

## HYDROGEOLOGICAL MAPPING OF THE WALLON REGION (BELGIUM) – Now On the WEB!!

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Since 1999, four teams from three universities are working on the hydrogeological mapping program of the Walloon Region. Up to now, 64 hydrogeological maps are already carried out (or completed), and at an annual rate of three maps per team, Wallonia will be entirely covered in 2010. This research is financed by the General Directorate for Natural Resources and the Environment – Ministry of the Walloon Region.

These maps are not yet officially published but they are available on request to the Walloon Region administrative staff. At the A0 format paper poster, hydrogeological map sheets are structured as follows:

- a main hydrogeological map, at a 1/25,000 scale, showing the several layers such as topography, geology (with lithostratigraphical formations grouped by hydrogeological units depending on their hydrogeological characteristics), hydrographic network, localisation of wells, springs, piezometers, galleries, drains, karstic phenomena, protected water areas, likely direction of underground flows, piezometry (piezometric lines or punctual hydraulic heads), etc.;

- some geological and hydrogeological cross-sections showing structure of the hydrogeological units and dated piezometric level;

- a lithostratigraphic table showing the correspondences between geological formations and hydrogeological units described as aquifers (high hydraulic conductivity), aquitards (medium hydraulic conductivity) and aquicludes (low hydraulic conductivity) on a lithological basis;

- some thematic maps, at a 1/50,000 scale, showing more specific information as the confined or unconfined nature of the hydrogeological units, characteristics of terrain upper aquifers, localisation of chemical analysis, pumping and tracing tests, well-logging, geophysical investigations, annually exploited volumes, thickness of the main aquifers, etc;

An explanatory booklet is available for each hydrogeological map. It develops general considerations on sub-regional geography, geology and hydrogeology for a better understanding of the map. It also focuses on specific hydrogeological aspects as local behaviour of the water table, karstic phenomena, hydrochemistry, hydraulic conductivity parameters, protected water areas, etc.

Thanks to WebGIS application, the Internet is the best tool to publish a document as dynamic as the hydrogeological maps are. Presently, the maps published throughout the Internet represent data for a given date and are discontinuous (map sheet per map sheet). The discontinuity is due, essentially, to

some technical problems, as differences versions of the geological maps (old one, end of 19<sup>th</sup> century and new one, not yet covered the entire Wallonia,) as others.

The aim of this WebGIS application is to facilitate the access to many data already highly requested by each interested by groundwater related problems, as well private persons as environmental agencies, industries or water supply agencies, etc. In a nearby future, some data will be in a diachronic mode. For example, punctual hydraulic heads will be updated with fieldwork campaigns, protected water areas after their approval by the regional government, official pumped volumes per year, etc. With term, the map published throughout the Internet will be geographically continuous on Wallonia and will be regularly updated.

The methodology adopted to design the WebGIS application is based on a “three model structure”, inside a step by step and cooperative approach. The first step consists to describe and to set up a permanent data model/structure (personal geodatabases) shared between co-producers, the four teams. The second step is the organising of layers and their symbology inside a cartographic model, duplicated for each map sheet. At least, map services are set up and integrated in a model WebGIS application, including individual parameters for each map sheet.

Contrary to the paper version, the hydrogeological maps on the Internet could be customised by the user to meet his own needs. The simplified but powerful application is designed to allow many combinations of layers of geographical information and also to display each component (see above) separately.

Figure 1 – Screenshot of the WebGIS application.  
<http://environnement.wallonie.be/cartosig/cartehydrogeo>

The WebGIS application designed for the hydrogeological map is fully integrated inside the wallon infrastructure of geographical data publishing.

We can quote some concrete examples of the use of these maps and this WebGIS application. In case of the design of a new producing well, the intersection between piezometric lines and isohypes gives a good indication to the driller for the optimal depth of the well. It also shows, for calcareous aquifers, the potentiality of karstic risks. The combination of isopiestic lines with pumped volumes allows understanding why the saturation level is deformed, without any effects of hydrographic network. It happens, for example, near a well-pumping battery or near an open quarry, generally with formation of a depression cone in this case. Another positive point is, when

pollution appears, to access quickly relevant information to assess the risk of its expansion and of the contamination of the aquifer.

Hydrogeological maps of Wallonia are appearing now on the Internet. Four maps are available, but the objective is to publish new maps periodically. Potential fields of application of such a document are various. This project will probably contribute to an efficient management and protection of groundwater resources in Wallonia.

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