

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

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WATER MONITORING ASSESSMENT REPORT – GEORGIA



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The assessment in Georgia was carried out during the second and third quarters of 2017 and its Final Draft Report (Version 2.0) had been agreed in December 2017. The current final version does not include any new assessments or additional findings, but reflects the new visibility requirements of the project only.

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CONTENTS

1	Project Summary	7
2	Executive summary	8
3	Introduction	10
4	Assessment Objectives	12
4.1	Objectives	12
4.2	Assessment methodology.....	13
4.3	Chronology	14
5	Activities	15
5.1	Activities regarding groundwater	15
5.1.1	Activity 2.1.1 Assessment of monitoring and laboratory infrastructure, capacities and needs.....	15
5.1.2	Activity 2.1.2 Purchase of equipment, including hydrogeological and water quality monitoring stations and rehabilitation and upgrade of existing equipment and existing laboratories	16
5.1.3	Activity 2.2.1 Preparation of training plans and organisation of hands-on trainings and training of trainers with regard to monitoring and laboratory analyses and to support laboratories for accreditation.....	16
5.1.4	Activity 2.3.1 Assessment of the needs and identification of priorities in implementation of the RBMPs.....	17
5.1.5	Activity 2.3.2 Technical Support in the elaboration and implementation of the pilot RBMPs.....	18
5.2	Activities regarding surface water.....	20
5.2.1	Activity 2.1.1 Assessment of monitoring and laboratory infrastructure, capacities and needs.....	20
5.2.2	Activity 2.1.2 Purchase of equipment, including hydrological and water quality monitoring stations and rehabilitation and upgrade of existing equipment and existing laboratories	23
5.2.3	Activity 2.2.1 Preparation of training plans and organisation of hands-on trainings and training of trainers with regard to monitoring and laboratory analyses and to support laboratories for accreditation.....	24
5.2.4	Activity 2.3.1 Assessment of the needs and identification of priorities for implementation of the RBMPs.....	26
5.2.5	Activity 2.3.2 Technical Support in the elaboration and implementation of the pilot RBMPs.....	26
6	Related Issues.....	27
6.1	Legal and institutional reform	27
6.2	Institutional sustainability of selected institutions	27
7	Next steps.....	28
7.1	Linkage with laboratory assessment	28

7.2	Programming	28
7.2.1	Groundwater programming	28
7.2.2	Surface water programming	32
8	Strategic outlook and Recommendations	35

List of Tables

Table 1:	Existing assessment methods of NEA according to the questionnaire.....	20
Table 2:	Existing monitoring expertise of NEA according to the questionnaire	21
Table 3:	Existing assessment methods of NEA according to the questionnaire.....	21
Table 4:	Proposed equipment list for the biological laboratories at the NEA's Department of Fisheries, Aquaculture and Water Biodiversity and NEA's chemical lab in Batumi	24
Table 5:	Proposed additional EUWI+ activities to enhance labs analytical and status evaluation capabilities.....	24
Table 6:	Groundwater roadmap for Georgia	29
Table 7:	Surface water roadmap for Georgia.....	32

Abbreviations

BQE	Biological quality element
CW	Coastal water
DOA	Description of action
EC	European Commission
EaP	Eastern Partnership
EECCA	Eastern Europe, Caucasus and Central Asia
EU	European Union
EUWI+	European Union Water Initiative Plus
EPIRB	Environmental Protection of International River Basins
EQS	Environmental Quality Standards
GW	Groundwater
GWB	Groundwater body
ISO	International Standards Organisation
IWRM	Integrated Water Resources Management
MENRP	Ministry of Environment and Natural Resources Protection of Georgia
NEA	National Environmental Agency
NPD	National Policy Dialogue
QA	Quality assurance
QC	Quality control
QM	Quality management
RBMP	River Basin Management Plan
SW	Surface water
TW	Transitional water
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 Georgia

MENRP	Ministry of Environment and Natural Resources Protection
NEA	The National Environment Agency
NWP	National Water Partnership

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:

1. Legislation, policy development and institutional consolidation
2. Laboratory and monitoring system enhancement
3. River Basin Management Plan development
4. River Basin Management Plan implementation
5. 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 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.

This assessment report summarises the current state of knowledge regarding the existing water monitoring and management systems in Georgia and takes into account the findings of the forerunner EPIRB project and existing River Basin Management Plans. It indicates the needs identified for capacity building in Georgia, which are necessary in order to bring the country's water management in line with the Water Framework Directive (WFD).

Assessment focused primarily on the current status of ground- and surface water (identification and delineation of water bodies and preliminary identification of main pressures) and gaps in the light of the requirements of the WFD. The secondary focus was on the current situation of the quantitative and chemical groundwater monitoring network, as well as the monitoring of the biological quality elements in surface and coastal waters, and some general indications of areas of improvement.

The key Georgian institutions engaged in groundwater management and the current project, are the Ministry of Environment and Natural Resources Protection of Georgia (MENRP) and the National Environmental Agency (NEA). The Georgian institutions currently working on surface water issues and monitoring are the NEA in Tbilisi and the NEA in Batumi.

An assessment of the infrastructure of the Georgian monitoring institutions revealed that they already have concrete ideas, which not only relate to monitoring infrastructure, but also the training and further support needed to draw nearer to the WFD. There is a rich history of groundwater monitoring in Georgia, however with the collapse of the Soviet Union the related network was neglected. Some groundwater bodies were already identified and delineated during the EPIRB project. The NEA staff is familiar with the approach to groundwater monitoring stipulated by the WFD, which differs from the more traditional scientific hydrogeological approach followed in the Soviet era. The next step towards the WFD consists of the identification, delineation and characterisation of groundwater bodies in the Alazani-Iori and Khrami-Debed basins.

Scientific expertise regarding the Biological Quality Elements involved in surface water monitoring exists in Georgia, but some additional training activities with a focus on WFD compliance are still required. The two institutions visited do not cover hydromorphology and the limited number of experienced staff for surface water monitoring will limit the development of ecological assessment systems and delay the implementation of RBMPs.

The Fisheries and Black Sea Monitoring Department of the NEA in Batumi has a strong focus on fish. Water reservoirs and lakes are currently monitored for the whole country at 61 monitoring sites as part of biological and ichthyological studies. Macrophyte assessment commenced in 2016, starting with coastal waters and continuing with surface waters. The responsible experts were trained outside the country.

An assessment of the laboratories for transitional and coastal water showed that they possess a sufficient number of trained staff and basic analytical equipment, and use appropriate methods. The available sampling and analytical equipment in the laboratories is generally in an operational condition, but some items need servicing, or should be replaced with the help of EUWI+ financial support.

Staffing capacity is low, but owing to the fact that most of the biological scientists participated in previous or current EU projects (EPIRB and EMBLAS), they are familiar with the WFD requirements related to sampling, reporting, etc. However, there is still a need for further improvement and advisory support from EUWI+.

A basic budget for human resources, infrastructure maintenance and the purchase of essentials is essential for the establishment of a representative monitoring network for groundwater and all categories of surface water.

In order to facilitate the development of River Basin Management Plans and build respective capacity in the Georgian administration, a clear and pragmatic step-by-step procedure regarding the delineation of water bodies and the development of monitoring networks (based on the existing guidance of the Common Implementation Strategy of the Water Framework Directive and of the EPIRB project) is under development. This procedure will include draft templates for water body characterisation and a template for the characterisation of monitoring sites (based on the EPIRB Water Body at Risk Report and EU and Austrian experience). These will be introduced in a series of workshops and via work packages completed in the interim periods, which will be complemented by theoretical and practical training on sampling in close coordination with field surveys.

3 INTRODUCTION

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

The EUWI+ action is built on the lessons learned from several development initiatives of the European Union in the water sector in Georgia, consisting primarily of the EUWI EECCA and EPIRB projects.

This overall project objective 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 and biological and (physico-)chemical analyses. In view of limited resources and the necessity for effectiveness and efficiency, ground- and surface water monitoring must be carried out where it is most urgently required. The data generated has to be transformed into the information needed to acquire and use the knowledge necessary for risk-based and targeted water management, as stipulated by the WFD. A second key challenge is therefore the strengthening of water management capacities within the framework of River Basin Management Planning and its implementation.

Groundwater is often a major source of drinking water and an important resource for industry (food processing etc.), agriculture (e.g. irrigation, fish farming) and thermal water supply (balneology, heating purposes). Furthermore, it plays a vital role in the hydrological cycle, as it is critical for the maintenance of wetlands and feeding of river flows. It acts as an important buffer during dry periods and provides the base flow to many surface water systems.

Restricted water quantity is one of the many threats posed to surface waters and therefore aquatic organisms. Pollution ranging from chemicals and pesticides (e.g. agricultural runoff) to organic waste, and morphological alterations can impact water quality and ecological status.

Surface water systems are amongst the most threatened, but precious habitats, as they are subject to multiple pressures. They account for less than 0.01% of the planet's total surface area, but support more than 100,000 species. Continuous monitoring of the ecological status of rivers and lakes that takes pressure-impacted relationships into account represents a platform for sustainable water management and thus provides a basis for many human lives.

The WFD aims to achieve good chemical status of all water bodies, good ecological status or potential of all surface waters, and good quantitative status of groundwater bodies. Achieving these objectives requires the implementation of various steps and both the identification and delineation of water bodies, and targeted and cost-efficient monitoring are essential. These basic steps subsequently help to focus the implementation of the most appropriate measures in a cost-efficient manner and thereby achieve the greatest possible benefit from the resources available.

This report covers the water-related aspects of the following activities:

- Activity 2.1.1 Assessment of monitoring and laboratory infrastructure, capacities and needs;
- Activity 2.1.2 Purchase of equipment, including hydrological and water quality monitoring stations and rehabilitation and upgrade of existing equipment and existing laboratories;
- Activity 2.2.1 Preparation of training plans and organisation of hands-on training and training of trainers with regard to monitoring and laboratory analyses and to support laboratories for accreditation;

- Activity 2.3.1 Assessment of the needs and identification of priorities in implementation of the RBMPs;
- Activity 2.3.2 Technical Support in the elaboration and implementation of the pilot RBMPs.

These activities are closely related to Activity 2.2.1 regarding capacity building in the laboratories (equipment, analytics, QA/QC, accreditation) and Activities 2.3.1 to 2.3.7, which involve the development and implementation of RBMPs.

In order to define and target the exact water-related steps to be taken within each activity of Result 2 of the EUWI+ project, it was necessary to conduct a thorough assessment of the status quo and the related trajectories of the partner country administrations. This ground- and surface water management assessment report summarises the current state of knowledge on the existing water monitoring and management systems. It indicates the needs identified for capacity building along with the step-by-step approach of the WFD to cyclical ground- and surface water management. This extends from the delimitation and characterisation of water bodies, including the anthropogenic pressures to which they are subjected, to the resultant risk to the achievement of the WFD's environmental objectives, the definition of a suitable and feasible monitoring network, sampling at the monitoring sites, the analysis of the generated data, the assessment of water body status, the definition of measures to ensure the adequate protection of water resources and biological quality elements, and the required implementation of these steps.

This report also has links to the rehabilitation and/or procurement and installation of monitoring equipment. The assessments presented in this report are preliminary, information having been gathered and elaborated through meetings between the responsible technical and management staff in the Georgian administration and the UBA water team. The assessments are subject to constant revision, as the teams working in the Georgian administration and the member state consortium continue to develop the activities foreseen under the EUWI+ project.

4 ASSESSMENT OBJECTIVES

4.1 Objectives

In order to establish project priorities and targets, an assessment of the current state of ground- and surface water management and the monitoring situation was carried out with the aim of identifying potential gaps and areas of support via the project. According to the step-by-step approach of the WFD, as management units water bodies have first to be identified and delineated before a monitoring network can be developed in line with the directive's principles.

The WFD typology for surface waters (Annex II, section 1) is organised by initially classifying water bodies in broad categories (rivers, lakes, transitional, coastal waters, artificial water bodies, heavily modified water bodies) and secondly, by differentiating water body types within these categories. This is achieved using fixed typologies: System A, which is based on an eco-region, altitude, catchment area and geology, and an alternative typology, System B, which consists of a mixture of obligatory and optional factors.

Due to this dependency, at this stage the assessment focused primarily on the current status of ground- and surface waters (identification and delineation of water bodies and preliminary identification of the main pressures), and the gaps in the light of WFD requirements.

The secondary focus was on the current situation of the groundwater monitoring network and the monitoring of biological quality elements, as well as some general indications of areas of improvement. The detailed assessment of the groundwater monitoring infrastructure and capacities will be completed once the groundwater bodies are established. The following aspects required assessment:

- The need for a review of existing delineation methodology and groundwater bodies in EPIRB pilot basins (feeds into Activity 2.3.1);
- The need for hands-on training to delineate groundwater bodies in the river basin districts newly included in the EUWI+ project (feeds into Activities 2.2.1 and 2.3.2);
- The current status of groundwater monitoring and initial indications with respect to training, infrastructure and equipment requirements (feeds into Activities 2.1.1 and 2.1.2).

The assessment of the surface water monitoring infrastructure was completed during six missions. Corresponding questionnaires in the respective countries were prepared with a focus on:

- The current status of surface water monitoring (feeds into Activity 2.1.1):
 - Qualified staff numbers and their respective fields of expertise
 - The existing monitoring of biological quality elements and available expertise
 - Monitoring and reference sites
 - Data availability
- Equipment needs (feeds into Activity 2.1.2):
 - On-site assessment of sampling/monitoring equipment
 - Identification of equipment needs
- Training needs (feeds into activity 2.2.1):
 - Initial indication of training needs for sampling and identification
 - Sampling and identification training for additional biological quality elements

This assessment report summarises the findings described in detail in the mission reports, which are an essential part of the assessment activities. Moreover, the assessment report identifies gaps and proposes steps aimed at the sustainable implementation of the WFD within the EUWI+ project, as well as providing a strategic outlook on the further needs for action beyond the time frame of the EUWI+ project.

4.2 Assessment methodology

During the inception phase and the assessments at the beginning of the implementation phase of the EUWI+ project, meetings were held with representatives of the responsible administration and relevant international projects. Georgian institutions working in groundwater management and involved in the present project include the MENRP (Integrated Management Department for Water, Air, Land, Climate Change) and the NEA (Department of Geology). In order to collect the required information, meetings took place with both administrative management and technical staff.

The following aspects were discussed:

- Existing EPIRB methodologies, e.g.
 - Guidelines on identification, characterisation and delineation of groundwater bodies
 - Guidelines on sampling
- The existing (draft) River Basin Management Plan(s)
 - The identified, delineated and characterised groundwater bodies
 - The pressure analysis methodology for groundwater
 - The pressure data employed
 - The risk and status assessment methodology and the results
- The existing and planned groundwater monitoring activities:
 - The legal basis, existing rules and responsibilities
 - The distribution and location of monitoring points
 - The monitored parameters and monitoring frequency

The administration's experts were asked to provide their opinions regarding the following:

- Are the EPIRB methodologies understandable, logical, tailored to the local situation and easily applicable in other areas? What needs to be improved? What should be better explained? Who are the readers/users?
- Have gaps or problems with regard to the groundwater aspects of the existing (draft) RBMP(s) already been identified. Is there a need for updates?
 - Are you happy with the identified groundwater bodies, or might a re-delineation be necessary and helpful?
 - Are you happy with the methods and procedures applied in the RBMPs? Are they clearly explained, understandable and logical? Can they be easily applied to other river basins?
 - Have all pressures been considered (e.g. land use, urban areas, forests, location of industrial sites, dump sites, groundwater abstractions, ...)? Have all potential pollutants been identified and considered?

- According to your instincts and experience does the RBMP identify those areas, which should be prioritised for action?
- Do you think that the results of the risk and status assessment reflect the actual situation? If not, is this because of the assessment methodology or the fact that certain data is incomplete or completely missing?
- Who is responsible for groundwater monitoring network/sampling? What kind of quality assurance is considered? Who receives the monitoring data results and what is the data used for?

The aim of these discussions with the national administration was to understand:

- Who will actually be responsible for the various steps of WFD implementation and who will be our counterparts for the single aspects.
- Which aspects of the EPIRB methodologies need to be improved in order to become more user-friendly and better tailored to the national situation/needs, as well as what needs to be improved for alignment with the WFD.
- Which additional (pressure) data needs to be explored and compiled for the next working steps.
- What are the next steps and who is doing what.

The Georgian institutions currently working on surface water issues and monitoring are the National Environmental Agency in Tbilisi and the National Environmental Agency, Fisheries and Black Sea Monitoring Department in Batumi.

After the surface water mission, a questionnaire was sent to and completed by our Georgian partners in order to summarise and supplement the knowledge gathered.

For the transitional and coastal surface water categories there is also a need for discussion with Georgian experts regarding existing EPIRB and EMBLAS methodologies, RBMPs, risk assessment and monitoring activities. Some of these topics, including the definition of individual responsibilities for WFD implementation will be clarified during the upcoming (Dec 2017) workshop on delineation in Batumi.

The UNDP-GEF Kura II project is an ongoing international project with links to EUWI+. Another international project, which was finished recently and was also linked to EUWI+, was the USAID G4G project. The groundwater assessment team participated in the first meeting of the UNDP-GEF Kura II Project Advisory Group, as well as in a stakeholder meeting on the development of WFD implementation guidance documents for Georgia of the USAID G4G project.

4.3 Chronology

The assessments mentioned above were carried out during the following missions:

- 1st groundwater assessment mission 12.-15.7.2017
- 1st surface water assessment mission 23.-26.7.2017
- 1st transitional and costal water mission 13.-17.9.2017
- A questionnaire on surface water monitoring was sent out to the institutions visited at the end of August 2017
- Questionnaires returned by
 - The National Environmental Agency in Tbilisi
 - The National Environmental Agency, Fisheries and Black Sea Monitoring Department in Batumi

5 ACTIVITIES

In conjunction with the review of the deliverables from the previous EPIRB project, the discussions with representatives of the responsible administration revealed the following current status and areas for support through the EUWI+ project.

5.1 Activities regarding groundwater

5.1.1 Activity 2.1.1 Assessment of monitoring and laboratory infrastructure, capacities and needs

Discussions concerning the current status of the monitoring infrastructure, capacities and needs were held with the technical and management staff of the Department of Geology at the National Environmental Agency. Given the limitations on HR and finances at the MENRP, investments in the improvement of the monitoring system are considered something of a luxury.

The department expressed an interest in whether EUWI+ could conduct the following activities:

- Build/rehabilitate wells/monitoring equipment.
- The software-based calculation of the available (renewable) GW resources, including the connection between precipitation in recharge areas and GW renewal.
- Qualitative and quantitative groundwater modelling.
- The delineation of protected areas, including safeguarded zones around wells. At present, old rules from the Soviet era are used for the latter.
- An exchange of experience with the geology departments of the other EUWI+ beneficiary countries, including for example manuals and training.
- The drawing of the attention of Georgia's administration to the importance of groundwater, in order to assist the department in achieving higher budget allocations.
- Improvement of the work already completed by the EPIRB project and its supplementation with more detail.
- Support of the delineation of groundwater bodies as required by the WFD.

The following general observations were made:

- Long historic monitoring time series are available, but the current monitoring system is insufficient. It is being improved by the NEA, but is lagging behind.
- For the last 20 years there was no groundwater monitoring at all.
- Groundwater is not regulated under the existing water law. This will probably not alter with the new water legislation and little change is expected with regard to groundwater management.
- The Environmental Pollution Monitoring Department at the NEA is responsible for collecting and analysing samples.
- The Department of Geology at NEA is responsible for groundwater monitoring.

- The Licencing Department at NEA was responsible for groundwater abstraction permits, but this function will be transferred to a unit in the Economics Ministry, which is governed by the law on mineral resources.
- There are no GW quality standards and drinking water standards are used instead.

There is a rich history of GW monitoring in Georgia, which was one of the first activities of the Geological Survey and initially focused on mineral waters. 2016 marked the 175th anniversary of the Geological Survey, however with the collapse of the Soviet Union, GW studies ended entirely and groundwater monitoring network was abandoned.

Some groundwater monitoring restarted in recent years. The wells are currently sampled for chemical and microbiological parameters once every six months. Private household wells abstract groundwater from the uppermost aquifer layer for the domestic water supply. Water quality information regarding this extraction is unavailable.

Drinking water standards are employed for GW monitoring because GW is typically used as drinking water. The department is aware that ideally parameter selection should be dynamic in order to reflect the changing pressures on groundwater. For more detailed information on the monitoring network past and present, the aquifers in the Alazani-Iori basin, an initial overview of anthropogenic pressures and the legal background of groundwater management in Georgia.

5.1.2 Activity 2.1.2 Purchase of equipment, including hydrogeological and water quality monitoring stations and rehabilitation and upgrade of existing equipment and existing laboratories

Decisions on the rehabilitation and upgrading of existing monitoring sites and the purchasing and installation of equipment for new groundwater monitoring sites will be taken on the basis of a sound understanding of the groundwater bodies and once the planning of the groundwater monitoring network has been finalised and the monitoring frequency and parameters determined.

Some groundwater bodies have already been identified and delineated in the EPIRB pilot basin. Under Activity 2.3.2, this work will be continued in the EUWI+ pilot basins. Once the existing monitoring infrastructure is fully assessed in all the pilot basins and can be assigned to the newly identified, delineated and characterised groundwater bodies, and in addition the gap between the status quo and the newly developed plan for the monitoring network is known, it will be possible to determine if, where, and how the rehabilitation of existing sites and the installation of new sites will be necessary, most suitable and possible with the resources available in order to implement the revised groundwater monitoring network. The selected equipment will influence the content of the training to be carried out under Activity 2.2.1. For further details see the groundwater roadmap for Georgia in chapter 7.2.

5.1.3 Activity 2.2.1 Preparation of training plans and organisation of hands-on trainings and training of trainers with regard to monitoring and laboratory analyses and to support laboratories for accreditation

The preliminary training plans for groundwater monitoring will be based on the insights obtained during the stepwise implementation of the groundwater roadmap for Georgia in chapter 7.2. Similarly, the individual training and the field survey(s) will be developed over the course of the EUWI+ project in order to allow maximum targeting on the needs of the Georgian administration. Training material and the groundwater survey manual will be based on EPIRB manuals, which will be revised if necessary. Sampling training and field survey(s) will be carried out once groundwater bodies have been identified, delineated and characterised, and after the design of the monitoring network, including frequencies and parame-

ters as part of Activity 2.3.2. The surveys will serve the validation of conceptual understanding and the gathering of the data necessary for enabling risk and status assessment. The exact content of training will also depend upon the equipment purchased, or to be purchased under Activity 2.1.2. Possibilities for conducting some of the monitoring training and the field surveys as regional workshops and trans-boundary exercises, and thereby fostering an exchange of experience between administrations and the establishment of working relations on a technical level, will be evaluated with all the stakeholders involved. For further details see the groundwater roadmap for Georgia in chapter 7.2.

5.1.4 Activity 2.3.1 Assessment of the needs and identification of priorities in implementation of the RBMPs

The ongoing revision of Georgia's water law will have very significant impacts on how water management is organised. As it is not planned to include GW in the revision, effects in this field are expected to be limited. Identified financial and staffing needs have to be communicated to Result 1. The aim of the EUWI+ project is not to improve the old institutional system based on the legislation, which is soon to be replaced, but the new one.

It was further stressed that it is important to assign and assume responsibilities on an individual level. MENRP management emphasised that the processes and methodologies of the WFD groundwater management cycle (delineation and characterisation, status classification etc.) should ultimately be owned and carried out by Georgia's administration, which is currently not structured as required for water management according to the WFD.

The UBA GW team underlined that the WFD is ideal for focusing effort where it is needed most. It would appear that it is extremely important to achieve a mutual understanding of two quite distinct approaches to GW management. On the one hand, there is the conceptual management approach as stipulated by the WFD and on the other, the more traditional scientific hydrogeological approach followed in the Soviet era. GW bodies are management units and not scientifically correct or precise descriptions of (parts of) aquifers. Similarly, full agreement and appreciation is necessary in respect of the WFD's risk-based management approach, as opposed to the more rigid approach followed in the Soviet era.

Further observations:

- Shallow GW is a highly important aspect for consideration under the WFD because of the risks to which it is subject and its relevance for drinking water supplies.
- Georgia does not have pesticide legislation, and classifiers are not defined. The administration does not possess disaggregated data on the legal employment of pesticides, or any data on their illegal use, which is apparently widespread. On the other hand, some participants in the UNDP-GEF Kura II PAG meeting explained that farms do not have the resources to use agro-chemicals, or can only afford very limited quantities.
- A representative of Georgian Water and Power (GWP), a private water supply and wastewater utility operating in eastern Georgia and supplying Tbilisi, signalled a willingness to participate in establishing a database for point source polluters.

At present, only two NEA staff members are working on groundwater issues. They are responsible for groundwater monitoring and the management of mineral resources with regard to groundwater. In addition, there are two contractors. Extra staff would mean higher costs, which the department cannot support.

The collapse of the Soviet Union in 1991 brought extreme changes to the Geological Survey/Department of Geology. Before 1991, the Georgian Geological Survey apparently had a staff of around 18,000, which included a diverse range of geologists, drillers, topographers and geodesists. The Survey worked all over the Soviet Union. The Hydrogeological Expedition had around 600 staff, as, compared to its current aforementioned two plus two contractors.

The department has hired 14 young staff members during recent years and they are still employed. However, it took around two years before they became fully operational.

The department has a great deal of data in Russian from the Soviet era, including:

- Hydrogeological maps: 1:100,000 and 1:50,000 covering all of Georgia, 1:25,000 for some municipalities, 1:10,000 for some aspects such as water supply issues.
- Information on individual boreholes
- More than 20,000 geological studies/reports.

The department wishes to write (executive) summaries of all the old reports in English and Russian. New reports always include summaries in English.

Digitalisation: A government order from 2015 mandated and finances the department to digitise maps and information. This work is supposed to finish in 2018. The department tries to link new and old studies using GPS.

GIS unit: The department has a young GIS team, which produces all the new maps in-house.

Geo-hazards unit: The department has a strong team working on geo-hazards, which does all the work in-house with financial support from the UNDP. The department wants to bring the hydrogeology unit up to the same level.

5.1.5 Activity 2.3.2 Technical Support in the elaboration and implementation of the pilot RBMPs

This activity focuses on the implementation of the existing RBMP for the Chorokhi-Ajaristskali basin developed during the EPIRB project, as well as on the development of two new RBMPs for the Alazani-lori basin and the Khrami-Debed basin respectively.

A clear and pragmatic step-by-step procedure on how to identify aquifers, delineate GWBs and design monitoring networks (based on existing CIS and EPIRB guidance) is currently undergoing completion. This procedure will include a draft template for GWB characterisation (based on the EPIRB Water Body at Risk Report and EU and AT experience) and a template for the characterisation of monitoring sites (based on EU and AT experience).

The UBA GW team provides input on important aspects for consideration when identifying, delineating and characterising groundwater bodies. NEA hydrogeologists have already assembled relevant background information for the preliminary delineation and characterisation of GW bodies in the Alazani and lori basins. This includes an overview of the available geological and hydrogeological information on both basins, but data on the pressures to which GW is subjected still needs to be gathered. NEA hydrologists will draw up a preliminary list of the relevant pressures with the support of the UBA GW team. The resulting draft list of GW-relevant pressures will then be used by the IOW to collect pertinent data under Activity 2.3.6. Subsequently, a draft list of indicator parameters and monitoring frequencies related to these relevant pressures will be compiled. It should be noted that a guidance document on the 'Analysis of pressures and impacts and assessment of risks' was recently prepared as part of the USAID G4G project.

There will be three key hands-on workshops regarding the development of GWBs and the corresponding monitoring network. The workshops will represent joint efforts by the NEA hydrogeologists and the UBA GW team. They will feed into the RBMP work led by the IOW. Before and after the workshops, NEA hydrologists (possibly with support from external consultants) will work through the clearly defined steps necessary for the preparation of the next event. This will allow continuous and well-paced progress towards the RBMPs, with capacity being accumulated within the administration in order to ensure the institutional sustainability of WFD groundwater management.

The kick-off workshop will deal with the:

- a. Presentation of the procedure and underlying principles
- b. Hands-on training on GWB delineation
- c. Hands-on training on groundwater monitoring network design

The first workshop will focus on the:

- a. Discussion of draft GWBs and hands-on revision
- b. Discussion of the template for GWB characterisation
- c. Discussion/finalisation of identified GW-relevant pressures
- d. Discussion of draft monitoring networks and hands-on revision
- e. Presentation and discussion of a characterisation template for monitoring sites
- f. Discussion/finalisation of monitoring frequency and relevant (chemical) indicator parameters
- g. Discussion of investment needs
- h. Planning of sampling training and potential surveys

The second workshop will consist of:

- a. Further discussion and hands-on training/finalisation of GWB delineation
- b. Further discussion and hands-on training/finalisation of GWB characterisation (template and description);
- c. Further discussion and hands-on training/finalisation of the monitoring network
- d. Further discussion and hands-on training/finalisation of the characterisation of monitoring sites (template)
- e. Further discussion/finalisation of investment needs including the specifications.

The second workshop will consist of:

- a. Further discussion and hands-on training/finalisation of GWB delineation
- b. Further discussion and hands-on training/finalisation of GWB characterisation (template and description);
- c. Further discussion and hands-on training/finalisation of the monitoring network
- d. Further discussion and hands-on training/finalisation of the characterisation of monitoring sites (template)
- e. Further discussion/finalisation of investment needs including the specifications.

The focus of the third workshop will depend upon the progress made thus far:

- a. Finalisation of GWB delineation
- b. Finalisation of GWB characterisation
- c. Finalisation of the monitoring network
- d. Finalisation of monitoring site characterisation
- e. Finalisation of investment needs and specifications

These workshops will be followed by theoretical and practical training on sampling in close connection with the field survey(s), and possibly within a regional or trans-boundary context, as explained in chapter 5.1.3. For further details see the groundwater roadmap for Georgia in chapter 7.2.

5.2 Activities regarding surface water

5.2.1 Activity 2.1.1 Assessment of monitoring and laboratory infrastructure, capacities and needs

Scientific expertise regarding biological quality elements is available in Georgia, but there will be some additional training activities with a focus on WFD compliance. The two institutions visited do not cover hydromorphology.

The following institutions provided lists of available equipment (incl. brand, date of first operation and status), as well as capacities (staff numbers and knowledge levels) and assessment methods (e.g. parameters, intervals, WFD-compliance):

National Environmental Agency, Tbilisi

Joint activities with the Fisheries and Black Sea Monitoring Department are planned, as there is a lack of staff at the National Environment Agency in Tbilisi.

One expert on macroinvertebrates is highly motivated, experienced and in urgent need of support.

Table 1: Existing assessment methods of NEA according to the questionnaire

Method	Parameter/s	Interval	Site type <ul style="list-style-type: none"> Monitoring site Reference site Project based site selection 	Number of samples	WFD compliance
Modified AQEM STAR Macroinvertebrates <ul style="list-style-type: none"> Sampling methodology 	Sampling area per 1 site, 1m ²	1 or 2 per 1 year	<ul style="list-style-type: none"> Monitoring site Reference site Project based site selection IS THIS RIGHT ?? – <i>needs to be checked with Irakli (Irakli wrote this himself)</i>	38 Sites from 25 River in 2016 year.	Yes
software Asterics 4,04	Metrics for example BMWP index, EPT taxa ...		Projects		yes

The evaluation of the different methods in terms of WFD compliance has yet to be completed.

National Environmental Agency, Fisheries and Black Sea Monitoring Department, Batumi

The Fisheries and Black Sea Monitoring Department of the National Environment Agency has a strong focus on fish. Coastal resorts and lakes are currently monitored for the whole country at 61 monitoring sites as part of biological and ichthyological studies.

Macrophyte assessment began last year (2016), starting with coastal waters and subsequently with surface waters. The responsible experts were trained outside the country.

Table 2: Existing monitoring expertise of NEA according to the questionnaire

Fields of expertise	Level of knowledge trainee/experienced/advanced	Nr. of staff
• Fish	experienced	4
• Macroinvertebrates (benthic)	experienced	3
• Phytobenthos	experienced	1
• Phytoplankton	experienced	2
• Macrophytes	trainee /experienced	1
• Hydromorphology		
• Hydrology		
• Other, please specify – Zooplankton	experienced	2
• Other, please specify – Microbiology	experienced	1

14 experienced staff members with identification skills for all aforementioned biological quality elements are currently working at the Fisheries and Black Sea Monitoring Department.

Table 3: Existing assessment methods of NEA according to the questionnaire

Method	Parameter/s	Interval	Site type <ul style="list-style-type: none"> • Monitoring site • Reference site • Project based site selection 	Number of samples in year	WFD compliance
Membrane filtration method	total aerobic microbial count (220C; 370C); total coliforms; fecal coliforms.	Monthly	Three monitoring permanent site (20-30 meter away from the coast)	36	Yes
			One reference site (20-30 meter away from the coast)	12	
		Seasonal	Six monitoring stations in the Georgian Black Sea coastal zone (0,5-1 mile)	24	
Manual for Phytoplankton Sampling and Analysis in the Black Sea. Moncheva S., B. Parr, 2005. (updated 2010)	Phytoplankton abundance (cells/l) and biomass (mg/m ³)	Monthly	Three monitoring permanent site (20-30 meter away from the coast)	36	Yes
			One reference site (20-30 meter away from the coast)	12	
		Seasonal	Six monitoring stations in the Georgian Black Sea coastal zone (0,5-1 mile)	24	
The manual „Black Sea monitoring guidelines: meso-zooplankton“ (Aleksandrov B. et al. 2014)	Zooplankton abundance (ind/m ³) and biomass (mg/m ³)	Monthly	Three monitoring permanent site (20-30 meter away from the coast)	36	Yes
			One reference site (20-30 meter away from the coast)	12	
		Seasonal	Six monitoring stations in the Georgian Black Sea coastal zone (0,5-1 mile)	24	

Method	Parameter/s	Interval	Site type <ul style="list-style-type: none"> Monitoring site Reference site Project based site selection 	Number of samples in year	WFD compliance
The macrozoobenthos sampling followed the protocol described by Todorova & Konsulova (2005).	Macrozoobenthos abundance (ind/m ²) and biomass (mg/m ²)	Monthly	One monitoring permanent site (20-30 meter away from the coast)	12	Yes
			One reference site (20-30 meter away from the coast)	12	
		Seasonal	Six monitoring stations in the Georgian Black Sea coastal zone (0,5-1 mile)	24	
The manual “Black Sea Monitoring Guideline: Macrophytobenthos” (Minicheva et al., 2015).	Biomass of Macrophytes, morphofunctional indexes	Seasonal	Two monitoring permanent site	8	Yes
		Seasonal	One reference site	4	

The evaluation of the different methods in terms of WFD compliance has yet to be completed.

Assessment methodology, objectives and established needs for the biological laboratories for transitional (TW) and coastal waters (CW)

During one assessment mission (13.9. – 17.9.2017), the NEA Fisheries and Black Sea Monitoring Department’s chemical laboratory in Batumi was inspected with regard to its staff capacities, available sampling and analytical equipment, as well as the methods practiced for the determination of BQE supporting elements in TW & CW.

The results obtained indicated that this laboratory has a sufficient number of trained staff, basic analytical equipment and uses appropriate methods. The laboratory is currently involved in a national monitoring programme (Chorokhi River and Batumi coastal strip), but has also been a partner in EU projects (EPIRB and EMBLAS II). However, it must be taken into account that the NEA Fisheries and Black Sea Monitoring Department in Batumi does not have a suitable research vessel, or adequate and sufficient water samplers for work in the TW & CW pilot area of the Chorokhi River estuary and the adjacent coastal waters from Batumi to the south of Poti. Furthermore, some analytical equipment requires servicing, or should be replaced. Therefore, financial assistance from the EUWI+ project is necessary. Apart from financial assistance, a need for technical and advisory support from the EUWI+ was also defined, especially for activities such as monitoring planning and performance, as well as result evaluation. Such assistance could be provided through workshops (Chapter 5.2.3).

The evaluation of the different methods in terms of WFD-compliance has to be completed. A review of the established reference sites must also be carried out before site selection can be finalised.

The assessment methodology applied in the biological labs of the NEA’s Fisheries and Black Sea Monitoring Department in Batumi was 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, intercalibration exercises, national reference conditions, use of indices, etc.). The insights acquired from the first assessment mission in September 2017 and from the “Biological Monitoring Questionnaire” indicate that in general the biological labs cover the required BQE's for TW & CW, with the exception of the fish BQE in TW.

To ensure the successful involvement of the NEA's Fisheries and Black Sea Monitoring Department labs in EUWI+ project activities, two main objectives were established:

- a. The identification of the laboratories' needs for sampling and analytical equipment, equipment servicing and consumables, which feeds into Act. 2.1.2;
- b. The identification of the laboratories' needs for additional training on methods, quality assurance, reference conditions, the EQR concept and other WFD-relevant issues (feeds into Act.2.2.1).

The laboratory assessment revealed that in addition to (a) the available sampling and analytical equipment in the labs is generally in an operational condition, but some items need servicing, or should be replaced with the help of EUWI+ financial support. Moreover, that apart from (b) the laboratories' staff capacity is relatively low, but still sufficient for planned monitoring activities. All the labs are located in the same building, which ensures close cooperation amongst them, as well as a possibility for the sharing of basic equipment. Due to the fact that most of the biological scientists have participated in previous or current EU projects (EPIRB and EMBLAS), the sampling and determination techniques applied, the use of "Black Sea suitable" indices, result evaluation and status reporting are generally in line with WFD requirements. However, there is still a need for "fine tuning" by means of technical and advisory support from the EUWI project. The same support is also needed for setting up BQE monitoring frequencies, quality assurance improvement, the organisation of intercalibration exercises and the determination of national, type-specific reference conditions.

5.2.2 Activity 2.1.2 Purchase of equipment, including hydrological and water quality monitoring stations and rehabilitation and upgrade of existing equipment and existing laboratories

Final decisions regarding procurement are yet to be made, but lists of equipment needs were drafted in the questionnaires and will be assessed during procurement.

National Environmental Agency, Fisheries and Black Sea Monitoring Department, Batumi

Equipment needs at the NEA according to the questionnaire:

- Scientific boat (about 10 m. length, with inboard engine, with el. Winch and arrow);
- Portable echosounder;
- Multiparameter portable water quality tester;
- Electrofishing gear;
- Benthic grab (0.100 m²);
- Hansen closing plankton net, with messenger and messenger-operated closing mechanism;
- Heiston net with mechanical flow meter;
- Bathometer (10 litre).

Table 4: Proposed equipment list for the biological laboratories at the NEA’s Department of Fisheries, Aquaculture and Water Biodiversity and NEA’s chemical lab in Batumi

Laboratory	Activity	Status	Suggested EUWI+ assistance	Estimated costs (EUR)
Biological (BQE (TW & CW))	Chl a standards	Missing	Organize	< 200
	Plankton nets	Needs replacement	Purchase	< 1.000
	Van Veen grab	Needs replacement	Purchase	3.000 – 5.000
	Microbalance	Needs service	Finance	< 1.000
	Underwater camera with housing			< 5.000
	Fishing nets (TW)	Missing	Purchase	< 1.000

National Environmental Agency, Tbilisi

Existing equipment at NEA according to the questionnaire:

- Identification Guides for Fish, Macroinvertebrates and Macrophytes.
- Hand nets, Ethanol and Containers for Macroinvertebrates Sampling .
- Fish electro Samplers for small rivers 3 pieces.
- Field sampler for General Chemical quality elements 1 pieces.
- Sampling car for Biological laboratory.

Suggested EUWI+ financial assistance for the planned activities of chemical and biological laboratories at the NEA’s Fisheries and Black Sea Monitoring Department in Batumi

Table 5: Proposed additional EUWI+ activities to enhance labs analytical and status evaluation capabilities

Topic	Timeline	Estimated costs
Participation in proficiency testing schemes (PTS) in water analysis (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 rounds of PTS: one participation in 2018, the second in 2019	3.000 €

5.2.3 Activity 2.2.1 Preparation of training plans and organisation of hands-on trainings and training of trainers with regard to monitoring and laboratory analyses and to support laboratories for accreditation

The preliminary training plans for surface water monitoring will be based on a detailed assessment of the needs of the institutions responsible for surface water monitoring in Georgia. Individual training and field survey(s) will be developed within the framework of the EUWI+ project in order to attain maximum targeting on the requirements of the Georgian administration. Training materials and the development of a surface water survey manual will be based on EPIRB manuals, which will be revised if necessary. Sampling training and field survey(s) will be carried out for various body monitoring parameters. The surveys will serve to validate conceptual understanding and gather the data necessary for the enabling of risk and status assessment. The exact content of training will also depend upon the equipment purchased or to be purchased under Activity 2.1.2. The fostering of exchanges of experience between administrations and the establishment of working relations on a technical level will be evaluated.

Joint training with neighbouring countries is planned. Tbilisi and Batumi are already closely linked on an expert level. If electro-fishing training is planned, permission is required, as soon as the dates are set.

Initial regional workshops are planned in order to discuss the requirements of the WFD and develop a stepwise approach to implementation. Subsequently, individual training will be organised for the specific needs relating to the assessment of biological quality elements.

National Environmental Agency, Tbilisi

NEA stated training needs in the questionnaire:

- Intercalibration training on macroinvertebrates sampling, identification and data management.
- Training on fish sampling and methodology under WFD.
- Training on macrophytes sampling and identification under WFD.

National Environmental Agency, Fisheries and Black Sea Monitoring Department, Batumi

NEA stated training needs in the questionnaire:

- Phytoplankton sampling and analysing (Marine and inland waters);
- Zooplankton sampling and analysing (Marine and inland waters);
- Benthic macroinvertebrates sampling and analysing (marine and inland waters);
- Phytobenthos and macrophytes sampling and analysing (marine and inland waters);
- New methods of ichthyological researches.

General training workshops on WFD-relevant issues (TW & CW) for the chemical and biological labs of the NEA's Fisheries and Black Sea Monitoring Department in Batumi

- **Delineation workshop (timeframe: February 2018)**
 - Common implementation strategy
 - Identification of TW & CW water types and water bodies
 - Artificial and extensively modified water bodies
- **TW & CW preparative monitoring workshop (timeframe: March – June 2018)**
 - BQE monitoring frequencies
 - Final check on 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

5.2.4 Activity 2.3.1 Assessment of the needs and identification of priorities for implementation of the RBMPs

The WFD requires information to be gathered and maintained regarding the type and magnitude of significant anthropogenic pressures, and indicates a broad categorisation of the pressures into:

- Concentrated sources of pollution
- Diffuse sources of pollution
- Effects of modifying the flow regime through abstraction or regulation
- Morphological alterations.

The impact assessment should use both information from the pressure review and any other information, e.g. environmental monitoring data, to determine the likelihood of the surface water body failing to meet environmental quality objectives. For bodies at risk of falling short of their specified objectives, it will be necessary to consider the implementation of additional monitoring and a programme of measures.

The review process is described in five parts, which correspond to the sub-sections in the WFD Annex II Section 1:

1. Characterisation of surface water body types
2. Eco-regions and surface water body types
3. Establishment of type-specific reference conditions for surface water body types
4. Identification of pressures
5. Impact assessment

The content of training on these topics will very much depend upon the needs and difficulties identified as requiring a solution. At the same time, the SW experts will continue working between the workshops and should questions arise, communications can take place via emails or phone. As SWB definition for GWBS has to be completed for the whole country, SW experts from other basins will also start work.

5.2.5 Activity 2.3.2 Technical Support in the elaboration and implementation of the pilot RBMPs

This activity focuses on the implementation of the existing RBMP for the Chorokhi-Ajaristskali basin developed during the EPIRB project, as well as on the development of two new RBMPs with one for the Alazani-Iori basin and one for the Khrami-Debed basin. For coastal monitoring we decided that the pilot area would extend from the Turkish/Georgian border up to the south of Poti.

A clear and pragmatic step-by-step approach (manual) similar to that used for GW will be implemented for SW, SWB characterisation and delineation, and the development of the design of monitoring networks (based on existing CIS and EPIRB guidance). This procedure will include a draft template for SWB characterisation (based on the EPIRB Water Body at Risk Report and EU and AT experience) and a template for the characterisation of monitoring sites (based on EU and AT experience). These documents and templates will form a basis for further tailoring and national adaptation during the implementation process.

The UBA SW team provides input on the important aspects requiring consideration when identifying and delineating surface water bodies. Georgian experts will draw up a preliminary list of relevant pressures with the support by the UBA SW team. The resulting draft list of SW-relevant pressures will then be used by the IOW to collect data under Activity 2.3.6. Subsequently, a draft list of indicator parameters and monitoring frequencies related to these relevant pressures will be compiled.

6 RELATED ISSUES

6.1 Legal and institutional reform

The ongoing revision of Georgia's water law will have a very significant impact upon water management organisation. As it is not planned to include GW in the revision, effects in this field are expected to be limited. The identified financial and staffing needs have to be communicated to Result 1. In order to increase accountability, the Department of Geology at the NEA wants the 'well passport' to be put into law and become mandatory. The department thinks that GW should be regulated under the water legislation. The department is also aware that the lack of legal restrictions on well depth and any respective reporting requirement needs to be changed. The department checks all applications for new licences.

6.2 Institutional sustainability of selected institutions

In order to establish a representative monitoring network for GW and all categories of SW human resources and a basic budget for infrastructure maintenance and the purchase of essentials is needed. The very limited number of experienced staff for surface water monitoring will limit the development of ecological assessment systems and delay RBMP implementation. Another disruptive factor with regard to successful project implementation will be the ongoing restructuring of the Georgian Ministry of Environment and Natural Resources Protection and its National Environmental Agency, which is the primary partner of the EUWI+ project.

7 NEXT STEPS

7.1 Linkage with laboratory assessment

The identification of the significant anthropogenic pressures on water goes hand-in-hand with the identification of the associated chemical substances and indicators, which should be part of the monitoring system. Precise adjustment in line with activity 2.1.2 in terms of laboratory needs and capacities is recognised as a guarantee that these substances can be analysed in the relevant laboratories.

7.2 Programming

7.2.1 Groundwater programming

A clear and pragmatic step-by-step procedure on how to identify aquifers, delineate GWBs and design monitoring networks is currently under development.

If considered necessary by the member state consortium and the Georgian administration, a groundwater survey might be organised during the summer of 2018 in order to fill the gaps in the baseline data required for further steps in the RBMP process.

A regional workshop on the principle requirements of the WFD could be organised jointly for the Georgian institutions working on ground- and surface water.

See below for the groundwater roadmap for Georgia.

Table 6: Groundwater roadmap for Georgia

	Implementation steps	Georgian experts	MS-consortium	Timing (Location)
1.	<p>Preparatory (home) work by MS consortium experts:</p> <ul style="list-style-type: none"> • A clear and pragmatic stepwise procedure (terms of reference) on how to identify aquifers, delineate GWBs and design monitoring networks (based on existing CIS and EPIRB guidance). • This will include a draft template for GWB characterisation (based on the EPIRB Water Body at Risk Report and EU and AT experience) and a template for the characterisation of monitoring sites (based on EU and AT experience). 		UBA (ToR)	
2.	<p>Kick-off workshop</p> <ol style="list-style-type: none"> a. Presentation and discussion of step-by-step procedure. Background and principles of: GWB delineation, characterisation and groundwater monitoring. b. Exemplified, practical hands-on training on GWB delineation for a selected case study. c. Exemplified, practical hands-on training on groundwater monitoring network design for a selected case study. 	NEA, Department of Geology	UBA	
3.	<p>Preparatory (home) work by country experts:</p> <p>Groundwater bodies</p> <ol style="list-style-type: none"> a. First draft delineation of the GWBs following the stepwise procedure (in map 1:200,000): <ol style="list-style-type: none"> i. Compilation of hydrogeological information (maps, profiles...). ii. Selection of aquifers of relevance from a WFD perspective (used, intended to be used, linked to ecosystems). iii. Compilation of available pressure information (maps, inventories). b. Compilation of a draft list of GW-relevant pressures for each GWB (that should be considered by IOW for data collection). <p>Monitoring</p> <ol style="list-style-type: none"> a. Inventory of existing monitoring sites and existing wells/springs, which could be potentially used as monitoring sites (consider multipurpose use). b. First draft monitoring network for each GWB in line with the principles of the step-by-step procedure. c. Compilation of a draft list of (chemical) indicator parameters related to the relevant pressures and monitoring frequencies. <p>Documentation of the applied methodology and considered information (extension and tailoring of the 'step-by-step procedure', inclusion of references and literature).</p>	NEA, Department of Geology		
4.	<p>1st workshop with a focus on:</p> <p>Groundwater bodies</p> <ol style="list-style-type: none"> a. Discussion of draft GWBs and hands-on revision. b. Presentation and discussion of the characterisation template and the structure of the 'verbal' description of GWBs. c. Discussion/finalisation of the list of identified GW-relevant human pressures. <p>Monitoring</p> <ol style="list-style-type: none"> a. Discussion of draft monitoring networks and hands-on revision. b. Presentation and discussion of the characterisation template for monitoring sites. c. Discussion/finalisation of monitoring frequency and relevant (chemical) indicator parameters. d. Discussion of investment needs (e.g. new sites and those to be refurbished, additional infrastructure and sampling equipment). <p>Planning of sampling training and potential surveys.</p>	NEA, Department of Geology	UBA	

	Implementation steps	Georgian experts	MS-consortium	Timing (Location)
5.	<p>Preparatory (home) work by country experts:</p> <p>Groundwater bodies</p> <ol style="list-style-type: none"> Revision of GWB delineation according to the conclusions of the workshop. Inclusion in GIS. Modification of the GWB template and the description structure to national needs in accordance with the conclusions of the workshop. <p>Characterisation of each GWB according to the template and the description structure</p> <p>Monitoring</p> <ol style="list-style-type: none"> Revision of monitoring networks for each GWB, based on the conclusions of the workshop. Inclusion in GIS. Adjustment of the monitoring site template to national needs according to the conclusions of the workshop. Characterisation of the monitoring sites according to the template. Elaboration of investment need specifications (e.g. new sites and those to be refurbished, additional infrastructure and sampling equipment). <p>Documentation of the applied methodology and considered information (extension and tailoring of the 'step-by-step procedure', inclusion of references and literature).</p>	NEA, Department of Geology		
6.	<p>Preparatory (home) work by MS consortium experts:</p> <ol style="list-style-type: none"> Training material on sampling (if necessary update of the EPIRB manual with UA examples). Survey manual 		UBA	
7.	<p>2nd workshop</p> <p>Depending upon the progress made between the workshops, the following activities could either be finalised, or progress and open questions discussed further:</p> <p>Groundwater bodies</p> <ol style="list-style-type: none"> Further discussion and hands-on training/finalisation of GWB delineation. Further discussion and hands-on training/finalisation of GWB characterisation (template and description). <p>Monitoring</p> <ol style="list-style-type: none"> Further discussion and hands-on training/finalisation of monitoring network. Further discussion and hands-on training/finalisation of monitoring site the characterisation (template). Further discussion/finalisation of investment needs including specifications. 	NEA, Department of Geology	UBA	
8.	<p>Preparatory (home) work by country experts.</p> <p>Depending on the progress made thus far:</p> <p>Groundwater bodies</p> <ol style="list-style-type: none"> Completion of GWB delineation. Completion of GWB characterisation (templates and description). <p>Monitoring</p> <ol style="list-style-type: none"> Completion of monitoring network design. Completion of monitoring site characterisation. Completion of investment need specifications. <p>Documentation of the applied methodology and considered information (extension and tailoring of the 'step-by-step procedure', inclusion of references and literature).</p>	NEA, Department of Geology		

	Implementation steps	Georgian experts	MS-consortium	Timing (Location)
9.	<p>3rd workshop – focus depends upon the progress made thus far:</p> <p>Groundwater bodies</p> <ul style="list-style-type: none"> a. Finalisation of GWB delineation. b. Finalisation of GWB characterisation. <p>Monitoring</p> <ul style="list-style-type: none"> a. Finalisation of the monitoring network. b. Finalisation of monitoring site characterisation. c. Finalisation of investment needs and specifications. 	NEA, Department of Geology	UBA	
10.	Theoretical and practical training on sampling (e.g. in close harmony with field survey(s)).	NEA, Department of Geology	UBA	
	The document regarding the step-by-step implementation procedure is a living document, which is continuously being supplemented with GE details and the literature used in order to finally achieve tailored GE guidance.	NEA, Department of Geology	UBA	

7.2.2 Surface water programming

In accordance to the step-by-step approach of the WFD, the implementation of the following activities is planned for 2018 and 2019.

Training can be incorporated into surface water surveys. The goal is to ensure standardised sampling techniques and data collection as a basis for all monitoring activities. In order to maximise the outcome, fieldwork will aim at the generation of valuable survey data and thus fill in the gaps in the baseline data required for further steps in the RBMP process.

Table 7: Surface water roadmap for Georgia

	Implementation steps	Georgian experts	MS-consortium	Timing (Location)
1.	<p>Preparatory (home) work by MS consortium experts:</p> <ul style="list-style-type: none"> • Assessment of the status quo: EPIRB documents regarding characterisation, typology and surface water body delineation • ToR for SW water body delineation • Review of existing characterisation, typology and surface water body delineation • Organisation and logistics of regional workshops 		UBA	
2.	<p>Delineation workshop One joint workshop covering water body delineation is planned Characterisation, typology and surface water body delineation</p> <ol style="list-style-type: none"> a. Background and principles b. Review of existing data/documents c. Presentation of examples 	Name/ institute	UBA	25 – 26 April 2018 Kiev
3.	<p>Preparatory (home) work by country experts: Presentation of Water Framework Directive implementation/compliance steps containing information on:</p> <ul style="list-style-type: none"> • Pre-existing water body delineation • Selection of biological quality elements • Monitoring site selection • Pressure impact relation 	Name/ institute		
4.	<p>Regional workshops A regional workshop is planned for the Caucasus region, AZ, GE & AM, focusing on:</p> <ol style="list-style-type: none"> a. Assessment systems <ol style="list-style-type: none"> i. Biological quality elements ii. Standardised sampling and indication potential b. Monitoring network <ol style="list-style-type: none"> i. Monitoring network design ii. Site selection iii. Sampling frequency 	Name/ institute	UBA	11 – 15 June 2018 Tbilisi

	Implementation steps	Georgian experts	MS-consortium	Timing (Location)
	Interactive hands-on training a. Risk assessment and pressure impact relationships i. Presentation of the selected case study and general discussion ii. Two working groups for biological quality elements and hydromorphology possible			
5.	Sharing workshop outputs with French team a. Preliminary risk assessment b. Preliminary SW WB delineation		UBA/IOW	
6.	Evaluation of equipment list a. Preparation of procurement b. Confirmation of equipment list by countries		UBA	
7.	Preparatory (home) work by MS consortium experts: Survey design a. Logistics b. Dates		UBA	
8.	Preparatory (home) work by country experts: a. Site selection for training/survey activities based on interactive hands-on training (regional workshop) i. One site per country in pristine condition/ with little impact and one heavily impacted site within new EUWI+ river basins ii. Site selection considering logistics: max. of 4-hour drive between sampling sites b. Identification of main pressures i. Review of EPIRB documents and existing data ii. Finalisation of the list of the main pressures on different types of water bodies	Name/ institute		
9.	1st training/survey For the first training/survey, two suitable sampling sites (e.g. above and below an impoundment) should already be identified. a. Field work with a focus on standardised sampling techniques b. Macroinvertebrates will be investigated in all six countries c. As an additional biological quality element, phytobenthos is proposed in four countries, except for Georgia and Azerbaijan, where fish sampling will be conducted during joint training d. Species identification and data evaluation will be discussed, but can only be focused on additionally during specific in-depth training later in the year.	Name/ institute	UBA	Third week of September
10.	Preparatory (home) work by country experts: a. Species identification b. Data gathering	Name/ institute		

	Implementation steps	Georgian experts	MS-consortium	Timing (Location)
11.	Preparatory (home) work by MS consortium experts: a. Training material on sampling (if necessary update of the EPIRB manual) b. Draft manuals		UBA	
12.	2nd training/survey Depending upon the first fieldwork activities and the questionnaire on biological monitoring, the second round of training can be tailored to specific needs.	Name/ institute	UBA	2019
13.	Linkage with French team Data management and delivery of training/survey data		UBA/IOW	

8 STRATEGIC OUTLOOK AND RECOMMENDATIONS

The Environmental Monitoring and Information Centre and the UBA GW team will discuss and agree a groundwater roadmap for Georgia. The steps foreseen in this roadmap will then be implemented jointly, with ownership of the process lying with EMIC, and the UBA GW team providing support.

The involvement of significant numbers of junior staff in the exercises and training is highly recommended in order to facilitate the long-term transfer of hydrogeology and groundwater management knowledge. The gathering of such specific knowledge usually takes many years and intensive practice and forms the basis for sustainable groundwater management, environmental protection and water supply security in the future.

This step-by-step procedure for the Georgian administration will ensure positive results, while adhering to the concept of institutional sustainability, i.e. the development of capacity within Georgia's administration, which will enable it to continue along the path of approximation to the WFD and the principles of IWRM. It is recognised that the EUWI+ project will represent a first and important step in this direction, but that additional external support might be required at later stages of this approximation process.



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