EU4Environment in Eastern Partner Countries:

Water Resources and Environmental Data (ENI/2021/425-550)

SURFACE WATER SURVEY AZERBAIJAN 2023

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EU4Environment
Water and Data in Eastern Partner Countries

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About EU4Environment – Water Resources and Environmental Data

This Programme aims at improving people's wellbeing in EU's Eastern Partner Countries and enabling their green transformation in line with the European Green Deal and the Sustainable Development Goals (SDGs). The programme's activities are clustered around two specific objectives: 1) support a more sustainable use of water resources and 2) improve the use of sound environmental data and their availability for policy-makers and citizens. It ensures continuity of the Shared Environmental Information System Phase II and the EU Water Initiative Plus for Eastern Partnership programmes.

The Programme is implemented by five Partner organisations: Environment Agency Austria (UBA), Austrian Development Agency (ADA), International Office for Water (OiEau) (France), Organisation for Economic Co-operation and Development (OECD), United Nations Economic Commission for Europe (UNECE). The action is co-funded by the European Union, the Austrian Development Cooperation and the French Artois-Picardie Water Agency based on a budget of EUR 12,75 million (EUR 12 million EU contribution). The implementation period is 2021-2024.

https://eu4waterdata.eu

CONTENTS

EXECUTIVE SUMMARY **8**

1. INTRODUCTION AND SCOPE **9**

1.1. Selected river basins and sampling sites 10
1.2. Quality Elements and sampling methods 12
1.3. Chemical analyses 13
1.4. Responsibilities 14
1.5. Quality assurance 15

2. RESULTS **16**

2.1. Field protocols and hydro-morphological site description 16
2.2. Chemical results 16
2.3. Biological results 18

3. DISCUSSION OF RESULTS **21**

4. NEXT STEPS AND LESSONS LEARNED **22**

5. ANNEXES **23**

LIST OF TABLES

Table 1: Parameters analysed in the field and in the laboratory. 9

Table 2: List of sampling sites 10

Table 3: Sampling dates, meteorological and hydrological conditions 12

Table 4: List of analysed parameters and analytical methods 13

Table 5: Responsibilities during the SW Survey 2023 14

Table 6: Results of physical and chemical analyses conducted on water samples taken from Kura basin rivers on 15-20.05.2023 16

Table 7: Taxa-list 18

Table 8: Results of Ecological Status 20

LIST OF FIGURES

Figure 1: Map of sampling sites 11

LIST OF ABBREVIATIONS

ADA..... Austrian Development Agency

BQE ..... Biological Quality Elements

EU ..... European Union

EU4EnvWD..... EU4Environment in Eastern Partner Countries: Water Resources and Environmental Data

IOW/OIEau..... International Office for Water, France

RBMP ..... River Basin Management Plan

Reps ..... Representatives (the local project staff in each country)

UBA..... Umweltbundesamt GmbH, Environment Agency Austria

WFD ..... Water Framework Directive

LLC.....Limited Liability Company

Country Specific Abbreviations Azerbaijan

MENR..... Ministry of Ecology and Natural Resources

NHS ..... National Hydrometeorological Service

Executive Summary

This report provides the results of the surface water survey conducted in 17 river areas in May 2023.

The involved institutions were the National Hydrometeorological Service, Azelab LLC and the Environment Agency Austria. The activities took place under the Programme “EU4Environment – Water Resources and Environmental Data”.

Investigated parameters included hydromorphological site descriptions, physico-chemical analyses, and ecological status assessment based on the biological quality element of benthic invertebrates. At two sites the biological data indicated a good status, four sites showed moderate status, three sites indicated poor status, and four sites were classified a bad status. No macroinvertebrates were found in the samples in the remaining four sites. Overall, the results partly confirm the risk analysis carried out previously for this area, while others show an improvement of the ecological status compared to former investigations. At some sites, the results of the biological and the chemical analyses do not indicate the same level of pressure. Future investigations are necessary in these cases to validate the results and increase the confidence of the ecological status assessment.

This survey was a successful exercise of training and increasing the expertise in surface water sampling and analyses with the goal to make the ecological monitoring in Azerbaijan compliant with the requirements of the European Water Framework Directive.

1. Introduction and Scope

The objective of this survey in spring 2023 was to investigate the current status of the water bodies in the upper Kura basin. The survey was a joint operation by the National Hydrometrological Service of Azerbaijan (HMS), Azelab LLC, and the programme "EU4Environment Water & Data".

The stations to be conducted within the framework of the project were determined by the experts of the National Hydrometrology Service .

Table 1: Parameters analysed in the field and in the laboratory.

Country	**Azerbaijan**
River basin	Kura, Aras
Campaign [1)]	May 2023
Objective	
Quality elements	Biological quality components: • Macrozoobenthos Supporting elements: • Hydro-morphological site description • General physico-chemical quality elements
Preparation of field work	10.05.2023 – 14.05.2023
Field work	15.05.2023 – 20.05.2023
Chemical analyses	17.05.2023 – 30.05.2023
Biological analyses	22.05.2023 – 25.07.2023

1.1. Selected river basins and sampling sites

Table 2: List of sampling sites

River basin	River	WB	River type	Site	Nr	HMWB [1)]	Risk [2)]	Significant Pressure [3)]	Latitude [4)]	Longitude [4)]
Kura	Kura-Shikli	Kur011-1-WB002	1	Shikli-2	SW001	No	R	Urban, agricultural and transboundary impacts	45.700	41.180
	Ganjachay	Kur011-3-WB005	2	Downstream	SW002	No	R	Urban and agricultural impacts	46.250	40.420
	Balakanchay	Gan107-2-WB043	5	Balakan city	SW003	No	Nr	Urban and agricultural impacts		
	Talachay	Gan1051-2-WB036	5	Zagatala city	SW004	No	R	Urban and agricultural impacts	46.644598	41.624249
	Talachay	Gan1051-2-WB035	2	Zagatala city (right bank of the river)	SW004.1	Yes	R	Urban and agricultural impacts	46.6445980	41.6242490
	Ayrichay	Gan101-5-WB017	2	After reservior	SW005	Yes	R	Agricultural impacts	46.909364	41.238499
	Kanikh	Gan10-3-WB023	1	Before reservior	SW006	No	PR	Urban and agricultural impacts		
	Alijanchay	Kur013-4-WB021	1	Khaldan	SW007	Yes	R	Urban and agricultural impacts	47.2140480	40.719201
	Kura	Kur014-2-WB025	1	Evlakh city	SW008	No	R	Urban and agricultural impacts	47.1681540	40.5940840
	Karasu	Gan104-4-WB032	2	Zardab	SW009	Yes	R	Urban and agricultural impacts	47.42113	40.13311
	Kura	Kur0152-2-WB035	1	Sabirabad	SW010	No	R	Urban and agricultural impacts	48.26135	40.01069
Aras	Aras	Kur0152-2-WB036	2	Saatly	SW011	No	R	Urban and agricultural impacts	48.26216	40.00260
Kura	Kura	Kur015-4-WB037	1	Surra	SW012	No	R	Urban and agricultural impacts	48.31513	40.04108
	Kura	Kur016-1-WB038	1	Shirvan	SW013	No	R	Urban and agricultural impacts	48.53073	39.56590
	Kura	Kur016-1-WB039	1	Salyan	SW014	No	R	Urban and agricultural impacts	48.59118	39.36246
	Kura	Kur016-1-WB040	1	Neftchala	SW015	No	R	Urban and agricultural impacts	49.14526	39.2357
	Kurakchay			Chaykand	*)	Yes	PR		46.311537	40.423769

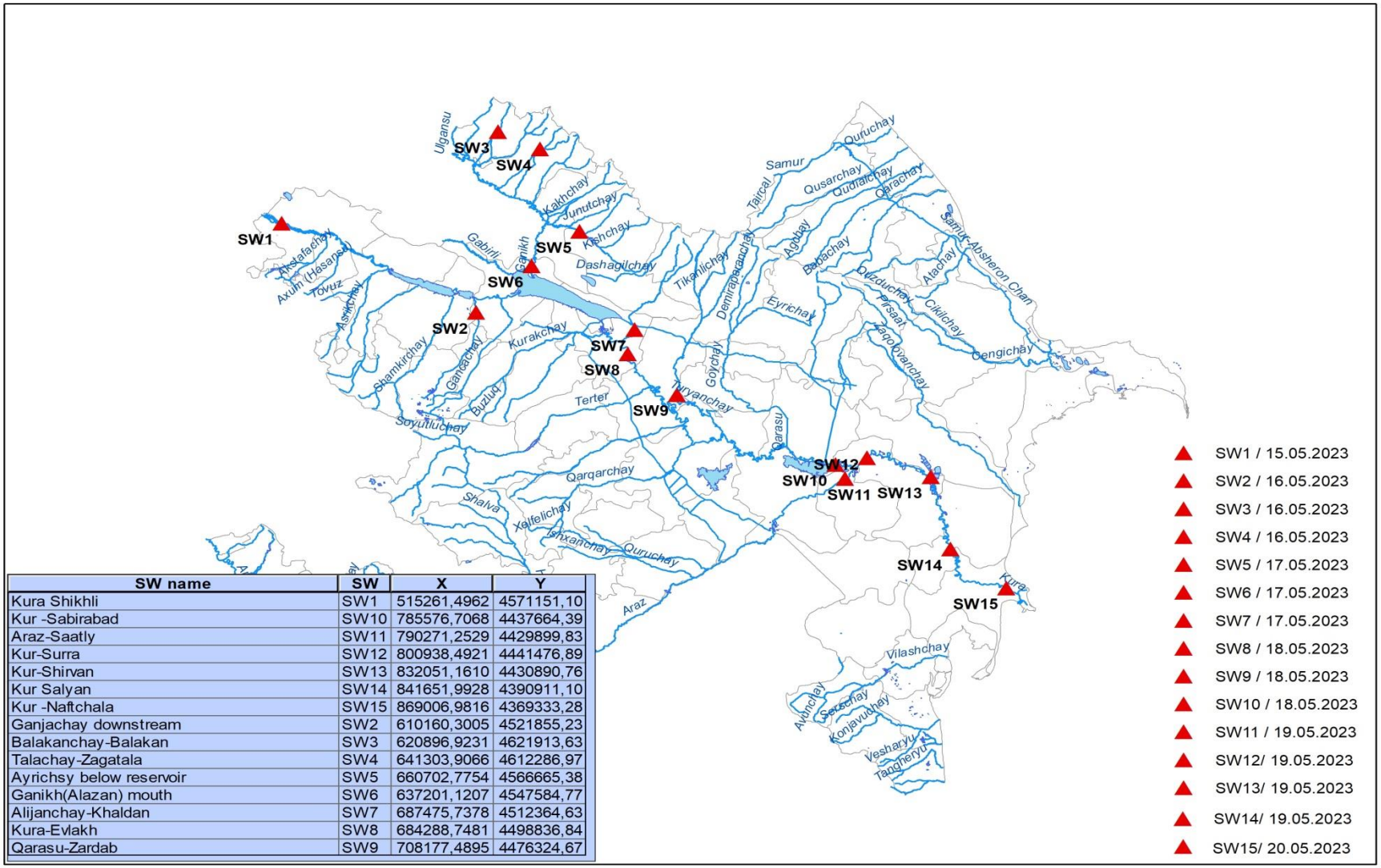
[1)] Assignment as provisional HMWB: yes / no

[2)] Assignment of the risk status: R = at risk, PR = possibly at risk, NR = not at risk

[3)] Significant pressure: N = no significant pressure, P = organic pollution, E = eutrophication, T = toxic impact, H = hydro-morphological alterations, M = multi-stressor, O = other, U = unknown

[4)] Latitude, Longitude: Format = Degree with six decimals (e.g. as 44.630139, conversion from 44° 37’ 48.5’’ through calculation 44 + 37 / 60 + 48.5 / 3600)

[*)] additional sampling site selected during the field campaign



SW name	SW	X	Y
Kura Shikhli	SW1	515261,4962	4571151,10
Kur -Sabirabad	SW10	785576,7068	4437664,39
Araz-Saatly	SW11	790271,2529	4429899,83
Kur-Surra	SW12	800938,4921	4441476,89
Kur-Shirvan	SW13	832051,1610	4430890,76
Kur Salyan	SW14	841651,9928	4390911,10
Kur -Naftchala	SW15	869006,9816	4369333,28
Ganjachay downstream	SW2	610160,3005	4521855,23
Balakanchay-Balakan	SW3	620896,9231	4621913,63
Talachay-Zagatala	SW4	641303,9066	4612286,97
Ayrichsy below reservoir	SW5	660702,7754	4566665,38
Ganikh(Alazan) mouth	SW6	637201,1207	4547584,77
Alijanchay-Khaldan	SW7	687475,7378	4512364,63
Kura-Evlakh	SW8	684288,7481	4498836,84
Qarasu-Zardab	SW9	708177,4895	4476324,67

Figure 1: Map of sampling sites

Table 3: Sampling dates, meteorological and hydrological conditions

Sampling date	Sampling point	Code	Discharge [m^3/s]	River width [m]	Air temperature [°C]
15.05.2023	Kura-Shikli	SW001	520	200	20
16.05.2023	Ganjachay	SW002	2.5	5	14
	Balakanchay	SW003	7.2	2.5	22.4
	Talachay	SW004	0.7	3.5	20
	Talachay(right side)	SW004.1	0.7	3.5	20
17.05.2023	Ayrichay	SW005	0.5	15	21
	Kanikh	SW006	200	1.5	21
	Alijanchay	SW007	20	4	18
18.05.2023	Kura Yevlakh	SW008	150	220	21
	Karasu	SW009	35	15	20
	Kura Sabirabad	SW010	250	19	23
	Kurakchay	–	7	–	14
19.05.2023	Araz-Saatly	SW011	15.5	10	21
	Kura-Surra	SW012	268	20	–
	Kura-Shirvan	SW013	250	18	17
20.05.2023	Kura-Salyan	SW014	230	20	16
	KuraNeftchala	SW015	250	23	23

1.2. Quality Elements and sampling methods

Biological quality elements:

Macroinvertebrates were sampled according to the multi-habitat sampling (MHS) method developed during EU AQEM and STAR projects.

For a single sample, up to 20 (depending on the heterogenity of sampling site) sub-samples were taken from every sampling site and transported to the laboratory for further analysis (see Annex 1). Rare and endangered animals such as large mussels or crayfish were picked out, documented in the field, and released again. Samples were fixed with ethanol, stored in a cooling box and delivered to the laboratory for sorting and identification.

Where the habitat was suitable, phytobenthos (diatoms) was collected as well (protocol see Annex 2). Identification and analysis of phytobenthos is not part of this report.

Supporting elements:

Hydro-morphological site description where noted and a protocol was filled at each sampling site.

The following general physico-chemical parameters were measured at each site: pH, electrical conductivity, water temperature, dissolved oxygen and oxygen saturation. Chemical analyzes of other parameters were carried out in the laboratory (see below).

Samples were cooled at 4 °C and stored separately according to ISO standard where necessary and transported to the laboratory.

Table 4: List of analysed parameters and analytical methods

Parameter	Unit	Standard
Field measurements		
Water temperature	°C	-
Oxygen concentration	mg/l	ISO 5814
Oxygen saturation (O_2-Sat)	%	ISO 5814
pH	-	ISO10523
Electrical conductivity (EC)	µS/cm	ISO7888
Laboratory measurements		
Smell		ISO 4121
Colour		ISO 7887
Turbidity	FTU (NTU)	ISO 7027
Temperature	°C	ISO 7027
Hydrogen indicator, pH	-	ISO 10523
Electrical conductivity	µS /cm	ISO 7888
Oxygen concentration	mg/l	ISO 814
Oxygen saturation (O_2-Sat)	%	ISO 5814
Biological Oxygen Demand (BOD_5)	mg/l	ISO 5815
Chemical Oxygen Demand (COD)	mg/l	ISO 6060
Chloride ion, Cl^-	mg/l	ISO 9297
Sulphate ion, SO_4^{2-}	mg/l	ISO 9280
Calcium ion, Ca^{2+}	mg/l	ISO 11885
Magnesium ion, Mg^{2+}	mg/l	ISO 11885
Sodium, Na^+	mg/l	ISO 11885
Kalium, K^+	mg/l	ISO 11885
Orthophosphate ion, PO_4^{3-}	mg/l	ISO 6878
Ammonium ion, NH_4^+	mg/l	ISO 6777
Nitrate ion, NO_3^-	mg/l	ISO 7890-3
Suspended solids	mg/l	ISO 11923

1.3. Chemical analyses

Sample analysis was performed according to ISO standards and relevant SOPs implemented in the laboratory. The list of methods is given in Table 3.

Water temperature (WT), transparency (Tr), dissolved oxygen (DO), oxygen saturation (O2-sat), pH and electrical conductivity (EC) parameters were analysed under both field and laboratory conditions. Other parameters were analysed in the chemical laboratory between 18.05.2023 and 27.05.2023

1.4. Responsibilities

AzeLab LLC is a centralized laboratory of the Ministry of Ecology and Natural Resources. AzeLab LLC is the institution responsible for the analysis and analysis of the main ecological indicators of the environment (water, air, soil) in the Republic of Azerbaijan. According to the charter of AzeLab LLC, it can act as a party in the projects of various organizations within the framework of cooperation. Within the framework of the U4Environment in Eastern Partner Countries: Water Resources and Environmental Data project, AzeLab LLC participated and closely cooperated with the National Hydrometrology Service in the implementation of the project.

AzeLab LLC was responsible in the organization of the necessary equipment for the field measurements, the analysis of the biological and chemical samples , kind contribution,as well as the preparation of thefinal report.

Table 5: Responsibilities during the SW Survey 2023

Responsibilities	Institution, contact person, email-address
General	
Responsible for the organisation of surface water body sampling	Institute: Contact person: RaminaAbdullayeva E-Mail: abdullayevaramina@gmail.com
Field work	
Responsible for field work (biological and chemical sampling, hydro-morphological site description)	Institute:AzeLab LLC, and National Hydrometeorological Service Contact persons: Chemistry:GulnaraAbbasova, E-Mail: gulnara_abbasova1980@mail.ru Biology: Ilaha Gurbanova, E-Mail: qurbanovailahe04@gmail.com Huseynova Gulgaz , E-Mail: gulgez.huseynova85@gmail.com Hydromorphology: VafadarIsmayilov, E-Mail: is_vafadar@mail.ru
Responsible for functional check of sampling equipment	Institute: National Hydrometeorological Service Contact person: GulnaraAbbasova E-Mail: gulnara_abbasova1980@mail.ru
Responsible for calibration of on-site measuring equipment	Institute: National Hydrometeorological Service Contact person: GulnaraAbbasovaE-Mail: gulnara_abbasova1980@mail.ru
Chemical analysis	
Overall responsible for the chemical analysis in the lab, including reporting and data delivery	Institute: AzeLab LLC Contact person: RaminaAbdullayeva E-Mail: abdullayevaramina@gmail.com
Responsible for sample transport from the field to the laboratory	Institute: Sadig LLC Contact person: Mirvari Guliyeva Tel: +994502229989
Analysing laboratory and contact person	Institute: AzeLab LLC Contact person: RaminaAbdullayeva E-Mail: abdullayevaramina@gmail.com

Responsibilities	Institution, contact person, email-address
Biological analysis	
Overall responsible for the biological analysis in the lab, including reporting and data delivery	Institute: AzeLab LLC Contact person: Ilaha Gurbanova E-Mail:qurbanovailahe04@gmail.com

1.5. Quality assurance

Analyzes were conducted according to ISO standards. The used device, equipment and chemical containers have been checked by the calibration institution and have certificates. Before the analyses, the calibration curves were updated and checked with quality samples.

A sample handover protocol can be found in Annex 5 of this report (seperate document).

2. Results

2.1. Field protocols and hydro-morphological site description

Each Hydro-morphological site descriptions protocols are given in Annex 3 (separate document).

2.2. Chemical results

Table 6: Results of physical and chemical analyses conducted on water samples taken from Kura basin rivers on 15-20.05.2023

№	Parameter	Unit of measure-ment	Kura (Shikhli) SW 1	Balakan chay SW 3	Talachay Zagatala SW4	Talachay Zagatala right side SW4.1	Ganjachay down-stream SW2
1	Temperature	°C	25.0	23.0	16.9	17.0	15.7
2	Dissolved oxygen (concentration)	mgO_2/l	7.2	7.1	7.2	4.2	6.0
3	Dissolved oxygen (saturation)	%	82.0	81.0	82.0	81.0	68.0
4	Biochemical oxygen demand (BOD_5)	mgO_2/l	4.8	1.84	1.2	0.6	4.9
5	Chemical oxygen demand (COD)	mgO_2/l	5.3	2.3	1.5	0.76	6.1
6	Hydrogen indicator, pH	–	7.87	7.92	7.96	8.01	7.72
7	Electrical conductivity	µS/cm	333	210	239	92.5	303
8	Chloride ion, Cl^-	mg/l	12.52	2.64	3.96	4.61	7.25
9	Sulphate ion, SO_4^{2-}	mg/l	84.3	76.9	75.9	29.0	75.9
10	Hydrocarbonate ion, HCO_3^-	mg/l	207.5	109.8	134.2	152.5	207.5
11	Calcium, Ca^{2+}	mg/l	38.6	29.9	30.0	12.2	35.8
12	Magnesium, Mg^{2+}	mg/l	10.0	7.8	7.8	3.2	9.3
13	Sodium, Na^+	mg/l	1.51	1.08	1.7	0.614	9.18
14	Potassium, K^+	mg/l	1.4	0.7	2.0	0.5	2.0
15	Total phosphorus, TP	mg/l	0.303	0.352	0.117	0.068	0.123
16	Total dissolved phosphorus, DP	mg/l	0.291	0.312	0.098	0.047	0.105
17	Orthophosphate ion, PO_4^{3-}	mg/l	0.095	0.169	0.0032	0.049	0.085
18	Ammonium ion, NH_4^+	mg/l	0.25	<LOD	<LOD	<LOD	0.97
19	Nitrite ion, NO_2^-	mg/l	0.04	<LOD	<LOD	<LOD	0.44
15	Nitrate ion, NO_3^-	mg/l	2.56	2.19	2.14	2.81	2.8
16	Suspended solids	mg/l	359.4	231.8	257.9	205.6	351.4

LOD = limit of detection

№	Parameter	Unit of measurement	Kurakchay	Ayrichay downs-tream SW 5	Qanıkh before the reservoir SW 6	Alijanchay Khaldan SW 7	Kura Yevlakh SW8	Garasu Zardab SW9
1	Temperature	°C	8.9	18.2	18.5	19.0	18.2	19.0
2	Dissolved oxygen (concentration)	mgO_2/l	6.9	7.1	6.1	6.5	6.8	7.0
3	Dissolved oxygen (saturation)	%	80.0	81.0	69.0	73.0	74.0	80.0
4	Biochemical oxygen demand (BOD_5)	mgO_2/l	4.48	8.6	8.9	8.5	9.9	6.96
5	Chemical oxygen demand(COD)	mgO_2/l	5.6	10.76	11.1	10.63	12.4	8.7
6	Hydrogen indicator, pH	–	8.3	8.06	8.1	8.0	8.2	8.15
7	Electrical conductivity	µS/cm	154.0	548.0	277.0	886.0	704.0	511.0
8	Chloride ion, Cl^-	mg/l	6.6	14.5	7.9	51.4	48.8	15.16
9	Sulphate ion, SO_4^{2-}	mg/l	13.57	81.17	56.91	167.3	130.4	115.0
10	Hydrocarbonate ion, HCO_3^-	mg/l	61.0	176.9	115.9	164.8	146.3	152.6
11	Calcium, Ca^{2+}	mg/l	21.0	64.5	35.1	74.3	70.1	58.9
12	Magnesium, Mg^{2+}	mg/l	5.47	16.8	9.1	19.2	18.2	15.3
13	Sodium, Na^+	mg/l	1.51	17.2	8.83	61.2	50.9	19.5
14	Potassium, K^+	mg/l	0.4	4.9	0.1	4.0	4.6	3.5
15	Total phosphorus, TP	mg/l	0.06	0.09	0.033	0.166	0.196	0.078
16	Total dissolved phosphorus, DP	mg/l	0.05	0.07	0.10	0.51	0.16	0.24
17	Orthophosphate ion, PO_4^{3-}	mg/l	0.04	0.06	0.04	<LOD	<LOD	0.07
18	Ammonium ion, NH_4^+	mg/l	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
19	Nitrite ion, NO_2^-	mg/l	0.02	0.02	<LOD	0.03	0.02	0.02
15	Nitrate ion, NO_3^-	mg/l	7.06	1.22	3.18	5.4	2.85	3.29
16	Suspended solids	mg/l	116.8	377.4	237.2	548.3	472.5	383.6

№	Parameter	Unit of measurement	Kura Sabirabad SW10	ArazSaatlı SW11	Kura Surra SW12	Kura Shirvan SW13	Kura Salyan SW14	Kura Nephtchala SW15
1	Temperature	°C						
2	Dissolved oxygen (concentration)	$mgO_2/$	6.9	6.6	7.1	7.0	6.9	6.6
3	Dissolved oxygen (saturation)	%	82.0	79.0	84.0	83.0	82.0	79.0
4	Biochemical oxygen demand (BOD_5)	mgO_2/l	2.66	4.9	4.2	6.2	3.0	7.0
5	Chemical oxygen demand (COD)	mgO_2/l	3.32	6.12	5.3	7.75	3.8	8.7
6	Hydrogen indicator, pH	–	6.6	7.1	7.0	7.6	7.2	7.76
7	Electrical conductivity	µS/cm	933	2340	1018	1147	1214	1237
8	Chloride ion, Cl^-	mg/l	61.68	233.97	75.4	96.42	106.35	112.02
9	Sulphate ion, SO_4^{2-}	mg/l	196.5	630.0	299.9	264.3	236.0	277.4
10	Hydrocarbonate ion, HCO_3^-	mg/l	183.1	213.6	204.5	176.9	177.0	183.1
11	Calcium, Ca^{2+}	mg/l	77.1	204.2	85.7	161.3	176.7	180.9
12	Magnesium, Mg^{2+}	mg/l	20.1	53.1	22.3	41.9	45.9	47.1
13	Sodium, Na^+	mg/l	82.8	232	86.1	109	122	125
14	Potassium, K^+	mg/l	3.47	13.8	3.89	5.94	4.09	5.49
15	Total phosphorus, TP	mg/l	0.05	0.02	0.08	0.04	0.082	0.013
16	Total dissolved phosphorus, DP	mg/l	0.04	0.01	0.06	0.02	0.071	0.01
17	Orthophosphate ion, PO_4^{3-}	mg/l	0.02	0.008	0.04	0.01	0.03	0.004
18	Ammonium ion, NH_4^+	mg/l	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
19	Nitrite ion, NO_2^-	mg/l	0.02	0.28	0.05	0.03	0.01	0.04
15	Nitrate ion, NO_3^-	mg/l	1.36	7.87	5.4	6.43	4.7	5.3
16	Suspended solids	mg/l	626.2	1588.9	783.4	862.3	872.9	936.4

2.3. Biological results

Biological analyses revealed 8 taxonomic groups: Ephemereptera, Trichoptera, Coleptera, Decapoda, Gastropoda, Diptera, Odonata, Amphipoda and Hirudinea. The groups with the highest species diversity were Ephemereptera and Diptera. Macroinvertebrates have been detected by region in the table below. At four sites (Ganjachay SW 02, Garasu SW 9, Kura-Salyan SW 014, Kura-Neftchala SW 015) no macroinvertebrates were detected at all as a results of flooding prior to the sampling date.

Table 7 gives the complete taxa list of benthic invertebrates found and identified at each site.

Table 7: Taxa-list

	River	*Class*	*Order*	*Family*	*Genus/Species*	*Ind*
1	Kura	Crustacea	Decapoda	Gammaridae	Gammarus	6
2	Ganjachay downstream	No macroinvertebrates in the sample due to flooding				
3	Balakanchay-Balakan SW 003	Insecta	Trichoptera	Limnephilida	Limnephilinae	6
		Insecta	Coleptera	Elmidae	*Elmis*	3
		Insecta	Ephemeroptera	Heptageniidae	*Ecdyonurus macani*	5
		Insecta	Ephemeroptera	Baetidae	*Baetis alpinus*	3
		Insecta	Diptera	Tabanidae	*Tabanus*	1
		Insecta	Diptera	Empididae	*Clinocera nigra*	5
		Insecta	Diptera	Chironomidae	*Chironomus (Chironomus)*	3
4	Talachay-Zagatala SW 004	Insecta	Diptera	Chironomidae	*Chironomus*	*4*
5	Talachay-Zagatala right side SW 04.1	Insecta	Trichoptera	Hydropsychidae	*Hydropsyche fulvipes/instabilis*	4
		Insecta	Ephemeroptera	Baetidae	*Baetis rhodani*	87
		Insecta	Ephemeroptera	Baetidae	*Baetis alpinus*	6
		Insecta	Ephemeroptera	Baetidae	*Baetis fuscatus*	3
		Insecta	Ephemeroptera	Heptageniidae	*Ecdyonurus macani*	85
		Insecta	Ephemeroptera	Heptageniidae	*Epeorus*	6
		Insecta	Ephemeroptera	Baetidae	*Baetis buceratus*	7
		Insecta	Diptera	Simuliidae	*Simulium*	82
		Insecta	Diptera	Chironomidae	*Chironomus*	11
		Insecta	Diptera	Blephariceridae	*Liponeura*	6
		Insecta	Diptera	Stradiomyidae	*Odontomya*	1
6	Ayrichay after reservoir SW 005	Insecta	Trichoptera	Hydropsychidae	*Hydropsyche fulvipes/instabilis*	37
		Insecta	Ephemereptera	Baetidae	*Baetis rhodani*	10
		Insecta	Ephemeroptera	Baetidae	*Baetis alpinus*	2
		Insecta	Diptera	Simuliidae	*Simulium*	3
		Insecta	Diptera	Empididae	*Hemerodromia baetica*	7
7	Ganikh(Alazan) mouth SW 006	Insecta	Trichoptera	Hydropsychidae	*Hydropsyche siltalai*	31
		Insecta	Ephemereptera	Baetidae	*Baetis rhodani*	2
		Insecta	Ephemereptera	Heptageniidae	*Ecdyonurus macani*	9
		Insecta	Diptera	Chironomidae	*Chironomus*	1
		Insecta	Diptera	Pediciidae	*Dicranota*	1
		Insecta	Diptera	Simuliidae	Simuliinae	11
8	Alijanchay-Khaldan SW 007	Insecta	Ephemereptera	Baetidae	*Baetis rhodani*	44
		Insecta	Ephemereptera	Caenidae	*Caenis*	68
		Insecta	Ephemereptera	Heptageniidae	*Ecdyonurus macani*	7
		Insecta	Ephemeroptera	Heptageniidae	*Heptagenia sulphurea*	2

	River	Class	Order	Family	Genus/Species	Ind
		Insecta	Diptera	Chironomidae	*Chironomus (Chironomus)*	7
		Insecta	Diptera	Simuliidae	Simuliinae	18
		Annelida	Oligochaeta	Lumbricidae	*Lumbricus*	1
		Insecta	Trichoptera	Hydropsychidae	*Hydropsyche fulvipes/instabilis*	146
8	Kura-Yevlakh SW 008	Insecta	Odonata	Gomphidae	*Gomphus*	3
		Insecta	Diptera	Chironomidae	*Chironomus (Chironomus)*	3
		Crustacea	Decapoda	Gammaridae	*Gammarus*	49
		Crustacea	Decapoda	Palaemonidae	*Palaemon*	5
		Crustacea	Decapoda	Gammaridae	*Paramysis lacustris*	9
		Mollusca	Gastropoda	Bithynidae	*Bithynia tentaculata*	11
		Annelida	Oligochaeta	Lumbricidae	*Lumbricus*	18
		Annelida	Oligochaeta	Tubificidae	*Tubifex*	1
11	Kura-Sabirabad SW 010	Insecta	Trichoptera	Hydropsychidae	*Hydropsyche fulvipes/instabilis*	1
		Crustacea	Decapoda	Gammaridae	*Paramysis lacustris*	18
		Annelida	Oligochaeta	Lumbricidae	*Lumbricus*	2
		Annelida	Oligochaeta	Tubificidae	*Limnodrilus hoffmeisteri*	1
12	Aras- Saatly SW 11	Insecta	Diptera	Chironomidae	*Chironomus*	2
		Crustacea	Decapoda	Gammaridae	*Gammarus*	25
		Crustacea	Amphipoda	Corophiidae	*Corophium robustum*	23
13	Kura- Surra SW 012	Insecta	Trichoptera	Hydropsychidae	*Hydropsyche fulvipes/instabilis*	5
		İnsecta	Odonata	Gomphidae	*Gomphus*	5
		Insecta	Diptera	Empididae	*Clinocera nigra*	2
		Insecta	Ephemeroptera	Heptageniidae	*Ecdyonurus macani*	5
		Insecta	Ephemeroptera	Heptageniidae	*Epeorus*	2
		Crustacea	Decapoda	Gammaridae	*Gammarus*	12
		Crustacea	Decapoda	Gammaridae	*Paramysis lacustris*	76
		Annelida	Oligochaeta	Lumbricidae	*Lumbricus*	2
		Annelida	Oligochaeta	Lumbricidae	*Lumbricus variegatus*	7
14	Kura-Shirvan SW 013	Insecta	Trichoptera	Hydropsychidae	*Hydropsyche fulvipes/instabilis*	2
		Insecta	Ephemeroptera	Heptageniidae	*Ecdyonurus macani*	1
		Crustacea	Decapoda	Gammaridae	*Paramysis lacustris*	30
15	Kura-Salyan SW 014	No macroinvertebrates in the sample due to flooding				
16	Kura Neftchala SW 015	No macroinvertebrates in the sample due to flooding				
17	Kurakchay Chaykand	Insecta	Trichoptera	Hydropsychidae	*Hydropsyche siltalai*	5
		Insecta	Odonata	Lestidae	*Lestes sponsa*	1
		Insecta	Ephemeroptera	Baetidae	*Baetis alpinus*	6
		Insecta	Ephemeroptera	Heptageniidae	*Epeorus*	2
		Insecta	Ephemeroptera	Ephemeridae	*Ephemera*	1
		Insecta	Diptera	Chironomidae	*Chironomus (Chironomus)*	18
		Insecta	Diptera	Simuliidae	Simuliinae	2
		Insecta	Diptera	Empididae	*Clinoceranigra*	8
		Insecta	Diptera	Athericidae	*Atherix ibis*	1
		Annelida	Oligochaeta	Lumbricidae	*Lumbriculus variegatus*	1

These taxa were then used to determine the biological status using the Ecological Status Classification System1 (ESCS) based on benthic invertebrates developed during the EUWI+ project. Table 7 lists the results of the biological status and compares it to the results of 2022.

Table 8: Results of Ecological Status

River	WB	Site	Site-Nr	HMWB	Risk	Significant Pressure	Latitude	Longitude	Biological Status
Kura	Kur011-1-WB002	Shikhli	SW001	No	R	Urban, agricultural and transboundary impacts	45.700	41.180	5
Ganjachay	Kur011-3-WB005	Downstream	SW002	No	R	Urban and agricultural impacts	46.250	40.420	-
Balakanchay	Gan107-2-WB043	Balakan city	SW003	No	Nr	Urban and agricultural impacts			3
Talachay	Gan1051-2-WB036	Zagatala city	SW004	No	R	Urban and agricultural impacts	46.644598	41.624249	5
Talachay	Gan1051-2-WB035	Zagatala (right bank of the river)	SW04.1	Yes	R	Urban and agricultural impacts	46.6445980	41.6242490	2
Ayrichay	Gan101-5-WB017	After reservoir	SW005	Yes	R	Agricultural impacts	46.909364	41.238499	4
Ganikh(Alazan)	Gan10-3-WB023	Before reservoir	SW006	No	PR	Urban and agricultural impacts			3
Alijanchay	Kur013-4-WB021	Khaldan	SW007	Yes	R	Urban and agricultural impacts	47.2140480	40.719201	3
Kura	Kur014-2-WB025	Yevlakh city	SW008	No	R	Urban and agricultural impacts	47.1681540	40.5940840	4
Karasu	Gan104-4-WB032	Zardab	SW009	Yes	R	Urban and agricultural impacts	47.42113	40.13311	-
Kura	Kur0152-2-WB035	Sabirabad	SW010	No	R	Urban and agricultural impacts	48.26135	40.01069	5
Aras	Kur0152-2-WB036	Saatly	SW011	No	R	Urban and agricultural impacts	48.26216	40.00260	5
Kura	Kur015-4-WB037	Surra	SW012	No	R	Urban and agricultural impacts	48.31513	40.04108	3
Kura	Kur016-1-WB038	Shirvan	SW013	No	R	Urban and agricultural impacts	48.53073	39.56590	4
Kura	Kur016-1-WB039	Salyan	SW014	No	R	Urban and agricultural impacts	48.59118	39.36246	-
Kura	Kur016-1-WB040	Neftchala	SW015	No	R	Urban and agricultural impacts	49.14526	39.2357	-
Kurakchay		Chaykand	*)	Yes	PR		46.311537	40.423769	2

*) additional sampling site selected during the field campaign

3. Discussion of results

Continuous monitoring is important in studying environmental changes. The results of continuous monitoring carried out for many years provide a basis for evaluating the ecological status of environmental objects. By assessing the status of surface water, it is possible to implement protection and restoration measures.

Due to flooding before monitoring, it may affect the quality indicators of the analyses.

Down below we discuss the **results** at each site:

SW001 Kura Shikhli
Bad biological status and only 1 taxa was found. This result does not match the chemical data. Physico-chemical analysis indicate good level. Only 1 taxa was found in 2022 too but physico-chemical analysis indicate lower levels of pollution.

SW002 Ganjachay Downstream
No macroinvertebrates were found, probably due to flooding prior to the sampling campaign. Chemical indicators also indicate pollution in the river. In 2022, the biological status was high, and the chemical indicator was at a low level of pollution

SW003 Balakan Balakanchay, SW006 Ganikh (Alazan) mouth
Both sites were classified as moderate based on biological data, whereas the physico-chemical analysis indicates good level.

SW004 Zagatala Talachay
Bad biological status but physico-chemical analysis indicates good level.

SW04.1 Zagatala right side
Biological status and physico-chemical analysis indicate good level.

SW005 Ayrichay below reservoir
Biological status and physico-chemical analysis indicate low lewel.

SW007 Alijanchay, SW012 Kura Surra
Both of them indicate moderate biological status,but the chemical analisys indicate level of pollution.

SW010 Kura Sabirabad, SW011 Aras Saatly
Both sites were classified as bad based on biological data. Looking at the physico-chemical analysis at this site, the results suggest a significant level of pollution.

SW008 Kura Yevlakh
Moderate biological status, the physico-chemical analisys indicate also low level of pollution.

SW009 Kura Zardab, SW014 Kura Salyan, SW015 Kura Neftchala
No macroinvertebrates were found in the sample. Chemical analysis indicates low level pollution.

SW013 Kura Shirvan
Although the biological status shows a deviation from good status, the physico-chemical indicator pollution is classified good.

Kurakchay

It was the first time that research was conducted in this river. Biological status and chemical analysis results were evaluated as good.

Generally, the biological and the physico-chemical data indicated comparable levels of pollution, but in several cases the results did not comply. It is possible that other impacts than physio-chemical stressor affects the biological community. Besides, the class boundaries of physico-chemical and/or biological assessment may be too strict or too relaxed and need to be adjusted.

4. Next steps and Lessons learned

In May 2023, water quality indicators were monitored in the downstream of the main water bodies of the country.

Future monitoring:

Monitoring of transboundary rivers with the Republic of Georgia is planned in October. The goal is to assess the quality indicators of water in the rivers, the ecological status of water resources and to study the additional effects.

During the monitoring conducted in May 2023, biological, chemical and hydromorphological studies were conducted. In order to assess the ecological status of river waters according to the European Water Framework Directive

The basis of the classification of surface water bodies are the Biological Quality Elements (BQE) consisting of fish, macroinvertebrates, phytobenthos, phytoplankton, and macrophytes, while physico-chemistry and hydromorphology act as supporting elements.

Proposal of quality elements:

- Biology
    - Macroinvertebrates (all rivers)
    - Phytobenthos (in small rivers, and were suitable habitat is available)
    - Phytoplankton (in very large rivers and lakes/reservoirs only)
    - Fish and macrophytes will be classified by expert judgment or by using local information (fishermen). If no information is available, these BQE will be included in a later phase. The same is true for macroinvertebrates and phytobenthos in lakes.
- Supporting elements
    - General physico-chemical parameters (all rivers and lakes)
    - Hydromorphology (based on a general classification of the river network)

Not all BQE can be covered at the moment by national means. AzelabLLC would like to add phyto-benthos analysis to their expertise in the coming months. During this campaign, diatom samples were taken as a first step but not analysed under the microscope. Further trainings of local experts on this BQE are needed.

For future reports it is recommended to include class boundaries and classification results for the physico-chemical data to allow a better comparison between BQE status assessment and water quality parameters.

5. Annexes

Annex 1: AQEM field protocols (as scans)

Annex 2: Protocol for diatom sampling

Annex 3: Chemical data summary

Annex 4: Biological data summary

Annex 5: Metadata

Annexes are available as separate documents

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