



Groundwater vulnerability maps for pesticides for Flanders

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Pesticides are increasingly being detected in shallow groundwater and are one of the main causes of the poor chemical status of phreatic groundwater bodies in Flanders. There is a need for groundwater vulnerability maps in order to design monitoring strategies and land-use strategies for sensitive areas such as drinking water capture zones. This research focuses on the development of generic vulnerability maps for pesticides for Flanders and a tool to calculate substance-specific vulnerability maps at the scale of Flanders and at the local scale. (1) The generic vulnerability maps are constructed using an index based method in which maps of the main contributing factors in soil and saturated zone to high concentrations of pesticides in groundwater are classified and overlain. Different weights are assigned to the contributing factors according to the type of pesticide (low/high mobility, low/high persistence). Factors that are taken into account are the organic matter content and texture of soil, depth of the unsaturated zone, organic carbon and redox potential of the phreatic groundwater and thickness and conductivity of the phreatic layer. (2) Secondly a tool is developed that calculates substance-specific vulnerability maps for Flanders using a hybrid approach where a process-based leaching model GeoPEARL is combined with vulnerability indices that account for dilution in the phreatic layer. The GeoPEARL model is parameterized for Flanders in 1434 unique combinations of soil properties, climate and groundwater depth. Leaching is calculated for a 20 year period for each 50 x 50 m gridcell in Flanders. (3) At the local scale finally, a fully process-based approach is applied combining GeoPEARL leaching calculations and flowline calculations of pesticide transport in the saturated zone to define critical zones in the capture zone of a receptor such as a drinking water well or a river segment.

The three approaches are explained more in detail and illustrated with the results for the entire Flanders region and for a case-study focusing at a drinking water production site in West Flanders.