Transboundary Aquifer Information Sheet

**AS150 – Irtysh-Obsky**

**Geography**
- Total area TBA (km²): 906,000
- No. countries sharing: 2
- Countries sharing: Kazakhstan, Russian Federation
- Population: 11,700,000
- Climate Zone: Humid Continental
- Rainfall: 390

**Hydrogeology**
- Aquifer type: Multiple layers hydraulically connected
- Degree of confinement: Mostly confined, but some parts unconfined
- Main Lithology: Sediment - sand

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Cross-section showing the 3 main aquifer layers (the part mainly within Kazakhstan)

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

<table>
<thead>
<tr>
<th>Kazakhstan</th>
<th>Russian Federation</th>
<th>TBA level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recharge (mm/yr) (1)</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Renewable groundwater per capita (m³/yr/capita)</td>
<td>520</td>
<td></td>
</tr>
<tr>
<td>Natural background groundwater quality (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human dependency on groundwater (%)</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>Groundwater depletion (mm/yr)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater pollution (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater development stress (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population density (Persons/km²)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transboundary legal framework (Scores) (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transboundary institutional framework (Scores) (6)</td>
<td></td>
<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).

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

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>Primary Porosity</th>
<th>Secondary Porosity</th>
<th>Transmissivity (m²/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>&lt;5</td>
<td>100</td>
<td>250</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>Russian Federation</td>
<td>5</td>
<td>20</td>
<td>650</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>
</tbody>
</table>

* Including aquitards/aquiclude

X A value was provided in the questionnaire, but it was considered un-realistic and therefore removed from the table.
Aquifer geometry
This is a multiple layered hydraulically connected system that is 3-layered within Kazakhstan and a 4-layered within the Russian Federation. The aquifer is mostly confined but some parts are unconfined. The average depth to the water table is 5 m within Russia and <5 m within Kazakhstan. The average depth to the top of the aquifer varies from 20 m (Russia) to 100 m (Kazakhstan). The average thickness of the aquifer system varies from 250 m (Kazakhstan) to 650 m (Russia).

Hydrogeological aspects
The main aquifer lithology is sediment – sand, with sand and gravel in the upper Oligocene complex and mainly sand in the Upper-Cretaceous and the Lower-Cretaceous formations. All three horizons are characterised by a high primary porosity with no secondary porosity, and furthermore by a high horizontal and a low vertical connectivity. The average transmissivity value is 750 m²/d (Kazakhstan). The average annual recharge, that is 100 % due to natural recharge processes, has been estimated as 1375 Mm³/yr (Kazakhstan) and the total volume of groundwater within the system is 3424 km³.

Linkages with other water systems
The predominant source of recharge is through precipitation on the aquifer area and runoff into the aquifer area from Russia. The predominant groundwater discharge mechanism is through river base flow (Russia), and through groundwater flow into surrounding aquifers (Kazakhstan). (see appendix)

Environmental aspects
Some of the natural groundwater quality is not fit for drinking water purposes and this is mainly due to elevated levels of natural salinity over a significant portion part of the aquifer but the data is not available to determine the percentage of the aquifer area that has been affected. No noticeable anthropogenic groundwater pollution has been identified to date over the aquifer area. No data is available with regard to the extent of shallow groundwater and groundwater dependent ecosystems over the aquifer area.

Socio-economic aspects
The annual amount of groundwater abstraction from the aquifer that was measured during 2010 was 242 Mm³. No data is available with regard to the total amount of fresh water that was abstracted over the aquifer area for the same period.

Legal and Institutional aspects
No Transboundary Agreement currently exists, nor is it currently under preparation. No Institution currently exists for TBA management.

Hot spot
This TBA is a high-yielding, fairly shallow, largely artesian groundwater resource. The aquifer is intensively exploited in Russia for water supply of large cities (Novosibirsk, Barnaul, etc.). According to groundwater monitoring data in the Russian Federation, the groundwater cone of depression as a result of these abstractions has grown to more than 50 000 km² and has spread to the territory of Kazakhstan. A joint investigation regarding the exploitable resources of this major transboundary groundwater resource needs to be urgently carried out. A Bi-lateral Agreement for its joint operation and sustainable development is essential.
Appendix: AS75

Preirysh: Groundwater recharge zones

Contributors to Global Inventory

<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation</th>
<th>Country</th>
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<th>Role</th>
</tr>
</thead>
<tbody>
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<td>Contributing 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.

Both TBA countries have contributed to the information. Some quantitative information was also available, and some of the indicators could be calculated.
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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.

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**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 ground water, lakes, rivers, large marine ecosystems and the open ocean. More information on TWAP can be found on: [www.geftwap.org](http://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](http://www.twap.isarm.org) or [www.un-igrac.org](http://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](mailto: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).

**Version:** October 2015