# Transboundary Aquifer Information Sheet

## 12N - Santa Cruz

### Geography
- Total area TBA (km$^2$): 9300
- No. countries sharing: 2
- Countries sharing: Mexico, United States of America
- Population: 970 000
- Climate zone: Arid
- Rainfall (mm/yr): 450

### Hydrogeology
- Aquifer type: Multiple layers hydraulically connected
- Degree of confinement: Whole aquifer unconfined
- Main Lithology: Sediment – sand and sandstones

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### Map and Cross-section

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

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

### 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>Human dependency on groundwater (%)</th>
<th>Groundwater depletion (mm/y)</th>
<th>Groundwater pollution (%)</th>
<th>Population density (Persons/km²)</th>
<th>Transboundary legal framework (Scores)</th>
<th>Transboundary institutional framework (Scores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>36</td>
<td>770</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>A</td>
<td>47</td>
<td>70</td>
<td>A</td>
</tr>
<tr>
<td>United States of America</td>
<td>TBA level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>110</td>
<td>X</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>Mexico</td>
<td>20</td>
<td>&lt;5</td>
<td>300</td>
<td></td>
<td>Whole aquifer unconfined</td>
<td>High primary porosity fine/medium sedimentary deposits</td>
<td></td>
<td>1900</td>
</tr>
<tr>
<td>United States of America</td>
<td>TBA level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

* A value was provided in the questionnaire, but it was considered un-realistic and therefore removed from the table.
12N - Santa Cruz

Aquifer description

Only Mexico has provided information

Aquifer geometry
It is a multiple 6-layered, hydraulically connected, system. The whole aquifer is unconfined. The average distance to the groundwater table is 20m and the average total vertical thickness of the aquifer system is 300m.

Hydrogeological aspects
The main lithology is sediment – sand and sandstones that has a high primary porosity as well as a secondary porosity: fractures. The average aquifer transmissivity is 1 900 m²/d. The average annual aquifer recharge is estimated at 38Mm³/annum coming from a recharge area of 310 km². The total groundwater volume is 7.8 km³.

Linkages with other water systems
Recharge to the aquifer system is from precipitation on the aquifer area and discharge from the system is through evapotranspiration.

Environmental aspects
Groundwater across the whole aquifer area is suitable for human consumption. Only in superficial layers is there a problem of elevated sulphate levels. No pollution has been identified. Shallow groundwater, as well as groundwater dependent ecosystems, occurs in over 36% of the aquifer area.

Socio-economic aspects
Annual average groundwater abstraction has been estimated as 26 Mm³/annum, which is also the figure provided for total annual fresh water abstraction. There has been no groundwater depletion.

Legal and Institutional aspects
Mexico makes mention of a Bilateral Agreement with full scope. It also identifies its National Institution with a full mandate and full capacity. Groundwater management is undertaken according to national law and regulations.

Emerging issues
Information is only available from one country. Noticeable is that the groundwater abstraction in Mexico is approaching the average annual recharge to the aquifer in that country.

Contributors to Global Inventory

<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation</th>
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</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.

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).

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