

# WATER RESERVES OF GARABAGH REGION AND SURROUNDING AREAS

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**Environmental  
Monitoring  
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## AZERBAIJAN REPUBLIC

- The territory of Azerbaijan is located in the eastern part of the South Caucasus and west of the Caspian Sea between the latitudes 38°24' and 41°54' north latitude, 44°46' and 50°50' east longitude.
- The area of the territory of the Republic of Azerbaijan is 86.6 thousand km<sup>2</sup>
- Azerbaijan is a predominantly mountainous country with a diverse and complex terrain. Along with high mountain ranges, there are plains, lowlands and depressions. The absolute height of the area varies between 4480 m (Bazarduzu peak, Greater Caucasus) and minus 27 m (current level of the Caspian Sea), and the average height is 657 m.
- There are four natural regions in Azerbaijan: Greater Caucasus, Lesser Caucasus (including the territory of Nakhchivan AR), and Lankaran and Kur-Araz lowlands.







Naxçıvan MR. Sadərek rayonu

## AZERBAIJAN REPUBLIC

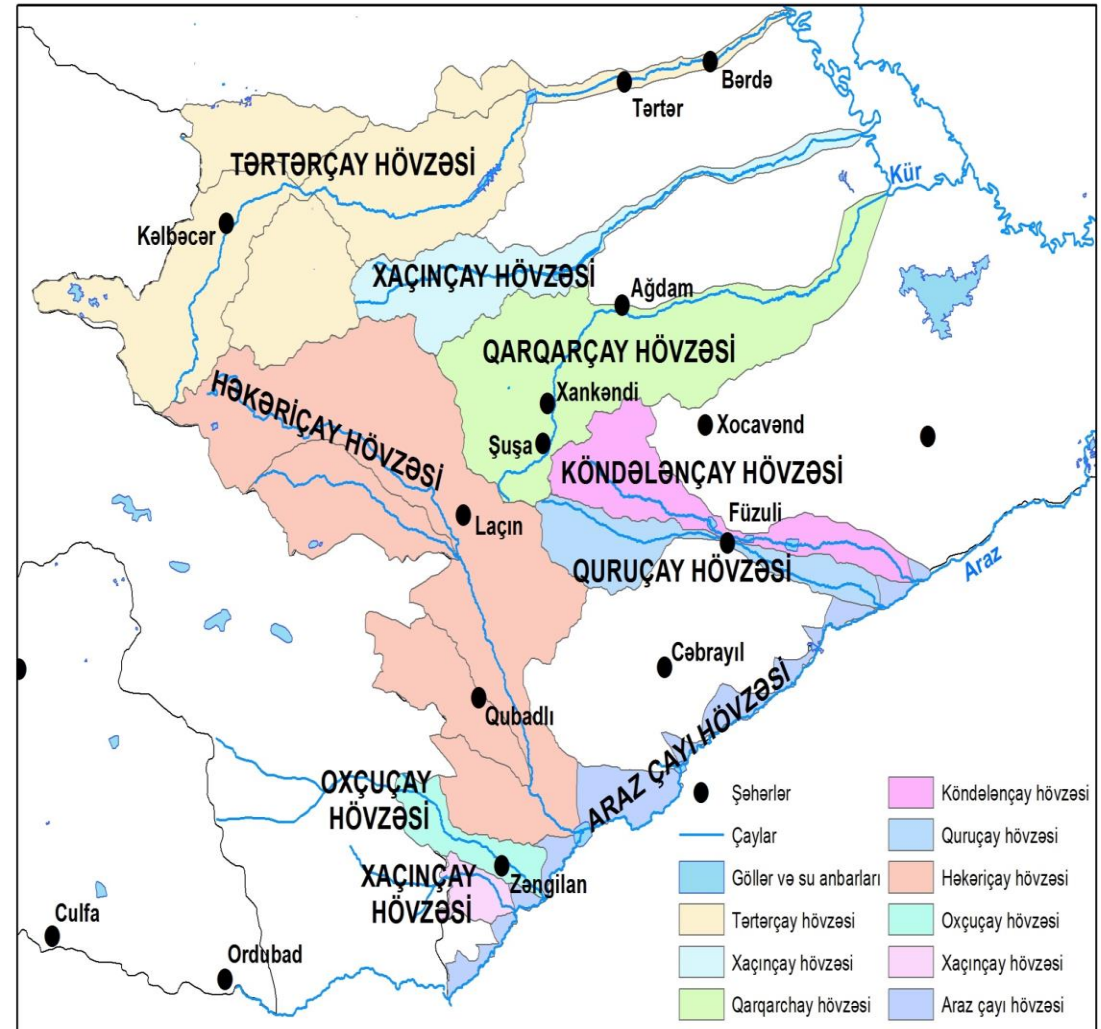
- Of the 11 climate types on Earth, 8 are observed in Azerbaijan - from semi-desert and arid steppe climates to mountain tundra climates.
- The average annual temperature is 9-10<sup>0</sup> C in mountainous and foothill areas, and 14-15<sup>0</sup> C in plain areas. Precipitation is unevenly distributed in the area - 1600-1800 mm per year in Lankaran natural region, and 200-350 mm in Absheron.
- Total water resources 30 Bln kub.m (20 Transboundary and 10 local rivers) which currently is reduced for about 15% under climate change. About 2 Bln kub m of total waters are formed in liberated areas.
- The main water bodies belonging to the hydrographic network- rivers, lakes and reservoirs are unevenly distributed in different natural regions of the country. For example, the density of the river network varies from 0.20 km / <sup>2</sup> (Absheron-Gobustan) to 0.84 km / km<sup>2</sup> (Lankaran), and the average density is 0.36 km / km<sup>2</sup>





# The main rivers flowing through the area

- Tartarchay – with 2 reservoirs on it
- Khachinchay – with 1 reservoir on it
- Kondalanchay – with 3 reservoirs on it
- Quruchay
- Hekarichay
- Zabukhchay
- Barghusad (Transit river)
- Okchuchay (Transit river)
- Khachinchay (Transit river)



# TARTARCHAY

- **Tartarchay** flows through Kalbajar, Aghdara, Tartar and Barda regions and flows into Kura river.
- The average annual water discharge is 18.3 m<sup>3</sup>/second, and the flow volume is 577 million m<sup>3</sup>
- Sarsang (total water capacity 565 mln.m<sup>3</sup>) and Sugovushan (total water capacity 5.9 mln.m<sup>3</sup>) reservoirs were built on Tartarchay in 1976 for irrigation and energy purposes.



# KONDELANCHAY

- It flows through the territory of Khojavand and Fuzuli regions and flows into the Araz river. The average annual water discharge of the river is 0.70 m<sup>3</sup>/second, and the flow volume is 22.1 million m<sup>3</sup>.
- The flow is formed mainly from rain and underground waters and partly from snow water. In spring, rainwater causes flooding in the river. In some years, autumn rains also cause small floods
- There are 3 reservoirs on Kondalanchay
  - 1st reservoir - total volume 2.1 million m<sup>3</sup> (built in 1950)
  - 2nd reservoir - total volume 3.2 million m<sup>3</sup> (built in 1964)
  - 3rd reservoir - total volume 9.5 mln.m<sup>3</sup> (built in 1981)





## HAKARICHAY

- It flows through the territory of Lachin and Gubadli regions and flows into the Araz river.
- The average annual water discharge is 10.8 m<sup>3</sup>/second, and the flow volume is 340.6 million m<sup>3</sup>. It is the second largest river of the Lesser Caucasus after Tartarchay (together with Bazarchay) within Azerbaijan.
- The flow of the river is formed by snow, rain and underground water.
- In spring and summer, the melted snow water causes flooding in the river.

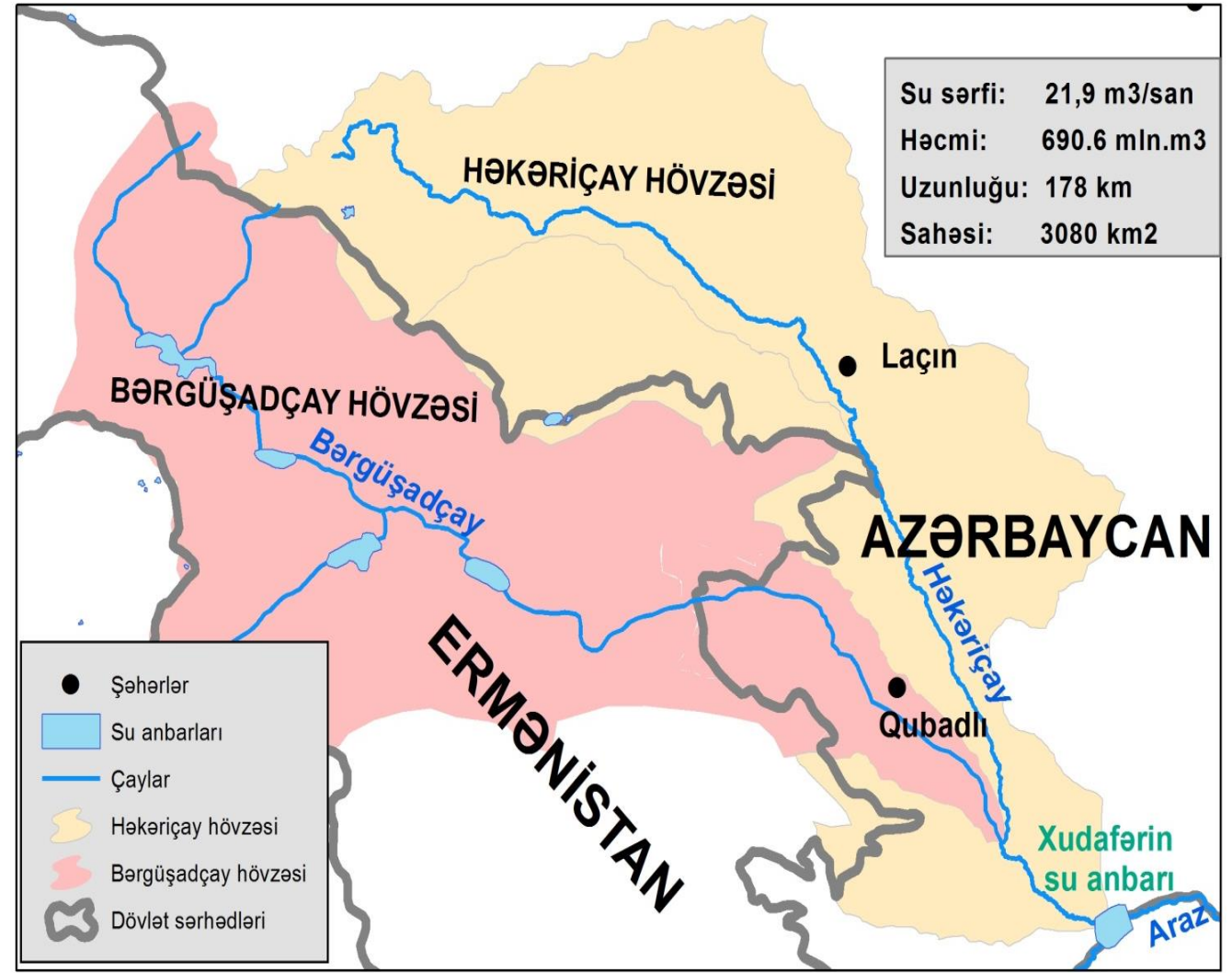




# BERGUSHADÇAY

➤ The main part of the flow of Barghushadchay (Bazarchay) is formed in the territory of Armenia. The river passes through Gubadli and Zangilan regions and joins the Hakari river.

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# OKCHUCHAY

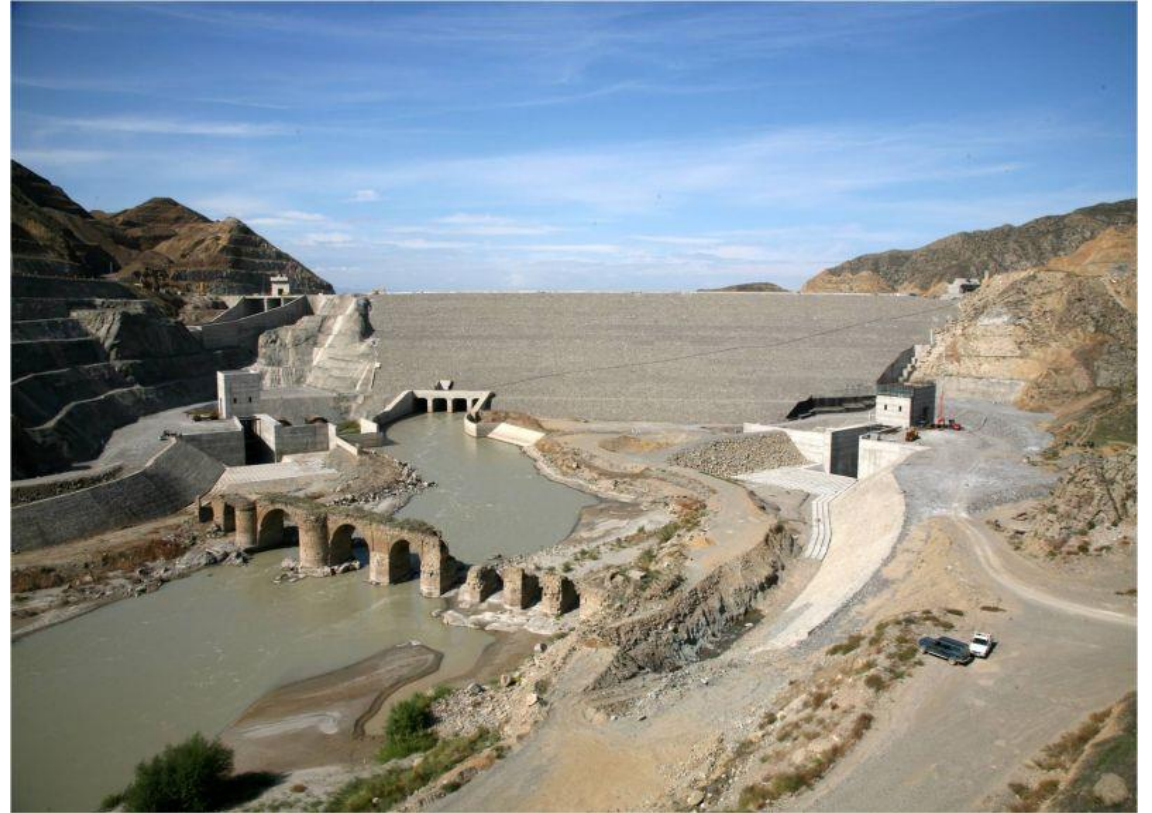
- Okchuchay – is formed in the territory of Armenia and flows into the Araz River in the territory of Zangilan region.
- The average annual water discharge is 10.0 m<sup>3</sup>/second, and the flow volume is 315.4 million m<sup>3</sup>.
- River water is used for irrigation





## Khudafarin reservoir

- volume 1612 mln.m<sup>3</sup>
- useful volume 1495 million m<sup>3</sup>
- the length of the reservoir is 31.8 km
- average width 2.9 km
- average depth 35 m
- the maximum height of the dam is 64.0 m
- the maximum width of the dam is 10.0 m
- water mirror area 74.4 km<sup>2</sup>
- The capacity of SES is 2x100 Mw
- average annual electricity production 766 million kW (Azerbaijan 388 million kW)
- Irrigated arable land 264 thousand hectares Azerbaijan (Iran 100 thousand hectares).





## Qız qalası reservoir

- Gyz Galasy reservoir is located 13 km
- below Khudafar reservoir: total volume is 56.75 million m<sup>3</sup>
- useful volume 54.5 million m<sup>3</sup>
- dead volume is 7.5 million m<sup>3</sup>
- maximum height 37.0 m
- The length of the channel is 12.4 km
- average width 500 m
- average depth 18 m
- the width is 10.0 m
- water mirror area -5.54 km<sup>2</sup>
- average annual electricity production 2x40=80 MW



# About the hydrology work done in the liberated territories during 2020-2022



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# Hydrological stations operating in the area

No	Name of the precinct	Located territory	To action the year it started	Where is it poured?	Average annual water consumption	Observation stand year
1	Tartarchay-Kalbajar	Kalbajar district	1934	Kur River	5,11	1993
2	Tartarchay-Veng	Aghdara district	1969	Kur	15,8	1991
3	Tartarchay-Su confluence	Tarter district	1914	Kur	24,0	1991
4	Turagaychay-mansab	Tarter district	1929	Tarter	3,34	1988
5	Levchay-Kamishli	Kalbajar district	1950	Tarter	5,81	1991
6	Tutkunchay-mansab	Kalbajar district	1951	Tarter	3,68	1989
7	Gargarchay-Agakhorpu	<b>Askeran district</b>	1928	Kur	1,70	1989
8	Khachinchay-Vanklu	Tarter district	1933	Kur	1,29	1990
9	Köndelanchay-Red market	Tarter district	1949	Araz	0.63	1990
10	Guruchay-Tugh	Khojavand district	1934	Araz	1,91	1989
11	Hekarichay-Shalva	Lachin district	1978	Araz		1989
12	Hekarichay-Lachin	Lachin district	1926	Araz	10,7	1989
13	Zabukhchay-Zabukh	Lachin district	1926	Hekari	5,24	1988
14	Zabuhchay-Minkend	Lachin district	1950	Hekari	2,44	1989
15	Oxçuçay- Zəngilan	Zangilan district	1935	Araz	11,2	1988
16	Barghushad- Eyvazli	Gubadli district	1927	Araz	20,7	1975
17	Basitchay-Razdara	Zangilan district	1958	Araz	1,90	1989



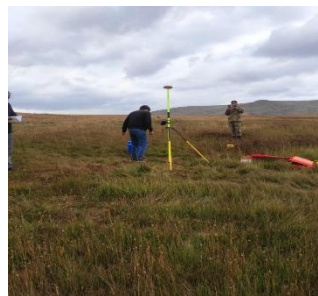
## Water resources of the rivers flowing through the area

According to the prepared multi-year values, the total water supply of the rivers flowing through the territory in the period before the occupation is about 2350 mln.m<sup>3</sup>, which was about 24% of the internal water resources of the country.

No	River - precinct	Located territory	length, km	catchment area, km <sup>2</sup>	Average water discharge, m <sup>3</sup> /sec.	Average annual volume, million m <sup>3</sup>
1	Tartarchay-Kalbajar	Tartarchay-Kalbajar	200	483	5,11	161
2	Tartarchay-Veng	Aghdara district	200	1915	15,8	499
3	Tartarchay-Su confluence	Tarter district	200	2460	24,0	758
4	Turagaychay-mansab	Tarter district	35	162	3,34	105
5	Levchay-Kamishli	Kalbajar district	36	363	5,81	184
6	Close to Tutkunchay-mansab	Kalbajar district	35	522	3,68	116
7	Gargarchay-Agakhorpu	Khojaly district	115	238	1,70	53,7
8	Khachinchay-Vanklu	Aghdam district	119	175	1,29	40,7
9	Köndelanchay-Red market	Khojavand district	89	166	0,63	19,9
10	Guruchay-Tugh	Khojavand district	82	201	1,91	60,3
11	Hojazsuchay-Hojaz	Lachin district	63	414	0,59	18,6
12	Hekarichay-Shalva	Lachin district	113	83	1,14	36,0
13	Hekarichay-Lachin	Lachin district	113	1180	10,7	338
14	Zabuhchay-Minkend	Lachin district	51	113	2,44	76,9
15	Zabukhchay-Zabukh	Lachin district	51	496	5,24	165
16	Basitchay - Razdara	Zangilan district	44	266	1,90	60,0
17	Barghusad-Eyvazli	Gubadli district	158	5650	20,7	654
18	Okchuchay-Gafan	Zangilan district	83	1175	11,2	354
<b>Total</b>					<b>74,4</b>	<b>2350</b>

On March 3-7, 2021, hydrological measurements were carried out in Big Alagol, Zalkhagol and Karagol lakes.

1. Rappers are established to connect to world ocean level (Baltic Sea)
2. Level gauges established
3. Coordinates and levels are defined
4. The level was connected to Baltic System





In 2021, for the first time, measurement works were carried out with a modern device in order to assess the water content of the rivers flowing through the area.

During the year, water consumption was measured 7 times in 11 locations, including 10 rivers flowing through the area.

Measuring works were carried out with a modern "SOMMER RP-30" portable measuring device

The measured water consumption was compared with the multi-year norm.

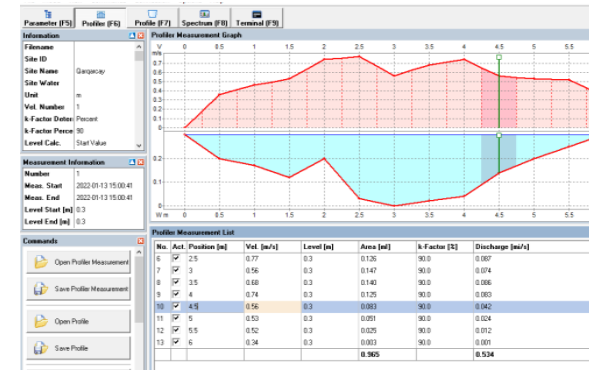
At the same time, the measured water consumption data was used in the preparation of the "Water Management balance" of 2021.





During the 4 months of 2022, measurement works were carried out in the rivers flowing through the area

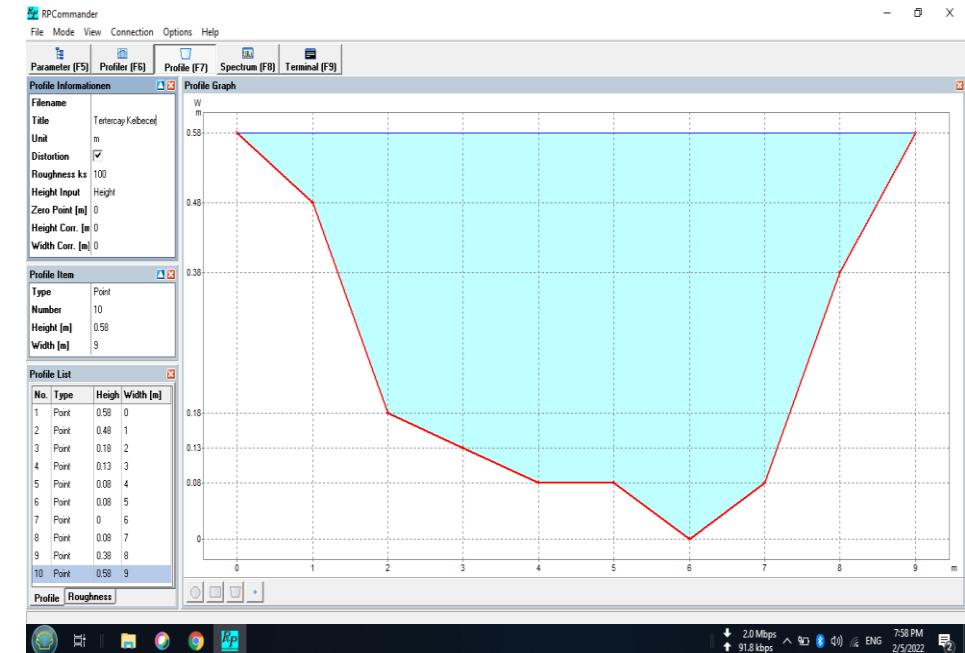
In 2022, the number of rivers flowing through the area and the number of stations was increased, and water consumption was measured 7 times in 13 stations, including 11 rivers.



Measuring works were carried out with a modern "SOMMER RP-30" portable measuring device

The measured water consumption was compared with the multi-year norm.

At the same time, the measured water consumption data were used in the prediction of the water level expected during the spring-summer flood period in the rivers flowing through the area.



## Comparison of measured water levels during 4 months of 2022 with the multi-year norm

№	River - precinct	13.01		25-27.01		03-04.02		24-26.02		29-31.03		13-14.04		19-21.04	
		Su sərfi m <sup>3</sup> /s	Normanin %-i	Su sərfi m <sup>3</sup> /s	Normanin %-i	Su sərfi m <sup>3</sup> /s	Normanin %-i	Su sərfi m <sup>3</sup> /s	Normanin %-i	Su sərfi m <sup>3</sup> /s	Normanin %-i	Su sərfi m <sup>3</sup> /s	Normanin %-i	Su sərfi m <sup>3</sup> /s	% of norm
1	Tartarchay-Kalbajar					4,10	151								
2	Tartarchay-Veng					10,0	131								
3	Levchay-Kamishli					1,79	71								
4	Tutkunchay-mansab														
5	Khachinchay-Aghdam														
6	Khachinchay-Aghdam	0,53	96												
7	Hekarichay-Khanlig			13.1	244			5.39	97						
8	Zabukhchay-Zabukh					5,56	118								
9	Bargushadchay-Gubadli			14.0	124			9.59	84	9.898	71			7.80	20.7
10	Okchuchay-Zangilan			4.34	152			3.31	107	9.982	207	9.85	62.6	9.85	62.7
11	Basitchay-Razdara			0.76	117			1.41	183	3.275	134			3.50	59.2
12	Kondalanchay- Qajar			0.06	19			0.06	19	0.047	8			0.36	30.2
13	Guruchay-Khojavand			0.09	16			0.18	31	2.821	245			1.59	33



# ON ENVIRONMENTAL MONITORING

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## MONITORING CARRIED OUT IN TERRITORIES LIBERATED FROM OCCUPATION

After the liberation of the Karabakh region from the occupation, comprehensive monitoring has been carried out regularly since December 2020 in order to study and evaluate the current situation of the territory.

During the conducted monitoring, the quality of atmospheric air, the actual radiation background of the environment was determined in the area cleared of mines and unexploded ordnance of war, in order to determine the quality and pollution status of the transit and internal rivers, reservoirs and other water bodies flowing through the area, as well as the quality of the arable land of the area. water, bottom sediment and soil samples were taken.

Relevant physico-chemical laboratory analyzes were performed on the samples taken, and based on the results, evaluation works were carried out on the territory.

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## ENVIRONMENTAL QUALITY MONITORING IN TERRITORIES FREED FROM OCCUPATION

During the first quarter of 2022

- 90 water samples, 1530 analyses;
- 3 soil samples, 27 analyses;
- Bottom sediment sample 9 samples, 90 analyses;
- Radiation background measurements in Fuzuli, Jabrayil, Zangilan, Gubadli, Khojavand (Agoghlan district) regions;

During 2021

- 747 water samples, 20169 analyses;
- 2852 analyzes of 136 soil samples;
- Bottom sediment sample 748 pieces 7517 analysis
- Dosimetric measurements were carried out at a total of 237 points in Fuzuli, Jabrayil, Zangilan, Gubadli, Khojavand, Shusha, Aghdam, Kalbajar, Lachin, Tarter regions in terms of radiation background.

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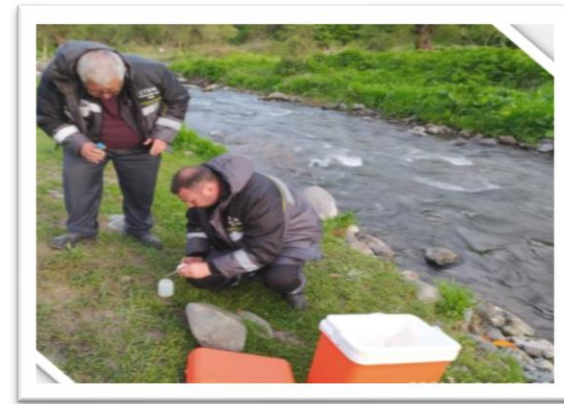
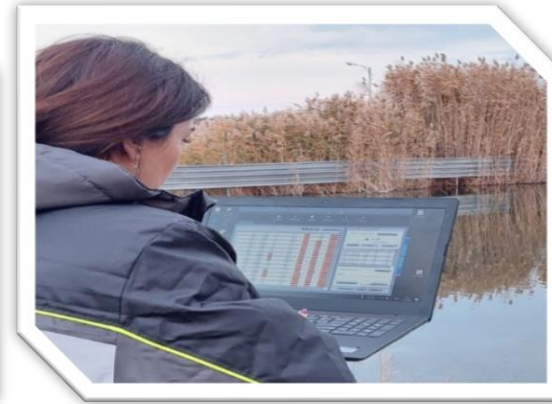


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## MONITORING OF WATER BODIES IN LIBERATED AREAS

### MONITORED WATER BODIES:

- OKCHUCHAY;
- BESITCHAY;
- ARAZ RIVER;
- BERGUSHAD RIVER;
- CROSSING RIVER;
- GURUCHAY RIVER;
- TARTAR RIVER;
- Khachinchay;
- GARGAR RIVER ;
- DARK RIVER;
- ZABUCH RIVER;
- SALVA RIVER;
- ; CANYATAQ RIVER;
- LEVCHAY;
- WALNUT RIVER;





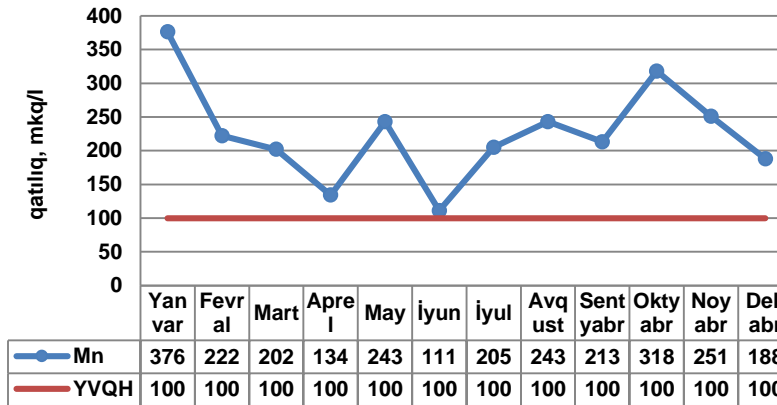
## WATER QUALITY IN RIVERS FLOWING THROUGH LIBERATED TERRITORIES

Based on the results of the monitoring carried out in 2021, it can be said that the transboundary rivers Araz, Okchuchay, Bargushad, Basitchay in the Karabakh region are subject to high pollution.

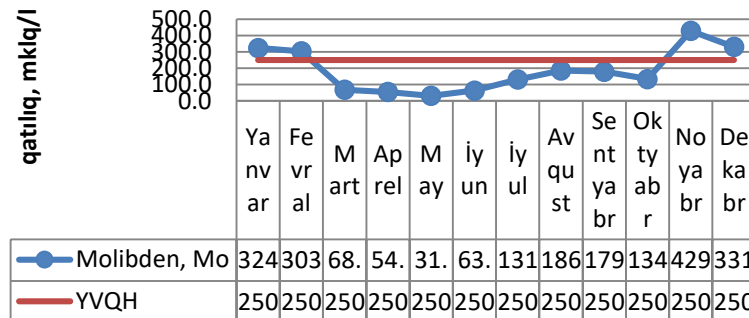
Thus, according to the monitoring results of the rivers, it was determined that Okchuchay is the most polluted. In the samples taken from the border point of the river with the Republic of Armenia, it was determined that the concentration of heavy metals and biogenic substances was many times higher than the norm. It should be noted that the reason for the pollution of the river is the waste water discharged from the copper-molybdenum combine operating in the territory of the Republic of Armenia.

Wastewater is discharged into the river without treatment, which leads to the pollution of the river with heavy metals. High level pollution of the river with heavy metals leads to disruption of the ecosystem of the river and destruction of bioresources living there. Such an event was observed at the beginning of March 2021, as a result of the discharge of a large amount of waste water into the river, a mass destruction of fish occurred in the river..

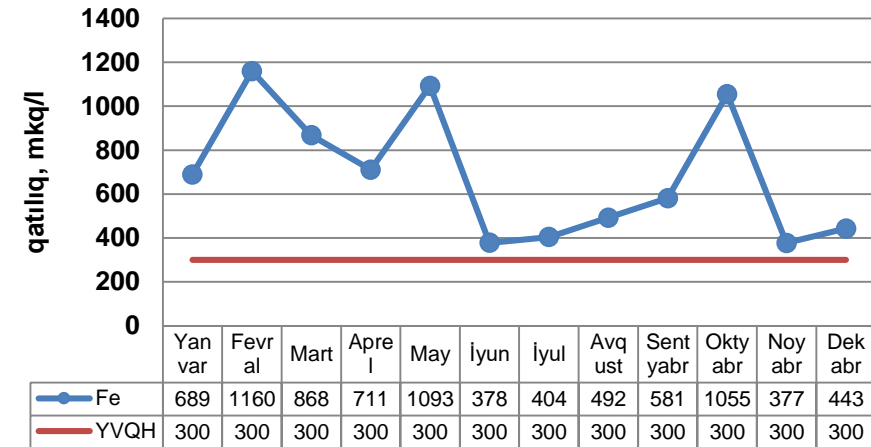
### Change dynamics of manganese in the waters of Okchuchay



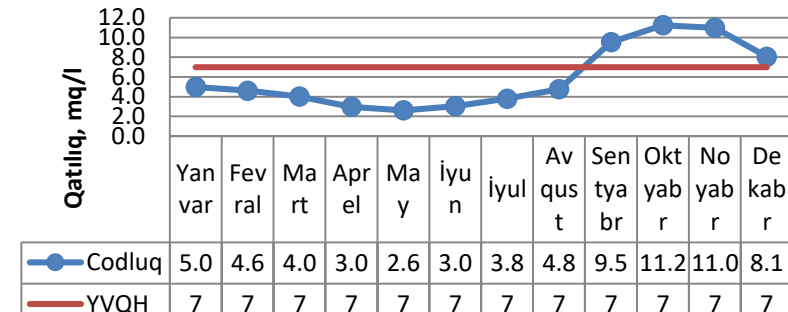
### Change dynamics of molybdenum in Okchuchay waters



### Iron change dynamics in the waters of Okchuchay



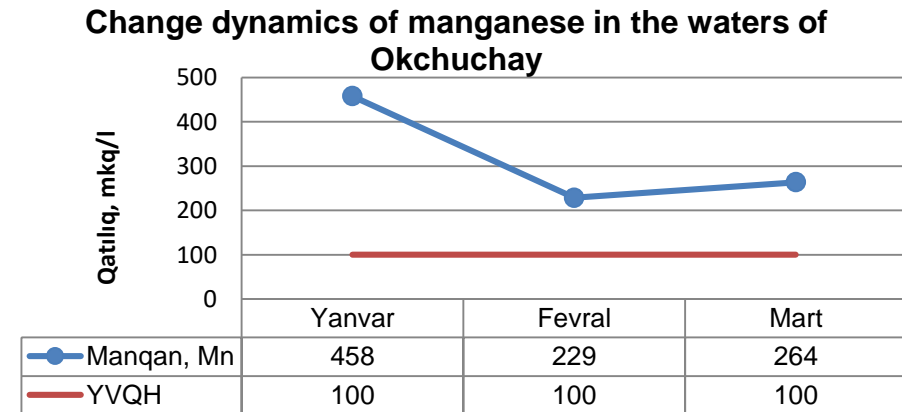
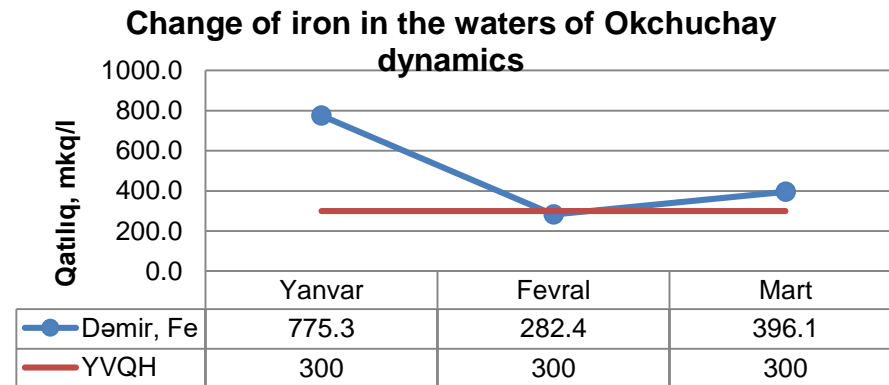
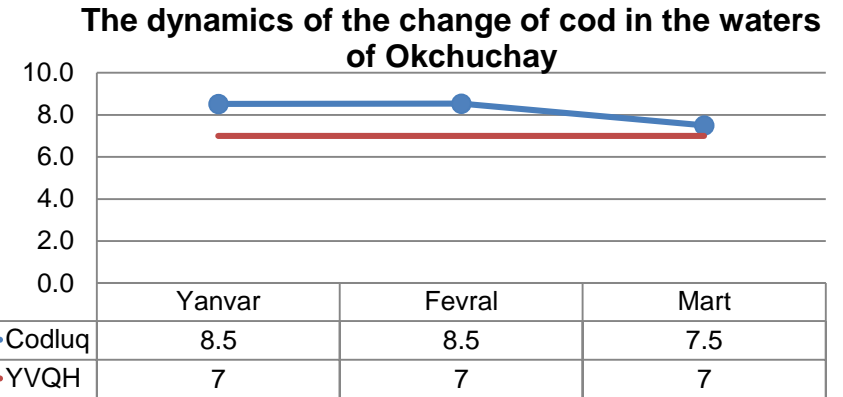
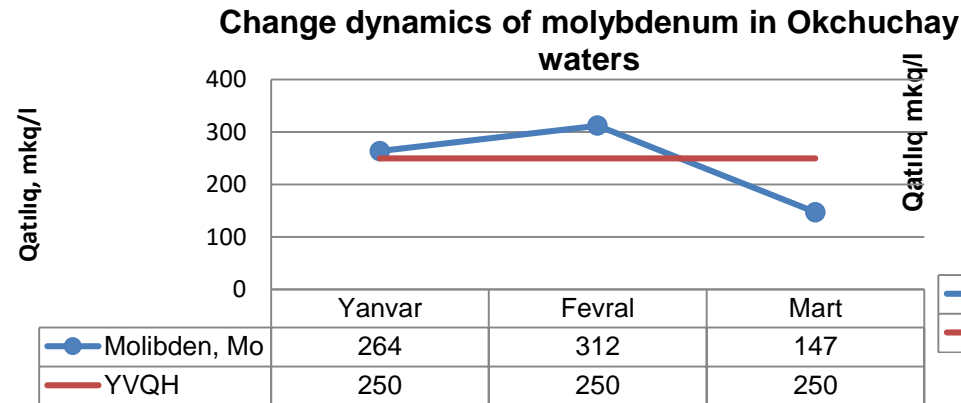
### The dynamics of the change of cod in the waters of Okchuchay



# CHANGE DYNAMICS OF HEAVY METALS IN OKCHUCHAY DURING THE FIRST QUARTER OF 2022

During the first quarter of 2022, in order to determine the quality of water in the rivers passing through the Karabakh region, monitoring and water samples were taken every decade in the transboundary Okchuchay, Bargushad and Basitchay, and monthly in Hekari, Kondalan and Guru chai..

According to the results, the level of pollution in transboundary rivers is higher than in other internal rivers.



## ENVIRONMENTAL QUALITY AUTOMATIC STATIONS CONSIDERED FOR INSTALLATION IN LIBERATED AREAS

By 2022, installation of quality sensors in order to monitor the water quality online in the Okchuchay, Basit, Bargushad and Araz rivers flowing across the border from the Karabakh territory

Installation of radiation background early warning monitoring control stations in Zangilan, Fuzuli, Kalbajar and Shusha cities within the framework of the project to be implemented under the Technical Cooperation Program of the UN AEBA organization in 2022-2024;

Within the framework of the State Investment project in 2024-2026, it is planned to install automatic air quality stations in the cities of Aghdam and Shusha.

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# Tertarchay-Veng Automatic Hydrological Station



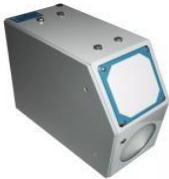




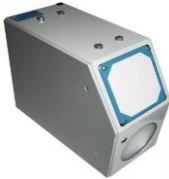
# Monitoring equipment

## Non-contact Water Flow velocity and Discharge Measurement sensor:

### Radar sensor

1	-Non-Contact Discharge Radar System	Hyquest Solutions, Australia	LVQ35		<i>HyQuest Solutions LVQ-35 is sensor for continuous discharge measurement of rivers, open channels and canals with known cross-section profile. The sensors use innovative radar technology to measure velocity, water level and discharge</i>
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### Water Level Sensor: Radar sensor

2	Water Level Sensor	Hyquest Solutions, Australia	LVQ35		<i>HyQuest Solutions LVQ-35 is sensor for continuous discharge measurement of rivers, open channels and canals with known cross-section profile. The sensors use innovative radar</i>
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# Gauging equipment

## Water Temperature sensor



3	Water Temperature sensor	Global Water's-USA	WQ-101		<p><i>Global Water's WQ101 Temperature Sensor is a rugged and reliable device for highly accurate submersible water temperature measurement</i></p>
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## Rain gauge

4	Rain gauge	YSI USA	H-3401		<p><i>The model H-3401 is a precision tipping bucket rain gauge used in hydrometeorological applications. Each gauge is calibrated at a rate of 10 mm (4 in) per hour.</i></p>
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# Gauging equipment

<u>Water Quality sensors</u>					
5	Water Quality Sensor	YSI a Xylem Brand, USA	EXO 3 Multiparameter Water Quality Sonde		EXO Multiparameter Sondes — the best-in-class platform for the highest quality data. EXO's dynamic range of smart sensors provide comprehensive multiparameter water quality data while SmartQC ensures proper calibrations and top sensor performance.
6	Ceilometer	Eliasson- Sweden	CBME 80B		<i>The Eliasson cloud ceilometer CBME80B is a compact and lightweight standalone instrument for measuring cloud base height and vertical visibility.</i>

# Results

- After the automatic stations start to operate, observation data will be restored, the quality of observations will be increased,
- Continuous monitoring at those points will expand our capabilities in the field of monitoring and determining the intensity of potentially dangerous hydrological events, especially in the field of increasing the efficiency of forecasts for floods and floods.
- At the same time, the change of the water resources of the region will be evaluated based on the observation data of the local and transit rivers flowing through the area.
- Automatic stations will allow to assess transboundary pollution of rivers

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