Aquifer code EU10 – Detrital Aquifer of the Guadiana Middle Basin

**Geography**
- Total area TBA (km²): 3500
- No. countries sharing: 2
- Countries sharing: Portugal, Spain
- Population: 220,000
- Climate zone: Mediterranean
- Rainfall (mm/yr): 520

**Hydrogeology**
- Aquifer type: 2-layered, hydraulically connected
- Degree of confinement: Unconfined
- Main Lithology: Sediments – sands, silts and clays

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**Simplified Cross-section showing recharge and discharge zones**

Map and cross-section are only provided for illustrative purposes. Dimensions are only approximate.
**Aquifer code EU10 – Detrital Aquifer of the Guadiana Middle Basin**

**TWAP Groundwater Indicators from Global Inventory**

<table>
<thead>
<tr>
<th></th>
<th>Portugal</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recharge (mm/y)</td>
<td>57</td>
<td>19</td>
</tr>
<tr>
<td>Renewable water per capita (m³/capita)</td>
<td>1200</td>
<td>300</td>
</tr>
<tr>
<td>Natural background groundwater quality (%)</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Human dependency on groundwater (%)</td>
<td>48</td>
<td>10</td>
</tr>
<tr>
<td>Groundwater depletion (mm/y)</td>
<td>65</td>
<td>64</td>
</tr>
<tr>
<td>Groundwater pollution (%)</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Population density (Persons/km²)</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>Groundwater development stress (%)</td>
<td>F</td>
<td>E</td>
</tr>
<tr>
<td>Groundwater development stress (score)</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>TBA level</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></th>
<th>Portugal</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance from ground surface to groundwater table (m)</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Depth to top of aquifer formation (m)</td>
<td>40</td>
<td>&lt;5</td>
</tr>
<tr>
<td>Full vertical thickness of the aquifer system* (m)</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Degree of confinement</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Predominant aquifer lithology</td>
<td>High primary porosity fine/medium sedimentary deposits</td>
<td>No secondary porosity</td>
</tr>
<tr>
<td>Primary Porosity</td>
<td>No secondary porosity</td>
<td>No secondary porosity</td>
</tr>
<tr>
<td>Secondary Porosity</td>
<td>No secondary porosity</td>
<td>No secondary porosity</td>
</tr>
<tr>
<td>Transmissivity (m²/d)</td>
<td>27</td>
<td>550</td>
</tr>
</tbody>
</table>

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

* Including aquitards/aquicludes

TBA level

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**Transboundary Aquifer Information Sheet**

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**Portugal**

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**Spain**

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**TBA level**

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Aquifer code EU10 – Detrital Aquifer of the Guadiana Middle Basin

Aquifer description

Aquifer geometry
The aquifer system is composed of two unconfined, unconsolidated sedimentary hydraulically connected aquifers (Neogenic and alluvial Quaternary) with different hydraulic characteristics. Thickness ranges between a minimum of 15m (Portugal) and 120m (Spain). The top of the aquifer protrudes to the surface in places. Piezometric level ranges between 1 and 23 m.a.s.l (Portugal).

Hydrogeological aspects
The main aquifer lithology are sediments, comprising silt and clay and they present an inter-granular porosity (The lithology information provided in the data base does not appear consistent with the porosity description). An estimate of average transmissivity of 27 m²/d is available for the Portuguese side and 550 m²/d for the Spanish side. The average annual recharge is estimated at 61 Mm³/annum (over 2168 km²) and 12 Mm³/annum (over 176 km²) for the Spanish and for the Portuguese part of the aquifer respectively (see Appendix). Total groundwater volume was estimated as 17.5 and 0.5 km³ respectively.

Linkages with other water systems
Groundwater flow is to the river valley and aquifer recharge is from precipitation and induced recharge by irrigation return flows. The Neogenic aquifer partially discharges to the alluvial aquifer. Main aquifer discharge is to river base flow to the Guadiana River draining to the Atlantic coast and also spring discharge on the Spanish side. Groundwater discharges may affect water quality.

Environmental aspects
Natural groundwater quality does not satisfy drinking water standards in a significant part of the aquifer (80% in Spain) due to elevated nitrate concentrations in Spain and elevated salinity in Portugal. A significant part of the aquifer on both sides has been polluted through agricultural practices, resulting in nitrogen species greater than 50 mg/l. This information is based on limited monitoring wells which do not allow further conclusions on water quality. No information was provided on the extent of the shallow part of the aquifer indicated under aquifer geometry.

Socio-economic aspects
Drinking water supply and agricultural irrigation are the principal groundwater uses in both countries. Portugal reports an annual groundwater abstraction of 8 Mm³/annum and Spain 21 Mm³/annum. The annual fresh water abstraction in Spain was recorded as 220 Mm³/annum. Portugal mentions specifically that there is no groundwater depletion. The level of exploitation compared to annual recharge still remains low and the exploitation potential of aquifer remains high.

Legal and Institutional aspects
No agreed institutional framework has been established for the transboundary aquifer, but different control measures apply, following the regulations existing in both states. Portugal reports a national institution with full mandate and capacity.

Priority issues
No potential transboundary threats and pressures have been identified due to the low exploitation level. Nitrate levels in the water are a concern and need to be systematically monitored in a joint programme.
Transboundary Aquifer Information Sheet

Aquifer code EU10 – Detrital Aquifer of the Guadiana Middle Basin

Contributors to Global Inventory

<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation</th>
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<th>E-mail</th>
<th>Role</th>
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</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 countries provided adequate information to allow description of the transboundary system and the calculation of key groundwater indicators. The aquifer lithology information provided needs to be reviewed.

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: EU10

Map showing Recharge zones within the Detrital Aquifer of the Guadiana Middle Basin
Transboundary Aquifer Information Sheet

Aquifer code EU10 – Detrital Aquifer of the Guadiana Middle Basin

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).

Version: December 2015