PROJECT FACTSHEET

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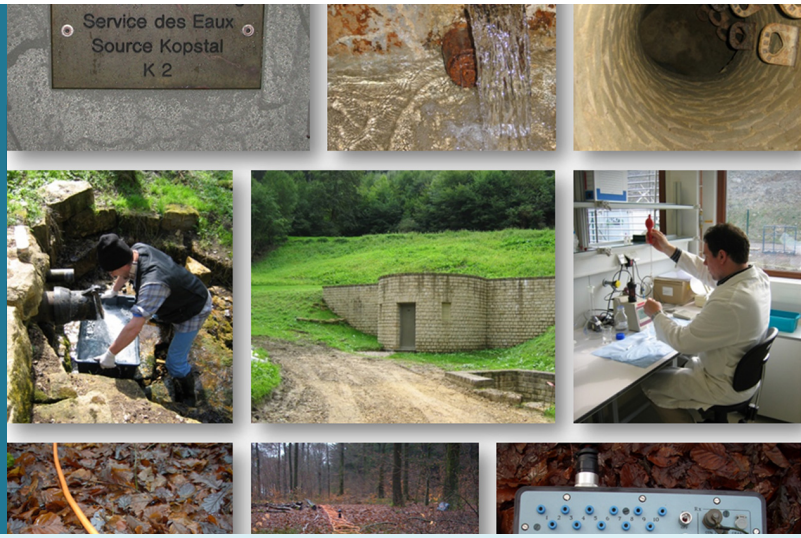
POLLUX-2

Monitoring the Luxembourg Sandstone aquifer on a long-term basis, to improve understanding of the water and pollutant transfer process



Inspiration

In Luxembourg, the Luxembourg Sandstone aquifer represents 50% of the country's drinking water supply and is the main supply source for its capital, Luxembourg City. To supply the population with tens of thousands of cubic metres per day, the aquifer is drained by a network of 70 springs. This water resource is not only very important strategically, it is also undeniably vulnerable in both quantitative and qualitative terms since it is subject to a combination of natural factors (seasonal and annual variations in rainfall) and human factors (contamination by pollutants). In this context, Luxembourg City wished to implement a sustainable and optimised approach for studying, monitoring and managing this drinking water resource. Hence, since the end of 2004, the Luxembourg City Water Service has worked in close cooperation with LIST as part of several successive projects, in order to learn more about the structure, functioning and quantitative and qualitative state of the Luxembourg Sandstone aquifer system.
Thanks to the many valuable insights gained in previous projects (characterising the inertia of the aquifer system in the face of climatic variations, determining the main problematic pollutants, their origins and the ways in which they develop, etc.), Luxembourg City is now able to manage this precious resource more effectively. Discharge prediction and quality management tools have been developed, as has a policy of incentives to reduce the flow of pollutants in the spring catchment areas, particularly in the context of agriculture. Furthermore, these projects have also exposed certain gaps in our knowledge. The transfer of water and pollutants across the Luxembourg Sandstone aquifer is still a complex process that is far from being fully understood. Moreover, its elevated position, and its associated historic use via the numerous springs by which it is drained naturally, mean that it has only a small number of deep observation points (wells and piezometers). Therefore, there is still much to learn about the deep internal structure of the Luxembourg Sandstone. Likewise, there is still great uncertainty concerning average water residence times, and potentially, therefore, average pollutant residence times within the Luxembourg Sandstone aquifer.

Innovation

The project will involve monitoring the Luxembourg Sandstone aquifer on a long-term basis, in order to further refine our understanding of the water and pollutant transfer process. Consequently, the management software used by the Luxembourg City Water Service will be updated by regularly transferring the data acquired and by re-evaluating discharge models, thus enabling the Service to monitor the quantitative and qualitative development of the resource used. The project will also endeavour to fill existing gaps in our knowledge of the internal structure of the Luxembourg Sandstone aquifer. To this end, the project will use two key tools:

- Electrical geophysical prospecting: a non-destructive prospecting method for obtaining a clearer picture of the hydrodynamic properties of deep-lying rocks via their electrical properties, using measurements taken at the earth's surface, and
- The measurement of tritium concentrations, in cooperation with New Zealand's Institute of Geological and Nuclear Science, in order to determine the average residence time of groundwater.

Impact

The results obtained by underground electrical geophysical prospecting and groundwater dating using tritium concentration measurements will make it possible to manage the Luxembourg City water network more effectively, as they will considerably reduce the inherent uncertainty concerning the transfer of water and pollutants across deep geological layers. Because the Luxembourg Sandstone is by far the most used groundwater resource in Luxembourg (80% of all groundwater used), this new information may also be useful for water managers at national level. In addition, the collaboration initiated with the water dating laboratory of the Geological and Nuclear Survey, which uses an innovative water dating method boasting a currently unparalleled degree of accuracy, may be beneficial for the entire Greater Region in the context of potential future projects concerning groundwater resources.

Partners

Service des Eaux de la Ville de Luxembourg (LU) , Geological and Nuclear Science (NZ)

Financial Support

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