Action funded by the EUROPEAN UNION

EUWI+ EU WATER INITIATIVE FOR EASTERN PARTNERSHIP

European Union Water Initiative Plus for
Eastern Partnership Countries (EUWI+): Results 2 and 3

ENI/2016/372-403

LABORATORY ASSESSMENT REPORT AZERBAIJAN

May 2019, Final Version
(based on Version 2.0 – Final Draft; December 2017)

umweltbundesamt ENVIRONMENT AGENCY AUSTRIA

International Office for Water

Responsible EU member state consortium project leader

Michael Sutter, Umweltbundesamt GmbH (AT)

EUWI+ country representative in Azerbaijan

Rafig Verdiyev

Responsible international thematic lead expert

Philipp Hohenblum, Umweltbundesamt GmbH (AT)

Responsible Azerbaijani thematic lead expert

Matanat Avazova, Ministry of Ecology and Natural Resources (AZ)

Authors

Philipp Hohenblum, Felizitas Zeitz, Umweltbundesamt GmbH (AT)

Imprint

Owner and Editor: EU Member State Consortium

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

Responsible IOW Communication officer:

Yunona Videnina
y.videnina@oieau.fr

May 2019

CONTENTS

List of Tables

List of Figures

Abbreviations

AFS ..... Atomic fluorescence spectroscopy
BQE ..... Biological quality element
CW ..... Coastal waters
DOA ..... Description of action
DOC ..... Dissolved organic carbon
EaP ..... Eastern Partnership
EC ..... European Commission
EECCA ..... Eastern Europe, Caucasus and Central Asia
ENP ..... European Neighbourhood Policy
EPIRB ..... Environmental Protection of International River Basins
EQS ..... Environmental Quality Standards
EU ..... European Union
EUWI+ ..... European Union Water Initiative Plus
GC ..... Gas chromatography
HPLC ..... High-performance liquid chromatography
IEC ..... International Electrotechnical Commission (international standards and conformity assessment for all electrical, electronic and related technologies)
ISO ..... International Standards Organisation
LLE ..... Liquid-liquid extraction
LOD ..... Limit of detection
LOQ ..... Limit of quantification
MENR ..... Ministry of Ecology and Natural Resources
MS ..... Mass spectrometry
NFP ..... National focal point
NPD ..... National policy dialogue
PTS ..... Proficiency testing scheme
QA ..... Quality assurance
QC ..... Quality control
QM ..... Quality management
RBMP ..... River Basin Management Plan
TOC ..... Total organic carbon
TW ..... Transitional waters
USAID ..... United States Agency for International Development
WB ..... World Bank
WFD ..... Water Framework Directive
WSS ..... Water supply and sanitation
WTP ..... Water treatment plant
WUA ..... Water Users Association

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

1 PROJECT SUMMARY

The Eastern Partnership (EaP) is a policy initiative launched at the Prague Summit in May 2009. It aims to deepen and strengthen relations between the European Union and its six eastern neighbours: Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine.

In recent years, the countries of the Eastern Partnership have demonstrated a willingness to align their water policies and practices with the general principles and specific requirements of the EU Water Framework Directive (WFD), as well as other thematic and sectoral water directives and UN Multilateral Environmental Agreements (MEAs). Moreover, Georgia, Moldova, and Ukraine have assumed commitments to reform water policies and implement the EU water *acquis* as part of the Association Agreements signed with the EU in 2014.

It is within this context that the *European Union Water Initiative Plus for the Eastern Partnership* (EUWI+) for Eastern Partnership Countries was initiated by the Directorate-General for Neighbourhood and Enlargement Negotiations (DG NEAR) of the European Commission.

The *European Union Water Initiative Plus for the Eastern Partnership* (EUWI+) was launched in September 2016 to assist the six Eastern Partnership countries to approximate to the EU Water Framework Directive and its associated directives. Its objective is to improve the sustainable management of water resources with a focus on trans-boundary river basin management.

EUWI+ focuses on five thematic areas:

- Legislation, policy development and institutional consolidation
- Laboratory and monitoring system enhancement
- River Basin Management Plan development
- River Basin Management Plan implementation
- Public awareness, communications, and data/information management

The OECD and UNECE are implementing activities under thematic area 1. Thematic areas 2–5 are being undertaken by a consortium of EU member states comprised of the Environment Agency Austria (UBA) and the International Office for Water (OIEau/IOWater) of France. Experts from other EU member states will also be involved in project activities.

The budget for these thematic areas for all six countries amounts to a total of EUR 24.6 million and is financed by the European Union with contributions from the governments of Austria and France. Its planned period of operation is from September 2016 until August 2020 (48 months).

A website has been created (http://euwipluseast.eu/en/) for the publication and dissemination all the data, information and services developed and used within the framework of this project.

2 EXECUTIVE SUMMARY

The *European Union Water Initiative Plus for the Eastern Partnership* (EUWI+) was launched in September 2016 to assist the six Eastern Partnership countries in approaching the EU Water Framework Directive (WFD) and its associated directives. The project objective is to improve the sustainable management of water resources with a focus on trans-boundary river basin management.

In order to establish project priorities and targets, an assessment of the current laboratory situation for the hydro-chemical testing of water was carried out during the second and third quarters of 2017 with the aim of identifying gaps and fields of improvement in the following areas, as defined in the description of the action (DOA) to the Grant Contract: the assessment of laboratory infrastructure, personnel capacities, analytical quality assurance, accreditation status, WFD-relevant sampling and testing methods, and documentation.

Laboratory infrastructure: There are several laboratories available in Azerbaijan working in the field of water analysis. The department of the Ministry of the Environment and Natural Resources (MENR) for National Environmental Monitoring in Baku acts as the main partner and maintains a laboratory for hydro-chemical analyses (Surface Water Pollution Monitoring Centre). In future, all types of water analyses (surface and ground water etc.) will be carried out in this laboratory. There are also several local laboratories associated with the MENR. Among others, the laboratories in Beylagan and Gazakh have additionally been chosen for EUWI+ project activities. The assessment of the Baku laboratory's general infrastructure revealed that the building and facilities do not meet ISO/IEC 17025:2005 requirements. The decision was made to renovate the MENR's water laboratory with the support of the EUWI+ project. The laboratories in Beylagan and Gazakh also need refurbishment.

General staff capacities: The MENR laboratory in Baku has seven staff members with advanced academic (chemistry) and university degrees. The personnel are well trained, committed, motivated to perform their assignments and meet the personnel capacity needs. The laboratories in Beylagan and Gazakh have eight and six staff members, respectively. The personnel are well trained, committed, motivated to perform their assignments and meet the personnel capacity needs.

WFD-relevant testing and sampling methods: The parameter assessment of the laboratory in Baku showed that only a small number of relevant parameters are covered by the laboratory's scope. However, several WFD-relevant testing methods for water are already established and are being performed, but the methods are not accredited. There is a need to expand the scope of the parameters in order to approach the requirements of the WFD in terms of priority substances. The other two laboratories perform the sampling and online measurement of the chemical and physical parameters.

Accreditation status: Due to several incompliances with ISO/IEC 17025 such as accommodation and environmental conditions, the laboratory in Baku is not yet accredited, but SOPs for analytical methods and fragmented documentation are in place. The other two laboratories in Beylagan and Gazakh are both not accredited

New equipment: The additional equipment needed for the analysis of new parameters and the approach to the WFD has been prepared and harmonised with the MENR.

Training: Three different training courses should be provided for all three laboratories: (i) General laboratory training that can be conducted independently on equipment, (ii) Hands-on training with existing equipment and (iii) Training on new equipment. The general training curriculum for the lab has been prepared and harmonised with the MENR laboratory. In addition, the supply of the relevant ISO- and chemical reference standard for existing equipment is foreseen, as well as method validation and the training of laboratory personnel. A list of parameters and methods has been prepared for the new equipment and as soon as the equipment is successfully installed, training can begin. In addition to training on laboratory equipment, training on WFD-relevant issues for the monitoring of transitional and coastal water was agreed.

Recommendation: Most of the laboratory equipment involves expensive investments and requires consumables (gases, chemicals, solvents etc.), maintenance, servicing, spare parts and budget for the establishment of new methods and a number of cost-intensive, supplementary procedures, which are needed to achieve valid results. For this reason, the drafting of a laboratory strategy would help identify critical items and establish actions to overcome bottlenecks. The authors of this report recommend developing a laboratory strategy for the MENR water laboratory for a period of 10 years.

3 INTRODUCTION

The European Neighbourhood Policy (ENP) provides a framework for closer relations between the EU and its neighbouring countries. The European Union Water Initiative Plus for Eastern Partnership Countries project (EUWI+) aims to furnish the neighbouring countries with further support during the improvement of their water quality and has a special focus on trans-boundary river basin management in the light of the WFD principles.

The EUWI+ is based upon the lessons learned from several development initiatives of the European Union in the water sector in Azerbaijan and the EUWI EECCA and EPIRB projects in particular.

This overall objective of this project addresses existing challenges in both the development and implementation of efficient water resource management.

One key, outstanding challenge is the further enhancement of water monitoring capacity through the geographical coverage of monitoring networks, laboratory infrastructure and the methodological basis for sampling, (physical-) chemical analyses, and ecological as well as hydro-morphological status determination.

Capacity building and increased regular national budgets for monitoring activities are often more urgently needed than sampling or laboratory equipment and is especially true of Azerbaijan.

Monitoring and appropriate laboratory capacities play a key role in the implementation of the WFD. Therefore, the WFD's daughter directive on technical specifications for chemical analyses and the monitoring of water status (Commission Directive 2009/90/EC[1] – QA/QC Directive) duly addresses quality assurance and the comparability and reliability of analytical results. Accreditation provides government bodies and regulators with confidence in the technical competence and quality of the data generated by the laboratories carrying out testing. For the accurate determination of the ecological status of surface waters, inadequate national methods should be replaced by inter-calibrated methods.

Consequently, the main objective of the EUWI+ project is to strengthen the monitoring infrastructure (monitoring network and laboratory infrastructure, sampling, measurement and laboratory equipment including the maintenance thereof), which is closely related to and goes hand-in-hand with activity 2.2.1 on capacity building through staff training (sampling, analytics, QA/QC, accreditation and ecological status or potential determination), which also contributes to output from activity 2.3, the implementation of RBMPs.

The assessment was carried out by visiting the laboratories involved in person in order to examine existing equipment, personnel, infrastructure and the laboratory premises, and by studying the list of required parameters in the WFD and checking their degree of implementation.

The main focus of this assessment report is on chemical analyses, including the physical-chemical parameters and priority substances according to the Commission Directive 2013/39/EC[2] and corresponding QA/QC topics, as well as the determination of BQEs, their supporting physico-chemical elements and hydro-morphological elements. During the assessment phase, it became apparent that according to ISO/IEC 17025:2005 [3] requirements, in general the laboratories' infrastructure (buildings, premises) is inadequate. Moreover, there is no research vessel available and trained staff do not cover all the requested BQEs.

---

[1] COMMISSION DIRECTIVE 2009/90/EC of 31 July 2009, which, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, lays down technical specifications for chemical analysis and monitoring of water status.

[2] Directive 2013/39/EU of the European Parliament and of the council amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy.

[3] ISO/IEC 17025:2005, General requirements for the competence of testing and calibration laboratories, International Standard Organisation, Switzerland.

4 ASSESSMENT OBJECTIVES OF THE CHEMICAL LABORATORIES

4.1 Objective

In order to establish project priorities and targets, an assessment of the current laboratory situation for the hydro-chemical testing of water (surface, ground-, transitional and coastal waters) was carried out to identify gaps and areas of improvement in the following fields, as defined in the description of the action (DOA) of the grant contract:

- Appropriate analytical equipment, laboratory infrastructure and consumables (feeds into Act. 2.1.2)
- (Further) needs for technical support for accreditation (feeds into Act. 2.1.3)
- Needs for training (feeds into Act. 2.2.1)
- Needs for a (further) increase in capacities and the strengthening of the technical competence of the administrative bodies' personnel (feeds into Act. 2.1.3 and 2.2.1)

The current report summarises the findings of the laboratory assessment, described in detail in the mission reports, which are an essential part of the assessment activities.

Moreover, the assessment report identifies gaps and proposes measures aimed at the sustainable implementation of the WFD within the EUWI+ project and offers a strategic outlook on the further action needed beyond the time frame of the EUWI+ project.

5 ASSESSMENT METHODOLOGY

During the inception phase there was already an opportunity for short visits to selected laboratories involved in regulatory water monitoring. In addition, laboratory questionnaires were distributed in order to gather relevant information in a systematic manner, i.e. a brief description of the laboratory, general personnel capacities, laboratory facilities, equipment, test methods, analytical quality assurance, documentation, reporting and the support needed for the EUWI+ project. Together with the country priorities and results from the previous EPIRB project, this information provided an initial indication of the current status and the basis for the in-depth, on-site assessment of selected candidate laboratories under project activity 2.1.1.

Beginning in May 2017, two assessment missions took place During these missions
the following aspects were covered via direct interviews with the responsible personnel:

- General staff capacities
- Laboratory facilities and infrastructure
- Analytical equipment, spare parts and consumables
- WFD-relevant testing and sampling methods (detailed methodology see Figure 1)
- Status of accreditation (based on the ISO/IEC 17025 requirements)
- Training needs

5.1 Parameter assessment approach

Figure 1 illustrates the general procedure for the in-depth assessment of the current laboratory scope of analysis for WFD parameters. The Commission Directive 2013/39/EC[4], “As regards priority substances in the field of water policy” not only defines the 45 priority substances, but also indicates the EQS values of the corresponding parameters in the relevant matrix (inland and other surface water and biota). Current analytical methods were compared with state of the art analytical methods for the determination of priority substances in surface water.[5] Analytical methods for the determination of priority substances in biota were compared with the methods indicated in the guidance document 33.[6] Apart from the assessment of priority substances in surface water, the WFD defines six physico-chemical quality elements (thermal conditions, oxygenation, salinity, nutrient status, acidification status, other pollutants). However, the EU member states are responsible for the selection of the relevant parameters for physico-chemical monitoring. Therefore, the guidance document published by the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management was used for the current physico-chemical parameter assessment.[7]

[4] DIRECTIVES DIRECTIVE 2013/39/EU OF THE EUROPEAN PARLIAMENT AND OF THE OUNCIL of 12 August 2013 amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy.

[5] R. Loos, 2012, Analytical methods relevant to the European Commission's 2012 proposal on Priority Substances under the Water Framework Directive, European Commission - Joint Research Centre (JRC), Institute for Environment and Sustainability (IES), Italy.

[6] European Union, Common implementation strategy of the water framework directive (2000/60/EC), 2014, Guidance document No. 33 on analytical methods for biota monitoring under the water framework directive, technical report 2014-084, Luxembourg.

[7] K. Deutsch et al., 2010, Leitfaden zur typspezifischen Bewertung gemäß WRRL, allgemein physikalisch-chemische Parameter in Fließgewässern, Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, Sektion VII, Wien.

For the surface water categories, transitional and coastal waters, the list of chemical and physico-chemical elements supporting the biological elements in the WFD CIS Guidance Document No. 13 was used.

The core parameters (oxygen content, pH value, conductivity, nitrate, and ammonium) to be analysed for the groundwater parameter assessment are listed in Annex V of the WFD. Additional groundwater parameters (e.g. heavy metals and pesticides), which are mandatory for compliant WFD groundwater monitoring, are laid down in the groundwater directive 2006/118/EC[8] In addition, EU member states are responsible for defining the limit values of the corresponding groundwater parameters. In this case, the Austrian Quality Target Ordinance for Groundwater was used as a basis for limit values for the current groundwater parameter assessment[9]

The assessment determines if the (WFD) parameter is within the scope of the analysis and is accredited according to ISO 17025 and the LOD and LOQ of the corresponding parameter. Moreover it evaluates if the LOQs are compliant with WFD EQS values, current instruments and the methods used for analysis.

The assessed data will lead to an identification of actions such as method adaptation (e.g. when LOQs need to be reduced in order to comply with WFD-EQS values, ISO technical standards require implementation instead of national standards), method expansion (e.g. when the parameter is not yet in scope of analysis), the procurement of equipment and consumables and personnel training.

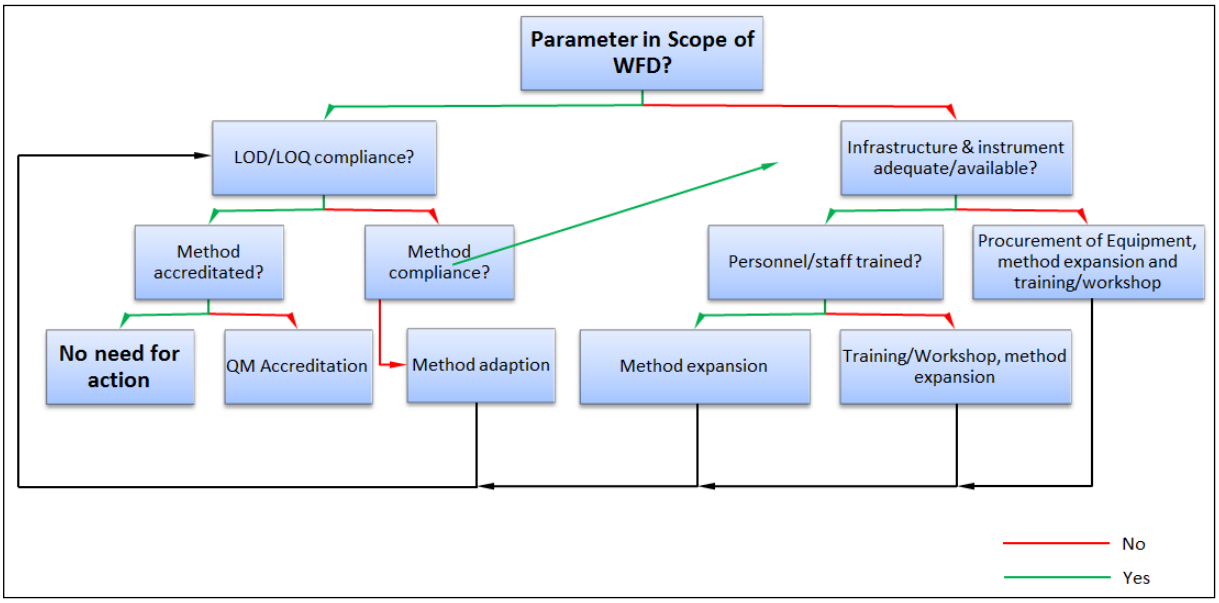

Figure 1: Flowchart illustrating the detailed hydro-chemical parameter assessment according to the WFD requirements

[8] Directive 2006/118/EC of the European Parliament and the Council on the protection of groundwater against pollution and deterioration.

[9] BGB II Nr. 89/2010: Bundesgesetzblatt für die Republik Österreich, 2010, Qualitätszielverordnung Chemie Grundwasser, Verordnung des Bundesministers für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft über den guten chemischen Zustand des Grundwassers

5.2 Chronology

Three assessment missions took place and are summarised in the following chronology with the main assessment milestones.

Questionnaires during the inception phase:

- 1st laboratory assessment mission 29.5. – 2.6.2017
- 2nd laboratory assessment mission 18.6. – 23.6.2017
- 3rd laboratory assessment mission 16.10. – 20.10.2017

6 LABORATORY SELECTION

There are several laboratories available in Azerbaijan, which are working in the field of water analysis. The Department for National Environmental Monitoring at the Ministry of the Environment and Natural Resources (MENR) acts as the main partner and maintains a laboratory for hydro-chemical analyses in Baku (Surface Water Pollution Monitoring Centre). In future, this laboratory will carry out all types of water analyses (surface and ground water etc.). In addition, chemical analyses of air samples will supplement the scope of the laboratory. There are also several local laboratories associated with the MENR from which the laboratories in Beylagan and Gazakh have been chosen for EUWI+ activities. This selection has been discussed with the NFP, but is to our knowledge not yet officially confirmed.

There are also laboratories belonging to the Ministry of Emergencies and the privately run AZEcolab. These are currently not foreseen for participation, but could play a role in the course of the project, as they have offered collaboration.

6.1 Laboratory facilities and infrastructure

During the EUWI+ project, assistance in method expansion and adaptation for additional priority substances can be provided, but it would seem to be more important and sustainable to support the MENR laboratory in Baku with the adaptation of its premises in order to ensure the appropriate laboratory conditions and infrastructure during the project phase. In addition to this process, the purchase of new equipment and related spare parts and consumables, quality management and technical training, further support for accreditation, as well as study tour participation by laboratory personnel to EU member states are planned.

6.1.1 Baku

It was evident that the laboratory in Baku was in a poor infrastructural condition. Fundamental prerequisites for a laboratory such as air conditioning (heating, cooling), fume extraction, the separation of laboratory and office rooms, ceramic floors and table surfaces are not ensured. These current conditions do not match the criteria for premises of ISO/IEC 17025:2005 standard (also see chapter 5.3 Accommodation and environmental conditions of ISO/IE 17025) and need to be ameliorated in order to achieve international accreditation. A bilateral process has been started to tackle this issue and create the basis for a sustainable laboratory.

6.1.2 Beylagan

MENR runs a hydro- (physical) chemical laboratory in Beylagan in the south of Azerbaijan. This laboratory is rather small, but the premises are in good condition and sufficient for the scope of analyses. There are two laboratory rooms and several office rooms. The building and the laboratory make a solid impression, the walls are freshly painted and the ceramic floors are in a clean condition.

6.1.3 Gazakh

This laboratory is very small and in a poor condition. Floors and walls are in a dilapidated state with spots of mould, broken tiles and crumbling plaster (dust source!). The furniture is mainly made of wood, but the rooms are basically clean. The infrastructure (water, electric power) needs to be overhauled as plugs and installations do not meet any standards. There is neither heating nor air conditioning in the rooms.

As long as the laboratory's role is taking samples, performing on-site measurements and shipping samples to the central laboratory in Baku, only minor adaptations (electrical installation, water supply) are needed.

6.2 General staff capacities

6.2.1 Baku

The laboratory personnel consist of seven staff members with academic (chemistry and ecology) and high school degrees. The personnel are well trained, motivated to perform their assignments and offer sufficient manpower. An improved knowledge of QA/QC and practical experience would be advantageous.

6.2.2 Beylagan

The laboratory personnel consist of eight staff members, but there is currently no information about their educational background. However, their number would seem to be sufficient. The personnel are well trained, motivated to perform their assignments and offer sufficient manpower. An improved knowledge of QA/QC and practical experience would be advantageous.

6.2.3 Gazakh

The laboratory personnel consist of six staff members and there is currently no information about their educational background. However, their number would seem to be sufficient. The personnel are well trained, motivated to perform their assignments and offer sufficient manpower. An improved knowledge of QA/QC and practical experience would be advantageous.

6.3 Analytical equipment, spare parts and consumables

6.3.1 Baku

Heavy metal analysis is currently performed by means of AAS, which due to its age needs repair and updating. In order to increase capacities and facilitate analyses, a multi-element analysis by means of ICP-OES/MS is desired. Another ion chromatography line would be of advantage in order to separate the measurement of background samples (low burden) from samples with higher concentrations, but its relevance for the WFD needs to be clarified. In order to foster organic analysis, the rehabilitation and update of existing GC devices would seem to be necessary, especially in the light of extending the scope of parameters. However, the main focus should be on updating the laboratory's infrastructure to an adequate level. Keywords are fume hoods, basic laboratory equipment for the extraction and evaporation of solvents, digestion and sample preparation (shakers, water baths, refrigerators, etc.).

6.3.2 Beylagan

The analytical scope of the laboratory relates to physical/chemical measurement and nutrient analysis. Equipment for this purpose is available, but some items seem to be outdated. The fume extractor is inoperative and needs to be replaced.

All local laboratories are also responsible for water sampling. Due to long distances and difficult climatological conditions, cooling devices and basic sampling material (bottles, etc.) are urgently needed.

6.3.3 Gazakh

The analytical scope of the laboratory is similar to that in Beylagan. The fume extractor is inoperative and the photometer outdated. Major support is needed for sampling and onsite measurement.

All local laboratories are also responsible for water sampling. Due to long distances and difficult climatological conditions cooling devices and basic sampling material (bottles, etc.) are urgently needed.

6.4 WFD-relevant testing and sampling methods

6.4.1 Baku

The parameter assessment approach showed that only a small number of relevant parameters are covered by the laboratory's scope. However, several WFD-relevant testing methods for water are already established and are being performed, but the methods are not accredited. There is a need to expand the scope of parameters to approach the requirements of the WFD in terms of priority substances. 10 out of 57 surface water-relevant priority substances are being adapted in the laboratory (still in progress) and a further eight could easily be added to the existing methods. A total of 39 require the development of a respective method. Of sixteen groundwater-relevant substances, twelve are within the scope of the laboratory and four need development. It is therefore clear that prior to extending the scope of parameters in stepwise fashion a begin must be made with easily applicable substances.

6.4.2 Beylagan

Several WFD-relevant testing methods for water are already fulfilled by order of the main laboratory in Baku. The taking of water samples at nearby sampling sites along with the measurement of in situ chemical and physical parameters is one task. Samples for heavy metals and other relevant parameters are sent to the main laboratory in Baku.

6.4.3 Gazakh

Here, physical/chemical and nutrient parameters are mainly analysed. The laboratory is responsible for taking samples in the region, performing on-site measurements and shipping the samples for further analysis to Baku.

6.5 Status of accreditation (based on ISO/IEC 17025 requirements)

6.5.1 Baku

The laboratory is not yet accredited, but SOPs for analytical methods and loose documentation are in place. At present, a quality manual, which would form a basis for all further steps related to ISO/IEC 17025, is not available. At the same time, the Meteorological Twinning Project is drafting a quality manual for air quality control together with the laboratory colleagues, which will also act as a starting-point for the water laboratory. As the quality manual is a general document and unrelated to different matrices (air, soil, water, biota, etc.), this draft can be used for the laboratory universally. SOPs should be revised and adapted accordingly to the standard methods required by the WFD and ISO/IEC 17025.

However, the current status of the laboratory does not allow for accreditation based on ISO/IEC 17025 because of several incompliances, especially with regard to clause 5.3, which refers to accommodation and environmental conditions. Nonetheless, the project team informed the responsible persons in the laboratory and the ministry and offered to support in overcoming this issue on the basis of a collaboration agreement. Official steps have been initiated and to date (December 2017) there are positive signals regarding the refurbishing the laboratory according to the suggestions made.

6.5.2 Beylagan

No accreditation exists but SOPs for analytical methods and standards provided by the central laboratory in Baku are in use.

6.5.3 Gazakh

No accreditation exists but SOPs for analytical methods and standards provided by the central laboratory in Baku are in used.

6.6 Training needs

6.6.1 Baku

The air quality measurement Twinning Project has already begun work on a quality manual. This is an excellent starting point for EUWI+, as the scope of the manual can easily be extended to the water laboratory. Training on QA/QC and specific methodologies for WFD priority substances and the extension of existing methods will be in focus. In order to ensure a common understanding of the basic terminology required by ISO/IEC 17025, basic training covering the following topics has been suggested:

- Accommodation & environmental conditions
- Test & calibration methods and method validation
- Measurement traceability
- The handling of test and calibration items
- Assurance of the quality of test and calibration results

6.6.2 Beylagan

Due to the very limited capacities and low sample throughput, the involvement in the EUWI+ project will focus on in-situ devices and participation in selected technical and QM training. As sampling is a major laboratory task, training in this field will also be provided. In order to ensure a common understanding of the basic terminology required by ISO/IEC 17025, basic training covering the following topics has been suggested:

- Accommodation & environmental conditions
- Test & calibration methods and method validation
- Measurement traceability
- The handling of test and calibration items
- Assurance of the quality of test and calibration results

6.6.3 Gazakh

Due to the very limited capacities and low sample throughput, the involvement in the EUWI+ project will focus on in-situ devices and participation in selected technical and QM training. As sampling is a major laboratory task, training in this field will also be provided. In order to ensure a common understanding of the basic terminology required by ISO/IEC 17025, basic training covering the following topics has been suggested:

- Accommodation & environmental conditions
- Test & calibration methods and method validation
- Measurement traceability
- The handling of test and calibration items
- Assurance of the quality of test and calibration results

6.7 Laboratory selection for BQE supporting elements (TW & CW) and the established status quo

During one assessment mission (11.9.-13.9.2017;) MENR's "Surface Water Pollution Monitoring Centre" in Baku was inspected with regard to its staff capacities, available sampling and analytical equipment, as well as the methods used for the determination of BQE supporting elements in TW & CW. The laboratory insights obtained indicated that with financial, technical and advisory assistance from the EUWI+ project this laboratory could be suitable for performing measurements, sampling and analytical work in the TW & CW pilot area of the Kura River. Taking into account the fact that MENR does not have a suitable research vessel and sampling devices for work in the shallow waters of the Kura Delta Pilot area, or the equipment for analysis of saline samples, the required financial assistance from EUWI+ is summarised in Table 2. Financial support should also be provided for participation in laboratory performance studies (inter-calibration exercises) for BQE supporting elements (Table 3).

Technical and advisory support from the EUWI+ project should be directed to the areas of monitoring planning, performance and result evaluation in the form of workshops (*"General training workshops on WFD-relevant issues (TW & CW) for the MENR Surface Water Pollution Monitoring Centre in Baku"*, page 27).

6.8 Assessment methodology and objectives for the biological laboratories (TW & CW)

The first assessment mission revealed that MENR's laboratories in Azerbaijan do not cover the BQE's required for TW & CW. A similar situation has also been noted in some EU member states and usually laboratories from universities or institutes are contracted for biological monitoring. The performance of biological monitoring in TW & CW has been agreed in the same manner with the deputy-head of the MENR's National Environmental Service. After the mission, labs for particular BQE's (phytoplankton, macroalgae, benthic invertebrates, angiosperms and fish) were identified at Baku State University, but the assessment of these laboratories still has to be performed. The assessment methodology for the upcoming laboratory evaluations will be of a general nature (staff capacities, facilities, analytical equipment, data handling, reports, etc.), but also of WFD relevance (appropriate sampling and determination techniques, monitoring frequencies, quality assurance, inter-calibration exercises, national reference conditions, use of indices, etc.).

Taking the aforementioned into account, the objectives will be the identification of laboratory needs for:

- Analytical and determination equipment, equipment servicing and consumables, which feeds into Act. 2.1.2);
- Training on inter-calibrated methods suitable for the Caspian Sea, development of reference conditions, EQR concept) (feeds into Act.2.2.1).

7 ACTIVITIES

7.1 Activity 2.1.2 – Equipment procurement

The main focus in the assessment phase was on the rehabilitation of the Surface Water Pollution Monitoring Centre laboratory. For this reason, several political and administrative steps have been initiated in order to come to an agreement and establish a basis for appropriate conditions/infrastructure with the aim of ensuring a sustainable operational mode for the laboratory's future. EUWI+ is able to contribute to this process and offers support. A collaboration agreement for this specific purpose is being drawn up.

Apart from specific training on methodologies, adequate analytical instruments and tools, an upgrade of existing equipment is needed to fulfil the requirements for chemical monitoring. As a result of the assessment missions to Azerbaijan, the following tables of needs have been prepared, which summarise the identified requirements and the desired support expressed by the beneficiary. The list of equipment is a draft and will be agreed with the beneficiary.

7.1.1 MENR laboratory in Baku (Surface Water Pollution Monitoring Centre)

Table 1: Suggested list for the procurement of equipment and consumables for the MENR lab in Baku

WFD relevance	Substance name/parameter	Equipment & consumables	Estimated costs
Equipment list			
Yes	Heavy metals	ICP-OES	€ 100,000
	VOC, pesticides	GC-MSD, with headspace and liquid injection autosampler	€ 120,000
Yes	Deionised water	Water purification system with cartridges	€ 10,000
Yes	Sample preparation for metal analysis of biota and sediments	Micro-wave digestion system	€ 20,000
Yes	Storage of biota samples	Deep freezer	€ 4,000
Yes	Double beam spectro-photometer	1 unit	€ 3,500
Yes	Analytical balances	4 units, € 1,250 each	€ 5,000
Yes	Automated pipette dispensers, 1, 5, 10, 20 mL	5 units	€ 750
	Multi meters (pH, O_2, cond, T etc.), laboratory and field proof	3 units	€ 7,500
	Stationary O2, conductivity, pH		€ 5,000
	Drying cabinet	4 units, need specification	
	Laboratory dishwasher		€ 10,000
	Rotary evaporation	1 unit, water bath	€ 2,500
	Refrigerators	2 units, reagents etc.	€ 300
Total (equipment)			**€ 288,550**

WFD relevance	Substance name/parameter	Equipment & consumables	Estimated costs
List of consumables			
Yes	Cd, Pb + Ni, potassium, sodium, magnesium, Cu, Zn, Mn, Cr, Fe	Single and multi-element hollow cathode lamps for AAS	€ 2,500
Yes	Organochlorine pesticides	Pesticide grade solvents	€ 1,000
Yes	Alachlor, isodrin, hexachlorbutadiene, delta-hexachlorocyclohexane, pentachlorobenzene, trichlorobenzene, dicofol, bifenox, heptachlor, aclonifen	Purchase of chemical reference materials for expanding the current analytical methods	€ 500
Yes	Atrazine, chlorfenvinphos, chlorpyrifos (chlorpyrifos-ethyl), simazine, trifluralin, cybutryn, cypermethrin, dichlorvos, terbutryn, benzene, carbon tetrachloride, trichloroethylene, tetrachloroethylene, 1,2-dichloroethane, dichloromethane, trichlormethane, bis(2-ethyl-hexyl)phthalat (DEHP), 4-tert-octylphenol, nonylphenol (4-nonylphenol, hexabromocyclododecane (HBCDD)	Purchase of chemical reference materials for method adaption	€ 2,500
Yes	Organochlorine pesticides	GC capillary column	€ 700
Yes	EN ISO 10695, EN ISO 15680, EN ISO 22032, EN ISO 10301, ISO 12010, ISO EN 18856, EN ISO 11369, EN ISO 18857-1, EN ISO 12673, EN ISO 17353, EN ISO 25101, EN ISO 11369, ISO/NP 21677, ISO 5667-12	Technical standard methods (ISO, EN) for the determination of priority substances	€ 200
Yes	Sampling of water for organic priority substances	50 amber glass bottles with conical shoulders (1L) 25 amber glass bottles with conical shoulders (2L)	€ 200
	Cooling boxes for sample transport	15 units each 100 L	€ 2,500
Total (consumables)			€ **10,100**
Total (equipment and consumables for the MENR laboratory in Baku)			**298,650**

Table 2: Suggested EUWI+ assistance for MENR's Surface Water Pollution Monitoring Centre in Baku

Activity	Status	Suggested EUWI+ assistance	Estimated costs (EUR)
Research cruises	Missing research vessel	Boat rental	< 1,000
Water sampling	Inadequate samplers	Purchase	< 3,000
T, S probe	Inadequate	Purchase	< 3,000
Photometer	Inadequate	Purchase, 10 cm cell	< 10,000
Various lab equipment	Insufficient or missing	Purchase	< 1,000
Inter-calibration exercise on nutrients	Missing	Organise	< 1,000
Total			**19,000**

Table 3: Suggested EUWI+ financial assistance for planned activities for MENR's Surface Water Pollution Monitoring Centre in Baku

Topic	Timeline	Estimated costs
Participation in water analysis proficiency testing schemes (PTS) (seawater, estuarine water) for dissolved oxygen, nutrients and Chl a Programmes: http://www,quasimeme.org/gfx_content/documents/Brochure%20quasimeme%202017.pdf http://www.association-aglae.fr/en/tags/proficiency-tests	One round of PTS: one participation in 2018, the second in 2019	€ 3,000

7.1.2 MENR laboratory in Beylagan

Table 4: Suggested list for procurement of equipment and consumables for the MENR laboratory in Beylagan

WFD relevance	Substance name/parameter	Equipment & consumables	Estimated costs
Yes	Dissolved oxygen (EN ISO 5814:2012)	Multimeter for the determination of conductivity, pH-values and dissolved oxygen incl. calibration standards (buffer solutions, …)	€ 2,500
	Dual-beam spectrophotometer		€ 3,500
		Water purification system	€ 10,000
Total (equipment and consumables for the MENR laboratory in Beylagan)			**€ 16,000**

7.1.3 MENR laboratory in Gazakh

Table 5: Suggested list for procurement of equipment and consumables for the MENR laboratory in Gazakh

WFD relevance	Substance name/parameter	Equipment & consumables	Estimated costs
Yes	Dissolved oxygen (EN ISO 5814:2012)	WTW multimeter for determination of conductivity, pH-value and dissolved oxygen incl. calibration standards (buffer solutions, …)	€ 2,500
	Dual beam spectrophotometer		€ 3,500
		Water purification system	€ 10,000
Total (equipment and consumables for the MENR laboratory in Gazakh)			**€ 16,000**

7.2 Technical support of laboratories for accreditation (Activity 2.1.3)

7.2.1 MENR laboratory Baku (Surface Water Pollution Monitoring Centre)

Table 6: Planned activities for the MENR laboratory in Baku (Surface Water Pollution Monitoring Centre)

Topic	Timeline	Costs
Participation in water analysis proficiency testing schemes (PTS) for selected groups of parameters Programme: http://www.umweltbundesamt.at/en/services/laboratory_services/interlaboratory_comparison/ic_wateranalysis/	Two different rounds of PTS: one participation in 2018, the second in 2020	€ 2,500
Participation in a study tour of selected laboratories and administrative bodies of the consortium partners by one laboratory staff member	2019	--

In addition, the following technical support of laboratories for accreditation under Activity 2.1.3 is planned:

Table 7: Suggested technical support for the MENR laboratory in Baku (Surface Water Pollution Monitoring Centre)

Substance name/parameter	Equipment, consumables & services	Estimated costs
Cu+Cr+Pb+Cd+Mn+Ni p/u AAS, 1g/l, 100 ml, reference material for heavy metals (Cu, Zn, Ni, Pb, Cd, Mn)	Purchase of chemical reference materials for existing accredited test methods	€ 1,000

All other training is summarised under Activity 2.2.1. (see chapter 7.3)7.3.

7.2.2 MENR laboratory in Beylagan

The following implementation steps are planned:

Table 8: Planned activities for the MENR laboratory in Beylagan

Topic	Timeline	Costs
Participation in water analysis proficiency testing schemes (PTS) for selected groups of parameters Programme: http://www.umweltbundesamt.at/en/services/laboratory_services/interlaboratory_comparison/ic_wateranalysis/	One round of PTS: one participation in 2018, the second in 2020	€ 1,250
Participation in a study tour of selected laboratories and administrative bodies of the consortium partners by one laboratory staff member	2019	--

All other training is summarised under Activity 2.2.1. (see chapter 7.3).

7.2.3 MENR laboratory in Gazakh

The following implementation steps are planned:

Table 9: Planned activities for the MENR laboratory in Gazakh

Topic	Timeline	Costs
Participation in water analysis proficiency testing schemes (PTS) for selected groups of parameters Programme: http://www.umweltbundesamt.at/en/services/laboratory_services/interlaboratory_comparison/ic_wateranalysis/	One round of PTS: one participation in 2018, the second in 2020	€ 1,250
Participation in a study tour of selected laboratories and administrative bodies of the consortium partners by one laboratory staff member	2019	--

All other training is summarised under Activity 2.2.1. (see chapter 7.3).

7.3 Preparation of training plans and organisation of hands-on training and trainer training with regard to monitoring and laboratory analyses and the support of laboratories for accreditation (Activity 2.2.1)

The following training needs were identified as a result of visits during the inception phase and the in-depth analysis of the current status of the technical capacity of the laboratories. We differentiated between hands-on training on existing equipment and the equipment to be purchased in the course of the project, and more general training, which can be held independently.

7.3.1 Equipment-dependent training for the MENR laboratories

Existing equipment – method expansion, adaption and validation

As method expansion, adaption and validation is carried out by MENR's laboratory in Baku (Surface Water Pollution Monitoring Centre) with regard to Baku, we merely refer to this laboratory. The laboratories in Beylagan and Gazakh will receive the information needed directly from the main lab in Baku (if required).

For the following parameters, method adaption, purchase of the relevant ISO- and chemical reference standard (see chapter 7.1.1), method validation and the training of laboratory staff members will be provided directly on the laboratory premises.

Table 10: Suggested implementation of parameters with existing equipment

Priority	Substance name/parameters	Comment (suggested techn. ISO standard)	Method description	Dates
1	Carbon tetrachloride, trichloroethylene, tetrachloroethylene, 1,2-dichloroethane, dichloromethane, trichlormethane	EN ISO 10301	LLE with n-hexane and detection by HS-GC-MS	Q2/2018
1	Benzene	EN ISO 11423	Direct detection by HS-GC-FID or HS-GC-MS	Q2/2018
2	Diuron, isoproturon, quinoxyfen	EN ISO 11369	Liquid-solid extraction and detection by HPLC-UV	Q4/2018

New equipment – method expansion, adaption and validation

For the equipment procured under activity 2.1.2 method validation is planned after successful installation and test runs for the following groups of compounds and related ISO standard methods indicated in Table 9:

Table 11: Suggested implementation of parameters with new equipment

Priority	Substance name/parameters	Comment (suggested techn. ISO standard)	Method description	Dates
1	Atrazine, chlorfenvinphos, chlorpyrifos (chlorpyrifos-ethyl), simazine, trifluralin, cybutryn, cypermethrin, dichlorvos, terbutryn	EN ISO 10695	LLE with dichloromethane and detection by GC-NPD or GC-MS	Q1/2019
1	Bis(2-ethyl-hexyl)phthalat (DEHP)	ISO EN 18856	C18-SPE and detection by GC-MS	Q1/2019
1	4-tert-octylphenol, nonylphenol (4-nonylphenol	EN ISO 18857-1	LLE with toluene and detection by GC-MS	Q1/2019
1	Dissolved organic carbon (DOC), total organic, total organic carbon	EN ISO 8245	DOC/TOC-Analyser	Q2/2019
1	Cadmium- and cadmium compounds, lead and lead compounds, nickel- and nickel compounds	EN ISO 15586	Acid digestion and detection by GF-AAS	Q2/2019
2	Pentachlorophenol	EN ISO 12673	Derivatisation with acetic anhydride, extraction with n-hexane and detection by GC-MS	Q3/2019

General training for laboratory personnel from the MENR laboratories in Baku, Beylagan and Gazakh

For general training (non-specific training), the participation of persons outside the EUWI+ (other relevant projects in the regions) is welcomed, but must take place on a self-financed basis. In such cases, EUWI+ cannot provide financial contributions.

- **Training for QA/QC and method validation (Q4/2017)**
  - Method validation (LOD, LOQ, measurement uncertainty)
  - QA/QC measures (e.g., blank values, control samples, recoveries)
  - Use of control charts
  - Improvement of LOQ
  - Measurement traceability
- **ISO 17025: 2017 new revision** – training regarding changed requirements and an exchange of experience for implementation (Q4/2018 at the earliest, or Q1/2019)
- **Training for internal auditors** based on the ISO 19011 guideline for auditing management systems and specific requirements of the ISO 17025 (Q3-4/2018)

General training workshops on WFD-relevant issues (TW & CW) for the MENR Surface Water Pollution Monitoring Centre in Baku

- **Delineation workshop (timeframe: January – March 2018)**
  - Common implementation strategy
  - Identification of TW & CW water types and water bodies
  - Artificial and heavily modified water bodies
- **TW & CW monitoring preparatory workshop (timeframe: March – June 2018)**
  - BQE monitoring frequencies
  - Final check of sampling and determination methodologies
  - Protocols
- **TW & CW monitoring results and ecological status reporting (timeframe: October – December 2018)**
  - Type-specific threshold values
  - Evaluation of results
  - GIS application

8 RELATED ISSUES

8.1 Laboratory waste management

At present, used chemicals, organic solvents and other hazardous laboratory waste are collected and stored in the laboratories. Sooner or later, the maximum storage capacities will be reached. In particular, an increase in technical capacity will also lead to a rise in the production of hazardous waste. An alternative solution for the handling of hazardous chemical waste needs to be found. As an example, we would refer to the procedures of the AZEcolab, where appropriate waste management is in place and a licensed company has been contracted for the regular disposal of hazardous materials.

8.2 Import regulations

According to information from the AZEcolab, there are basically no restrictions on the import of goods, consumables, services or spare parts in place in Azerbaijan. However, excluded from this principle are explosives which require special certification of the laboratory/operator.

8.3 Data security

A thorough check of the data infrastructure has yet to be carried out. However, discussions regarding the procurement of a server for data storage and web applications have been held with the Meteorological Twinning Project.

To our knowledge, the laboratory has no networks and does not employ server-based data handling. This should be a matter for further discussions, as data management is also a subject for accreditation. The risk of data loss would appear to be serious and therefore enhanced data security and protection are recommended.

9 INSTITUTIONAL SUSTAINABILITY OF SELECTED LABORATORIES

In order to run a laboratory properly, a basic budget for infrastructure maintenance and the purchase of essentials is needed. Essentials are seen as including standards (norms), reference materials, consumables, equipment and a budget for servicing of instruments and equipment, etc. Sustainable laboratory work needs a sustainable budget, which in the case of all three laboratories would seem to be lacking. An awareness of this fact is a managerial prerequisite for management and is appreciated by the EU experts.

Another aspect relates to the basic conditions at the laboratory premises. This issue was already touched upon in chapter 6.1 and EUWI+ seeks to counteract this situation by encouraging the ministry to refurbish the laboratory and by financially contributing to this process. The basis for approaching monitoring requirements is formed by proper conditions, which in turn are an ISO 17025 criterion. A concept for improvement was prepared in the assessment phase and submitted for consideration to the Minister of Ecology and Natural Resources of the Republic of Azerbaijan.

Modern analytical work demands high-end instrumentation and the appropriate quality management procedures. However, high-end instruments, are costly investments and require subsidies for use (energy), consumables (gases, chemicals, solvents etc.), maintenance, servicing, spare parts, the expense for the establishment of new methods and the various cost-intensive support procedures needed to achieve valid results. These aspects have also to be taken into account in the conceptualisation phase. It is imperative that this aspect is also mentioned and appropriate budgeting be considered in order to guarantee sustainable performance beyond the timeframes of funded projects. For this reason, the drafting of a laboratory strategy would help identify critical items and determine actions to overcome bottlenecks.

10 RECOMMENDATIONS AND STRATEGIC OUTLOOK

During the last assessment mission it was agreed with the NFP that a refurbishing process to started at the MENR laboratory in Baku. EUWI+ is also willing to contribute to the refurbishment financially and experts have already prepared a preliminary assessment document, which describes the status quo and provides recommendations. The document has been sent with a letter requesting laboratory refurbishing to the Minister of Ecology and Natural Resources. As several rules have to be fulfilled and administrative issues will have to be clarified in advance, strict scheduling is needed to cope with the EUWI+ structure. The earlier a high level decision can be achieved, the easier all further implementation will be.

Related documents:

- AZ_UBA_Mission Report_PH_FZ Oct 2017_2.1.1.doc; 3rd mission report
- EUWI+ AZ conclusions and recommendations.doc, recommendations for action
- EUWI+ contribution to lab refurbishment.doc, Letter to the Minister MENR

During this assessment only a few selected laboratories were adjudged. Therefore, this assessment cannot be seen as representing the situation of all the laboratories throughout the entire country.

As stated in the previous chapter, the authors recommend the preparation of a laboratory strategy for the selected laboratories for a period of ten years.

11 LINKS WITH OTHER PROJECT ACTIVITIES

- Legal and policy framework under Result 1
- Monitoring
- RBMP
- Data management
- Etc.

12 NEXT STEPS

With respect to this report the following steps need to be implemented as soon as possible:

- A review of the final draft assessment report by the beneficiaries
- The start of the procurement procedure (see section 7.1)
  - The purchase of consumables
  - Drafting of technical specifications for the new equipment by the beneficiaries in-line with WFD requirements in the English language
  - A review of the technical specifications by Environment Agency Austria experts
- Planning of technical support to the laboratories (see section 7.2)
- Planning of training activities (see section 7.3)
- A visit to the MENR laboratory by an IOW expert to assess the data security status

EUROPEAN UNION WATER INITIATIVE PLUS FOR THE EASTERN PARTNERSHIP (EUWI+ 4 EaP)

PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Assessment Mission AZ

1 MISSION OBJECT

The aim of the three assessment missions to Azerbaijan was to assess the laboratories of the Ministry of Ecology and Natural Resources (MENR) in terms of their capacity and capabilities to cope with the requirements of the Water Framework Directive (WFD) and to identify subjects for training and instrumentation. In particular, the Surface Water Pollution Monitoring Department of the Centre of National Monitoring Department of MENR and the local laboratories at Beylagan and Ghazak have been visited in order to assess the current status of their analytical work in relation to the WFD and their existing quality standards pursuant to EN ISO 17025:2005.

The focus of the assessment lay on the priority substances of the WFD in respect of methods, LOQ, quality procedures according to WFD. In addition, existing quality standards according to ISO/IEC17025: 2005 were evaluated.

The outcome of the assessment will be described in detail in an assessment report. This report focuses on the situation in the laboratory building and room conditions at the laboratory in Baku.

Persons to be met/institution visited

- Ministry of Ecology and Natural Resources, National Environmental Monitoring Department
  - Ms Matanat Avazova
  - Mr Arastun Hasanov
- National Environmental Monitoring Centre, Surface Water Pollution Monitoring Laboratory
  - Mr Vasif Aliyev, Head of Centre
  - Ms Ramina Abdullayeva, Ms Aybaniz Dushdurova
- Local laboratory in Beylagan (Mr Ilhan Haciyev, Head of Lab, Ms Khatira Sardarli QM rep.)
- Local laboratory in Ghazak (Mr Emin Sariyev, Mr Ismail Valiyev)

2 CURRENT STATUS AND APPROACH

Although the assessment activity has yet to be completed, essential recommendations need to be provided now in order to guarantee the achievement of subsequent project steps. Therefore, this paper, focuses solely on the observed laboratory conditions and several time-critical steps are suggested. They are aimed at improving the conditions of the laboratory by building on several preliminary but valid observations.

In particular, we would like to highlight the fact that even under the existing conditions the laboratory

performs well and the commitment and expertise of the personnel promises to provide a solid basis for approaching the goals set by the project.

Three laboratories of relevance for differing pilot river basins carry out work related to monitoring within the Water Framework Directive. However, the main analytical work is completed in the laboratory in Baku, where samples from the regions are sent. Descriptive physical and chemical parameters are analysed in the field, or in the local laboratories, while samples for organic and inorganic analyses are sent to Baku.

We support this structure as an efficient approach to the centralisation of advanced analytical work. For this reason, the performance of the local laboratories should be enhanced by the supply of the instruments and tools necessary to perform these assignments correctly. The central laboratory then has the task of performing the required analyses and managing the overall process. Therefore, from this perspective, the updating of the laboratory premises is urgently needed. In the following, we refer to the laboratory in Baku alone.

2.1 Laboratory premises

- MENR National Environmental Monitoring Centre
  - The building and rooms of the laboratory are in a very poor condition and do not meet criteria laid down by ISO 17025
  - There are partly damaged and crumbling walls, dust and water damage
  - Humidity, dust, noise, vibrations and electromagnetic fields may influence the occupational safety and work performance (interference and cross-contamination of samples and analytical processes)
  - There is no separation of the laboratory and offices
  - Due to the absence of a designated room and appropriate conditions, laboratory employees eat and drink in the laboratory (safety issue!)
  - There is an unnecessary exposure of the personnel to chemicals, noise and other stress factors in the laboratory due to the non-separation of office and administrative work

2.2 Location of the laboratory

- The laboratory is already located in a more or less traffic-calmed area outside the city centre; the influence of environmental contamination is probably low.
- There is easy access for logistics (sample pick-up and delivery) and available parking space
- The area is connected to public transport

2.3 Current technical infrastructure

- The water supply seems to work properly and in sufficient quantity; however, water damage (probably due to broken pipes) was observed on the walls/ceilings
- Electrical supply problem (network black-outs, unstable voltage) have been reported and the insufficient network structure is obvious:
  - Threat to high-end instruments, which can be ***severely*** damaged by these fluctuations
  - To overcome the instable power supply, sufficient UPS (uninterruptible power supply) devices are needed
  - We recommend the installation of an isolated electrical network with UPS for instruments and their control computers
  - Various supply lines are not properly installed and secured; loose cables, self-made connections, danger of power line overloads
- Insufficient fume extraction
  - The existing fume hoods appear to be insufficient in terms of their capacity to extract toxic and corrosive gases
  - The number of fume extractors is insufficient
- Air conditioning
  - Although air-conditioning is in place, its capacity is insufficient to keep the rooms at a constant temperature (e.g. open windows, fluctuating temperature). The same applies to the room heating in winter.
  - High-end instruments require very stable ambient conditions in order to perform accurately
- Various inappropriate materials are used for work benches (wood), floor (wood, linoleum) and should be replaced

2.4 Existing equipment

Without commenting on the list of desired instruments, which is about to be discussed in detail, several high-end analytical instruments exist, or are foreseen for procurement for the measurement of priority substances in water according to the WFD. These instruments and analytical procedures require the minimum room standard laid down in the EN ISO 17025:2005. **Under the current conditions, the purchase and installation of new equipment cannot be justified.**

Therefore, the member states consortium of EUWI+ experts recommends the following ideal configuration and design of the future laboratory

3 GENERAL RECOMMENDATIONS FOR A FULLY COMPLIANT LABORATORY

3.1 Configuration of rooms

As stated in chapters 5.1 and 5.5. (“Accommodation and environmental conditions”) of EN ISO 17025: 2005, laboratory facilities must not invalidate results, or adversely affect the required quality of any measurement. Therefore, the appropriate design of individual laboratory rooms, adapted to the instruments used, is required.

We suggest considering the following:

- Designate rooms for the following instruments
  - AAS/ICP-MS measurement room
  - GC-MSD, GC-FID, GC-ECD measurement room
    - The measurement room should contain instruments, the necessary infrastructure (pumps, gas supply) and a small desk for simple vial treatment (but not for chemical work!)
  - IC measurement room, potentially together with photometers and multi-parameter
  - Sample preparation rooms for organic and inorganic sample preparation; an additional room should be available to avoid cross-contamination (solvents, etc.)
  - Sample reception and distribution, bottle/equipment cleaning
  - Weighing room
  - Sample extraction
  - Milling, grinding, sieving, storage, possibly also a refrigerated room for sample storage
  - If possible, facilities for hazardous waste collection, storage and/or treatment should be considered
- Suggested design and infrastructure
  - Ideally, the rooms should not be higher than 2.5-2.8 meters in order to avoid a high volume for air conditioning
  - External sun protection (blinds); temperature and radiation
  - Fume extractor hoods installed in sample preparation rooms
  - Extractors for rooms with high-temperature instruments (GC, ICP etc.)
  - The rooms should be fitted with the appropriate materials (ceramic floor, ceramic table surfaces, dust-repellent wall painting, air-tight windows etc.) to facilitate regular cleaning

3.2 Minimum technical infrastructure

- In order comply with the requirements of analytical high-end instruments and ISO 17025, we suggest the following aspects be considered:
- Stable electrical power supply, in the case of using UPS-equipment for sensitive analytical equipment
- Appropriate heating and cooling (A/C) systems to guarantee stable indoor working conditions and the achievement of correct results by the equipment
- Stable water supply, sufficient in quantity
- Fume extractor hoods for sample preparation, extraction/evaporation, digestion and other processes involving exposure to gaseous or particulate chemicals

3.3 Recommendations regarding technical training

- Training on definitions according to ISO/IEC 17025:2005 to clarify the unambiguous use of terms during the project (end of 2017)
- Training on method validation – accuracy (veracity and precision) of measurement methods and results
- Specific training on methods and equipment will be agreed at a later date

3.4 Recommendations regarding quality standards

Current quality standards according to EN ISO 17025:2005

- According to EN/ISO 17025, a quality manager has to be appointed irrespective of other duties and responsibilities, in order fully commit to the challenges of quality management. The person holding this position must have access to all hierarchical levels and ensure that the quality system is implemented and followed at all times. As such, the position needs to be equipped with the necessary funds and empowerment for maintaining quality assurance in daily practice (EN ISO 17025:2005, chapter 4).

3.5 Recommendations towards sustainable performance

Modern analytical work demands high-end instrumentation and the appropriate quality management procedures. However, high-end instruments, are costly investments and require subsidies for use (energy), consumables (gases, chemicals, solvents etc.), maintenance, servicing, spare parts, the expense for the establishment of new methods and the various cost-intensive support procedures needed to achieve valid results. These aspects have also to be taken into account in the conceptualisation phase. It is imperative that this aspect is also mentioned and appropriate budgeting be considered in order to guarantee sustainable performance beyond the timeframes of funded projects.

3.6 Draft outline of the next steps

- Completion of this document outlining conclusions and recommendations
- Submission of a letter of request to the Minister of Nature Protection of Azerbaijan, appending this document of justification
- Drafting of a collaboration agreement within the project's budgetary limits
    - Detailed calculation of costs for
        - The removal of disused equipment/furniture
        - Architectural planning of the laboratory
        - Costs for the necessary replacement or refurbishment of room infrastructure (windows, doors, floor, heating, power supply, air conditioning, water etc.)
        - Refurbishing of walls, etc.
        - Costs for new laboratory furniture
        - Relocation of existing instruments and reinstallation
- Presentation of a detailed schedule for the foreseen activities foreseen
- Kick-off and implementation of the plan

umweltbundesamt
ENVIRONMENT AGENCY AUSTRIA

International Office for Water

www.euwipluseast.eu