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## Exploring the Role of Land Use evolution in Groundwater Modeling for Sustainable Management: A Case Study of the Lille Metropolitan Area

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Groundwater represents a crucial source of drinking water in the Lille metropolitan area. Despite its importance, the resource is vulnerable to potential evolution of land use: recharge, runoff and evapotranspiration processes in a soil-sealing context and cultural practices, etc... As a result, stakeholders emphasized the importance of exploring the influence of land use on groundwater to ensure sustainable management of the resource and enhance territorial planning. The actual 3D hydrodynamic model useful for the management of groundwater resources (MARTHE code) has a significant limitation in that it does not consider the impact of land use evolution. We propose here to investigate the contribution of a hydrological distributed numerical approach that incorporates land cover data in the groundwater modeling compared to a global approach at the scale of a peri-urban territory. To do so, we use the HELP code by considering the temporal and spatial evolution of land use and their associated characteristics such as vegetation, soil properties to detail recharge and runoff over more than 20 years that we incorporate to the initial groundwater model.

At a global scale of the Lille Metropolitan Area, we observed quite similar results on the water balance between the two approaches. However, the hydric components calculated by the model taking into account the land use evolution are drastically different at a local scale. The pertinent modelling approach depends on the study scale and it becomes essential to consider the land use evolution and its associated characteristics to quantify the impact of urban planning.

Topic: Catchment scale integrated surface water and groundwater studies