Assessment of transboundary aquifers in the context of the second Assessment of transboundary waters in the United Nations Economic Commission for Europe

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ABSTRACT

The key goal of UNECE second Assessment of Transboundary Rivers, Lakes and Groundwaters, currently prepared under the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention), is to facilitate informed decision-making on the management of shared water resources in Europe, Caucasus and Central Asia, provide the basis for continuous bilateral and multilateral cooperation under the Water Convention, and support all actors involved at the national, transboundary and regional levels. In the second Assessment, a holistic, integrated approach is applied, looking at both surface and groundwaters within each transboundary basin. Pressures on transboundary water resources are identified and their relative importance in the transboundary context evaluated. Legal, institutional and socioeconomic aspects are highlighted and cross-cutting themes that are a challenge for managing transboundary waters — such as predicted impacts of climate variability and change — are emphasized. The extent of transboundary cooperation (joint bodies, joint monitoring etc) currently in place and measures taken are also described. The assessment report will provide information on more than 140 transboundary rivers, more than 30 transboundary lakes and some 200 transboundary aquifers. The Assessment is prepared in close cooperation with national experts nominated by environment administrations of the participating countries. In this paper, the approach and some preliminary results of the second Assessment in South-Eastern Europe, Eastern and Northern Europe, and the Caucasus are described, with focus on transboundary aquifers.

Key words: transboundary waters, assessment, monitoring

1. INTRODUCTION

1.1. Objectives and scope

The key goal of the second Assessment of Transboundary Rivers, Lakes and Groundwaters, currently under preparation in the framework of the UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention), is to keep the state of shared water resources in Europe, Caucasus and Central Asia under scrutiny, facilitate informed decision-making on their management, provide the basis for continuous bilateral and multilateral cooperation under the Water Convention, and support all actors involved at the national, transboundary and regional levels. High attention is being devoted to the countries with economies in transition which are facing the biggest challenges.

In this paper, the approach applied is described and some preliminary results of the second Assessment in South-Eastern Europe, Eastern and Northern Europe, and the Caucasus are reported on, with focus on transboundary aquifers. This groundwater part of the assessment is carried out in cooperation with UNESCO and the International Groundwater Resources Assessment Centre (IGRAC). IGRAC has a key role in describing the key physical characteristics of the transboundary aquifers and delineating them. A number of challenges that have emerged in the process of preparing this regional inventory are also highlighted in the article.

1.2. Background and mandate

The first Assessment (UNECE, 2007) – prepared in response to the decision of the third Meeting of the Parties to the Water Convention in 2003 – was presented to the sixth Ministerial Conference "Environment for Europe" (Belgrade, October 2007). At the request of the appreciative Ministerial Conference, a second edition is prepared for the next (Seventh) Ministerial Conference, which is to be held in September 2011 in Astana, Kazakhstan. Like the first one, the second Assessment covers the Eurasian part of the UNECE region[1].

For transboundary groundwaters, the second Assessment builds on earlier inventorying efforts such as the 1999 inventory of transboundary groundwaters in Europe by the UNECE Task Force on Monitoring and Assessment as well as UNESCO-supported work, by IGRAC in particular.

In accordance with the Water Convention, the riparian Parties shall, at regular intervals, carry out joint or coordinated assessments of the conditions of transboundary waters and the effectiveness of measures taken to prevent, control and reduce transboundary impact. To this end, UNECE has developed over the years a number of guidance documents on monitoring and assessment of transboundary waters (for example, UNECE, 2006), also specifically on transboundary aquifers (UNECE Task Force on Monitoring and Assessment, 2000).

2. APPROACH

In the second Assessment, a holistic, integrated approach is applied, looking at both surface and groundwaters within each transboundary basin. Pressures on transboundary water resources are identified and their relative importance in the transboundary context evaluated. Legal, institutional and socioeconomic aspects are highlighted and cross-cutting themes that are a challenge for managing transboundary waters - such as predicted impacts of climate variability and change — are emphasized. The extent of transboundary cooperation (joint bodies, joint monitoring etc) currently in place and measures taken are also described. The assessment report will provide information on more than 140 transboundary rivers, more than 30 transboundary lakes and some 200 transboundary aquifers. The Assessment is prepared in close cooperation with national experts nominated by environment, water and hydrometeorological administrations of the all countries in the UNECE region. The International Water Assessment Center, the Water Convention collaborative center, plays a crucial role in the assessment preparations. Moreover, cooperation is also established with a number of international organizations including UNEP, UNESCO, Global Water Partnership Mediterranean, Regional Environment Centres etc.

The Assessment is carried out using a questionnaire and the filling out of the information concerning each riparian country's share of the basin or aquifer is coordinated by the nominated national focal points based on official data from the countries. As a parallel and complementary means of information collection, sub-regional workshops on transboundary management of water resources are organized, where the representatives of riparian countries have an opportunity to work together to develop an accurate picture of all transboundary waters in the sub-region. The workshops provide a forum for government officials, as well as representatives of non-governmental organizations to discuss pressing themes in each particular sub-region, allowing differences between them to be reflected in the assessment.

The methodology for the assessment of groundwaters broadly follows the Driving Forces-Pressures-State-Impact-Responses (DPSIR) framework adopted by the European Environment Agency (UNECE, 2006) to describe i) the pressures resulting from human activities, ii) the status in terms of

[1] UNECE has 56 Member States located in the European Union, non-EU Western and Eastern Europe, South-East Europe and Commonwealth of Independent States (CIS) and North America. A full list is available at http://www.unece.org/oes/nutshell/member_States_representatives.htm

both quantity and quality of groundwaters, iii) the impacts resulting from any deterioration in status and iv) management measures (i.e. responses) that have already been introduced, need to be applied, or are currently planned.

The information collected about groundwater includes physical characteristics of the transboundary aquifers (extent, thickness, lithology etc), delineations, main uses and functions, main pressures on groundwater quantity and quality, and predicted impacts of climate change. For consistent information collection by the questionnaire, transboundary groundwaters were classified according to general conceptual models describing the flow regime and the transboundary relationship between the countries sharing the aquifer.

3. PRELIMINARY RESULTS

In South-Eastern Europe[2], according to the information reported by the countries, groundwater is mainly used for drinking water, but there is some use for agriculture and industry also. Agriculture together with sewage and waste disposal is the most important pressure factor acting on groundwater resulting from human activities. Groundwater abstraction, industry and solid waste disposal are other significant pressure factors affecting groundwater, and mining or gravel extraction and tourism are also significant in the case of some transboundary aquifers.

In the Caucasus[3], the main pressure impacting on groundwater resources is sewerage and waste disposal, followed by agriculture and solid waste disposal. Mining is a notable pressure factor only in the case of some individual aquifers.

In general, transboundary cooperation related to groundwater is at a low level in the region, but there are good examples of cooperation, one being between France and Switzerland on the Geneva aquifer. In the Danube and Rhine basins, identifications of transboundary aquifers have been carried out in the framework of river basin commissions. Many bilateral and multilateral agreements on transboundary waters between or with participation of countries in the Eastern Europe, Caucasus and Central Asia region do not explicitly refer to groundwater, but there are also many that mention groundwater in their scope but their application to groundwater remains very low. It is a constraint to assessing the status of transboundary aquifers in many part of the region that recent groundwater monitoring data is very scarce or in some cases no monitoring activities are currently performed. This limits identifying appropriate management responses, and groundwater being covered by different legislation from surface waters for historical reasons in many countries of the former Soviet Union does not support integration. Cooperation between riparian countries in monitoring and assessment may provide an starting point for cooperation, and therefore joint characterization of groundwater bodies according to the requirements of European Union's Water Framework Directive (WFD) is encouraging, even if there are relatively few cases (for example, Austria and Slovenia characterized jointly the Karstwasser-Vorkommen Karawanken/Karavanke aquifer).

The principle of integrated management of surface and groundwater is missing in water laws in a number of countries of the former Soviet Union assessed so far. Monitoring groundwater resources in general is in the region commonly not part of the responsibilities of environmental authorities. Due to historical developments of the legislation (Soviet Union's water code as the basis), groundwater is treated separately, similarly to mineral resources.

[2] Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Hungary, Montenegro, Romania, Serbia, Slovenia, the former Yugoslav Republic of Macedonia and Turkey.
[3] The countries covered by this sub-regional assessment are Armenia, Azerbaijan, Georgia, the Islamic Republic of Iran, the Russian Federation and Turkey.

4. DISCUSSION: CHALLENGES

The outer border of the European Union represents a certain divide in the approach to assessment, concepts and regulatory obligations. Within EU, the member states are obliged to transpose the EU legislation, including the WFD, which has harmonized approaches.

In the EU, the WFD requires characterization of groundwater bodies. Nevertheless, at least from the parts assessed to far, it appears that also in the EU joint characterization of transboundary groundwater bodies remains limited. The knowledge in general about the location and extent of transboundary aquifers is limited. In some cases this seems to be influenced by local and limited use of groundwater resources and consequently low awareness or possibly perception of insignificant transboundary influence. In other cases, the provision of information provided by the countries is limited to aquifers the transboundary nature of which has been formally agreed upon between the sharing countries. The quality and detail of the information provided for the second Assessment depends also on the organization of water resources management in each country and the extent to which administration responsible for groundwater is involved in providing input to the Assessment.

From a technical point of view, the assessment of "invisible" groundwater is more complex than the assessment of the surface watercourses. While the presence and extent of surface water is usually a given fact, in the case of groundwater it is one of the main issues to be agreed upon between riparian countries.

A complete harmonisation of information is difficult to achieve because of differences in the scope and level of detail of assessment, its purpose or the assessment methodology used. For instance, the most recent information collected in many countries of South-Eastern and Eastern Europe is about transboundary groundwater bodies[4] (and not transboundary aquifers). Guidelines for definition of groundwater bodies are not unambiguous, which has led to somewhat different interpretations. Therefore, harmonization between transboundary groundwater bodies (as management units) and aquifers (as hydrogeological units) is not always easy.

In the second Assessment, the initial information on presence and extent of transboundary aquifers is collected from various sources (usually previous inquires and assessments) and harmonized, prior to sending it to countries that share the aquifer. Figure 1 shows a working map of transboundary aquifers in South-Eastern Europe. Various shadings are used to indicate aquifers the presence and extent of which need to be discussed and agreed upon by the aquifer countries. The working maps of this kind are used in the second Assessment in the face-to-face sub-regional workshops to assist the countries sharing the aquifers countries to reach agreements. Country representatives are encouraged to provide additional material for discussion. The response from the countries varies substantially.

[4] Groundwater body is defined as ''a distinct volume of groundwater within an aquifer or aquifers'' in the Water Framework Directive.

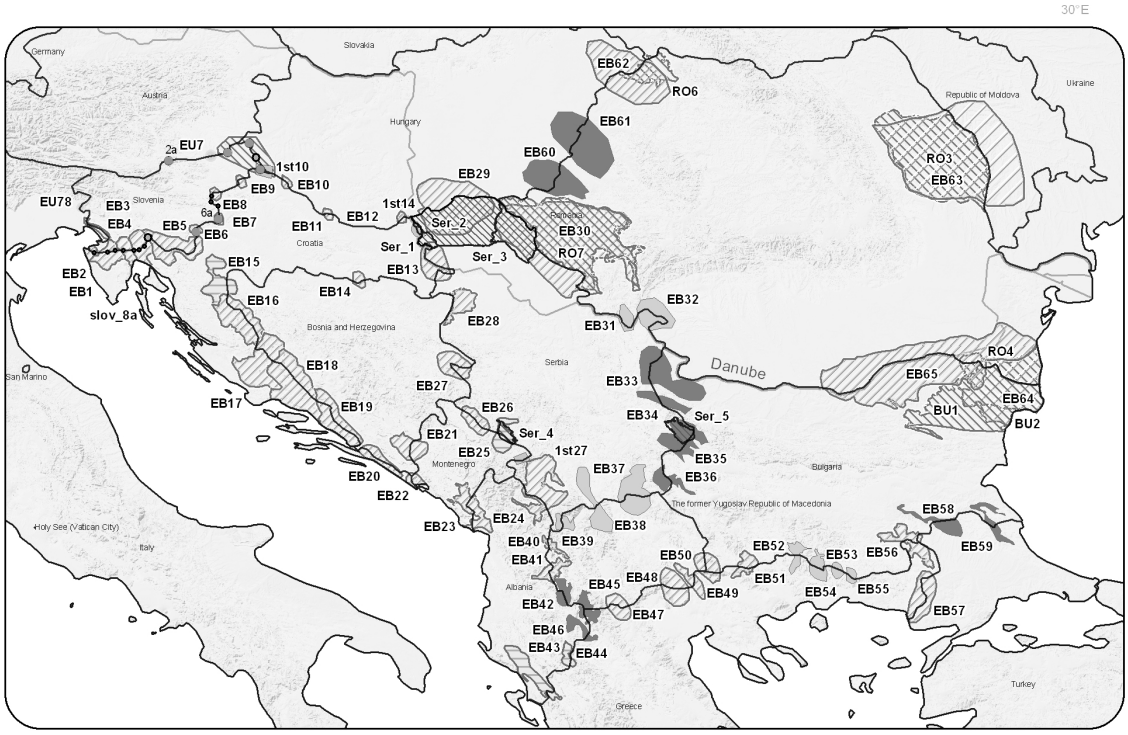

Figure 1. Transboundary aquifers in the South-Eastern Europe (a working map)

Due to these challenges, not the same level of information is systematically available. The information from different sides of the border can be asymmetrical. Socio-economic and for example population data are not commonly available at aquifer level. The remaining gaps indicate where additional information collection effort is needed.

Even if the limits of mandates of organizations as such can affect the effectiveness of data collection in such a regional assessment, the cost of data between them at the national level has emerged as a potential additional constraint.

The effort to discuss surface and groundwater in an integrated way in the assessment workshops was not initially fully successful: because of the prominence of surface water related issues, groundwater received less attention in general discussions. Therefore, some opportunity in the process has been reserved for groundwater experts to exchange bilaterally to refine the aquifer information before reporting it to the wider body of experts involved for a more holistic basin-level overview.

In some of the areas assessed so far, the transboundary aquifers are strongly linked to surface waters and therefore already for delineating the aquifers it is important to look at the river network and groundwater information jointly. This is the case for example in Eastern Europe, where a number of transboundary aquifers consisting of alluvium deposits of transboundary rivers were identified. The contribution of groundwater to the flow in a number of transboundary rivers is mentioned in several country reports. Also because of the interaction between surface water and a number of transboundary aquifers, surface water quality and quantity have important implications to the groundwater situation.

One of the aims of the Assessment is to identify situations where support is needed for extending cooperation. UNECE experience has demonstrated that technical cooperation on projects can pave the way for expansion into more institutional domain. UNECE strategy is to seek partners for the mobilization of necessary resources to support the riparian countries in their common efforts.

5. CONCLUSIONS AND THE WAY AHEAD

There is a pressing need for harmonizing approaches to characterizing and assessing the status of transboundary aquifers across the region. Regional assessment processes like UNECE's second Assessment can contribute to information exchange and discussion among the representatives of countries to develop a common understanding of the quantity and quality status of transboundary aquifers and the main pressure factors potentially affecting them.

The provisions of the UNECE Water Convention have been used as basis or inspiration in preparing most of the bilateral agreements on transboundary waters in the region. The Water Convention applies to all transboundary waters — surface waters and groundwaters alike. The Legal Board of the Water Convention is in the process of looking in detail into how the Convention applies to groundwater.

There is a need to establish transboundary mechanisms (e.g. joint bodies) for improved cooperation and data exchange. Where joint bodies on transboundary waters exist, expansion of activities to groundwater is recommendable. These structures facilitate cooperation, opening perspectives for seeing beyond the national (ground)water demands. River basins commissions such as International Commission for the Protection of the Danube River and the International Sava River Basin Commission have recently inventoried or are presently in the process of inventorying transboundary groundwater bodies, respectively. Capacity-building focused on transboundary groundwater resources, especially for more scarcely-resourced regional or transboundary institutions would help raising awareness at transboundary level.

Attention needs to be devoted to land-use planning and the joint management of surface and groundwater. This is particularly pressing in the countries where monitoring and management of surface and groundwaters fall into the mandates of different organizations. There is a need for policy and institutional reforms that support integration.

Upgrading of the existing infrastructure for monitoring and assessment of transboundary groundwaters and building the capacity in the countries' administrations is sorely needed. The second Assessment is making a valuable contribution to this end by identification and drawing attention to the management issues and cases related to (possible) disagreements and disputes about the use of transboundary water resources or where there are transboundary impacts on them. On the basis of this information, relevant transboundary interventions can be planned. UNECE is encouraging preparation of pilot projects for monitoring and assessment of transboundary groundwaters and engagement of development partners to support the countries in improving management of transboundary waters, including groundwater.

At the end of 2010 and at the beginning of 2011, transboundary aquifers in Central Asia and Western Europe, respectively, will be inventoried in the framework of the second assessment.

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