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

AUDIT REPORT

GROUNDWATER SAMPLING GEORGIA

Funded by
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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
EPIRB ..... Environmental Protection of International River Basins
ESCS ..... Ecological Status Classification Systems
EU ..... European Union
EUWI+ ..... European Union Water Initiative Plus
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 Georgia

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

NEA..... National Environment Agency

NWP..... National Water Partnership

1. Scope

Whenever a volume of water – in terms of groundwater, a groundwater body – is to be characterized, it is generally impossible to examine the whole volume and it is therefore necessary to take samples. Because one single sample – often 1 liter or even less – should represent volumes of thousands of liters of groundwater, qualified collection of samples is of utmost importance.

Since the repetition of whole sampling tours is mostly impossible and the comparability of data is otherwise not guaranteed at all, errors made during sampling cannot be repaired.

Therefore, the whole procedures of sampling – beginning with the preparation and planning, followed by the technical implementation in the field and ending with the documentation, the handover of the samples, as well as the cleaning and maintenance of the equipment – should be qualified processes.

The groundwater sampling audit aimed to assess whether the requirements of the ISO (International Organization for Standardization) standards and the EU Water Framework and Groundwater Directives to monitor groundwater are followed.

On 12th and 13th June 2023 experts from the National Environmental Agency of Georgia (NEA) took part in an on-site training on quality assurance aspects during water sampling. The training given by international experts of Umweltbundesamt Austria covered theoretical aspects, routine sampling procedures from preparation and planning of a sampling tour, calibration of field equipment, taking samples in the field and handover of samples to the laboratory. The international experts observed the national colleagues during their routine work .

This report reviews the sampling procedures observed, summarizes the observations and gives suggestions where further improvments in the quality of sampling can be achieved. Therefore, the report serves as a first step of sampling certification, even as a basis for future accreditation in the field of (ground)water sampling.

2. Activities performed

On 12th June 2023 an introduction about the importance of sampling in context with quality assurance was given to the experts of NEA by international experts of the Umweltbundesamt. The particular focus was on the content of the ISO 5667-1: Water quality — Sampling — Part 1: Guidance on the design of sampling programmes and sampling techniques.

It was highlighted, that there is lots of planning and coordination with responsible personnel to be done in advance of a sampling tour to answer all questions of a sampling programme.

Moreover, it was indicated that sampling requires quality assurance during the whole sampling process, before, during and after the actual work in the field.

One important document, the sampling or survey manual, was discussed among the participants. On the basis of the survey manuals developed and used during EUWI+ and EU4EnvWaterData, a draft national survey manual was presented by the experts of NEA. This document covers the main logistical and technical aspects of groundwater sampling in Georgia and will be used for the planning of each groundwater survey in Georgia, for both, national duties and for surveys initiated in the frame of international projects. Therefore, the whole document – even the included template of a sampling protocol – is bilingual, Georgian and English. The presented draft is of high quality and testifies to the

great motivation and high expertise of the groundwater experts of NEA. The presented document is still in the drafting process.

In the afternoon of 12th June 2023, the sampling equipment was prepared and checked for completeness. A focus was given to the new onsite measurement system of WTW (Multi 3630 IDS set F) that was used for the first time. The set contains of a precision device meter Multi 3630 IDS, including the sensors for electrical conductivity (EC) (TetraCon 925) and pH-value (SenTix 940), as well as an optical oxygen sensor (FDO 925), calibration and storage solutions for the sensors.

In the laboratory of NEA all three sensors where calibrated on the day before the sampling tour for the first time by experts of NEA. The pH-sensor was calibrated with special buffer solutions (DIN/NIST) in 20 ml glass ampules, the electrical conductivity sensor with 0.01 mol/l KCl solution and the optical oxygen sensor in saturated air in the delivered transport device. Within the calibration process, the manual of the device was consulted, supported by practical input of the experts of Umweltbundesamt.

In the morning of 13th June 2023 the national experts of NEA stored the equipment in the car and went to several monitoring stations near Tbilisi accompanied by the experts of Umweltbundesamt, who observed the national experts during their work onsite.

The experts of NEA performed typical groundwater sampling in the field, the experts of Umweltbundesamt observed the activities, discussed those points that attracted attention together with the national experts of NEA and provided instant recommendations.

3. Recommendations

Based on the observations gathered before, during and after the survey, the following aspects and activities are highly recommended to be considered in future groundwater sampling activities:

- Checklists for completeness of the needed equipment are highly recommended.
- Proof of technical functionality of the equipment should be done and documented before a sampling tour.
- Calibration of the new equipment was done for the first time with special precise buffer solutions in glass ampules. It should be considered that the WTW Multi 3630 IDS set F itself contains other technical buffer solutions in 50 ml plastic bottles.
  For the next calibration it is very important to change in the settings of the WTW Multi 3630 IDS device the settings of the used buffer solutions. It has to be changed from the initially used special precise buffer solution (from the first time calibration) to the technical buffer solution set from WTW, which is used for calibration from now on. This has to be done before the next calibration.
  The frequency of calibration is set manually and is indicated by blinking electrodes in the display of the meter Multi 3630 IDS.
- The buffer solutions should be stored in an appropriate place, ideally in the laboratory under controlled conditions.
- Buffer solutions have an expiry date after which they must not be used anymore. Use buffer solutions only one time and dispose them properly after this single use.

- The new WTW device shows and stores the calibration data. It is recommended to write these calibration data into a specific book or digital file each time, because such a documentation can help detecting at an early stage when a sensor is ageing.
- Cooling batteries have to be stored frozen in advance. Only frozen cooling batteries provide sufficient cooling of the samples.
- Avoid direct contact of frozen cooling batteries with the bottles.
- The cooling box should be big enough to be completely closed during the whole day.
- If possible, use two cooling boxes, one box with the empty bottles that need not be cooled and one box with the taken samples that is cooled the whole time. Open the cold cooling boxes only for inserting samples.
- Control the temperature in the cooling boxes several times during the day. E.g. on 13th June 2023, the sampled water temperatures were about 12 °C and the temperature inside of the cooling box was higher than 25 °C throughout the whole sampling day which is much too high. Ideally, the temperature inside the cooling box should be the same as the temperature of the sampled water underground.
- The measurement of the onsite parameters should be done in the flowing water at the site itself (and in water which was taken from the sites and stands in a bucket), to reflect the natural conditions especially of oxygen content and water temperature.
- Before measuring and reading the values at the devices, wait until the values are stable. The safest way using the new WTW equipment would be using the Autoread (AR) function of the device.
- Organoleptic parameters (taste, odour) should be observed in reality at the sampling site. These parameters should be added into the sampling protocol only after they have actually been controlled and not in advance.
- Next to the bottles also the caps of the bottles should be rinsed before filling the bottles.
- The automatic monitoring systems of the monitoring sites show several parameters which are automatically measured. These systems are not calibrated regularly. For that reason there is a realistic risk that the automatically measured data do not reflect correct data. It is recommended to write the values of these automatically detected parameters next to the values of the self-measured parameters in a special column of the sampling protocol. There should be a regular qualified process of calibrating and adjusting the automatic sensors of the monitoring sites. Otherwise the automatically gathered data are useless.
- Compare the self-measured data of your second pH & EC device (Combo by HANA) with the measurements of the WTW device. The WTW device – if calibrated – should give you the real and therefore better values.
- For discharge measurements 5 litre and 14 litre buckets are used. Check the printed scale on the buckets for correctness. Measure the discharge at the sampling site each time and compare with the automatically measured discharge. Note both in the sampling protocol.
- Use checklists for cleaning and maintenance of the whole equipment. These checklists should ideally contain the signature and the time by whom and by when the equipment was cleaned or maintained.

4. Summary

The overall impression of these 2 days of observation is that the groundwater experts of NEA are highly motivated and have high expertise in the procedures of groundwater sampling.

Some minor aspects of avoiding errors, that can be made, were rather new and need to be taken into account and included in routine work.

However, if the above recommendations will be implemented and the previous high quality activities continue to be applied in the same high quality way, the quality of the already good groundwater sampling will continue to improve and ensure representative samples according to international standards.

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