

# STATUS, TRENDS AND IMPACTS

## Chapter 3

### STATUS, TRENDS AND IMPACTS

**310** GROUNDWATER QUANTITY

**312** GROUNDWATER QUALITY

From the earlier work by UNECE and INWEB, and the discussion of pressure factors above, the most important issues for the status and trends of transboundary groundwater quality in SEE were expected to be nutrients, pathogens and organic compounds, and saline intrusion in the coastal regions. Major deterioration of status of groundwater quantity and associated impacts were not anticipated from the previous work and from the assessment of pressure factors. In general, the assessment confirms this picture, but with some local causes for concern.

## GROUNDWATER QUANTITY

From a groundwater quantity point of view, the most common problems reported were increased pumping lifts and reduction in boreholes yields, or the drawing of polluted water into the aquifer. The latter was mostly in the form of saline intrusion in coastal aquifers. The most widespread and severe saline intrusion and salt water up-coning problems occur as expected in the Dinaric littoral groundwaters of Albania, Croatia, Montenegro and Slovenia. Some evidence of degradation of ecosystems was also reported. Reported information on quantity problems is summarized in the table below and information for each groundwater is provided in the last chapter below.

### Summary of reported groundwater quantity problems in the SEE region

Problem	Increasing scale of problem 			
	1. Local and moderate	2. Local but severe	3. Widespread but moderate	4. Widespread and severe
Increased pumping lifts or costs	●●●●●●●●	●●●●		●●●
Reduction of borehole yields	●●●●●●●●	●●●●	●●●●	
Reduced baseflow and springflow	●●●●●●●●	●●●	●●	
Degradation of ecosystems	●●●●●●●●	●●	●●●●●●	●●●
Sea water intrusion		●		●●
Salt water upconing				●●●
Polluted water drawn into aquifer	●●●●●●●●	●●	●●●	●●●●
Land subsidence	●			
Other				
Declining groundwater levels	●●●●	●●●	●	
Use for energy production	●			

Notes: ● karstic groundwater ● alluvial groundwater

Each spot represents the specific scoring for each transboundary groundwater, distinguishing between the alluvial and karstic groundwaters. However, it should be noted that a complete lack of quantity problems was reported for 12 of the transboundary groundwaters in the region, and for others there was no data from which to make a judgement. Trends of water level decline were reported for some of the alluvial transboundary groundwaters in the region. Declines of 0.1 m/year and locally 0.5 m/year were reported by Serbia for the Backa groundwater shared between Serbia and Hungary. Similar declines of 0.2 m/year were reported by Serbia for the West Srem shared with Croatia and of up to 0.6 m/year locally within the Banat aquifer shared with Romania. The latter local effects were confirmed by the response from Romania. For the White Drin (Beli Drim) groundwater in Serbia, declines of up to 0.3 m/year were reported. However, these do not affect the Drini Bardhe groundwater in the lower part of the Drin River basin in Albania because the aquifers are not in direct hydraulic connection. For the Svilengrad/Stambolo/Orestiana groundwater shared between Greece, Bulgaria and Turkey, annual groundwater abstraction was reported to be significantly greater than annual replenishment, although

there was no report of declining water levels. Widespread but moderate problems of reduced baseflow and springflow and associated degradation of ecosystems were reported by Greece for the Dojran Lake aquifer. Moreover, declining surface water and groundwater inflows have resulted in major reduction of lake level and area, with 75% of the volume of water reported as having been lost between 1988 and 2002. Groundwater abstraction to replenish the lake has been partially successful, and recovery has been assisted by the more recent wet years.

Reports of transboundary impacts caused by groundwater quantity problems are rare in the region. The heavy water demand for irrigation in the Svilengrad/Stambolo/Orestiana groundwater shared between Greece, Bulgaria and Turkey was reported by Greece to have transboundary impacts on groundwater levels. Transboundary impacts in terms of groundwater quantity were also reported by The former Yugoslav Republic of Macedonia for the Bitolsko and Gevgelija aquifers, and by Serbia for the Banat and Backa groundwaters, although none of these appear large.

## GROUNDWATER QUALITY

In general, both alluvial and karstic groundwaters have reported groundwater quality problems. For only three was it specifically reported that there were no groundwater quality issues at all, and several more are incomplete or report a lack of data. One problem specific to the alluvial aquifers is that of arsenic of natural origin. Concentrations of up to 300 µg/l in the Backa, Banat and Baranja groundwaters shared by Serbia, Hungary, Romania and Croatia, respectively, exceed the drinking water standard of 10 µg/l and affect their use for potable supply. In some locations, expensive arsenic removal or importation of water either directly for supply or for dilution of local high arsenic contents is needed.

Groundwater quality problems in SEE are summarized in the table below, using a similar approach to that

for quantity presented in the table above. Each spot represents a reported quality problem. The most commonly reported anthropogenic groundwater quality problems are elevated nitrate concentrations and the presence of pathogens. These are mostly reported as local and of only moderate severity. The former are reported to originate from both agriculture and waste disposal; the latter mainly from human waste but occasionally from livestock. The assessment did not ask for detailed information on monitoring programmes or monitoring results, and the few indications of concentration ranges that were provided indicate some local nitrate concentrations above drinking water standards in the Sarmatian and Lower Cretaceous groundwaters shared by Bulgaria and Romania and in the Somes and Mures groundwaters shared between Hungary and Romania.

Summary of reported groundwater quality problems in the SEE region

Problem	Increasing scale of problem 			
	1. Local and moderate	2. Local but severe	3. Widespread but moderate	4. Widespread and severe
Salinization or saline intrusion	•••		•••	••
Nitrogen	••••••••••	•••••	•••••	
Pesticides	••••••••••			
Heavy metals	••••	••••	•	
Pathogens	••••••••••	••••	••••	
Industrial organic compounds	••	•	•	
Hydrocarbons	•••	•	•	
Other				
Arsenic			••••	•••••
Other natural salts and minerals (Fe, Mn)	••		••••	
Organic matters	••	•	••	••

Notes: • karstic groundwater • alluvial groundwater

The most severe local groundwater quality problems are probably caused by saline intrusion on the Adriatic coast. There are few reported instances of transboundary impacts of pollution of groundwater. These include the Svilengrad and Gevgelija groundwaters, where intensive agriculture with irrigation has also caused transboundary quantity

impacts, and the Una/Plesevice where waste disposal has produced negative transboundary impacts on groundwater quality. In the Lim groundwater, pollution in the upper part of the river is reported to cause groundwater quality problems lower in the basin.