Second Assessment of Transboundary Rivers, Lakes and Groundwaters under the UNECE Water Convention

Transboundary and Not-Tranboundary Aquifers in the Basin

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Bratislava, Slovakia
Groundwaters are the main source of drinking water and they underlie the economic development degree and living standard in the Slovak republic.

Slovak republic belong to the states with expressive orientation of water system on groundwaters.

Groundwater is the drinking water source of the highest quality. Both, groundwater (82.2 %) and surface water (17.8 %) are exploited as drinking water in Slovakia. Žitný ostrov is the biggest natural groundwater source in Slovakia and in Central Europe with app. 20 400 l.s-1 capacity.
The basic precondition of groundwater state assessment is definition the groundwater body.

- characterise the water,
- assessment water state,
- comparison with the environmental aims
DEFINITION GWB

in according the Regulation about water

• every GWB representatives definable capacity in aquifer
• it was necessary to defined all GWB in which extraction amounts are more than 10 m³/day (0.116 l.s⁻¹) or which supply with drinking water (> 50 persons)
• definition of GWB as transboundary
• GWB is incorporated to the river basin
• GWB were defined according geological and hydrogeological conditions and according the hydraulic boundary
• GWB were defined according to qualitative aspect of GW and according to significant differences in quality of GW
GWB we defined in 3 individual layers:

a) GWB of Quaternary sediments

b) GWB of pre-Quaternary rocks

c) Geothermal waters (deep circulation of groundwater with temperature over 15 °C)
Quaternary GWB
pre-Quaternary GWB
Geothermal GWB
Identified transboundary Quaternary GWB
Identified transboundary pre-Quaternary GWB
Identified transboundary geothermal GWB
The main part of groundwater extraction 8468.82 l.s\(^{-1}\) (76.1\%, year 2008) is for drinking water.
VAH RIVER BASIN
Quaternary pre-Quaternary assessed GWB
GWB assessed for the neighbouring basin
Vah – Mesozoic of West Tatras (-/74), GWB SK200270KF
Predominant lithology: limestones and dolomites
Stratigraphy and age: Middle and Upper Triassic
Thickness: mean 300 m; maximum 1500 m
Areal extent: 1006.513 km²
Dominant groundwater flow direction: from the both countries; from SK to Poland and from Poland to SK; (from E to W and from W to E)
Link with surface water systems is weak
This picture the most closely characterizes transboundary aquifer state border follows surface water catchment and groundwater divide, little transboundary groundwater flow
<table>
<thead>
<tr>
<th>Groundwater resources</th>
<th>m³/year (average for the years 2004-2006)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAH (SK200270KF)</td>
<td>51 321 686.99</td>
</tr>
<tr>
<td>Sector</td>
<td>VAH (SK200270KF)</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Agriculture %</td>
<td>0,3</td>
</tr>
<tr>
<td>Domestic %</td>
<td>83,2</td>
</tr>
<tr>
<td>Industry %</td>
<td>0</td>
</tr>
<tr>
<td>Energy %</td>
<td>x</td>
</tr>
<tr>
<td>Other %</td>
<td>16,5</td>
</tr>
<tr>
<td>Total m³/year</td>
<td>15 319 787,904</td>
</tr>
</tbody>
</table>
POPRAD RIVER BASIN
Dunajec and Poprad – Mesozoic of Belianske Tatras (-/75) – SK200440KF
Predominant lithology: limestones and dolomites
Stratigraphy and age: Middle and Upper Triassic
Thickness: mean 300 m; maximum 1500 m
Areal extent: 191,239 km²
Dominant groundwater flow direction: from the both countries; from SK to Poland and from Poland to SK; (from E to W and from W to E)
Link with surface water systems is weak
This picture the most closely characterizes transboundary aquifer state border follows major river, alluvial aquifer connected to river, little transboundary flow
<table>
<thead>
<tr>
<th>Groundwater resources</th>
<th>m³/year (average for the years 2004-2006)</th>
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<tbody>
<tr>
<td>POPRAD (SK200440KF)</td>
<td>13 598 307.41</td>
</tr>
</tbody>
</table>
### Annual water withdrawal by sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>POPRAD (SK200440KF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture %</td>
<td>x</td>
</tr>
<tr>
<td>Domestic %</td>
<td>100</td>
</tr>
<tr>
<td>Industry %</td>
<td>x</td>
</tr>
<tr>
<td>Energy %</td>
<td>x</td>
</tr>
<tr>
<td>Other %</td>
<td>x</td>
</tr>
<tr>
<td><strong>Total m³/year</strong></td>
<td><strong>230 211,072</strong></td>
</tr>
</tbody>
</table>
Quaternary
pre-Quaternary
GWB assessed for the neighbouring basin
IPEL/IPOLY – Alluvial Ipoly (-/52) – SK1000800P
Predominant lithology: sandy and loamy gravels
Stratigraphy and age: Quaternary; Holocene
Thickness: mean 5-10 m; maximum 15 m
Areal extent: 198,072 km²
Dominant groundwater flow direction: from the both countries; from SK to HU and from HU to SK; project ENWAT – hydraulic model of GW flow
Link with surface water systems is medium
This picture the most closely characterizes transboundary aquifer

state border follows major river, alluvial aquifer connected to river, little transboundary flow
<table>
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<tr>
<th>Groundwater resources</th>
<th>m³/year (average for the years 2004-2006)</th>
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</thead>
<tbody>
<tr>
<td>IPEL/IPOLY (SK1000800P)</td>
<td>4 662 078.42</td>
</tr>
</tbody>
</table>
## Annual water withdrawal by sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>IPEL (SK1000800P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture %</td>
<td>50.4</td>
</tr>
<tr>
<td>Domestic %</td>
<td>38.9</td>
</tr>
<tr>
<td>Industry %</td>
<td>8.3</td>
</tr>
<tr>
<td>Energy %</td>
<td>x</td>
</tr>
<tr>
<td>Other %</td>
<td>2.4</td>
</tr>
<tr>
<td><strong>Total m³/year</strong></td>
<td><strong>117 951,552</strong></td>
</tr>
</tbody>
</table>
Groundwater quality

VAH – chemical status of GWB SK200270KF and POPRAD – chemical status of GWB SK200440KF has been assessed as good.

IPOLY - In groundwater body SK1000800P increased content of total iron and manganese in groundwater is generated from geogenic sources.

- According to groundwater chemical status assessment (2007) in 64% area of groundwater body SK1000800P concentrations of nitrates and in 36% area concentrations of ammonia ions exceeded threshold values. Exceeded concentration of atrazine in eastern part of groundwater body has local character.

- Chemical status of groundwater body SK1000800P has been assessed as bad due to contents of ammonia ions, nitrates and sulphates.
Assessment of the groundwater body risk to achieved good chemical state up to 2015
for SK200270KF, SK200440KF, SK100080OP

Potential impact of point source pollution
GWB are not put into bodies at risk in consequence of bad qualitative state of GW

Potential impact of areal source pollution
Assessed was: potential impact of pesticides, nitrogen, land use
possible risk: Ipoly River basin
pollutants: NO$_3$, PO$_4$, Cl, pesticides
Quaternary GWB at risk to achieved good chemical state up to 2015
assessment of point and diffused pollution source

LEGENDA:
GWB is at risk
GWB is at possible risk
GWB is not at risk

2005 year, source: MŽPSR, VÚVH, SHMÚ, SVP
pre-Quaternary GWB at risk to achieved good chemical state up to 2015

assessment of point and diffused pollution source

GWB is at risk
GWB is at possible risk
GWB is not at risk

2005 year, source: MŽPSR, VÚVH, SHMÚ, SVP
Quaternary GWB at risk to achieved good quantitative state up to 2015

2005 year, source: MŽPSR, VÚVH, SHMÚ, SVP
pre-Quaternary GWB at risk to achieved good quantitative state up to 2015

2005 year, source: MŽPSR, VÚVH, SHMÚ, SVP
Thank you for your attention