# Transboundary Aquifer Information Sheet

## 27S - Puneños

### Geography
- Total area TBA (km²): 9400
- No. countries sharing: 2
- Countries sharing: Argentina, Bolivia
- Population: 13 000
- Climate zone: Highlands
- Rainfall (mm/yr): 150

### Hydrogeology
- Aquifer type: Multiple layers hydraulically connected
- Degree of confinement: Semi-confined, in some parts unconfined
- Main Lithology: Alluvial deposits and underlying Tertiary fractured material

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![Map and cross-section of 27S - Puneños](image)

**Legend**
- Transboundary aquifer
- Confined aquifer boundary
- Other aquifer(s)

**Others symbols**
- Rivers
- Lakes
- Political Borders
- TBA Location

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No cross-section available

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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>Argentina</th>
<th>Bolivia</th>
<th>TBA level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recharge (mm/y)</td>
<td>100</td>
<td>1</td>
<td>D</td>
</tr>
<tr>
<td>Renewable groundwater per capita (m³/y/capita)</td>
<td>2</td>
<td></td>
<td>E</td>
</tr>
<tr>
<td>Natural background quality (%)</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human dependency on groundwater (%)</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Groundwater depletion (mm/y)</td>
<td>100</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Groundwater pollution (%)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Population density (Persons/km²)</td>
<td>100</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Transboundary legal framework (Scores)</td>
<td>100</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Transboundary institutional framework (Scores)</td>
<td>100</td>
<td>1</td>
<td>1</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></th>
<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>Argentina</td>
<td>52</td>
<td>20</td>
<td>15</td>
<td>Aquifer mostly semi-confined, but some parts unconfined</td>
<td>Sediment - Sand</td>
<td>Very high primary porosity gravels/pebbles</td>
<td>Secondary porosity: Fractures</td>
<td>410</td>
</tr>
<tr>
<td>Bolivia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBA level</td>
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</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

The aquifer is a multiple 2-layered, hydraulically connected system. The average distance to the water table is 52m (varies between 5m and 100m). The average depth of the top of the aquifer is 20m and average vertical thickness of 15m. The aquifer is mostly semi-confined but some parts are unconfined (all Argentina data).

Hydrogeological aspects

The main aquifer is hosted in alluvial-colluvial deposits of Quaternary age, with coarse to very fine particle size, generally filling grabens composed of volcaniclastic units (Tertiary). It is characterised by a very high primary porosity with secondary porosity: fractures. It has a high horizontal and vertical connectivity. The transmissivity value of quaternary deposits ranges from 118 to 700 m²/day (average of 410 m²/day). The total groundwater volume within the Argentine side is 5 km³.

Linkages with other water systems

Recharge, that is 100% due to natural processes, is from the surficial overlying basin. Outflow is into lakes. The wetland Laguna de Pozuelo is located in this area. It features a very unique ecosystem in one of the most arid areas of the world. The low rainfall and lack of monitoring in the basin, makes it difficult to perform a water balance. The main discharge mechanism is through outflow into lakes.

Environmental aspects

Only about 1% of the natural groundwater within Argentina is unsuitable for human consumption as a result of natural salinity and this is only within the superficial layers. Some pollution has been identified in Argentina as a result of mining activities. 5% of the aquifer has shallow groundwater and 20% of the aquifer area is covered with groundwater dependent ecosystems.

Socio-economic aspects

In Argentina, the area is occupied by isolated populations that use the resource for their livelihood and raising cattle (sheep and llamas), as well as for agriculture. In the area of Pan de Azucar there is mining activity, suggesting localized contamination.

Legal and Institutional aspects

There is no specific legal agreement between the countries. There is also not as yet a National Institution with a mandate for groundwater resources.

Priority issues

While groundwater use is still low, joint monitoring should be initiated to gain an understanding of the hydrologic functioning of the unique Laguna de Pozuelo wetland. This as well as the monitoring of water use and water quality should be undertaken by the mandated national institutions.

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>
<tr>
<td>Alberto Manganelli</td>
<td></td>
<td>Uruguay</td>
<td><a href="mailto:albertomanganelli@yahoo.com">albertomanganelli@yahoo.com</a></td>
<td>Regional coordinator</td>
</tr>
<tr>
<td>Verónica del Carmen Musacchio</td>
<td>Facultad de Ingeniería y Ciencias Hídricas. Universidad Nacional del Litoral.</td>
<td>Argentina</td>
<td><a href="mailto:musavero@yahoo.com.ar">musavero@yahoo.com.ar</a></td>
<td>Contributing national expert</td>
</tr>
<tr>
<td>Ofelia Clara Tujchneider</td>
<td>Facultad de Ingeniería y Ciencias Hídricas. Universidad Nacional del Litoral.</td>
<td>Argentina</td>
<td><a href="mailto:ofeliatujchneider@yahoo.com.ar">ofeliatujchneider@yahoo.com.ar</a>; <a href="mailto:pichy@fich.unl.edu.ar">pichy@fich.unl.edu.ar</a></td>
<td>Lead National Expert</td>
</tr>
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</table>
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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.

The TBA system could not be described fully, because only one of the TBA countries provided adequate numerical information.

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.

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).