ISSN 2181-1296

ILMIY AXBOROTNOMA

НАУЧНЫЙ ВЕСТНИК **SCIENTIFIC JOURNAL**

2022-yil, 5-son (135) **TABIY FANLAR SERIYASI**

Kimyo, Biologiya, Geografiya

Samarqand viloyat matbuot boshqarmasida ro‘yxatdan o‘tish tartibi 09-25.
Jurnal 1999-yildan chop qilina boshlagan va OAK ro‘yxatiga kiritilgan.

BOSH MUHARRIR **R. I. XALMURADOV, t.f.d. professor**
BOSH MUHARRIR O‘RINBOSARLARI: **H.A. XUSHVAQTOV, f-m.f.d., dotsent**
A. M. NASIMOV, t.f.d., professor

TAHRIRIYAT KENGASHI:

M.X.ASHUROV	- O‘zFA akademigi
N.B. FERAPONTOV	- k.f .d., professor (Moskva davlat universiteti, Rossiya)
SH. M. TUGIZOV	- professor, Koliforniya universiteti, AQSh
H. I. AKBAROV	- k.f.d., professor (O'zMU)
E. A. ABDURAXMONOV	- k.f.d., professor (SamDU)
N. K. MUXAMADIYEV	- k.f.d., professor (SamDU)
L. A. BULAVIN	- Kiev milliy universiteti professori, Ukraina
X. Q. XAYDAROV	- b.f.d., professor (SamDU)
Z. I. IZZATULLAYEV	- b.f.d., professor (SamDU)
Sh. T. XOLIQULOV	- g.f.d., professor (SamDU)
S. B. ABBASOV	- g.f.d., professor (SamDU)
Q. S. YARASHEV	- g.f.d., professor (SamDU)
GUN-SIK PARK	- Seul univeriteti professori, Koreya
D.B.XURSANOV	- g.f.f.d., dotsent (SamDU)
M. S. QUZIYEV	- b.f.f.d., dotsent (SamDU)

Obuna indeksi – yakka tartbidagi obunachilar uchun **- 5583,**
tashkilot, korxonalar uchun **- 5584**

MUNDARIJA / СОДЕРЖАНИЕ / CONTENTS

KIMYO / ХИМИЯ / CHEMISTRY	
Nuraliyev S.R., Nurmonov S.E., Qodirov O.Sh. Distillangan yog' kislotalari asosida alifatik aminlar sintezi……..	3-7
Samatov S.B., Ziyadullayev O.E., Ikramov A., Ablakulov L.K., Abdurahmanova S.S. EtMgBr/Ti (OiPr)4/PhMe katalitik sistemasida benzaldegid va uning turli xil hosilalarini selektiv alkinillash jarayoni……	8-16
Kuronboyev D., Qutlimurotova N. Прикладные аспекти метода амперометрического определения серебра……..	17-21
Toirova G.X., Turaev X.X., Aliqulov R.V. Sho'rlangan tuproqlar melioratsiyasi uchun dimetilolkarbamid va ortofosfat kislota asosidagi ionalmashinuvchi materiallardan kompozitsiyalar sifatida foydalanish…….	22-26
Sulaymonova Z.A., Umarov B.B., Mutalipova D.B. Синтез и оптические свойства комплексов некоторых 3d металлов на основе β-дикарбонильных производных ферроцена…….	27-32
Eshqurbonov F.B., Raximov A.X., Boboqulova Sh.M., Abduraxmonov F.R. Xovdak bentoniti asosida ionalmashinuvchi kompozitsion materiallarni o'simlik yog'ini oqartirishda qo'llash……	33-36
Смятская Ю.А., Черемисина Е.М. Юсупова К.А. Полимерные пленки пищевого назначения на основе хитозана ……	37-42
Zhao J., Bozorov Kh.A., Aisa H.A. Synthesis of deoxyvasicinone analogs ……...	43-47
Zhao J., Murtazaeva Z., Buronov A., Tukhtaev D.B., Bozorov Kh.A., Aisa H.A. Neuroprotective properties of the pyrazolo[3,4-d] pyrimidinones …….	48-52
Xodjayorova G.R., Uzoqov J.R., Muxamadiyev N.Q., Alimuhammedov M.G. 1,3,5-Tris-(betta oksietil)geksagidrokso-s-triazinning ba'zi metall ionlari bilan hosil qiladigan komplekslarini kvant kimyoviy tadqiqi …….	53-60
Matyakubova M.X., Xudoyberganov O.I., Hasanov Sh.B. Cu(II) ionining qahrabo kislotasi va monoetanolamin bilan kompleks birikmalari sintezi va tahlili…….....	61-67
GEOGRAFIYA / ГЕОГРАФИЯ /GEOGRAPHY	
Komilova N.Q., Xudoyberdiyeva I.A. Navoiy viloyat tabiiy sharoiti va uni qishloq xo'jalik nuqtai nazaridan geografik baholash.	68-72
Mamajonov M., Dehqonov B. Andijon viloyati qishloq, o'rmon va baliqchilik xo'jaligi rivojlanishining iqtisodiy geografik jihatlari……	73-83
Jurayev J.S. Quyi zarafshon vodiysi landshaftlarida cho'llanish muammolarining oldini olishda suv manbalarining ahamiyati…….	84-88
Fayzullaev J.K. Groundwater quality changes in the narpay canal basin.....	89-96
BIOLOGIYA / БИОЛОГИЯ / BIOLOGY	
Botirova G., Amriddinova A., Rustamova N., Abulimiti Y. Isolation and identification of exopolysaccharide-based bioflocculant of soil bacteria bacillus simplex pbb-17……..	97-102
Norqulov M. Ziaddin- zirabuloq tog'lari lixenoflorasida tarqalgan epigey lishayniklarning taksonomik tahlili ……...	103-107

Mualliflarga

УДК 551.444(575.141)

GROUNDWATER QUALITY CHANGES IN THE NARPAY CANAL BASIN

J.K.Fayzullaev
Samarkand State University

Abstract.. In the paper, the importance of the Narpay canal in the economy, changes in the quality of groundwater in its basin, pollution of groundwater due to anthropogenic influence, and the hydrochemical regime of groundwater in the basin of the Narpay canal are studied.

Keywords: river, canal, ditch, basin, highway, grunt, well, reservoir, collector, anthropogenic, permissible rate, chemical elements, migration, water hardness, mineralization

Narpay kanali havzasidagi grunt suvlar sifatidagi o`zgarishlar

Annotatsiya. Maqolada Narpay kanalining xo`jalikdagi hamiyati, uning havzasidagi grunt suvlar sifatidagi `zgarishlar, antropogen ta`sir tufayli grunt suvlarning ifloslanishi atroflicha yoritilgan hamda Narpay kanali havzasidagi grunt suvlarning gidrokimyoviy rejimini o`rganilgan.

**Kalit so`zlar:** daryo, kanal, ariq, havza, trassa, quduq, suv ombori, kollektor, antropogen, ruxsat etilgan me`yor, kimyoviy elementlar, migratsiya, suvning qattiqligi, minerallashuv.

Изменение качества подземных вод в бассейне Нарпайского канала

Аннотация. В статье изучено значение Нарпайского канала в народном хозяйстве, изменение качества подземных вод в его бассейне, загрязнение подземных вод в результате антропогенного воздействия, гидрохимический режим подземных вод в бассейне Нарпайского канала..

Ключевые слова:. река, русло, канава, шоссе, грунт, колодец, водохранилище, коллектор, техногенная, допустимая норма, химические элементы, миграция, жесткость воды, минерализация.

Introduction. Clean drinking water is one of the biggest problems facing humanity, and with the increase in the population, increasing anthropogenic load on nature, its relevance is increasing year by year. Today, with the increase in water mineralization, water hardness is increasing. Currently, we can see that the hardness of ground water in large oases has increased by 1.5-2.0 times compared to SFR in most cases. Research conducted in the following years showed the participation of calcium (Ca) and magnesium (Mg) salts and 12 more elements beryllium (Be), boron (B), cadmium (Cd), potassium (K), sodium (Na), etc. in water hardness and it was determined that there is a correlative relationship between them.

Based on the research conducted in the Narpay canal basin, the factors affecting water quality can be divided into two groups: 1) natural factors and 2) anthropogenic factors. Currently, anthropogenic factors are in the first place in terms of impact on all water basins. Because the pollution of rivers, canals, ditches, reservoirs, lakes and other surface waters is directly related to human economic activities. Pollution of surface water affects underground water, first of all groundwater.

Since the Narpay canal receives its main water from the Kattakurgan reservoir, the water quality of the canal is related to this reservoir. The canal passes through densely populated villages to the south, so there are no large industrial enterprises directly polluting the canal water. However, near the canal route, there are private livestock (sheep, hen house, etc.) of the villagers, and part of the waste from them and houses is thrown into the canal. There are cafeterias, kitchens, petrol and gas stations, gravel and sand quarries, car wash facilities and hundreds of other places that directly and indirectly affect water pollution near the canal terrace. These run from the beginning to the end of the canal on both sides of the canal.[1]

Due to the anthropogenic influence, the most severe water pollution is mineral fertilizers and toxic chemical preparations (pesticides) used in crop fields. According to agrotechnical regulations, it is possible to apply 450-500 kg of nitrogen, phosphorus and potassium fertilizers per hectare per year. [3]

The Narpay canal basin is also a unique closed canal system. Its water pollution also increases from east to west. In the basin of the Narpay canal, the contribution of natural factors that pollute surface and underground water is significant. These factors are mainly related to the geological and geomorphological structure of the areas through which the Narpay canal passes. From the vicinity of the Kattakurgan reservoir of the canal basin to the northern slopes of the Zirabulok and Ziyovuddin mountains, in all parts

of the sub-mountain plains, including the Malik desert and the large part of the Middle desert plains, gypsum that is easily soluble in water ($CaSO_4$ $2H_2O$) is the presence of a layer.

Results and discussion. In order to determine the quality of groundwater in the Narpay canal basin, we first analyzed the water quality of the Kattakurgan reservoir and Chikish canal, the water flowing into the Cheganok collector. Because when water mineralization, water hardness, hydrogen index, nitrates and other pollutants in these waters are compared with the water of the Narpay canal, it is possible to determine the relationship between them and groundwater.[2]

Table 1

Water quality indicators of Karadarya near the city of Kattakurgan (UzGidromet information, 2017).

The name of the place where the water was analyzed	Ingredients that pollute water	Standard Fixed Rate (SFR)	Determined year, 2017		
			Average amount	Maximum amount	Minimum amount
The confluence of the Karadarya tributary of the Zarafshan River, the Chaganok collector in the city of Kattakurgan	Oxygen, mg O_2/l		8,44	6,2	
	BOD5 O_2/l		1,0	3,2	0,25
	CPO O_2/l		7,03	15,1	2,89
	Ammonium nitrogen, mg/l		0,04	0,13	0
	Nitrate nitrogen, mg/l	10	1,09	2,13	0,51
	Nitrite nitrogen, mg/l	1,0	0,011	0,027	0,001
	Iron, mg/l	0,3-0,1	0,01	0,03	0
	Copper, mg/l	1,0	3,9	7,8	2,4
	Zinc, mg/l	3,0	4,5	11,8	1,4
	Phenols, mg/l	0,001	0,001	0,004	0
	Oil products, mg/l	0,1	0,02	0,1	0
	Chromium VI, mg/l	0,05	0,4	2,2	0
	Fluorine, mg/l	0,7	0,4	0,88	0,2
	Arsenic, μg/l	0,05	0,5	3,0	0
	Mineralization, mg/l	1000	494,4	748	238,6

The average, maximum and minimum amounts of the given ingredients are given in the table. The amount of oxygen dissolved in water, the use of oxygen for 5 minutes, the chemical parameters of oxygen are normal. Similarly, nitrogen compounds are not up to the norm. This is self-evident, because nitrogen compounds are high in ditch and collector waters. Because of this, water is collected in ditches and collectors mainly from irrigated lands, and part of the nitrogen added to the ground is added to ditch waters through underground water. The Zarafshan River is the main source of water in Karadarya and Chikish Canal. Iron, copper, zinc - heavy metals, especially copper and zinc are visible from SFR. The maximum amount of copper is 7.8 times greater than that of SFR, and that of zinc is 4 times greater. The reason for this is related to the water of Zarafshan river. The amount of heavy metals in the water of the Zarafshan River is also high in the Rovotkhoja dam, which is related to non-ferrous metal and mining enterprises in Upper Zarafshan, that is, Tajikistan. In addition, machine-building and metallurgical enterprises in Samarkand and Kattakurgan will be seriously affected. Phenols and petroleum products are associated with organic waste, and their maximum amount is higher than SFR. Chromium and magnesium are related to heavy metals, and their amount is slightly higher than SFR.

Water mineralization is not up to standard in Karadarya. Its maximum amount is 748 mg/l (SFR 1000 mg/l). But the average indicator in the outlet canal is 525.4 mg/l, the maximum indicator exceeds the norm and is 1120.5 mg/l. It can be taken from the lowest water level in the Chikish canal.[5]

The water of Kara Darya and Chikish canal shows the general condition of surface water in this area. These waters change their chemical composition a lot before they sink into the ground and become groundwater. Water samples for chemical analysis were taken from the Narpay canal basin in October 2019.

Table 2

Water quality indicators of the Chikish canal of the Kattakurgan reservoir (UzGidromet information, 2017).

The name of the place where the water was analyzed	Ingredients that pollute water	Standard Fixed Rate (SFR)	Determined year, 2017		
			Average amount	Maximum amount	Minimum amount
Chikish canal of the Kattakurgon reservoir	Oxygen, mg O_2/l		8,21	7	
	BOD5 O_2/l	4	1,01	2,1	0,3
	CPO O_2/l		7,3	12,2	3,62
	Ammonium nitrogen, mg/l		0,08	0,16	0
	Nitrate nitrogen, mg/l	10	1,29	2,92	0,31
	Nitrite nitrogen, mg/l	1,0	0,074	0,406	0,6
	Iron, mg/l	0,3-0,1	0,01	0,02	0
	Copper, mg/l	1,0	3,8	8,4	2,3
	Zinc, mg/l	3,0	3,2	5,2	2,3
	Phenols, mg/l	0,001	0	0,002	0
	Oil products, mg/l	0,1	0	0,01	0
	Chromium VI, mg/l	0,05	0,2	0,6	0
	Fluorine, mg/l	0,7	0,36	0,59	0,24
	Arsenic, μg/l	0,05	1,9	8	0
	Mineralization, mg/l	1000	525,4	1120,5	347

Before taking water samples, from the beginning of the Narpay canal to the end of the canal (the canal ends in the form of a small stream before reaching the city of Navoi), an expedition was organized and asked about the quality of drinking water in each village and when the water quality started to deteriorate, what was the reason, when were the artesian wells were dug? Then, the level of soil salinity in the villages, its effect on productivity, the time of digging trenches, and their efficiency in removing salt were investigated. Along with survey, data was collected about the address of the well from which water samples will be taken, the depth of the well, the decrease and increase of water during the seasons or in connection with irrigation, changes in salinity and the year the well was dug. As far as possible, we collected water samples from old wells that were originally dug in the villages. The reason for this is that in every village there are main wells that the inhabitants have been using since the village was formed, and the water from these wells has been fresh and clean for centuries. During the expedition, we marked on the map from which wells water samples can be taken, and in each vessel where water samples were taken, complete information about the place of sampling and water was written and numbered.[7]

In the lower part of the region, in Narpai and Pakhtachi districts, the amount of salt in the water is much higher, and it is found that it is 2.5-4.0 times higher than the established norm. Also, the results of chemical analysis showed that the level of mineralization of artesian waters is 1.5-2.5 times higher than the norm. The fact that the gypsum layer is close to the surface of the earth around Ziyavuddin and Zirabulok mountains, and the dissolution of gypsum salts in the soil has led to an increase in water salinity.[6]

Water hardness depends on the amount of calcium and magnesium salts in it. The standard of water hardness in drinking water is set at 7 mg-equiv/l. In the lower parts of Middle Zarafshan, that is, in Narpai and Pakhtachi districts and around the city of Navoi, it can be seen that the hardness of ground water is 4-5 times higher than SFR. Water hardness reaches 24.8 mg-eq/l in well water in Khatirchi city. This is 3.5 times more than the norm. And in the city of Aktosh, it is 27.6 mg-eq/l, which means that it is 4 times more than the norm. Water salinity in Aktosh is 2000-2500 mg/l. For this reason, freshwater ponds have been built near many houses in the city of Aktash. They are filled from time to time with the help of water trucks.

In Narpay district, the highest water salinity was observed in ordinary well water in the village of Tortuvli. The salinity of the water is 2727 g/l, and the hardness of the water reaches 44 mg-equiv/l. The salinity in this water is 6.2 times higher than the norm, and constant consumption of such water is harmful to health, that is, it can cause stones in the stomach, gall bladder, urinary tract, and kidneys.

Table 3

Chemical composition of groundwater from the Narpay canal basin (October 2019)

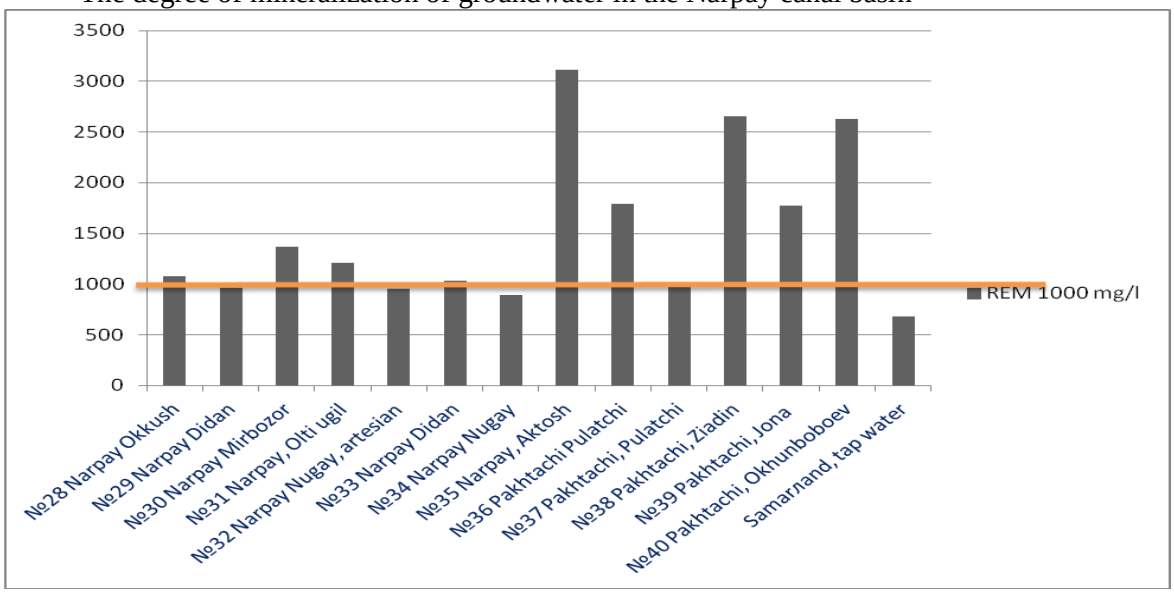
№	Location and depth of water sampling, m	Concentration	pH	HCO_3	Cl	SO4	Ca	Mg	Na+K	mineralization	hardness	nitrates
28	the well 35	mg/l	7,06	244	56,9	491	88,2	104,56	75,0	1078		18,86
		mg-ekv/l		4,00	1,61	10,2	4,40	8,59	3,13		13,0	0,304
29	the well 34,0	mg/l	7,27	212	56,2	441	96,2	87,55	59,1	966		13,95
		mg-ekv/l		3,47	1,58	9,18	4,80	7,20	2,46		12,0	0,225
30	the well 9,0	mg/l	7,19	314	91,1	610	96,2	126,46	127,2	1370		5,54
		mg-ekv/l		5,15	2,57	12,7	4,80	10,4	5,29		15,2	0,089
31	the well 35,0	mg/l	7,22	212	112,3	555	132,3	103,34	79,8	1209		14,48
		mg-ekv/l		3,47	3,17	11,5	6,60	8,49	3,32		15,1	0,234
32	the well 90	mg/l	7,24	221	56,6	422	116,2	80,28	44,2	955		14,92
		mg-ekv/l		3,62	1,59	8,78	5,79	6,60	1,84		12,4	0,241
33	the well 32,0	mg/l	7,26	265	56,9	443	92,2	109,43	44,7	1029		18,29
		mg-ekv/l		4,34	1,60	9,22	4,60	8,99	1,86		13,6	0,295
34	the well 34,0	mg/l	7,34	271	39,7	355	88,2	88,75	34,8	889		12,35
		mg-ekv/l		4,44	1,12	7,39	4,40	7,29	1,45		11,7	0,199
35	the well 6,0	mg/l	7,14	189	244,6	1798	501	194,56	163,9	3117		26,21
		mg-ekv/l		3,09	6,90	37,4	25,0	16,0	6,83		41,0	0,423
36	the well 8,0	mg/l	7,16	319	141,0	845	140,3	158,07	170,5	1793		19,48
		mg-ekv/l		5,23	3,97	17,6	7,00	12,9	7,10		20,0	0,314
37	the well 33,0	mg/l	7,34	247	68,9	431	76,1	92,45	90,3	1018		12,66
		mg-ekv/l		4,05	1,94	8,97	3,79	7,60	3,77		11,4	0,204
38	the well 11,0	mg/l	7,20	180	185,9	1546	290,6	212,79	212,7	2658		30,95
		mg-ekv/l		2,95	5,24	32,2	14,5	17,5	8,86		32,0	0,499
39	the well 24,0	mg/l	7,24	192	229,6	838	180,4	130,7	184,1	1776		22,23
		mg-ekv/l		3,15	6,48	17,4	9,00	10,7	7,67		19,75	0,359
40	the well 24,0	mg/l	7,14	171	127,3	1614	475,9	173,31	53,1	2629		14,57
		mg-ekv/l		2,80	3,59	33,6	23,7	14,2	2,21		38,0	0,235

Below we present analytical data on changes in water mineralization in the Narpay canal basin. 13 water samples taken in 2019 (Table 3) and Samarkand tap water are given together. We give them in the form of a diagram. The vertical line in graph 2 shows water mineralization in mg/l. In order to compare the mineralization of ground water in the Narpay canal basin, Samarkand city tap water was also analyzed. SFR (permissible norm) is given by a thick line, it is equal to 1000 mg/l. Columns below this line indicate water mineralization less than SFR, and columns above it indicate water mineralization higher than SFR. Samarkand tap water makes up 60% of SFR. Six of the remaining columns, that is, wells 28, 29, 32, 33, 34, 37, are also lower than SFR, but they may exceed the norm at some times of the year. The diagram shows that water mineralization in 7 wells is higher than SFR, especially in wells 35, 38, 40, the amount of dissolved salts is 2.5-3.0 times higher than SFR.

The depth of the wells varies depending on the location, the deepest well is 35 meters, and the shallowest is 6 meters. Water salinity is high in shallow wells, less than in deep wells. The low amount of salt in deep wells is due to the fact that the statistical height of water in these wells is not large, that is, the difference between the depth of the well dug and the height of the water rise is small. Only the salts in the layers dug in deep wells are dissolved. The influence of water seeping from the surface to the ground is small. In shallow wells, surface water is added to the ground water. In addition, the geological structure of the place has a big contribution. Water salinity is high in wells dug in areas with thick gypsum or gypsum-rich deposits.[4]

Figure 1

The degree of mineralization of groundwater in the Narpay canal basin



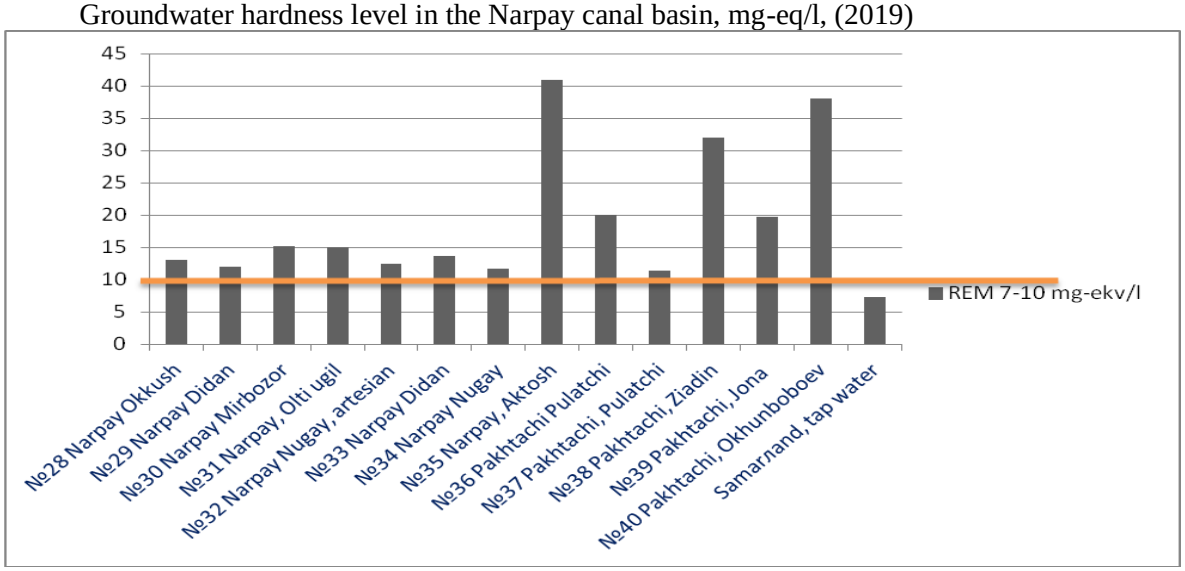
Natural water is never completely clean. The cleanest water is rainwater, but it also contains various impurities from the air, such as dissolved gases, dust, and microorganisms.

After the rainwater falls on the ground, part of it forms a stream in streams and rivers, and part of it soaks into the soil and various rocks and forms ground water. Water seeps through the upper layers of the earth and dissolves various substances on its way. For this reason, there were always dissolved substances in the water of wells, springs, rivers and lakes. The amount of these substances in different waters is different, but, generally speaking, their amount is from 0.01% to 0.05%.

The results of analyzes of water hardness taken from wells in the Narpay canal basin were compared with Samarkand tap water. This is clearly visible in figure 2. The hardness of Samarkand tap water is slightly below SFR. In the remaining 13 wells, water hardness is from 1.5 to 6.5 times higher than normal. Even according to the data of 2014, water hardness in artesian well waters of Narpay district is 8.8 mg-eq/l in the village of Khojakurgan, 15.52 mg-eq/l in Dustlik c/e. Therefore, water mineralization and hardness is high not only in well water (ground water), but also in artesian water between the layers in a large part of the basin of Narpay District. As we wrote above, this is related to the geological structure of the place.

Figure 2

Groundwater hardness level in the Narpay canal basin, mg-eq/l, (2019)



Chloride ions are found in all waters, its main source is halite (NaCl) salt. It is common in various rocks and deposits. It dissolves well in water, so it moves quickly with surface and underground water. Sulfate ions are also common in nature, but their mobility and migration are much

lower than chlorides. The main source of sulfate ions is gypsum ($CaSO_4$ H_2O) and anhydrides. Hydrocarbonate and carbonate ions are complex components of natural waters. The main source of these are deposits of various carbonate rocks (limestone, dolomite, marl, etc.) widely distributed in nature. Another source of hydrocarbons is carbon dioxide gas (CO_2) in the atmosphere and carbon (II) oxide (CO_2) in soils.

Among the cations, the sodium ion ranks first in distribution. All sodium salts are soluble in water. Because of this, it is good for them to migrate. The main source of sodium ion is rock salt (NaCl) and its compounds in deposits. At the same time, there is a lot of sodium in the composition of rocks (granites, etc.). Potassium is close to sodium in its chemical properties, and its main sources are sediments and igneous rocks.[9]

Natural sources of calcium ion are limestone, dolomite and limestone cemented rocks which are common in nature. Basic calcium salts ($CaSO_3$; $CaSO_4$ H_2O) are slowly soluble in water. For this reason, they are not large in natural waters. Hydrocarbonate calcium is abundant in non-saline soils and fresh waters. Magnesium is more difficult to dissolve in water than calcium. Magnesium ion is found in all natural waters, but it has rarely been observed in large quantities in natural water. Usually, the amount of calcium is high in low mineralized waters, and the amount of sodium is high in highly mineralized waters.

In the upper part of the studied area, the amount of calcium ions in well water is 100-180 mg/l (the norm is 180 mg/l). The amount of magnesium ion in artesian waters reaches 30-40 mg/l, but in groundwater it reaches 150, sometimes 200 mg/l. Taking into account that the standard of magnesium is equal to 40 mg/l, its amount increases 4-5 times in most well waters. Also, it was found that the amount of calcium ion in the lower part of Middle Zarafshan is 2-3 times more than SFR in well water. The large amount of these two cations increases water hardness, and constant consumption of such water causes various diseases in the human body, especially in the gall bladder, kidneys, urinary tract, and gastrointestinal system (Protasov 2001). The standard amount of sodium and calcium ions in water is 120 mg/l. Their amount in artesian waters almost does not exceed the norm, but in well waters, from the central part of Middle Zarafshan to the lower part, sodium-potassium amount increases up to 1.5-2.5 times compared to the norm. This is not the natural amount of sodium and potassium ions in groundwater, but the result of anthropogenic factors.[10]

The amount of sulfates from anions (the norm is 450 mg/l) also increases from the upper part of the middle Zarafshan to the lower part. In Narpay and Pakhtachi districts and in Pastdargom district (Ulus desert) where irrigated agriculture is carried out, it was observed that sulfates in well water exceeded the norm by 50-100 mg/l. In most cases, the amount of sulfates does not exceed 150-200 mg/l. Chlorides (norm 350 mg/l) do not exceed the norm in the Samarkand oasis of Middle Zarafshan. 700-750 mg/l was observed in well waters of Narpay and Pakhtachi districts, which is twice the SFR. This is related not only to the pollution of water due to human economic activities, but also to the increase in the melting of salts in the foothills and the location of natural salt layers close to the surface of the earth.[8]

An increase of cations and anions in groundwater is observed from the eastern part of Samarkand region to the west, and the largest indicators correspond to Narpay, Pakhtachi districts and the newly developed lands of Pastdargom district. An increase in calcium (Ca) and magnesium (Mg) ions increases water hardness. The magnesium ion multiplier is the bitterness of water. From the anions, the amount of sulfates and chlorides also increases from the east to the west of Samarkand region, and the largest indicators correspond to Narpay, Pakhtachi districts.

As a general conclusion, it can be said that the impact of human economic activity on underground water, especially ground water, in the Zarafshan Valley is great. Due to anthropogenic influence, the amount of calcium from cations and chlorides from anions in ground water is increasing. This situation is especially strongly felt in the lower part of Middle Zarafshan, and due to the increase in water salinity, fresh water storage ponds have been built in some villages.

Above mentioned, we gave general information on the main sources of anions and cations in natural waters and their distribution, quantity and distribution in the Zarafshan Valley. On the basis of these, we will comment on their distribution and quantity in the regions where we conducted research.

No excess of SFR was observed in any of the 13 water samples from which chloride ions were extracted. The SFR for chlorine is set up to 350 mg/l. The greater the mineralization of the water, the greater the amount of hydrocarbonate ions, the greater the salinity, the greater the amount. For

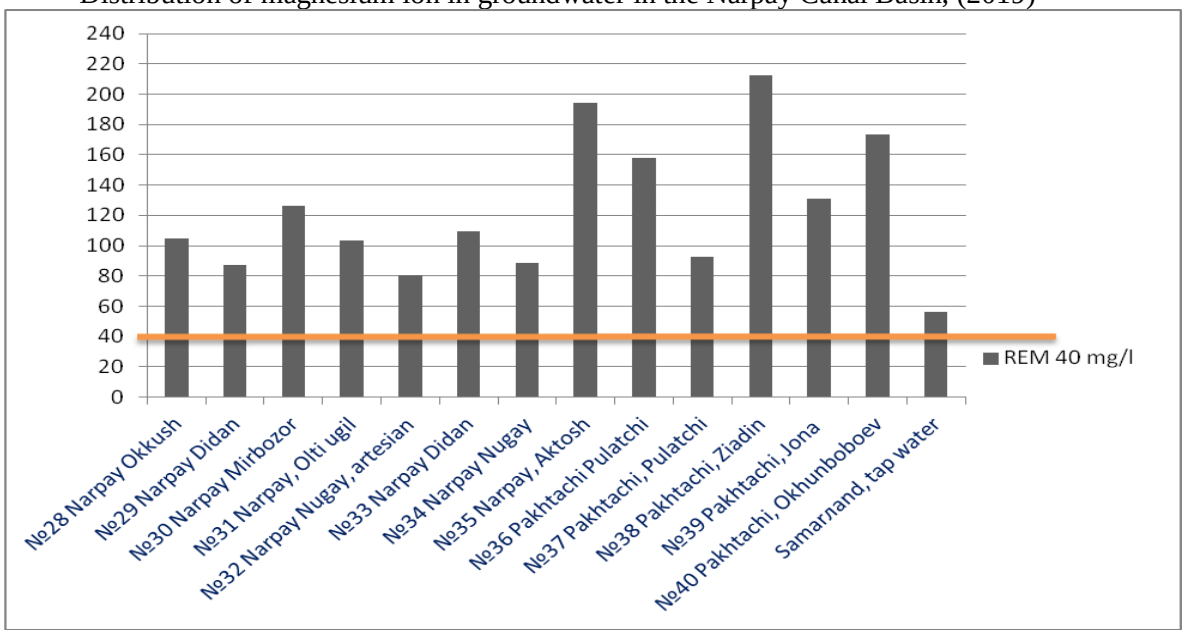
example, the amount of hydrocarbonate in Samarkand tap water is 299 mg/l, and its amount is 180 mg/l in the highest salinity well No. 38.

Among the cations, the amount of calcium ion also varies depending on water mineralization. The SFR for calcium is 180 mg/l. Four out of 13 wells #35 (501 mg/l), #38 (290 mg/l), #39 (180.4 mg/l), and #40 were observed at 475 mg/l. Water mineralization is also high in these wells.

The amount of magnesium ion is greater than SFR in all wells. The SFR for magnesium ion is set at 40 mg/l. The abundance of magnesium in water is related to the rapid solubility and migration of its salts.

Figure 3

Distribution of magnesium ion in groundwater in the Narpay Canal Basin, (2019)



Because sodium and potassium ions are close to each other in their properties, they are analyzed together.

The amount of sodium and potassium ions in the Narpay canal basin was five times higher than SFR in 13 analyzes (SFR for Na and K was set at 120 mg/l). It was found that the minimum amount of sodium and potassium was 34.8 mg/l in well No. 34, 44.2 mg/l in well No. 32, and 34.8 mg/l in well No. 33. This decrease is related to the decrease in water mineralization. The highest amount of these cations was determined in wells No. 35, No. 38 and No. 39 due to the increase in water mineralization. The SFR for the amount of nitrates (NO_3) in water is also given differently in different sources. Up to 45 mg/l in UzDSt (2011), up to 9.1 mg/l in UzHydromet instruction. The guideline of UzDSt issued in the following year is 10.0 mg/l. If we follow the indicators of UzDSt (2011), i.e. 10 mg/l, 12 out of 13 well water samples exceeded the norm by 1.5 to 3.0 times. Only 5.54 mg/l of nitrates was found in the water of well No. 30. If we follow the indicator SFR of 45 mg/l, the amount of nitrates in any well water does not reach SFR. But their total amount is much larger. The reason for this is organic and mineral fertilizers used in crop fields. 30-45% of them are absorbed by plants, the rest seeps underground, is washed away from the soil by wind and water.

The increase in salt content in groundwater and soil salinity in the Narpay canal basin occurred due to the development of areas with gypsum deposits on a large area. There are two ways to prevent this and reduce salinity. The first is to properly build ditches and collectors and constantly monitor them. Collectors and ditches are the most necessary way to remove saline water that has flowed from the ground. In many cases, the density of ditches is low, and the bottom of those ditches is filled with mud and reeds. Muddy ditches and collectors block the way of seepage water coming from the surrounding area and find a way back to the lowlands through them and increase the salinity of the well water. Therefore, ditches and collectors should be cleaned every year.

One of the best ways to reduce soil salinity is drip irrigation technology. According to experts, a huge amount of water is being wasted in the current irrigation system (furrows and irrigation). Especially on uneven surfaces, the waste of water during irrigation is even greater. When irrigating cotton with furrows, 15,000-18,000 m^3 of water is used per hectare four times. Drip irrigation

technology is the most convenient way to save water and evenly irrigate the land, reduce soil salinity, and reduce soil erosion. According to V. Antonov, A. Morozov, V. Sevryugen (2003), the advantages of drip irrigation are as follows: 1) the total amount of water used to irrigate one hectare of land is 750 m^3, which is 6 times more than the water provided by furrows few; 2) The coefficient of useful work in irrigation approaches 100%, which means that the wastage of water is sharply reduced; 3) Uniform irrigation of the field will reach 0.7-0.9%, as a result the yield of cotton will reach 45-55 centners instead of 22-25 centners/hectare. We fully endorse the opinion of these experts. At the time of current climate change and water shortage, drip irrigation has another very important aspect besides saving water. It consists of the following: a) firstly, when crop fields are drip-irrigated, the depth of water absorption into the ground does not reach one meter. Due to this, moisture remains above the salt layer. So, when the moisture does not reach the salt layer, the melting of salts and their movement towards the slopes and lowlands stops or decreases sharply; b) secondly, there is almost no soil washing; c) thirdly, the application of fertilizers to the land is controlled by a computer, as a result of which their consumption per hectare is drastically reduced.

In order to improve the quality of drinking water and the general ecological situation in the Narpay canal basin, it is necessary to revise the system of planting crops in irrigated agriculture. Current cotton, grain, corn planting areas should be changed depending on the soil conditions. For example, we recommend the establishment of orchards and vineyards based on drip irrigation instead of furrow or push irrigation technology in hilly and uneven terrain. There are 3,000 hectares of land in the southern part of the foothills in the central Zirabulok mountain and the foothills in the northern part of Ziyovuddin mountain. If crops based on drip irrigation are increased around the canal, the movement of underground water towards the Zarafshan river will decrease, their bringing of salts will decrease sharply, as a result, the process of desalination of well water will be restored.

References

1. Raxmatullayev A., Baratov X., Nurliboyev H., Satritdinov A. O`rta Zarafshon vohalarida grunt suvlari minerallashuvi va qattiqligining antropogen omillar ta`sirida o`zgarishi. Orol havzasi geoekologik muammolari: ilmiy g`oyalar, tadqiqotlar, innovatsiyalar. Xalqaro ilmiy-amaliy konfrensiya. Toshkent 2019 14-15-iyun,-149-153-b.
2. Raxmatullayev A., Baratov H., Bekqulov I., Fayzullayev J. Yangi sug`oriladigan yerlarda ichimlik suvi sifatini o`rganish va kartalashtirishning innovatsion jihatlari (Ulus cho`li va Narpay kanali havzasi misolida) Samarqand viloyatini innovatsion rivojlantirish: Muammo va yechimlar respublika ilmiy-amaliy konfrensiyasi materiallari. Samarqand 2020. -384-388-b.
3. Raxmatullayev A., Baratov H., Bekqulov I., Fayzullayev J. Arid iqlimli O`rta Zarafshon vodiysining grunt suvlar sifatiga inson xo`jalik faoliyatining ta`siri. Cho`llanish muammolari: dinamika, baholash, yechim. Xalqaro ilmiy-amaliy konfrensiya. Samarqand 2019 13-14-dekabr. 133-135-b.
4. Shirinboyev D., Xomanova M. Narpay kanalining gidrologik rejimi va ahamiyati. Orol mintaqasi va qo`shni hududlarda kompleks geografik tadqiqotlarning muammo va istiqbollari. Xalqaro ilmiy-amaliy konfrensiya. Nukus 2018 15-16-may. -381-382-b.
5. Shirinboyev D., G`aniyev Sh. Narpay kanali gidrologik rejimi va uning xalq xo`jaligidagi ahamiyati. SamDU Ilmiy axborotnoma. 5-son. Samarqand 2018. -175-178-b.
6. Rasulov A.R., Hikmatov F., Aytbayev D. Gidrologiya asoslari Toshkent 2003. 316 b.
7. Samarqand Gidrogeologiya stansiyasining hisoboti, 2001-2016-yy.
8. История Самарканда. С древнайших времен до октябрской революция. Том 1. –Ташкент 1969.
9. Raxmatullayev A., Baratov H. Inson xo`jalik faoliyatining yer osti suvlariga ta`sirini tayanch-tajriba uchastkada o`rganish va ularni kartalashtirish. Geodeziya, kartografiya va kadastr sohalarini rivojlantirishning dolzarb muammolari. Respublika ilmiy-amaliy konfrensiya materiallari. Samarqand 2014, -38-39-b.
10. Raxmatullayev A., Ravshanov A., Tirkashev N., Ravshanov Sh. O`rta va Quyi Zarafshon vohasida yer osti suvi minerallashuvidagi o`zgarishlar. Geografiyaning mintaqaviy muammolari. Respublik ilmiy-amaliy konfrensiyasi. Jizzax 2017, 17-19-b.