment plants, an increase in the costs of wastewater treatment, as well as an increase in anthropogenic load on water bodies. In this regard, the possibility of selling water supply and sewerage products in a segmented market for the housing stock is of interest, which requires a new logic of relations between the supplier and consumers. Segmentation of the market for water supply and sewerage products consists of dividing the population of consumers in the housing stock into narrow special groups according to the amount of water consumption, for each of which an appropriate price is set. The market for plumbing and sewerage products is proposed to be divided into five segments. In each segment, the value of specific water consumption is characterized by a range of values with upper and lower boundaries. For example, for the first segment, the social norm for specific water consumption and the social price of water supply and sewerage products are adopted. The boundaries of the range of changes in specific water consumption are determined taking into account the

distribution of total income of the population, based on the fact that consumers with higher incomes have more opportunities to use more "water-intensive" engineering equipment in their household. Determining the boundaries of the market depends on the range of variations in water consumption values.

However, the water from tube wells, which is used forcibly in most cases, is practically unsuitable not only for consumption, but also for economic purposes, and thus does not meet hygienic standards for the content of harmful substances in drinking water, because It is characterized by high mineralization and hardness, increased salt content, chlorides, sulfates, iron, boron, bromine and other ingredients, which leads to the widespread spread of a number of specific diseases.

Coverage of the population in the republic with centralized water supply systems in 2017 reached approximately 80.2% (Table 1).

The highest percentage of coverage with centralized water supply services was noted in the city of Tashkent (99.5%), as well as in the cities of Samarkand, Fergana and Andijan regions (about 93-98%). The lowest percentage of population coverage in urban areas is observed in the Jizzakh region (75%).

As for the rural population, the highest percentage of coverage is observed in Fergana and Andijan regions (80-87%), and the lowest among the rural population of Bukhara and Khorezm regions (42.4% and 56.8%, respectively), which clearly reflects shortage of fresh surface and ground water resources in these two areas.

8,910 rural settlements out of 11,012 have centralized water supply.

Table 1 – Population coverage by centralized water supply systems (in %)

Regions		**As Of 01/01/2018**			**As Of 01/01/2019**	
	Total	**In urban areas**	**In rural areas**	**Total**	**In urban areas**	**In rural areas**
The Republic of Uzbekistan	81,4	89,9	71,1	80,2	89,3	69,3
Republic of Karakalpakstan region:	67,7	73,3	61,3	66,6	72,0	60,5
Andijan	91,9	94,2	89,6	90,4	93,3	87,2
Bukhara	57,7	83,7	43,4	56,6	82,9	42,4
Jizzakh	70,3	75,8	65,9	68,9	74,9	64,2
Kashkadarya	73,9	86,6	62,9	72,8	85,7	61,7
Navoi	80,1	84,2	73,3	78,7	83,8	70,2
Наманганская	77,5	85,4	66,8	76,1	85,0	64,5
Samarkand	86,6	98,1	77,3	85,8	98,1	75,9
Surkhandarya	80,5	84,4	78,1	78,5	83,3	75,5
Syrdarya	82,4	80,0	84,2	81,6	79,7	83,1
Tashkent	78,8	85,2	70,9	77,7	84,8	69,0
Fergana	89,8	94,2	83,3	88,8	93,9	1,5
Khorezm	67,5	83,5	58,2	66,3	82,9	56,8
Tashkent city	100,0	100,0	-	99,5	99,5	-

The dynamics of changes in the quality of drinking water in the Republic of Uzbekistan over the past ten years is characterized by the fact that in a number of regions there is a tendency for the quality of supplied water to improve by 2017 compared to 2006, while in other areas it has deteriorated. In 2017, compared to 2006, there was a dynamic deterioration in the quality of drinking water in terms of chemical indicators (Figure 1):

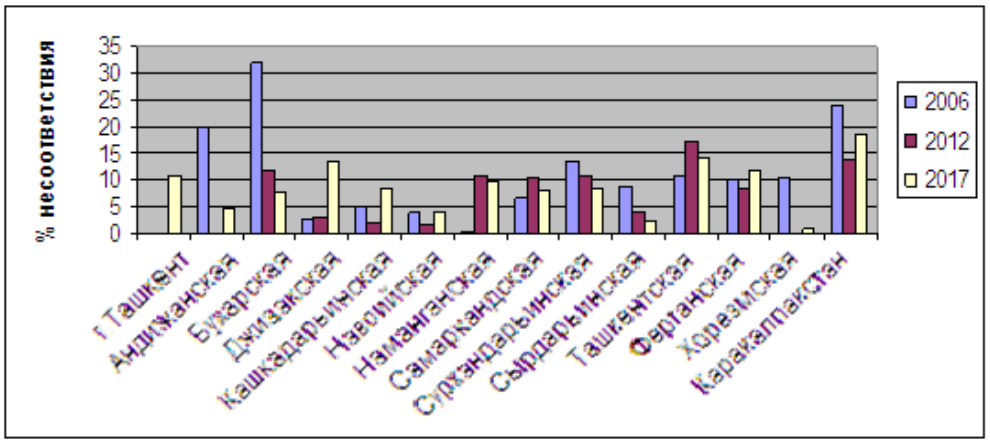


Figure 1 - Dynamics of changes in the quality of drinking water by chemical indicators

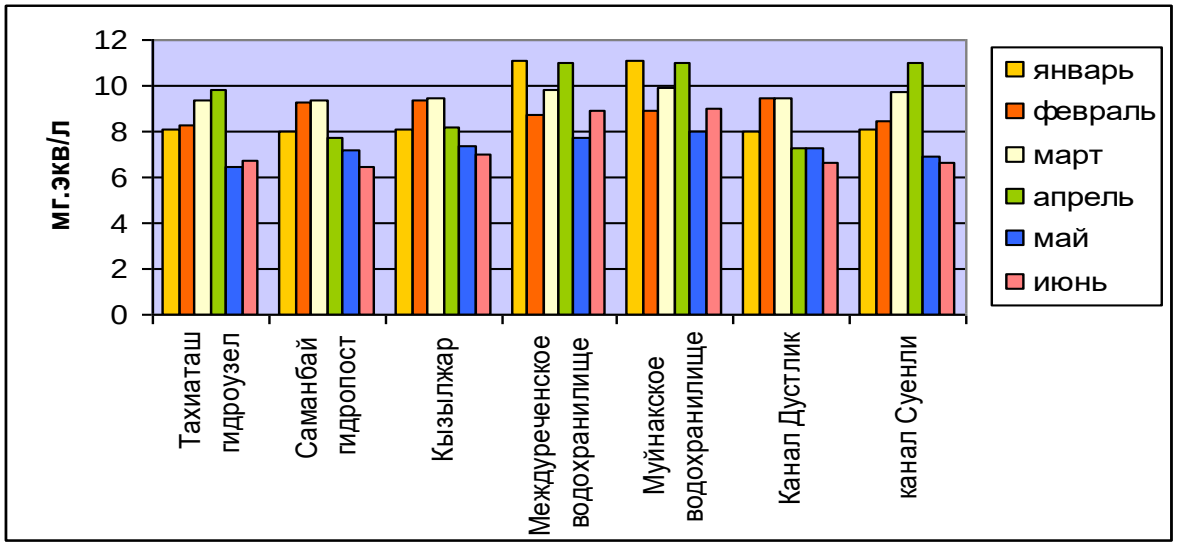
At the moment, the Aral Sea and the Aral Sea region, which is a zone of environmental disaster, are on the verge of complete degradation and extinction. The water problem in the Aral-Amu Darya water basin as a whole is that the surface water resources here are completely exhausted. In the Aral region, the entire territory of the water management basin is occupied by the Amudarya complex groundwater basin of the 1st order, consisting of a number of artesian basins of smaller orders. The main groundwater resources are concentrated in the Neogene-Quaternary, Paleogene and Upper Cretaceous aquifer complexes. The predicted resources of groundwater with mineralization up to 1 g/dm3 are 4.25 km3/year; 1-3 g/dm3 - 3.33; from 3-10 - 1.86 km/year. The total value of explored groundwater reserves is 1.4 km/year, including with mineralization up to 1 g/dm - 1.13 km3/year.
Research materials made it possible to assert that the formation of negatively acting factors of the human environment in the Aral region is directly related to the processes that determined the emergence of the Aral environmental crisis and the destabilization of the production sector of the Aral region. Groundwater has significant hardness, high mineralization and a high content of iron, boron and borates, exceeding the maximum permissible concentration 6 times. In addition, the content of iron, sulfates, chlorides, bromine and iodine exceeds the MPC several times. To date, the following main methods of water desalination have been identified in world practice: distillation, ion exchange, electrodialysis, freezing, solar desalination and reverse osmosis (hyperfiltration). The combination of these factors significantly complicates water purification, especially the processes of coagulation and filtration, however, using membrane technology ology for the demineralization of groundwater in water treatment plants, it is possible to significantly reduce the cost of treated water, and improve the quality of water by bringing them to the required standards if you use artesian wells with a depth of 50-60 meters.
Morbidity statistics made it possible to assert that some forms of nosology are directly related to water factors:

Morbidity indicators in dispensary control of the population (2016-2020 y)

№	The name of city and districts	2016 year		2017 year		2018 year		2019 year		2020 year	
		Total	Indicator per 100 thousand population	Total	Indicator per 100 thousand population	Total	Indicator per 100 thousand population	Total	Indicator per 100 thousand population	Total	Indicator per 100 thousand population
1	Urgench city	31	22,3	26	18,6	33	23,4	40	28,0	35	24,2
2	Tuprokkala	53	110,6	18	36,9	20	40,4	22	43,7	24	43,3
3	Khiva city					166	184,5	63	68,9	39	42,0
4	Bogot	286	185,5	324	206,7	256	160,5	191	117,7	133	80,5

5	Gurlan	6	4,3	67	47,1	113	78,3	109	74,4	105	70,7
6	Koshkopir	284	175,8	145	88,3	112	67,0	83	48,8	72	41,7
7	Urganchr	162	88,1	114	60,6	160	83,4	216	110,4	260	130,4
8	Khazorasp	443	238,4	385	203,9	333	173,5	279	142,9	221	113,8
9	Khanka	150	85,7	107	60,1	113	62,4	113	61,4	145	77,6
10	Khiva r.	715	319,8	672	295,6	350	247,8	290	201,8	351	240,2
11	Shavat	320	201,1	340	209,9	312	189,2	289	172,2	304	178,3
12	Yangiariq	129	118,1	123	110,8	119	105,5	115	100,3	111	95,4
13	Yangibazar	146	177,8	143	171,2	139	163,7	106	122,8	73	83,4
	By region	2725	296,4	2464	137,6	2226	122,3	1916	103,5	1873	99,6

Indicators of general water hardness of the river. Amu Darya



2. Conclusion

1. An analysis of existing water purification methods was carried out. Based on the results of the analysis, the most acceptable treatment option used in the technological scheme was determined.
2. As a result of the research, the feasibility of using the developed method of water purification in a combined technological scheme of water treatment for the Aral Sea region was established.

3. A new technological scheme has been developed with the combined use of three installations for step-by-step water purification. Based on the results of the experiments, the quality of water meeting the regulatory requirements was obtained, having passed all stages of technological purification.

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