EU4Environment in Eastern Partner Countries:
Water Resources and Environmental Data (ENI/2021/425-550)

SURFACE WATER SURVEY AZERBAIJAN 2022

Contract-No:
20940-C1/AZ-AzeLabLLC-2022/1

Funded by the European Union

EU4Environment
Water and Data in Eastern Partner Countries

SURFACE WATER SURVEY AZERBAIJAN 2022

Contract-No: 20940-C1/AZ-AzeLabLLC-2022/1

Funded by the European Union

EU4Environment
Water and Data in Eastern Partner Countries

EU4Environment in Eastern Partner Countries:
Water Resources and Environmental Data (ENI/2021/425-550)

ABOUT THIS REPORT

AUTHORS(S)

Beneficiaries

AzeLab LLC (AZ)

Authors

Ramina Abdullayeva AzeLab LLC Director

Gunel Gurbanova, AzeLab LLCchief biologist

Gulnara Abbasova, NHS, center director

Vafadar İsmayilov NHS,center director

Rafig Verdiyev, EU4WD country representative in Azerbaijan (AZ)

Daniel Trauner, Umweltbundesamt GmbH (AT)

Responsible EU member state consortium project leader

Alexander Zinke, Umweltbundesamt GmbH (AT)

EUWI+ country representative in Azerbaijan

Rafig Verdiyev (AZ)

Responsible international thematic lead expert

Daniel Trauner, Umweltbundesamt GmbH (AT)

DISCLAIMER

IMPRINT

Owner and Editor: EU4Environment-Water and Data Consortium

Umweltbundesamt GmbH	Office International de l'Eau (IOW)
Spittelauer Lände 5	21/23 rue de Madrid
1090 Vienna, Austria	75008 Paris, FRANCE

November 2023

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

LIST OF TABLES

LIST OF FIGURES

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 concerns a surface water survey at a total of 15 river sites in the catchment of the Upper-Kura river in Azerbaijan, conducted during October 2022. The involved institutions were the Hydrometrological Service of Azerbaijan, 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 status assessment based on the biological quality element of benthic invertebrates. At two sites the biological data indicated a high status and four further sites showed good status. Seven sites failed to reach the good biological status, with six of those being classified with moderate status and one as having bad status. At the two remaining sites, no water could be found and sampling was not possible.

Overall, some of the results confirm the risk analysis done previously for this area, while others show an improvement of status compared to previous investigations. However, some of the biological and chemical results do not indicate the same level of pressures and further future investigations will be necessary to increase the validity of the results.

This survey was a successful undertaking to repeat and increase expertise of surface water sampling and analyses in an effort to come closer to monitoring compliant with the European Water Framework Directive.

1. Introduction and Scope

The objective of this survey in autumn 2022 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 . In the last 3 years due to the Covid 19 pandemic, there has been no fundamental monitoring of issues such as the reduction of water capacity, salinization, and pollution in the Kura River, which is the main water source for the Azerbaijan Republic. Considering these issues, it was decided to monitor the rivers of the Lesser Caucasus flowing into the Kura River. 15 sampling sites were identified.

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

Country	Azerbaijan
River basin	Kura
Campaign [1)]	Autumn, October2022
Objective	
Quality elements	Biological quality components: • Macrozoobenthos Supporting elements: • Hydro-morphological site description • General physico-chemical quality elements
Preparation of field work	10.10.2022-16.10.2022
Field work	17.10.2022-22.10.2022
Chemical analyses	18.10.2022 –28.10.2022
Biological analyses	24.10.2022 – 25.12.2022

1.1. Selected river basins and sampling sites

Table 2: List of sampling sites

River basin	River	WB	River type	Site	Site-Nr	HMWB [1)]	Risk [2)]	Significant Pressure [3)]	Latitude [4)]	Longitude [4)]
Kura	Kura	Kur01-1-WB001	1	After reservior	SW001	No	R	Site water quality includes urban and agricultural impacts	41°18'53.14"	45° 7'41.68"
	Ganjachay	Kur011-1-WB002	6	Zurnabad	SW002	No	NR		40°29'41.6"	46°14'24.2"
	Ganjachay	Kur011-3-WB005	2	Zurnabad downstream	SW003	No	R	Site water quality includes urban and agricultural impacts	40°52'59"	46°25'76"
	Ganjachay	Kur011-4-WB006	2	Silk Way (under the bridge)	SW004	Yes	R	Site water quality includes urban and agricultural impacts	40°60'83"	46°31'77"
	Ganjachay	Kur011-5-WB008	2	Ganjachay downstream	SW005	Yes	R	Site water quality includes urban, industrial wastewater and agricultural impacts	40°42'36.8"	46°24'56.9"
	Qoshqarchay	Kur012-6-WB011	6	Khoshbulag	SW006	No	NR		40°44'03"	46°03'95"
	Qoshqarchay	Kur012-6-WB014	1	Befor Kura river	SW007	No	R	Site water quality includes urban, industrial wastewater and agricultural impacts	40°54'41"	46°17'44"
	Shamkirchay	Kur013-4-WB021	6	Upstream Shamkir reservior	SW008	No	R	Site water quality includes agricultural impacts	40°37'40.49"	45°59'44.07"
	Zayamchay	Kur014-2-WB025	5	Zayamchay upstream	SW009	No	NR		40°43'59"	45°39'47"
	Zayamchay	Kur014-2-WB028	2	Zayamchay downstream	SW010	Yes	R	there was no water	40°52'33.5"	45°45'34.4"
	Asrikchay	Kur0152-2-WB035	2	Asrikchay upstream	SW011	No	NR		40°43'29"	45°33'48"

	Asrikchay	Kur0152-2-WB036	2	Asrikchaydownstream	SW012	Yes	R	there was no water	40°57'59"	45°40'25"
	Tovuzchay	Kur015-4-WB037	2	Tovuzchay near the border	SW013	Yes	R	Site water quality includes urban, agricultural and transboundary impacts	40°56'51.6"	45°34'50.1"
	Akstafachay	Kur016-1-WB039	2	Akstafachaydownstream	SW014	Yes	R	Site water quality includes urban and agricultura impacts	41°11'24"	45°26'28"
	Kura	Kur01-5-WB045	1	Kazakh Shikli-2	SW015	Yes	R	Site water quality includes urban, agricultural and transboundary impacts	41°31'47"	45°12'82"

[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 = multistressor, 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)

Figure 1: Map of sampling sites

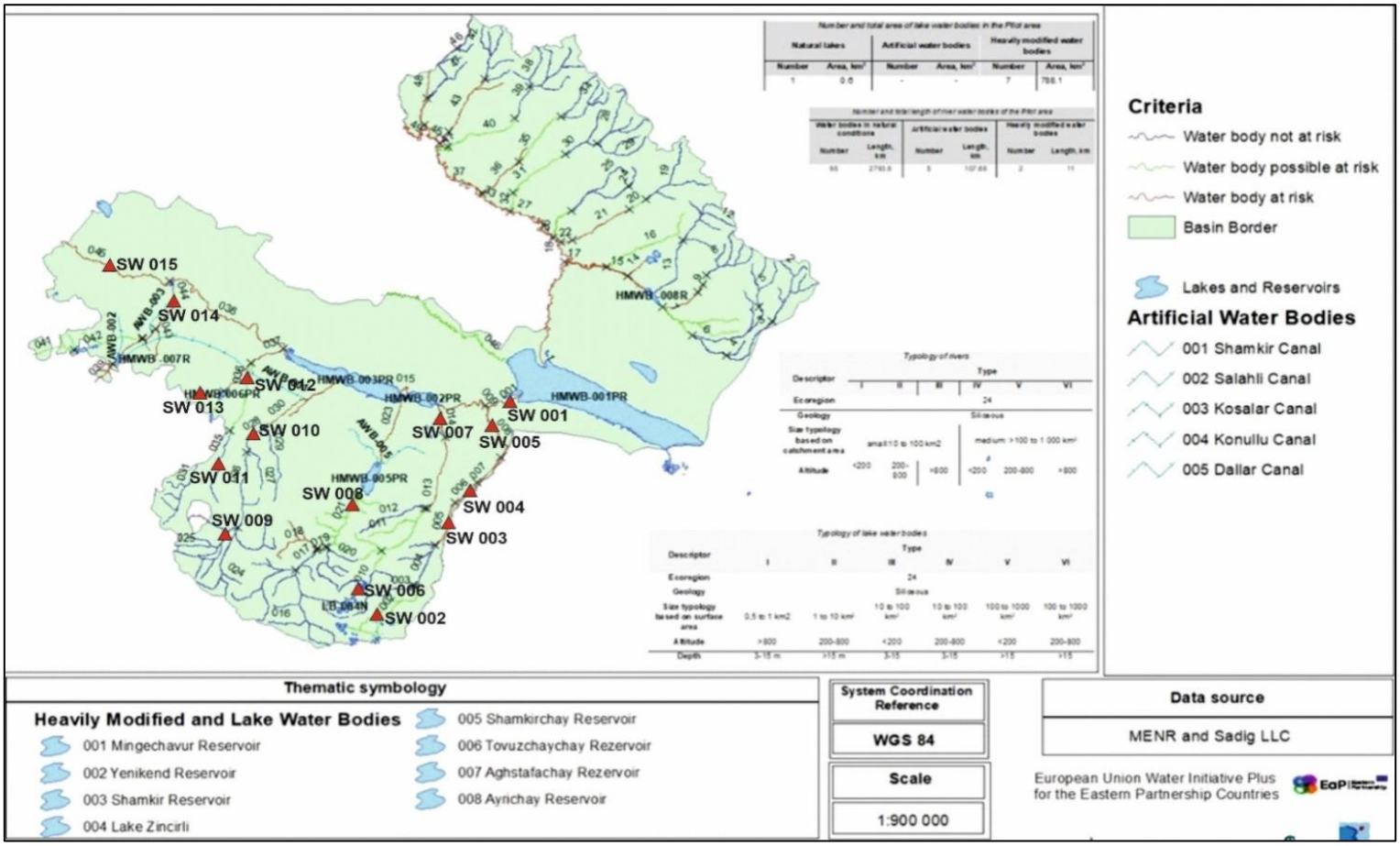

Table 3: Time, meteorology, hydrology

Sampling date	Sampling point	Code	Hydrology	Meteorology
17.10.2022	Kuraafter reservior	SW001	Discharge: 150 m3/s Width: 200 m	t-16^{0}C
18.10.2022	Ganjachay Zurnabad-up	SW002	Discharge: 2.5 m3/s Width: 5 m	t-15 ^{0}C, rainy weather conditions
	Ganjachay Zurnabad downstream	SW003	Discharge: 1.1 m3/s Width: 2.5 m	t-15^{0}C
	Ganjachay Silk Way	SW004	Discharge: 0.7 m3/s Width: 3.5 m	t-13^{0}C
19.10.2022	Ganjachay downstream	SW005	Discharge: 0.5 m3/s Width: 3 m	t-16^{0}C
	Qoshqarchayup Khoshbulag	SW006	Discharge: 0.3 m3/s Width: 1.5 m	t- 16 ^{0}C
	Qoshqarchay downstream	SW007	Discharge: 0.4 m3/s Width:2 m	t-14^{0}C
20.10.2022	Upstream Shamkir reservior	SW008	Discharge:1.1 m3/s Width:3m	t-17^{0}C
	Zayamchay upstream	SW009	Discharge:2.3 m3/s Width:5 m	t-16.5^{0}C
	Zayamchay downstream	SW010	Discharge: Width:	
21.10.2022	Asrikchay upstream	SW011	Discharge: 0.6 m3/s Width: 3m	t-170°C
	Asrikchay downstream	SW012	Discharge: Width:	
	Tovuzchay	SW013	Discharge: 0.84 m3/s Width: 4 m	170C
22.10.2022	Akstafachay	SW014	Discharge: 0.9 m3/s Width: 4 m	t-160C
	Kura	SW015	Discharge: 250 m3/san Width: 400 m	t-180C

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. 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. This was mainly a sampling exercise, as diatom expertise is being developed in Azelab LLC during this project. 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 analyses		
The smell		ISO 4121
Color		ISO 7887
The blur	FTU (NTU)	ISO 7027
Temperature	°C	ISO 7027
Hydrogen indicator, pH	-	ISO 10523
Electrical conductivity	µCm /cm	ISO 7888
Oxygen	mg/l	ISO 814
Oxygen saturation (O_2-Sat)	%	ISO 5814
Biological Oxygen Demand (BOD_5)	mg/l	ISO 5815

Parameter	Unit	Standard
Chemical Oxygen Demand (COD)	mg/l	ISO 6060
Chloride ion, Cl^-	mg/l	ISO 9297
Sulfate ion, SO_4^{2-}	mg/l	ISO 9280
Calcium ion, Ca	mg/l	ISO 11885
Magnesium ion, Mg	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 analyzed under both field and laboratory conditions. Other parameters were analyzed in the chemical laboratory between 18.10.2022 and 28.10 2022

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 the final report.

Table 5: Responsibilities during the SW Survey 2022

Responsibilities	Institution, contact person, email-address
General	
Responsible for the organisation of surface water body sampling	Institute: Contact person: Ramina Abdullayeva 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:Gulnara Abbasova, E-Mail: gulnara_abbasova1980@mail.ru Biology: Gunel Gurbanova, E-Mail: gunel-qurbanova-90@mail.ru Hydromorphology: Vafadar Ismayilov, E-Mail: is_vafadar@mail.ru
Responsible for functional check of sampling equipment	Institute: National Hydrometeorological Service Contact person: Gulnara Abbasova E-Mail: gulnara_abbasova1980@mail.ru
Responsible for calibration of on-site measuring equipment	Institute: National Hydrometeorological Service Contact person: Gulnara AbbasovaE-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: Ramina Abdullayeva 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: Ramina Abdullayeva E-Mail: abdullayevaramina@gmail.com
Biological analysis	
Overall responsible for the biological analysis in the lab, including reporting and data delivery	Institute: AzeLab LLC Contact person: Gunel Gurbanova E-Mail: gunel-qurbanova-90@mail.ru

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 analyzes conducted on water samples taken from Kura basin rivers on 17-22.10.2022

No	Parameter	Unit of measurement	Values at sites			
			Kur Yenikend SW001	Ganjachay Zurnabad SW 002	Ganjachay Zurnabad flow down SW003	Goshgarchay Khoshbulaq SW006
1	Smell, organoleptic meth.	–	Odorless			
2	Color, organoleptic meth.	–	Colorless			
3	Turbidity		6.35	1.79	2.90	18.6
4	Temperature	ºC	20.4	11.3	16.2	13.3
5	Hydrogen indicator, pH	–	7.81	7.94	7.90	8.14
6	Electrical conductivity	µCm /cm	516	281	704	180.8
7	Oxygen	mg/l	7.1	6.9	7.9	6.8
8	Oxygen saturation	O_2 - Sat%	78.0	75.0	84.0	74.0
9	Biological Oxygen Demand (BOD_5)	mgO/l	8.5	11.5	8.2	8.6
10	Chemical Oxygen Demand (COD)	mgO/l	10.6	14.4	10.2	10.7
11	Chloride ion, Cl^-	mg/l	24.1	3.5	12.8	4.25
13	Sulfate ion, SO_4^{2-}	mg/l	95.85	15.15	132.52	4.3
14	Calcium ion, Ca	mg/l	54.2	36.5	79.1	22.6
16	Magnesium ion, Mg	mg/l	15.4	8.98	20.2	9.5
17	Sodium, Na	mg/l	26.2	6.08	29.4	4.56
19	Potassium, K	mg/l	3.05	0.986	2.64	1.53
20	Orthophosphate ion, PO_4^{3-}	mg/l	0.05	0.03	0.02	0.03
21	Ammonium ion, NH_4^+	mg/l	0	0	0	0
22	Nitrate ion, NO_3^-	mg/l	2.33	4.68	5.84	2.48
23	Suspended solids	mg/l	1.0	2.0	2.0	3.0

2.3. Biological results

Biological analyzes revealed 8 taxonomic groups: Ephemereptera, Trichoptera, Coleptera, Plecoptera, Decapoda, Gastropoda, Diptera, Odonata, Hirudinea. The groups with the highest species diversity were Ephemereptera and Diptera. Macroinvertebrates have been detected by region in the table below.At two

sites(Zayamchay-down SW 010, Asrikchay downSW 012),biological and chemical samples were not taken because there was no water present.

Table 6 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	Insecta	Decapoda	Crangonidae	Crangon	23
2	Ganjachay-Zurnabad-up SW 002	Insecta	Ephemereptera	Heptageniidae	Ecdyonurus macani	14
		Insecta	Ephemereptera	Heptageniidae	Heptagenia sulphurea	27
		Insecta	Ephemereptera	Baetidae	Baetis rhodani	194
		Insecta	Trichoptera	Rhyacophilidae	Rhyacophila hirticornis	6
		Insecta	Trichoptera	Hydropsychidae	Hydropsyche fulvipes/instabilis	112
		Insecta	Coleptera	Elmidae	Elmis	1
		Insecta	Coleptera	Haliplidae	Brychius	2
		Insecta	Diptera	Ephydrinae	Setacera trina	3
		Insecta	Diptera	Simuliidae	Simuliinae	4
		Insecta	Diptera	Limoniidae	Hexatoma	9
		Insecta	Diptera	Chironomidae	Chironomus (Chironomus)	5
		Insecta	Diptera	Tipulidae	Prionocera	9
		Insecta	Plecoptera	Perlodidae	Isoperla	15
3	Ganchay-Zurnabad-down SW 003	Insecta	Odonata	Gomphidae	Gomphus	2
		Insecta	Ephemereptera	Baetidae	Baetis rhodani	2
		Insecta	Ephemereptera	Baetidae	Baetis alpinus/lutheri	4
		Insecta	Plecoptera	Perlodidae	Isoperla	9
		Insecta	Diptera	Limoniidae	Eloeophila	1
		Insecta	Diptera	Tabanidae	Tabanus	7
		Insecta	Diptera	Chironomidae	Chironomus (Chironomus)	21
		Insecta	Odonata	Gomphidae	Gomphus	2
4	Ganjachay-silkway SW 004	Insecta	Diptera	Chironomidae	Chironomus	3
		Insecta	Ephemereptera	Baetidae	Baetis rhodani	2
		Insecta	Ephemereptera	Baetidae	Baetis alpinus/lutheri	19
		Insecta	Ephemereptera	Caenidae	Ecdyonurus macani/torrentis	38
		Insecta	Trichoptera	Hydropsychidae	Hydropsyche fulvipes/instabilis	13
		Insecta	Diptera	Similidae	Simulium maculatum	3
		Insecta	Coleptera	Haliplidae	Brychius	2
5	Ganjachay-downstream SW 005	Insecta	Ephemereptera	Ephemeridae	Ephemera vulgata	1
		Insecta	Ephemereptera	Baetidae	Baetis rhodani	60
		Insecta	Ephemereptera	Baetidae	Baetis alpinus/lutheri	27
		Insecta	Ephemereptera	Caenidae	Ecdyonurus macani/torrentis	5
		Insecta	Ephemereptera	Baetidae	Baetis	9
		Annelida	Hirudinea	Erpobdellidae	Erpobdella	1
		Insecta	Trichoptera	Hydropsychidae	Hydropsyhe	207
		Insecta	Diptera	Chironomidae	Chironomus (Chironomus)	21
		Insecta	Diptera	Simuliidae	Simuliinae	9
		Insecta	Diptera	Tipulidae	Tipula	3
		Insecta	Diptera	Limoniidae	Hexatoma	2
		Insecta	Odonata	Gomphidae	Gomphus	10
		Insecta	Odonata	Lestidae	Austrolestes annulosus	4
6	Qoshqarchay-Khoshbulaq	Insecta	Ephemereptera	Baetidae	Baetis niger	52
		Insecta	Ephemereptera	Insecta	Baetis rhodani	37

	SW 006	Insecta	Ephemereptera	Baetidae	Baetis alpinus/lutheri	48
		Insecta	Ephemeroptera	Caenidae	Caenis macrura	23
		Insecta	Ephemeroptera	Heptageniidae	Ecdyonurus macani	51
		Insecta	Coleoptera	Haliplidae	Haliplus (Haliplus)	43
		Insecta	Coleoptera	Gyrinidae	Gyrinus	2
		Insecta	Diptera	Chironomidae	Chironomus (Chironomus)	15
		Insecta	Diptera	Tabanidae	Tabanus	2
		Insecta	Diptera	Pediciidae	Dicranota	1
		Insecta	Diptera	Simuliidae	Simuliinae	238
		Insecta	Diptera	Limoniidae	Hexatoma	3
		Insecta	Coleoptera	Haliplidae	Haliplus (Haliplus)	65
		Insecta	Trichoptera	Hydropsychidae	Hydropsyche fulvipes/instabilis	43
		Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	1
		Insecta	Coleoptera	Dytiscidae	Stictotarsus procerus	6
7	Qoshqarchay-down SW 007	Insecta	Ephemereptera	Insecta	Baetis rhodani	14
		Insecta	Ephemeroptera	Heptageniidae	Ecdyonurus macani	3
		Insecta	Diptera	Chironomidae	Chironomus (Chironomus)	5
		Insecta	Diptera	Simuliidae	Simuliinae	23
		Insecta	Diptera	Empididae	Clinocera nigra	3
		Insecta	Coleoptera	Dryopidae	Dryops	1
		Insecta	Trichoptera	Hydropsychidae	Hydropsyche fulvipes/instabilis	61
		Insecta	Coleoptera	Dryopidae	Dryops	1
8	Shamkir river (above the reservoir) SW 008	Insecta	Coleoptera	Elmidae	Limnius	13
		Insecta	Trichoptera	Hydropsychidae	Hydropsyche fulvipes/instabilis	103
		Insecta	Odonata	Gomphidae	Gomphus	4
		Insecta	Ephemereptera	Insecta	Baetis rhodani	27
		Insecta	Ephemereptera	Baetidae	Baetis alpinus/lutheri	38
		Insecta	Diptera	Chironomidae	Chironomus (Chironomus)	25
		Insecta	Diptera	Simuliidae	Simuliinae	3
		Insecta	Diptera	Tabanidae	Tabanus	5
9	Zayamchay-up SW 009	Insecta	Ephemeroptera	Heptageniidae	Ecdyonurus macani	8
		Insecta	Ephemereptera	Baetidae	Baetis rhodani	25
		Insecta	Ephemeroptera	Caenidae	Caenis macrura	24
		Insecta	Diptera	Tabanidae	Tabanus	27
		Insecta	Diptera	Chironomidae	Chironomus (Chironomus)	13
		Insecta	Diptera	Chironomidae	Diamesini	1
		Insecta	Trichoptera	Hydropsychidae	Hydropsyche fulvipes/instabilis	103
		Insecta	Odonata	Gomphidae	Gomphus	21
		Crustacea	Decapoda	Potamidae	Potamon potamios	1
10	Zayamchay-down SW 010	No water				
11	Asrikchay-up SW 011	Insecta	Ephemereptera	Baetidae	Baetis niger	78
		Insecta	Ephemereptera	Baetidae	Baetis rhodani	112
		Insecta	Ephemereptera	Baetidae	Baetis alpinus/lutheri	192
		Insecta	Ephemeroptera	Caenidae	Caenis macrura	62
		Insecta	Ephemeroptera	Heptageniidae	Ecdyonurus macani	25
		Insecta	Diptera	Chironomidae	Chironomus (Chironomus)	2
		Insecta	Diptera	Tabanidae	Tabanus	1

		Insecta	Diptera	Simuliidae	Simuliinae	44
		Insecta	Diptera	Stratiomyidae	Odontomyia	3
		Insecta	Trichoptera	Hydropsychidae	Hydropsyche fulvipes/instabilis	9
12	Asrikchay downSW 012	No water				
13	Tovuhaychay near the borderSW 013	Insecta	Diptera	Chironomidae	Chironomus (Chironomus)	22
		İnsecta	Diptera	Similidae	Simulium maculatum	14
		Insecta	Diptera	Tipulidae	Tipula	1
		Insecta	Diptera	Empididae	Chelifera	2
		Insecta	Diptera	Muscidae	Limnophora	17
		Insecta	Diptera	Empididae	Clinocera nigra	6
		Insecta	Ephemereptera	Insecta	Baetis rhodani	7
		Insecta	Ephemereptera	Baetidae	Baetis alpinus/lutheri	10
		Insecta	Trichoptera	Hydropsychidae	Hydropsyche fulvipes/instabilis	24
		Insecta	Odonata	Coenagrionidae	Coenagrion puella	2
14	Akstafachay downstream SW 014	Insecta	Trichoptera	Hydropsychidae	Hydropsyche fulvipes/instabilis	3
		Insecta	Odonata	Gomphidae	Gomphus	2
		Insecta	Odonata	Lestidae	Chalcolestes viridis	19
		Insecta	Ephemereptera	Baetidae	Baetis rhodani	38
		Insecta	Diptera	Chironomidae	Chironomus (Chironomus)	13
		İnsecta	Diptera	Similidae	Simulium maculatum	3
		Insecta	Diptera	Tabanidae	Tabanus	2
		Mollusca	Gastropoda	Bithyniidae	Bithynia	4
15	KuraShikli-2 SW 015	Insecta	Ephemereptera	Baetidae	Baetis niger	16
		Insecta	Ephemereptera	Insecta	Baetis rhodani	31
		Insecta	Ephemereptera	Baetidae	Baetis alpinus/lutheri	53
		Insecta	Ephemeroptera	Heptageniidae	Ecdyonurus macani	8
		Insecta	Coleoptera	Elmidae	Limnius	4
		Insecta	Diptera	Chironomidae	Chironomus (Chironomus)	48
		Insecta	Diptera	Simuliidae	Simuliinae	33
		Insecta	Diptera	Stratiomyidae	Odontomyia	1
		Insecta	Trichoptera	Hydropsychidae	Hydropsyche fulvipes/instabilis	5
		Insecta	Odonata	Gomphidae	Gomphus	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 2020.The only 5 of the 15 sites of this survey were previously classified based on biological data, while the assessment of the other ten sites was based on the risk analysis. Therefore, the confidence of the values was increased.

Table 8: Results of Ecological Status

River	WB	Site	Site-Nr	HMWB	Risk	Significant Pressure	Latitude	Longitude	Biological Status 2022	Biological Status 2020	Confidence 2020*
Kura	Kur01-1-WB001	After reservoir	SW001	No	R	urban and agricultural impacts	41°18'53.14"	45° 7'41.68"	5	3-5	C
Ganjachay	Kur011-1-WB002	Zurnabad	SW002	No	NR		40°29'41.6"	46°14'24.2"	1	2-3	C
Ganjachay	Kur011-3-WB005	Zurnabad downstream	SW003	No	R	urban and agricultural impacts	40°52'59"	46°25'76"	3	3	A
Ganjachay	Kur011-4-WB006	Silk Way (under the bridge)	SW004	Yes	R	urban and agricultural impacts	40°60'83"	46°31'77"	3	3-5	C
Ganjachay	Kur011-5-WB008	Ganjachay downstream	SW005	Yes	R	urban, industrial wastewater and agricultural impacts	40°42'36.8"	46°24'56.9"	1	3-5	C
Qoshqarchay	Kur012-6-WB011	Khoshbulag	SW006	No	NR		40°44'03"	46°03'95"	2	3	A
Qoshqarchay	Kur012-6-WB014	Before Kura river	SW007	No	R	urban, industrial wastewater and agricultural impacts	40°54'41"	46°17'44"	3	3-5	C
Shamkirchay	Kur013-4-WB021	Upstream Shamkir reservior	SW008	No	R	agricultural impacts	40°37'40.49"	45°59'44.07"	3	2-3	C
Zayamchay	Kur014-2-WB025	Zayamchay upstream	SW009	No	NR		40°43'59"	45°39'47"	2	1-2	C
Zayamchay	Kur014-2-WB028	Zayamchay downstream	SW010	Yes	R	there was no water	40°52'33.5"	45°45'34.4"	n.a.	3	A
Asrikchay	Kur0152-2-WB035	Asrikchay upstream	SW011	No	NR		40°43'29"	45°33'48"	2	1	A
Asrikchay	Kur0152-2-WB036	Asrikchaydownstream	SW012	Yes	R	there was no water	40°57'59"	45°40'25"	n.a.	2-3	C
Tovuzchay	Kur015-4-WB037	Tovuzchay near the border	SW013	Yes	R	urban, agricultural and transboundary impacts	40°56'51.6"	45°34'50.1"	3	3-5	C
Akstafachay	Kur016-1-WB039	Akstafachaydownstream	SW014	Yes	R	urban and agricultural impacts	41°11'24"	45°26'28"	3	3-5	C
Kura	Kur01-5-WB045	Kazakh Shikli-2	SW015	Yes	R	urban, agricultural and transboundary impacts	41°31'47"	45°12'82"	2	2	A

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 the Covid-19 pandemic, there has been no substantial monitoring of surface waters in the regions in the last 2 years. Construction works, anthropogenic activitesin the river basin, increasing population and global climate changes, are the most important factors that lead to a decrease in water levels of rivers. As a result of the monitoring conducted in November 2022, the mentioned above were also observed in the rivers of the Upper-Kurabasin.

Based on the results, we can say that 2-5 times highe rpollution levels wereobserved in the lower reaches of the rivers compared to the upper reaches. In the lower streams, the number of individuals species richness less than in higher reaches. The water in Zayamchay down and Asrikchay down has completely dried up. The green strip in the surrounding area dried.

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

SW001 Kura after reservoir
Bad biological status and only 1 taxa was found. This result does not match the chemical data. Physico-chemical analysis indicate lower levels of pollution. This makes the biological status questionable and it is recommended to repeat sampling at this location to confirm the result and investigate the reasons for failing the good ecological status at this site.

SW002 Ganjachay Zurnabad
Results show a high biological status. This means that this site is not at risk of failing the good biological status and the confidence level of this result could be increased compared to 2020, which was only based on risk analysis. Physioco-chemical analysis indicate low levels of pollution.

SW003 Ganjachay Zurnabad downstream, SW004 Ganjachay Silk Way, SW007 Qoshqarchay before Kura,SW013 Tovuzchay, SW014 Akstafachay
These sites all were classified as having moderate biological status. Compared to the results of 2020,either no change occurred, or the estimation of the risk analysis was confirmed. According to the physico-chemical analysis,SW013 and SW014 showed high levels of pollution.SW003,SW004,and SW007 before Kura were moderately polluted.

SW005 Ganjachay downstream
The biological status 2020 (based on risk analysis) classified this site as failing the good status (3-5).Surprisingly, the data collected during this survey showed a high biological status, not matching the risk analysis. Looking at the physico-chemical analysis at this site, the results suggest quite high levels of pollution and pressures at SW005. It is recommended to repeat sampling at this site during future campaigns to see if the results can be replicated.

SW006 Qoshqarchay Khoshbulag
In 2020, this site was classified as having moderate biological status. Data from the survey 2022 let us conclude that it increase to good (2) biological status. A welcome improvement. Physico-chemical analysis indicate low levels of pollution.

SW008 Shamkirchay upstream reservoir

The classification of 2020 (2-3)wasconfirmed asmoderate (3) biological status. Physico-chemical analysis indicate low levels of pollution. It would be interesting to investigate if other pressures and related chemical parameters are responsible for failing the good biological status.

SW009 Zayamchay upstream

The classification of 2020 (1-2) was confirmed as good (2) biological status. Physico-chemical analysis indicate low levels of pollution.

SW010 Zayamchay downstream, SW012 Asrikchaydownstream

As unfortunately no water was present at both sites, the classification of 2020 remains as the lates information (3 respectively 2-3). Especially at SW012 it is recommended to sample in the future, as no actual biological data has been collected from this water body so far. Physico-chemical analysis indicate low levels of pollution.

SW011 Asrikchay upstream

The biological status worsened from high (1) in 2020 to good (2) in 2022. Physico-chemical analysis indicate lower levels of pollution. It would be of interest to investigate if this change is connected to any new or increased pressures within the vicinity of the water body.

SW15 Kura Kazakh Shikli-2

No change of biological status was observed and the water body remained in good (2) biological status. Physico-chemical analysis indicate lower levels of pollution.

4. Next steps and Lessons learned

In some of the sites, the results of previous sampling and the risk analysis could be confirmed during this survey. This adds to the credibility of the findings.

In other situations, were the findings did not match (e.g. SW001, SW005) it is recommended to repeat sampling in the future to confirm the results.

As the study area of this survey has been covered during other campaigns previously, it is planned to extend the scope of the monitoring for 2023 to areas below the Kura reservoir.In the next monitoring plans, it is planned to study rivers that have not been studied so far. In the monitoring plan of 2023, it is planned to study the water quality indicators downstream of the main water bodies of the country and to expand the monitoring.Increased levels of agricultural pressures,water abstraction and the increasedsalinization that has occurred in the mouth of the Kura River in recent years urgent issues.

Future monitoring:

During the monitoring conducted in October 2022, biological, chemical and hydromorphological studies were conducted. In order to assess the ecological status of river waters according to the EuropeanWater 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. Azelab LLC, would like to add phytobenthos analysis to their expertise, in the coming years. Further trainings of local experts on this BQE are needed.

5. Annexes

Annex 1:AQEM field protocols (in Excel format)

Annex 2:Chemical field protocols

Annex 3: Hydro-morphological site description

Annex 4: Chemical data summary (in Excel format)

Annex 5: Protocol for sample handoverAnnex 6: Water quality norms

Annex 7: MHS protocols scanned

Annex 8: Protocol for diatom sampling

Annex 9: Biological data summary (in Excel format)

Annex 10: ESCS Results

Annex 11: Metadata

Annex 12: Photo documentation

Annexes are available as separate documents

Funded by the European Union

EU4Environment
Water and Data in Eastern Partner Countries

www.eu4waterdata.eu

Implementing partners

umweltbundesamt
ENVIRONMENT AGENCY AUSTRIA

Austrian Development Agency

OiEau International Office for Water

OECD
BETTER POLICIES FOR BETTER LIVES

UNECE

Co-funded by

With funding from
Austrian Development Cooperation

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

AGENCE DE L'EAU