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

LABORATORY TRAINING AND ACCREDITATION REPORT (ACTIVITIES 1.4.4 AND 1.4.5)

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ABOUT THIS REPORT

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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 programme is principally funded by the European Union and co-funded by 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

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List of abbreviations

ADA ..... Austrian Development Agency
BQE ..... Biological Quality Elements
DoA ..... Description of Action
DG NEAR ..... Directorate-General for Neighbourhood and Enlargement Negotiations of the European Commission
EaP ..... Eastern Partners
EC ..... European Commission
EECCA ..... Eastern Europe, the Caucasus and Central Asia
EMBLAS ..... Environmental Monitoring in the Black Sea
ESCS ..... Ecological Status Classification Systems
EU ..... European Union
EUWI+ ..... European Union Water Initiative Plus
EU4WD ..... EU4Environment in Eastern Partner Countries: Water Resources and Environmental Data
GEF ..... Global Environmental Fund
ICPDR ..... International Commission for the Protection of the Danube River
INBO ..... International Network of Basin Organisations
IOW/OIEau ..... International Office for Water, France
IWRM ..... Integrated Water Resources Management
NESB ..... National Executive Steering Board
NFP ..... National Focal Point
NGOs ..... Non-Governmental Organisations
NPD ..... National Policy Dialogue
OECD ..... Organisation for Economic Cooperation and Development
RBD ..... River Basin District
RBMP ..... River Basin Management Plan
Reps ..... Representatives (the local project staff in each country)
ROM ..... Result Oriented Monitoring
ToR ..... Terms of References
UBA ..... Umweltbundesamt GmbH, Environment Agency Austria
UNDP ..... United Nations Development Programme
UNECE ..... United Nations Economic Commission for Europe
WFD ..... Water Framework Directive

Country Specific Abbreviations Armenia

EMIC ..... Environmental Monitoring and Information Centre (until January 2020)

HMC..... Hydrogeological Monitoring Centre (since February 2020)

MNP..... Ministry of Nature Protection

SCWS..... State Committee on Water Systems

SWCIS..... State Water Cadastre Information System of Armenia

WRMA ..... Water Resources Management Agency

Country Specific Abbreviations Azerbaijan

Azersu JSC..... JSC Water Supply and Sanitation of Azerbaijan

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

WRSA ..... Water Resources State Agency of Ministry of Emergency Situations

Country Specific Abbreviations Georgia

MENRP..... Ministry of Environment and Natural Resources Protection

NEA ..... National Environment Agency

NWP..... National Water Partnership

Country Specific Abbreviations Moldova

AAM..... Agency “Apele Moldovei”

AGMR..... Agency for Geology and Mineral Resources

AMAC..... Association of Apacanals

ANRE..... National Agency for Economic Regulation of the Energy Sector (also regulates WSS)

EAM ..... Environment Agency Moldova

MoAgri..... Ministry of Agriculture (of the Republic of Moldova)

MoENV..... Ministry of Environment (of the Republic of Moldova)

Moldova..... Republic of Moldova

SHS..... State Hydrometeorological Service

Country Specific Abbreviations Ukraine

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

NAAU ..... National Accreditation Agency of Ukraine

SAWR ..... State Agency of Water Resources

SEMS..... State Environment Monitoring System

1. ACTIVITIES AND RESULTS

1.1. Capacity Building through method extension (*Activity 1.4.4*)

1.1.1. Purpose

In order to keep the level of environmental controls in water at the same level, a corresponding document was developed within the European Union. This is the European Water Framework Directive (WFD). Among other things, it describes the water bodies to be analysed and the corresponding parameters. This activity focussed on learning how to measure these chemical parameters in order to expand the scope of parameters in the partner countries laboratories.

This EU4WD work in 2022-2024 has built up on the substantial investments and capacity building provided already during the EUWI+ project (2016-2021). The partner laboratories were therefore again given the opportunity to take part in several method-training sessions, which were conducted by experienced trainers from the laboratory of the Environment Agency Austria, an ISO 17025 accredited body. The focus was placed on the 'organic' parameters that need to be analysed using gas chromatographic separation and mass selective detection (GC/MS).

1.1.2. Implementation

Due to the war in Ukraine, it was not possible to hold any training courses on site in this country. Therefore the methods training courses were held as regional training sessions in other EaP countries. Two employees from all partner laboratories were invited to each training session. As the focus was on the GC/MS methods, the employees who will also operate this device were specifically addressed.

In a pre-training mission in April 2023, all partner laboratories with the exception of Ukraine were visited to review and assess the status of the laboratories, e.g. are the GC/MS ready for use, in which laboratory could regional training sessions be held and are there sufficient trained staff available? Also the technical possibilities (available devices) in the countries were discussed. For example, VOCs can only be measured using a headspace module for GC/MS, which is not available in Armenia.

Overall, five regional training sessions were held with a total of six different methods and parameter groups. The methods and parameters are listed in the table below. Out of 44 parameters addressed, 36 are parameters from the WFD and eight complementary parameters could be easily added. Azerbaijan and Georgia each hosted the training twice and Moldova once.

Before the regional training sessions were held, the required or missing consumables were organised in advance on the basis of information from the relevant host laboratories, as far as possible.

METHOD	PARAMETER	TRAINING DATE	HOST
ISO 28540 – Water quality – Determination of 16 polycyclic aromatic hydrocarbons (PAH) in water – Method using gas chromatography with mass spectrometric detection (GC-MS)	Naphthalene, Acenaphthene, Acenaphthylene, Fluorene, Phenanthrene, Anthracene, Pyrene, Fluoranthene, Benzo[a]anthracene, Chrysene,	21.-24.11.2022 29.08.-01.09.2023	NEA, Tbilisi, Georgia NEA, Tbilisi, Georgia

	Benzo[k]fluoranthene, Benzo[b]fluoranthene, Benzo[a]pyrene, Dibenz[a,h]anthracene, Indeno[1,2,3-cd]pyrene, Benzo[g,h,i]perylene		
ISO 6468 – Water quality — Determination of certain organochlorine insecticides, polychlorinated biphenyls and chlorobenzenes — Gas chromatographic method after liquid-liquid extraction	Alachlor, Atrazine, Chlorfenvinphos, Chlorpyrifos (Chlorpyrifos-ethyl), Aldrin, Dieldrin, Endrin, Isodrin, DDT total, para-para-DDT, Endosulfan, Hexachloro-benzene, Hexachloro-butadiene, Hexachloro-cyclohexane, Pentachloro-benzene, Trichlorobenzene (1,2,3-; 1,2,4-; and 1,2,5), Trifluralin, Heptachlor, Heptachloroepoxide	29.08.-01.09.2023	NEA, Tbilisi, Georgia
EN ISO 10301 – Water quality — Determination of highly volatile halogenated hydrocarbons — Gas-chromatographic methods	1,2-dichloroethane, Dichloromethane, Tetrachloro-ethylene, Trichloro-ethylene, Trichloromethane (chloroform)	09.-20.10.2023	AZELAB, Baku City, AZERBAIJAN
EN ISO 20595 – Water quality — Determination of selected highly volatile organic compounds in water — Method using gas chromatography and mass spectrometry by static headspace technique (HS-GC-MS)	Benzene	09.-20.10.2023	AZELAB, Baku City, AZERBAIJAN
EN ISO 18857-1 – Water quality — Determination of selected alkylphenols — Part 1: Method for non-filtered samples using liquid-liquid extraction and	Nonylphenols, Octylphenols	09.-20.10.2023 23.-27.09.2024	AZELAB, Baku City, AZERBAIJAN EAM, Chisinau, Republic of Moldova

gas chromatography with mass selective detection			
ISO EN 18856 – Water quality — Determination of selected phthalates using gas chromatography/mass spectrometry	Di(2-ethylhexyl)phthalate (DEHP)	23.-27.09.2024	EAM, Chisinau, Republic of Moldova

1.1.3. Training Insights and Enhancement Recommendations

From the perspective of the two training courses in Tbilisi in November 2022 and in August 2023, and the training in Baku in October 2023 and in Chișinău in September 2024:

The participants were all very motivated and worked with great dedication during the practical exercises. However, there was a lack of practice in handling small quantities. Also, not everyone was confident in calculating dilution series. Some of them also had a few problems with handling different units for concentrations. This is a little surprising, since all these training sessions were not the first in which these things were practiced. It is also a little strange that it was only noticed in Baku that no one had any idea how to operate the GC-MS/MS. It was also surprising that working with the headspace sampling technique did not appear to have been practiced in the past. Presumably, the training content from the previous training courses was not practiced in the participating laboratories. It can therefore be assumed that the methods taught in the previous training courses were not implemented in the participating laboratories and are therefore not available for water quality monitoring. This is evident because homework (one in the second training on PAHs in Tbilisi) was not done.

There also seems to be little interest on the part of the authorities and those responsible for implementing the analytical methods to comply with the regulations for water and wastewater treatment. The laboratories are not equipped for ultratrace analysis. They lack basic equipment, such as an adequate number of glassware items in the required sizes, especially for small volumes, balances with a suitable weighing range, efficient facilities for cleaning glassware and for storing chemicals such as solvents, to name just a few. Disposable equipment such as Pasteur pipettes must be used as such. The laboratory operator must provide the necessary means, otherwise it will not work.

Laboratory waste is often not collected, but only disposed of via the wastewater.

The lack of interest in these pollutant controls is also evident from the fact that material purchased as part of the project was found in the original packaging (Rotavapor, microliter pipettes) in both laboratories. Both items are actually needed for previously taught methods such as PAH or OCP.

English language skills are very important, especially when working with the device software or manuals for hardware maintenance. Some training participants have only a limited knowledge of English, which leads to misunderstandings. Even though a mobile translator (e.g. Google) could be used nowadays, it would possibly be much more useful to practice the English language.

When planning such practical lab training for methods based on international standards, such as ISO standards, it could be very useful if these standards were provided to the participants in advance so that they could prepare better for the training. This could also lead to time savings for better discussions and training on the methods themselves.

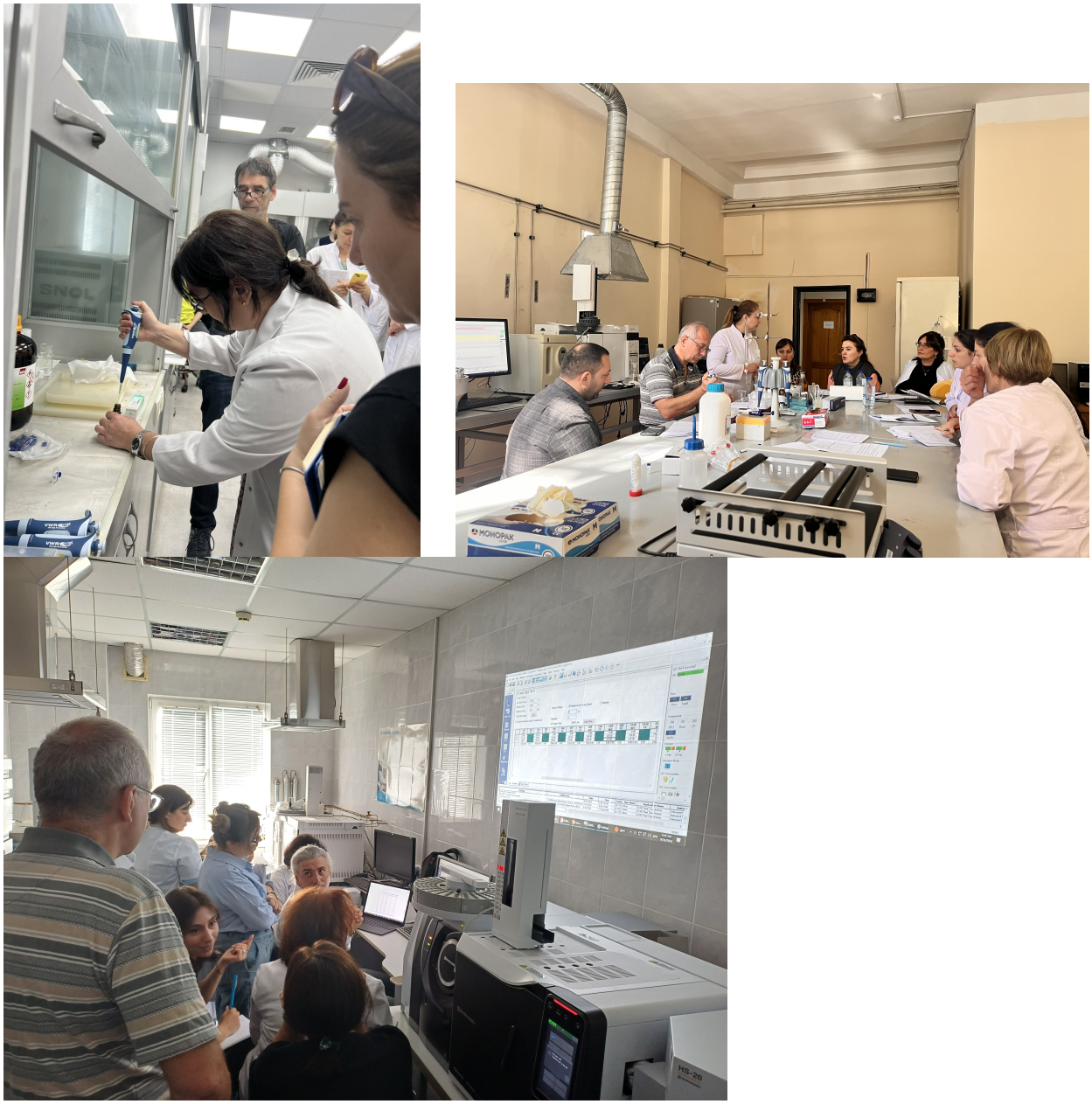

Figure 1: Regional trainings at NEA, Tbilisi, Georgia (2023), AZELAB, Baku City, AZERBAIJAN (2023) and EAM, Chisinau, Republic of Moldova (2024)

1.2. Accreditation or re-accreditation and quality management of reference laboratories (*Activity 1.4.5)*

1.2.1. Purpose

The international standard ISO 17025 for laboratory accreditation exists to ensure confidence in the operation of laboratories. Laboratories complying with the requirements of this standard are able to generate valid results. To ensure the validity of results, the validity shall be regularly monitored. This monitoring includes, among other measures, the participation in inter-laboratory comparisons and

proficiency testing schemes. This external quality control allows laboratories to monitor their performance by comparing their data with other laboratories.

Therefore, one EU4WD activity allowed the partner laboratories to participate in **proficiency testing** (PT) schemes organized by the Environment Agency Austria in cooperation with IFA Tulln, Austria, for selected groups of chemical compounds in surface waters. The Environment Agency Austria is an accredited proficiency testing provider according to EN ISO/IEC 17043[1] since 2017 for the area of air quality, since 2020 in addition also for the area of chemical testing in water.

1.2.2. General remarks

All interlaboratory comparisons were performed according to the requirements of EN ISO/IEC 17043. For each PT round a minimum of 15 testing laboratories participated. ISO 5725-2[2] and ISO 13528[3] was used as the basis for the statistical analysis. The *consensus value* as the mean value of the results of the participants without outliers was used to evaluate real sample proficiency tests (at least n=6 valid data sets are available).

The consensus value is additionally checked for plausibility by comparing the results with a competent laboratory. If necessary, the evaluation of the real sample proficiency tests is done by the consensus value of expert laboratories (accredited participants without outliers). The expanded measurement uncertainty of the assigned value is calculated via the reproducibility standard deviation of the results of participants without outliers (k=2). The *z-score* is used as assessment criterion for participant performance, however these values are confidential data and therefore not reported here. The indicated dates in the tables below refer to the sample dispatch date.

1.2.3. Armenia

The Hydrometeorology and Monitoring Center (HMC), surface water quality monitoring service laboratory in Yerevan had not been accredited at the start of the project, but two UBA expert missions with accreditation-relevant agendas have been carried out in recent years. The first was the so-called pre-training mission. Here, among other things, the current status of the work for the submission of the accreditation documents was determined. The second mission was an external audit by UBA at the HMC laboratory. In the audit mission in particular, the quality management system was checked again and weaknesses were pointed out, before the actual ISO 17025 **accreditation** audit by the Armenian authority happened, which was **successfully achieved on July 2024**.

The laboratory participated in the following proficiency testing schemes for chemical analysis in water:

[1] ISO 17043: Conformity assessment — General requirements for the competence of proficiency testing providers

[2] ISO 5725-2: Accuracy (trueness and precision) of measurement methods and results, Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method

[3] ISO 13528: Statistical methods for use in proficiency testing by interlaboratory comparison

Date	Name of PT	Parameters	Submitted Parameters
Mar 2022	M160	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, U, Zn, Hg	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, U, Zn
Feb 2023	M165	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, U, Zn, Hg	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, U, Zn
Feb 2024	M170	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, U, Zn, Hg	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, U, Zn
Mar 2022	N160	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness, total-N, DOC	NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness
Feb 2023	N165	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness, total-N, DOC	NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness
Feb 2024	N170	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness, total-N, DOC	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness

1.2.4. Azerbaijan

The Azelab LLC laboratory in Baku participated in the following proficiency testing schemes for chemical analysis in water:

Date	Name of PT	Parameters	Submitted Parameters
Mar 2022	M160	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, U, Zn, Hg	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Zn
Feb 2023	M165	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, U, Zn, Hg	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Zn
Feb 2024	M170	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, U, Zn, Hg	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, Zn
Mar 2022	N160	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness, total-N, DOC	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness, total-N, DOC
Feb 2023	N165	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness, total-N, DOC	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness, total-N
Feb 2024	N170	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness, total-N, DOC	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total hardness, total-N
Feb 2023	H115	2,6-Dichlorobenzamide, Alachlor, Atrazine, Atrazine-desethyl, Atrazine-desethyl-desisopropyl, Atrazine-desisopropyl, Bromacil, Chloridazon, Chloridazon-despheny, Chloridazon-methyl-desphenyl, Clopyralid, Cyanazine, Dimethenamide, Diuron, Metolachlor, N,N-Dimethylsulfamide (DMS), Nicosulfurone, Prometryn, Propazine, Sebuthylazine,	Atrazine, Atrazine-desethyl, Atrazine-desisopropyl, Chloridazon, Cyanazine, Simazine, Terbuthylazine, Terbuthylazine-desethyl

		Simazine, Terbuthylazine, Terbuthylazine-desethyl, Terbutryn	

1.2.5. Georgia

The LEPL National Environmental Agency's Laboratory for Air, Water and Soil Analyses in Tbilisi participated in the following proficiency testing schemes for chemical analysis in water:

Date	Name of PT	Parameters	Submitted Parameters
Mar 2022	M160[4]	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, U, Zn, Hg	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, Zn
May 2023	M167	Al, As, Be, Cd, Ce, Cr, Co, Cu, Li, Fe, Gd, Pb, Mn, Ni, Se, Ag, U, V, Zn, Hg	Al, As, Cd, Cr, Co, Cu, Pb, Mn, Ni, Se, Zn
Nov 2023	M169	Al, Sb, As, Ba, Pb, Cd, Cr, Fe, Cu, Mn, Mo, Ni, Se, Sr, U, Zn, Sn	Al, As, Ba, Pb, Cd, Cr, Cu, Mn, Mo, Ni, Se, Zn
Mar 2024	M171	Al, As, Pb, Cd, Cr, Fe, Cu, Mn, Ni, Hg, Se, U, Zn	Al, As, Pb, Cd, Cr, Cu, Mn, Ni, Hg, Se, Zn
Mar 2022	N160[4]	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness, total-N, DOC	Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, SO_4^{2-}, total hardness
May 2023	N167	Conductivity, Total hardness, alkalinity, HCO_3^-, Ca^{2+}, Mg^{2+}, Na^+, K^+, NO_3^-, NO_2^-, NH_4^+, Cl^-, SO_4^{2-}, o-PO_4^{3-}, B, DOC, total-P (as PO_4^{3-}), $KMnO_4$-Index	NO_3^-, NO_2^-, NH_4^+, Cl^-, SO_4^{2-}, o-PO_4^{3-}
Nov 2023	N169	Total hardness, alkalinity, electrical conductivity (25°C), HCO_3^-, Ca^{2+}, Mg^{2+}, Na^+, K^+, NO_3^-, NO_2^-, NH_4^+, Cl^-, SO_4^{2-}, o-PO_4^{3-}, B, DOC, total-P (dissolved), pH, total-N	Ion chromatograph out of order, no results submitted

[4] Results were submitted after the closing date, as the samples were stuck at customs

Mar 2024	N171	Conductivity, Total hardness, alkalinity, HCO_3^-, Ca^{2+}, Mg^{2+}, Na^+, K^+, NO_3^-, NO_2^-, NH_4^+, Cl^-, SO_4^{2-}, o-PO_4^{3-}, B, DOC, total-P (as PO_4^{3-}), Si, F^-	Na^+, K^+, NO_3^-, NO_2^-, NH_4^+, Cl^-, SO_4^{2-}, o-PO_4^{3-}, F^-
Apr 2024	P25	Acenaphthene, Acenaphthylene, Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenzo[a,h]anthracene, Fluoranthene, Fluorene, Indeno[1,2,3-cd]pyrene, Naphthalene, Phenanthrene, Pyrene	Acenaphthylene, Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[k]fluoranthene, Dibenzo[a,h]anthracene, Fluoranthene, Fluorene, Indeno[1,2,3-cd]pyrene, Pyrene

1.2.6. Moldova

The EAM partner laboratory in Chisinau had been accredited for nutrients and heavy metals in 2021 (EUWI+). It participated in the following proficiency testing schemes for chemical analysis in water:

Date	Name of PT	Parameters	Submitted Parameters
Mar 2023	M166	Al, As, Pb, Cd, Cr, Fe, Cu, Mn, Ni, Hg, Se, U, Zn	Pb, Cd, Cr, Cu, Mn, Ni, Hg, Zn
Mar 2024	M170	Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, U, Zn, Hg	Cd, Cr, Cu, Pb, Mn, Ni, Zn, Hg
Mar 2022	N160	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness, total-N, DOC	NH_4^+, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness
Feb 2023	N165	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness, total-N, DOC	NH_4^+, Ca^{2+}, Cl^-, electrical conductivity (25°C), Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness
Mar 2024	N170	Alkalinity, NH_4^+, B, Ca^{2+}, Cl^-, electrical conductivity (25°C), HCO_3^-, Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value,	NH_4^+, Ca^{2+}, Cl^-, electrical conductivity (25°C), Mg^{2+}, NO_3^-, NO_2^-, o-PO_4^{3-}, pH-value, Na^+, K^+,

		Na^+, K^+, SO_4^{2-}, total-P (as PO_4^{3-}), total hardness, total-N, DOC	SO_4^{2-}, total-P (as PO_4^{3-}), total hardness
Apr 2024	P25	Acenaphthene, Acenaphthylene, Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenzo[a,h]anthracene, Fluoranthene, Fluorene, Indeno[1,2,3-cd]pyrene, Naphthalene, Phenanthrene, Pyrene	Acenaphthene, Acenaphthylene, Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenzo[a,h]anthracene, Fluoranthene, Fluorene, Indeno[1,2,3-cd]pyrene, Naphthalene, Phenanthrene, Pyrene
Okt 2023	H117	Acetamiprid, Aldrin, Atrazine, Atrazine-desethy, Atrazine-desisopropyl, Bromacil, Clothianidin, Cyanazine, Dieldrin, Dinotefurane, Endrin, Heptachlor, Imidacloprid, Lindane (Gamma-HCH), Nitenpyram, Prometryn, Propazine, Sum Chlordane, Sum DDD, Sum DDE, Sum DDT, Sum Endosulfan, Thiacloprid, Thiamethoxam	Aldrin, Atrazine, Prometryn, Propazine

1.2.7. Ukraine

As a result of repeated support and guidance during EUWI+ and EU4WD, the partner laboratory for the Northern Basin of Dnipro River in Vyshgorod was accredited in January 2024 for chromatography for 47 indicators (organochlorine pesticides, PAHs, POPs), but it has not participated in PT schemes offered several times during this EU4WD program (main justification: no safe transport of samples in Ukraine).

On 13 July 2022 UBA has been informed that, due to the Russian war of aggression, the light was turned off for 4-6 hours according to the local power supply schedule, and this can happen in an emergency at any time indefinitely. Equipment susceptible to electricity cut-offs (e.g. GC-MS/MS, AAS, AFS, etc.) are therefore turned off as no generator is available, and the UPS can only withstand an outage of 20 minutes. The entire laboratory works in emergency mode as far as technically feasible and possible at the situation of war. Still, currently, all chemical and spectrometric analysis are constantly performed.

In winter 2022/2023, UBA discussed with the Vyshgorod laboratory several options of support for the acquisition of a fuel-driven generator for independent electricity supply. This proved as not feasible.

In order to still overcome the transportation barriers for PT samples at least for certain parameters, that should be test-analysed at the laboratory, UBA offered in April 2024 to take water samples with an UBA colleague travelling to Kyiv. However, this offer was also declined from the head of the laboratory.

2. Conclusion

The results of the proficiency tests carried out by the relevant partner laboratories showed that the analysis of simple parameters such as nutrients or metals is already relatively comparable with the European standard. Even if there are frequent irregularities, which are usually due to inadequate operational baseline funding of laboratories, or insufficiently skilled personnel, a good basis is given. For this reason, the focus of EU4WD support was on those organic parameters that can be analysed using GC/MS devices. This showed that working in small concentration ranges still poses major problems. Especially as the equipment and financing of the laboratories is far from adequate. Here, the handling of these small concentrations must be practised in order to reach a comparable standard. These exercises were not carried out by most laboratories. As a result, the trainees showed little motivation to work on the GC/MS devices or to familiarise themselves with them outside of the training sessions. Whether this was due to a lack of equipment, time, understanding or other reasons could not be sufficiently determined, as long-term on-site supervision was also not possible.

Furthermore, a legal anchoring of these parameters would be a further “motivation” for the laboratories to include them in their work tasks in a timely manner, but this requires sufficient baseline funding. As things stand at present, it is therefore essential that these methods are further developed and incorporated into routine operations in the near future, so that experience can be built up. Further participation in proficiency tests will show to what extent the partner laboratory results match the standards of the European laboratories, and if so, an extension of the accreditation to include these organic parameters can be applied for in order to progress with WFD compliance.

No clear statement can be made about the quality of the analysis of the Ukrainian partner laboratory, as no proficiency tests could be sent to the laboratory due to the war and the laboratory was only able to function to a limited extent due to regular power cuts. Nevertheless, two Ukrainian employees were able to take part in each of the regional training sessions. Unfortunately, they have not yet been able to apply their knowledge, as the GC/MS requires a constant power supply for several days. This is currently not possible in Ukraine.

At the start of EU4WD, only two of the five partner laboratories were accredited in accordance with ISO 17025 and the aim was to get at least two more to apply for 17025 accreditation. With the support of the project and UBA experts, this was achieved and the two laboratories from Armenia and Ukraine have already received valid ISO 17025 accreditation in 2024. This constitutes a major milestone for the laboratories and is of enormous importance for maintaining a European quality standard.

Nevertheless, it is only one of many steps that still need to be taken, including the expansion of the scope of accreditation to include other parameter groups such as PAHs or pesticides. Apart from the Ukrainian partner laboratory, no other partner laboratory has been accredited yet for these parameters. As already, mentioned, the knowledge has been transferred via five trainings but this is not or insufficiently applied, or the conditions for applying these methods are not met, except perhaps at the Vyshgorod laboratory.

Nevertheless, to summarise, it can be said that important progress has been made in all partner laboratories, in spite of all institutional weaknesses, notably at the partner laboratory in Armenia. Reality is that the laboratories and countries need more time and continued support to pursue this further in order to meet the European standard in all areas.

3. Dokumentation and products

List of missions and training courses and the corresponding documentation in reports (not publicly available)

Mission	Date	Mission report
Regional method training on PAHs in Georgia	21.-24.11.22	EU4EnvWD_MISSION-REPORT_GEO1
Pre-Training mission in AZ, GE, AM, MD	24.-28.04.23	EU4EnvWD_AM_Pretraining_mission_report_ 20230622, EU4EnvWD_AZ_Pretraining_mission report_ 20230703, EU4EnvWD_MISSION-REPORT_GE, EU4EnvWD_MD_mission report_ 20230705
Regional method training on PAHs and organochlorine pesticides in Georgia	29.08.-01.09.23	EU4EnvWD_MISSION-REPORT_GEO2
Regional method training on alkylphenols in Baku	07.-13.10.23	EU4EnvWD_MR_AZ_regional_training_alkylphenols
Regional method training on VOCs in Baku	17.-20.10.23	EU4EnvWD_MISSION-REPORT_AZN
Audit Mission	18.-21.12.23	EU4EnvWD_AM_Auditreport_ 20250428
Regional method training on phthalate and alkylphenols in Baku	23.-27.09.2024	EU4EnvWD_MD_MISSION-REPORT_ 20250313
Quality analysis and Quality control Mission	18.-22.08.24	EU4EnvWD_GE_MISSION-REPORT_ 20240927

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