

3D VISUALISATION OF GROUNDWATER QUALITY AND GROUNDWATER QUANTITY CONTRIBUTES TO SUSTAINABLE PLANNING AND PROTECTION OF GROUNDWATER

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A good understanding of groundwater systems is essential for weighing different interests relating to human uses that depend on the water resources. The Roer Valley Graben (RVG), a Dutch, Flemish and German transboundary area, contains an important aquifer system that is crucial for many uses, including drinking and industrial water supply and heat storage, as well as playing a role in the conservation of terrestrial and aquatic ecosystems. In H3O-PLUS, which is part of the Horizon2020 funded GeoERA RESOURCE-project, 3D visualisation of transboundary patterns of measured groundwater quality and groundwater heads has been realised, contributing to improved sustainable planning and protection of groundwater.

Two groundwater viewers were developed, one for groundwater quality and one for groundwater heads, bringing cross-border groundwater data together. In these viewers, the cross-border (hydro)geological 3D models were merged and subsequently used for interpretation purposes, relating groundwater properties to the subsurface hydrogeological structure. For example, water quality problems in eastern North Brabant, the Netherlands, can be visualised by showing the concentrations of various hydrochemical parameters (e.g. nitrate, sulphate, oxidation capacity) relative to the shallow Beegden and Sterksel Formations and the deeper Peize/Waalre and Kieseloolite Formations. The concentration differences between the formations can be analysed on maps, in cross sections and in different types of graphs.

Due to deterioration of water quality over the depth range of the formations mentioned, abstractions for drinking water supply were shut down or moved towards deeper aquifers in the Peize/Waalre and Kieseloolite Formation in the RVG. The increase in abstractions in these aquifers contributed to the decrease of groundwater heads, which is now visualized visible using the groundwater quantity viewer. This tool enables the easy identification of temporal trends in groundwater heads for individual observation wells. Moreover, the tool allows for aggregation of trends over larger areas, depth ranges and/or geological Formation are and visualizing them maps and cross-sectional views.

The two viewers enable the interactive viewing of hydrochemical and hydrological information in relation to the hydrogeological structure of the subsurface. By using the cross-border harmonised (hydro)geological models, this is even possible across national borders in the Roer Valley Graben groundwater system. Combining information from both the quality and quantity viewer, the tools enable establishing interdependencies between groundwater quality developments and quantitative water trends, thus supporting integral sustainable management and protection of the resource.

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