Transboundary Aquifer Information Sheet

**AS36 - Syr Daria**

**Geography**
- Total area TBA (km²): 300 000
- No. countries sharing: 2
- Countries sharing: Kazakhstan, Uzbekistan
- Population: 1 800 000
- Climate Zone: Arid
- Rainfall (mm/yr): 160

**Hydrogeology**
- Aquifer type: Multiple-layered hydraulically connected
- Degree of confinement: Mostly confined, but some parts unconfined
- Main Lithology: Sediments – sand and gravel

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**Legend**
- **Transboundary aquifer**: Partially confirmed aquifer boundary, Other aquifer(s)
- **Others symbols**: Rivers, Lakes, Political Borders, TBA Location

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No cross-section available

Map and cross-section are only provided for illustrative purposes. Dimensions are only approximate
## TWAP Groundwater Indicators from Global Inventory

<table>
<thead>
<tr>
<th></th>
<th>Recharge (mm/y)</th>
<th>Renewable groundwater per capita (m³/y/capita)</th>
<th>Natural background groundwater quality (%)</th>
<th>Groundwater depletion (mm/y)</th>
<th>Human dependency on groundwater (%)</th>
<th>Groundwater pollution (%)</th>
<th>Population density (Persons/km²)</th>
<th>Groundwater development stress (%)</th>
<th>Transboundary legal framework (Scores)</th>
<th>Transboundary institutional framework (Scores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>15</td>
<td>2000</td>
<td>0</td>
<td>8</td>
<td>&lt;5</td>
<td>D</td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uzbekistan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBA level</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

(1) Recharge: This is the long term average recharge (in m³/yr) divided by the surface area (m²) of the complete country segment of the aquifer (i.e. not only the recharge area).

(2) Natural background groundwater quality: Estimate of percentage of surface area of aquifer where the natural groundwater quality satisfies local drinking water standards.

(3) Groundwater pollution: A. No pollution has been identified; B. Some pollution has been identified; Positive number: Significant pollution has been identified (% of surface area of aquifer).

(4) Groundwater development stress: Annual groundwater abstraction divided by recharge.

(5) Legal framework: A. Agreement with full scope for TBA management signed by all parties; B. Agreement with limited scope for TBA management signed by all parties; C. Agreement under preparation or available as an unsigned draft; D. No agreement exists, nor under preparation; E. Legal Framework differs between Aquifer States (see data at National level).

(6) Institutional Framework: A. Dedicated transboundary institution fully operational; B. Dedicated transboundary institution in place, but not fully operational; C. National/Domestic institution fully operational; D. National/Domestic institution in place, but not fully operational; E. No institution exists for TBA management; F. Institutional Framework differs between Aquifer States (see data at National level).

A value was provided in the questionnaire, but it was considered un-realistic and therefore removed from the table.

## TWAP Groundwater Indicators from WaterGAP model

<table>
<thead>
<tr>
<th></th>
<th>Renewable groundwater per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current state (m³/y/capita)</td>
</tr>
<tr>
<td></td>
<td>Human dependency on groundwater (%)</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>240</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>2</td>
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<tr>
<td>TBA level</td>
<td>150</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Population density</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current state (Persons/km²)</td>
</tr>
<tr>
<td></td>
<td>Human dependency on groundwater (%)</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>2</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>0</td>
</tr>
<tr>
<td>TBA level</td>
<td>1</td>
</tr>
</tbody>
</table>
AS36 - Syr Daria

Key parameters table from Global Inventory

<table>
<thead>
<tr>
<th>Distance from ground surface to groundwater table (m)</th>
<th>Depth to top of aquifer formation (m)</th>
<th>Full vertical thickness of the aquifer system* (m)</th>
<th>Degree of confinement</th>
<th>Predominant aquifer lithology</th>
<th>Predominant type of porosity (or voids)</th>
<th>Secondary Porosity</th>
<th>Transmissivity (m²/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>20</td>
<td>20</td>
<td>930</td>
<td>Aquifer Mostly confined, but some parts unconfined</td>
<td>Sediment - Sand</td>
<td>High Primary porosity fine/medium sedimentary deposits</td>
<td>No Secondary porosity</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>TBA level</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

* Including aquitards/aquicludes
X A value was provided in the questionnaire, but it was considered un-realistic and therefore removed from the table.

Aquifer description

All the information in the database is from Kazakhstan only. The regional report contains some general aquifer information.

Aquifer geometry

The aquifer is a multiple 3-layered hydraulically connected system that is mostly confined but some parts are unconfined. The average depth to the water table is 20m within Kazakhstan, where the average depth to the top of the aquifer is also 20m and the average thickness of the aquifer system is 930m. The described basin occupies a huge part of the Turan Depression.

Hydrogeological aspects

A confining layer of the Paleogene age (100 m in thickness) separates two hydrogeological levels: A top level: Pliocene-Quaternary complex - sedimentary aquifer mainly gravel, sand with high primary porosity and no secondary porosity and a middle level: Cretaceous complex - sedimentary aquifer mainly sand with high primary porosity and no secondary porosity. The average transmissivity is 3 300 m²/d. The annual recharge is estimated at 2 800 Mm³/annum and total groundwater volume as 9 900 km³.

Linkages with other water systems

The top aquifer is recharged by inflows of interstitial and karst waters from overlying Paleozoic rocks. Recharge also occurs by infiltration of rainfall, surface waters from rivers and streams, and groundwater that circulates through tectonic discontinuities. The regional direction of the groundwater flow is towards the local base level, the Aral Sea (see Appendix).

Environmental aspects

Groundwater in a significant part of the aquifer in Kazakhstan is not fit for human consumption due to elevated salinity. The chemical composition and TDS contents vary to a great extent depending on the location of recharge areas and water sources: from 100 mg/l near rivers and canals to 70 000 mg/l in non-irrigated areas. No pollution has been identified.
Socio-economic aspects
The mean annual volume of groundwater abstraction in Kazakhstan is 120Mm³/annum, largely for domestic use. This is less than 5% of the available recharge and no water level depletion has been observed.

Legal and Institutional aspects
There is no agreement between countries at this stage and also no national institution with a mandate for groundwater management. However groundwater abstraction, groundwater quality protection, and drilling control are done according to law/ regulations, and measures are also applied in practice.

Priority Issues
Due to the small population and the low intensity of use of groundwater, there are no transboundary issues at present. Monitoring the groundwater contribution to the Aral Sea water balance is vital in the light of the major environmental disaster here.

Contributors to Global Inventory

<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation</th>
<th>Country</th>
<th>E-mail</th>
<th>Role</th>
</tr>
</thead>
<tbody>
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<td>Lead National Expert</td>
</tr>
</tbody>
</table>

Considerations and recommendations
Most data in the tables and text above have been provided by national and regional experts (listed above) or have been derived from the global WaterGAP model. See colophon for more information, including references to data from other sources.

Only one of the two aquifer states has supplied information that allowed adequate description of the aquifer and calculation of some of the groundwater parameters.

Data gaps and also differences between data from national experts (Global Inventory) and data derived from WaterGAP highlight the need for further research on transboundary aquifers.
Appendix: AS36

Syr Daria: Groundwater flow directions

Colophon

This Transboundary Aquifers information sheet has been produced as part of the Groundwater Component of the GEF Transboundary Water Assessment Programme (GEF TWAP). GEF TWAP is the first truly global comparative assessment of transboundary groundwater, lakes, rivers, large marine ecosystems and the open ocean. More information on TWAP can be found on: www.geftwap.org. The Groundwater component of TWAP carried out a global comparison of 199 transboundary aquifers and the groundwater systems of 41 Small Island Developing States. The data used to compile this transboundary aquifer information sheet has been made available by national and regional experts from countries involved in the TWAP Groundwater project. For aquifers larger than 20,000 km² and which are not overlapping, additional data are available from modelling done by the Goethe University Frankfurt (Germany) as part of TWAP Groundwater. All data were compiled by UNESCO-IHP and the International Groundwater Resources Assessment Centre (IGRAC – UNESCO Category II Institute). Values given in the fact-sheet represent an approximate guide only and should not replace data obtained from recent local assessments. The editors of this information sheet are not responsible for the quality of the data.

For more information on TWAP Groundwater and for more data, please have a look at the TWAP Groundwater Information Management System which is accessible via www.twap.isarm.org or www.un-igrac.org.

Request:
If you have additional data or information about this transboundary aquifer that can improve the quality of this information sheet and the underlying database, please contact us via email at info@un-igrac.org. If appropriate, the information will be uploaded to the database of transboundary aquifers and will also be used in new versions of this information sheet.

References:
- Climate: Climate indicates the major climate zone which occurs in the aquifer area. If more than 1 climate zone is present the zone with the largest surface area was selected. Source climate data: ArcGIS Online (2015), Simplified World Climate zones. Owner: Mapping Our World GIS Education. Original map: National Geographic World Atlas for Young Explorers (1998).
- All other data: TWAP Groundwater (2015).

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