

# Groundwater thematic workshop

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## Peer Review Project

*8-9 September 2016, Kalmar (Sweden)*

*South Baltic Water District*

# REPORT

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## I – Objective of the workshop

### Objective:

This workshop aimed to exchange on best practices in the planning process for Groundwater Water Management based on field experience from practitioners in several member states. It is a direct continuation of the Peer Review missions that occurred in this domain. It gave an opportunity to complete the identification of issues and solutions identified by the European partners in Water Framework Directive implementation regarding groundwater issues.

The workshop was organised in three sessions dealing more particularly with the following aspects of groundwater management:

- **Topic 1 - Characterisation of groundwater bodies**
  - Methodologies and models for the assessment of quantitative and qualitative status
  - Trends evaluation and analysis; derivation of reference values and threshold values in groundwater bodies
  - Methodologies applied to the RBMP dealing with groundwater dependent ecosystems and aquatic ecosystems interaction with surface water
- **Topic 2 - Management of quantitative and qualitative monitoring networks**
  - Groundwater monitoring programs review and data management
  - Recommendations for improving groundwater monitoring programs - screening programs, grouping monitoring points, monitoring of groundwater bodies at risk
- **Topic 3 - Programme of Measures for groundwater bodies**
  - Groundwater protection areas and effective groundwater cleaning
  - Groundwater abstractions management

Lesson learned, issues and solutions were gathered from participative exchanges in order to build recommendations.

Duration: 1,5 days

## II – List of Participants

Are Vallin	<b>Swedish</b> South Baltic Water District Authority / coordinator
Carola Lindeberg	<b>Swedish</b> South Baltic Water District Authority/ coordinator
Åse Eliasson	<b>Swedish</b> South Baltic Water District Authority/ coordinator
Niklas Holmgren	<b>Swedish</b> South Baltic Water District Authority/ coordinator
Irene Bohman	<b>Swedish</b> South Baltic Water District Authority/ water director
Katrin Herrlin Sjöberg	<b>Swedish</b> South Baltic Water District Authority / coordinator
Anna-Karin Weichelt	County Administrative Board Jonkoping ( <b>Sweden</b> ) / civil servant
Jenny McCarthy	Geological Survey of <b>Sweden</b>
Sven Andersson	County Administration Kalmar / Administrator ground water resources, <b>Sweden</b>
Anne Fleig	<b>Norwegian</b> Water Resources and Energy Directorate (NVE) / senior engineer
Atle Dagestad	Geological Survey of <b>Norway</b> / hydrogeologist
Anna Seither	Geological Survey of <b>Norway</b> / hydrogeologist
Ruxandra Balaet	<b>Romanian</b> Ministry of Environment, Water and Forest;
Elvira Marchidan	National Administration "Apele Romane", <b>Romania</b>
Dumitru Neagu	National <b>Romanian</b> Institute of Hydrology and Water Management
Kersti Turk	Ministry of Environment, Water department, <b>Estonia</b> / Senior Officer Water Department
Inga Retike	<b>Latvian</b> Environment, Geology and Meteorology Centre / hydrogeology expert
Ada Pandeale	National Institute of Hydrology and Water Management, <b>Romania</b>
Philippe Sennhauser	International Office for Water, <b>France</b>
Lennart Johansson	<b>Swedish</b> South Baltic Water District Authority / coordinator

## III- Agenda

<i>Day 1</i>		
<b>TIME</b>	<b>TOPIC</b>	<b>SPEAKERS</b>
<b>08.30-9.00</b>	<b>Registration and Coffee</b>	
09.00-09.10	Welcome to Kalmar	Mr Niklas Holmgren South Baltic water district authority
09.10-09.50	Introduction to the workshop days	Ms Elisa Vargas - European Commission Mr Philippe Sennhauser - Peer Review project representative
<b>Topic 1: Characterisation of groundwater bodies</b>		
10.00-10.30	Comparison of the implementation of the WFD in Catalonia and Sweden.	Ms Carola Lindeberg
10.30-11.45	Collaborative work session on Topic 1 Short presentations of Norway (Mr Atle Dagestad) and Latvia (Ms Inga Retiķe)	All participants

11.45-12.15	Water shortage in the southeast of Sweden in 2016 and introduction of the field visit.	Ms Åse Eliasson
12.15-14.30	Lunch break (including transportation)	
14.30-16.30	Field visit to the water supply for Kalmar <ul style="list-style-type: none"> <li>• Groundwater artificial recharge</li> <li>• Protection areas for groundwater abstraction</li> </ul>	Kalmar water
18.30	Dinner	

<b>Day 2</b>		
<b>TIME</b>	<b>TOPIC</b>	<b>SPEAKERS</b>
8.30-8.45	Summing up day 1 and introducing day 2.	Mr Philippe Sennhauser Ms Irene Bohman
<b>Topic 2: Management of quantitative and qualitative monitoring</b>		
8.45-9.15	Lesson learned from Groundwater Trends Assessment in Romania.	Ms Ruxandra Balaet Mr Dumitru Neagu Ms Elvira Marchidan
9.15-9.45	Monitoring of groundwater resources in Sweden.	Ms Carola Lindeberg
9.45-10.00	Coffee break	
10.00-11.00	Collaborative work session on Topic 2	All participants
<b>Topic 3: Programme of Measures for groundwater bodies</b>		
11.00-12.00	Collaborative work session on topic 3	All participants
12.00-12.30	Conclusions on topics 1,2,3 Debriefing, next steps and final conclusions	Reporters: - Ms Carola Lindeberg - Ms Ruxandra Balaet - Ms Katrin Herrlin Sjoberg  Mr Philippe Sennhauser
12.30-13.30	Lunch break	

## **IV – Contacts**

Ada Pandele, peer review secretariat representative for the workshop: [ada.pandele@hidro.ro](mailto:ada.pandele@hidro.ro)

Peer review secretariat: [peer.review@oieau.fr](mailto:peer.review@oieau.fr) or Philippe Sennhauser: [p.sennhauser@oieau.fr](mailto:p.sennhauser@oieau.fr)

Åse Eliasson, information and support from the host institution: [ase.eliasson@lansstyrelsen.se](mailto:ase.eliasson@lansstyrelsen.se)

## V – Introduction to the workshop days

Niklas Holmgren, strategist at the Swedish South Baltic District Authority, welcomed the participants to Kalmar. He presented the Swedish participation in the Peer Review process, the South Baltic river basin district, the key values of the region and the main environmental problems in relation to the implementation of the Water Framework Directive (WFD) (see presentation<sup>1</sup>)

Elisa Vargas, Policy officer for the Water Framework Directive at the European Commission (EC) DG Environment, also chair of the WFD working group on groundwater, presented the importance of the Peer Review exercise in sharing experience, gaps and solutions in the ongoing work of the member states. She also explained the importance of keeping the process independent between member states and the EC, which is the reason why the Peer Review secretariat is separated from the EC.

The results of the experts meeting in Kalmar will be presented at the CIS workshop in Bratislava the 25-26 of October. Ms. Vargas also said that there will likely be a second phase of the Peer Review process as the feedback from the river basin authorities has been very positive.

Phillipe Sennhauser - International Office for Water, France - and representative of the Peer Review secretariat, presented the purpose of the Peer Review exercise, the tools and organisation, and the main outcomes and messages. He stressed the importance of clearly identifying the issues and problems for the implementation of the WFD, considering the coming review of the WFD. The final report of the Peer Review process is planned for November 2016. Mr. Sennhauser also shortly presented the results of the evaluation from the Participating River Basin Districts and the Reviewing Experts.

Ada Pandele - National Institute of Hydrology and Water Management, Romania - and representative of the Peer Review secretariat, presented the results from the undertaken peer review missions focusing groundwater issues. The following river basins have been reviewed concerning specific issues with groundwater management in the peer review process:

1. Italy, Autorità di Bacino dei fiumi dell' Alto Adriatico (methodologies used for the assessment of quantitative and chemical status, and trend assessment)
2. Sweden, South Baltic Water District authority (groundwater monitoring and characterisation of groundwaters)
3. Spain, Catalan Water Agency (groundwater quantity and quality assessment and trend analysis, groundwater to surface water ecosystems relationship)
4. Malta - SEWCU, MEH, MEPA, MSDEC (relationship between surface and groundwater: ecology and hydrology issues – link with drought issues)
5. Luxembourg, Water Management Agency (Groundwater and Monitoring)

The main outcomes from these Peer reviews are shown in the presentation<sup>1</sup>.

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<sup>1</sup> All the presentations are available on the Peer Review project website (<http://aquacoop.eu/peer-review/index.php/workshops/groundwaterworkshop>) and on the South Baltic Water District Authority website (<http://www.vattenmyndigheten.se/sv/nyheter/2016/pages/europeiska-grundvattenexperter-till-kalmar-i-september.aspx/>)

## VI- Discussion and outcomes of the workshop

### Summary from Topic 1- Characterization of groundwater

Rapporteur: Carola Lindeberg

The differences in number of groundwater bodies are based on different geological conditions and therefore different methods for delimitation the boundaries of the groundwater bodies are used. These national conditions have to be considered when comparing monitoring program, risk- and status assessment, impact sources, programs of measures and quality standards between member states.

Natural background levels in groundwater can usually not be extrapolated from a specific area, such as a member state, due to different geological areas etc. However, national threshold values and parameters that have a threshold values could be more similar between member states. This is especially the case for anthropogenic pollutants where there are no natural background levels.

Relatively few groundwater bodies have been classified with bad status. In waterbodies with bad status it is often nitrogen compounds causing the problem. Relatively few groundwater bodies are contaminated by other pollutants, especially with relation to pesticides, which is remarkable if we consider the high nitrogen concentrations from agriculture areas. Can the lack of data for pesticides depend on expensive analyses and monitoring of the wrong pesticides, i.e. pesticides no longer in use, but which are still remaining?

Few groundwater bodies have bad quantitative status.

The impact sources for groundwater bodies are more or less the same in all member states.

There is a need for more guidance for the work with groundwater dependent ecosystem. More collaboration and sharing good examples of methods are required.

For trend analyses there is a need for more guidance to point out a suitable method for the analyses.

### Number of groundwater bodies as a comparison

Sweden: 3300 (3800)	73,29 GWB / 10 000km <sup>2</sup>
Norway: 1200	31,15 GWB / 10 000km <sup>2</sup>
Romania: 143	6 GWB / 10 000km <sup>2</sup>
Estonia: 39	8,60 GWB / 10 000km <sup>2</sup>
Catalonia: 37	12,16 GWB / 10 000km <sup>2</sup>
Latvia: 16	2,48 GWB / 10 000km <sup>2</sup>

### Summary from workshop 2 - Monitoring of groundwater

Rapporteur: Ruxandra Balaet

Discussions on the Topic 2 within the workshop had taken into account not only the quantitative and chemical monitoring networks, but also the results of the monitoring activity and their usage during the RBMP elaboration.

All represented countries have groundwater monitoring networks. Participants presented how groundwater monitoring is done in their countries and how the results are used. Differences due to specific hydrogeology and water management organization were presented and discussed.

General agreement was reached on the fact that the monitoring network and programme must have a scientific (hydrogeological) approach and must be based on pressures impact assessment. Also relations with surface waters must be taken into account and connectivity with ecosystems considered.

Cost burden was discussed, most of the countries trying to optimize the monitoring networks and reduce costs. Opinions shared by the participants showed that monitoring issues should be discussed in detail also at the European Union level, where a Watch List for groundwater is prepared.

The general conclusion of the experts was that the member states should do monitoring in a pragmatic ways but not to lose the scientific approach.

### **Summary from workshop 3 – programme of measure of groundwater**

Rapporteur: Katrin Herrlin Sjöberg

The main issues identified are:

1. Monitoring/measures/policy analysis - what are the connections in-between? Often monitoring is carried out independently of the pressures or of the policy.
2. Cost-effective measures are often in conflict with other policies ex. Rural Development Plans, Common Agricultural Policy, etc.
3. Measures for surface waters quality and flood management can be bad for groundwater, i.e. Natural Water Retention Measures such as ponds for N-reduction and storm water management in urban areas, which may increase the pollutant loads flowing into the groundwater bodies.
4. Funding – PPP: depending on the water management funding policy of the member states, it may be difficult to always fund the most cost-effective measures at the best locations.
5. Groundwater aspects need to be included in the planning processes for urban areas.

Recommendation:

For exemptions, article 4.4 (Extension of the deadline) is mostly used, but article 4.5 (less stringent environmental objectives) has to be used in the future when the time scale for the decline of contaminants already present in the groundwater bodies is too long. Another possibility is the use of the article 4.4 (Extension of the deadline) after 2027 with the exemption due to natural conditions, if the contaminants are present but due to natural conditions, i.e. contaminant from bedrock.

Lessons Learned and best practices:

- Which measures are used in the member states for polluted groundwater?
  - Small aquifers - pump and treat, active walls- very expensive;
  - Large aquifers - the only solution is to prevent further contamination and reduce the pressures by land-use regulations, and to wait for the groundwater body to go back "by itself" to a natural state by in-situ remediation: for these groundwater bodies we need to have less stringent targets;
  - Is infiltration a measure to speed up declination of pollutions?

- Prevention is the best solution, as there are no cost-effective direct measures. Most of the member states apply measures for protecting groundwater bodies (protection areas, agriculture and reduction of the use of pesticides and fertilizers, etc.)

**The workshop and the discussions on the different topics enabled to reach the following outcomes:**

- The local conditions regarding groundwater bodies and groundwater uses differ a lot between the member states and, in the same member states, between different regions. For example, Catalonia has ten times less Groundwater bodies per unit surface than Sweden, with a monitoring network much more developed. The knowledge of the groundwater bodies is thus more advanced in Catalonia than in Sweden. This may be explained by the fact that regions such as Catalonia rely much more on groundwater resources than regions, such as Sweden, with more abundant surface water resources and with less dense population.

In regions where the monitoring of groundwater is not much developed, the characterisation of groundwater bodies must be based on the available data, but also on expert judgement and models (soil, type of aquifer, rainfall, pressures etc.). This is important to identify the water bodies “at risk” for which monitoring should be established (for drinking water in particular). In Sweden similar types of groundwater bodies with similar pressures are grouped together when assessing the status. Prioritisation should be given to groundwater bodies where the water abstraction is critical.

The situation is similar in Norway, where the groundwater uses are not so critical and where the residence time in the groundwater bodies is quite short (around 6 months, in average): as a result, the groundwater monitoring is not seen as a priority, and few monitoring stations are available, mostly focusing on natural background groundwater quality and reference groundwater bodies with few/no impacts from human activities. This leads to a lack of monitoring data from GWB with pressures and makes the characterisation work challenging; but by expert judgement, it can be determined that most of the groundwater bodies have a good quantitative and qualitative status.

- **The different priorities and water resources situations of the member states have led to little focus on the groundwater bodies in some regions with abundant surface water resources, and the lack of data is problematic to answer to European obligations. For groundwater assessment and trend analysis it may be more interesting to develop models (i.e. methods of grouping similar groundwater bodies) and experts' judgement in these regions rather than investing large amounts of money in a monitoring network. Monitoring should focus on groundwater bodies identified as “at risk” or in “bad state” and can be optimized in many cases**

- In Romania, it is quite the opposite: the hydrogeological monitoring network is well developed, but there have been some difficulties in assessing the threshold values: the Romanian experts had to develop methods to assess the natural background levels and threshold values for groundwater bodies. This situation is similar in Latvia: it is difficult to assess all the processes that are taking place in the groundwater bodies, and thus to forecast quantitative and qualitative trends (when there is a trend).

- **A more practical European guidelines document could be developed on this issue, in order to provide concrete methodologies to assess the trends:** for example, it is important to know the "age" of the water in large aquifers in order to be able to understand from which time period substances that can be found in the groundwater body are coming from.
- Romania and Catalonia are using the "20percent rule" - according with the CIS-Guidance Document no. 18 "Guidance on Groundwater Status and Trend Assessment" - which allows to classify a groundwater body as in good status if less than 20 percent of the water body is in bad status, giving some flexibility to member states to reach the objectives of the WFD. The use of this 20 percent rule could be developed by Sweden, even if its application is made difficult by the fact that Swedish groundwater bodies are relatively small and numerous and thus have few monitoring points.
  - **Using the 20 percent rule of the water body area for the weighted status assessment should be considered when it concerns drinking water.**
- There was also a discussion on *which parameters have to be monitored regarding groundwater?* In some cases, parameters which are analysed and monitored are not adapted to the local existing conditions: few substances which may be present due to local activities/conditions are not monitored. It was also pointed out that sometimes Member States don't realise having problems, as the parameters causing/showing the problems are not monitored.
  - **A "screening" should be implemented, in order to allow a better identification of the substances that could be present and need to be monitored.**
  - **A "watch list" should be established, in order to anticipate potential emerging new substances in groundwater bodies as groundwater lack a list of what should be monitored in comparison to surface water. There is an ongoing discussion at EU level about making a Watch list for groundwater, voluntary imitative looking on pharmaceuticals (Watch list).**
- For some countries (Italy and Spain for example), there are extensive monitoring programmes, which may focus on drinking water quality and treatment rather than on broader environmental issues. This makes the data analysis quite difficult and laborious, and may lead to reporting issues.
  - **There is sometimes a need to reduce the monitoring programs, and have less frequent measures, for fewer (but better selected) parameters.**
  - **Groundwater dependent ecosystems will be the next challenge, how to implement this in practice. Scotland has looked into this.**
  - **When addressing groundwater dependent ecosystems, a recommendation is to consider surface and groundwater altogether: for example in Sweden and Norway surface and groundwater are closely connected, with fast water transfers in aquifers.**
- The location of the monitoring stations was also discussed, in particular when there is point source pollution: how close should the monitoring stations be from the pollution emission? In Norway, the monitoring is not made too close to point source pollution, but rather downstream of the area with the pressure, taking also into account the importance to know what is ending up in the surface water and focusing on groundwater dependant ecosystems in priority.

- **Recommendations could be made by the EC on this issue, as well as for the monitoring of urban pollutants.**
- The solutions to deal with polluted groundwater bodies and for them to reach a good status are quite difficult to find when the residence time is long and considering the complexity and slowness of the processes that may be taking place in the groundwater body.
  - **In most cases, only time will enable the groundwater body to reach a natural state again. The solution is thus to implement prevention measures to reduce pressures on the groundwater bodies, and monitor the effect on the water quality. In some cases (groundwater bodies with long residence time), it will lead to the impossibility of fulfilling the WFD objectives by 2027.**

#### **Link to additional material**

Handbook on monitoring in urban areas – Swedish Language:

<http://www.lansstyrelsen.se/Stockholm/Sv/publikationer/2012/Pages/regional-miljoovervakning-av-grundvatten.aspx>

<http://www.lansstyrelsen.se/skane/Sv/publikationer/2012/Pages/miljoovervakning.aspx>

VISS (Water information system in Sweden) showing for example program of measures related to Nybroåsen, Kalmar water supply: <https://viss.lansstyrelsen.se/Waters.aspx?waterEUID=SE627524-151840>).

“ Implementation of the Water Framework Directive - A comparison between Ireland and Sweden”:

[http://www.lansstyrelsen.se/Jonkoping/Sv/publikationer/rapporter/2009/Pages/2009\\_31.aspx](http://www.lansstyrelsen.se/Jonkoping/Sv/publikationer/rapporter/2009/Pages/2009_31.aspx)

## **Annex 1: Recommendations from the Peer Review missions focusing on Groundwater:**

### **Autorità di Bacino dei fiumi dell'Alto Adriatico, Italy: Assessment of groundwater qualitative and quantitative status**

- reviewing the National legislation and increase the flexibility of the use of National Background Levels for determining Threshold Values for groundwater bodies
- need for further refinement of the methodologies used to allow increased flexibility in the development and application of Threshold Values
- increased use of groundwater balance models in quantitative status determination
- optimization and harmonization of the management of quantitative and qualitative monitoring networks
- increased use of 'expert judgement', in order to reduce the number of 'unknown status' groundwater bodies
- Increased use of water balance assessment for evaluation of the quantitative status

### **South Baltic Water District, Sweden: Groundwater Monitoring**

- clarifying who is responsible for monitoring and maintenance of a data base for groundwater use and evaluation of groundwater quality
- registration of the individual groundwater drillings for water supply and the amount of groundwater used for irrigation using a reliable data base
- developing data bases, relevant indicators and models for groundwater resources availability, groundwater use and groundwater quality at the district level, using the contribution of local, regional and national authorities.
- developing a national policy for costing and pricing of groundwater, especially for irrigation
- Desalination plants should be considered only as an ultimate solution by taken into consideration due to environmental impacts from saline wastewaters and the CO<sub>2</sub> contribution to climate change

### **Catalan Water Agency, Catalonia, Spain: Groundwater quality assessment**

- chemical status for groundwater bodies should be determined for each of the pollutants which contribute to the groundwater bodies as being at risk of failing good status and for all pollutants that contribute to the risk
- risk assessment can be extended to include information for more parameters that might affect the groundwater status
- using screening programme for new pollutants that can be discovered in the environment, e.g. pollutants included in the "Watch list"
- uses of the groundwater should be considered when assessing exceedance of threshold values
- more parameters might be included in the Catalonian list for groundwater threshold values
- trend analyses can be used to complement the risk assessment

- grouping monitoring points and focus monitoring in groundwater bodies at risk
- a further development of methods to assess impacts from groundwater to groundwater dependent ecosystems is recommended

**Sustainable Energy and Water Conservation Unit (SEWCU), Ministry for Energy and Health (MEH); Malta Environment and Planning Authority (MEPA), Malta: Relationship between surface and groundwater: ecology and hydrology issues – link with drought indices**

- Should be considered in the future the assessment of water stress conditions, by using indices or not and also the assessment of the compensation effect of water accumulation due to recharge on periods of water consumption peaks
- Assessment of the status of Maltese groundwater bodies must be realized on a regular basis
- Is highlighted the need of coordination to fulfil the objectives of WFD and other European Directives – such Habitat Directive and Birds Directive

**Water Management Agency, Luxembourg: Groundwater and Monitoring**

- clearly summarize all changes between the 1st and the 2nd RBMP in the results of the assessments, the methodologies and the extent of assessments and measures
- For the implementation of the 'GWAAE test' a stepwise procedure was proposed
- The WFD compliant consideration of groundwater dependent or associated aquatic and terrestrial ecosystems needs interdisciplinary discussions with chemists and ecologists / water experts and nature protection experts / experts from WFD and Natura 2000 responsible ministries to act jointly



- Recommendation: Screening we have to look for new substances which are not in the classic measured parameters, in link with what is used for human activities.
- The parameters which are monitored need to evolve.
- More parameters for checking chemical status and common threshold values (depending on anthropogenic pressure) is needed.
- Methods /best practice for cost-effective monitoring is needed
- Screening of chemical substances that reflect surface activities
- Dating of groundwater sample for screening.
- Better planning needed for monitoring, in order not to lose money (exploitable, useful data) – no need to have too much data if we cannot use it.

### **Topic 3 Programme of measure**

- What can be done with contaminated groundwater without huge costs
- What is other MS doing with contaminated groundwater
- How to deal with already forbidden compounds (BAM and PBDE) and other pesticides. Time!
- Funding of measures, good examples+
- Planning process in urban areas- how do you involve measures preventing a deterioration of the water stress.
- How has PPP been applied/implemented