APSUGIS: A GIS-BASED INTERFACE FOR GROUNDWATER VULNERABILITY ASSESSMENT AND RISK MAPPING

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The Apsû method was developed to produce groundwater intrinsic and specific vulnerability maps based on a quantitative description of contaminant transport processes in the subsurface. It is based on the source-pathway-receptor approach, driven by two concepts: land surface danger that accounts for lateral flow on land surface and infiltration and subsurface attenuation capacity. Vulnerability classes are based on physically-based criteria reflecting the sensitivity of groundwater to pollution events, namely contaminant travel time across the unsaturated zone, pollution duration, or contaminant concentration or mass recovery factors at the groundwater table.

To facilitate the application of the Apsû method to case studies, GIS-based applications and interfaces have been developed to integrate geodatabases and user interfaces in the same environment software. The main geodatabase contains all the data required for the calculation of the vulnerability coefficient, such as spatial data (topography, land cover, hydrological network, meteorology, soil types...) and specific databases on contaminant properties (i.e. Koc values, degradation constants...), on hydrogeological properties of geological layers constituting the unsaturated zone flow path. Specific user interfaces have been developed to prepare and export spatial data required by the Apsû calculations. Once the groundwater vulnerability factors are calculated, another user interface is available to automatically create and customize different thematic layers related to groundwater vulnerability mapping. This integrated system makes it possible to automate numerous data formatting geoprocessing operations, and to ensure data integrity by minimizing user interactions with the data (spatial frame, data projection, link between spatial data and databases, etc.) and to focus work on the specificities of the areas studied and the interpretation of the vulnerability maps created.

The GIS-based interface has been used to produce groundwater vulnerability maps for the main aquifers of the Walloon Region of Belgium, as a support to the implementation of the EU Water Framework and Groundwater Directives. They will also serve as a basis for aquifer and groundwater contracts that aim at implementing land management measures to improve the quality of groundwater in groundwater protected areas and safeguard zones. Results will also be presented on the combination of the groundwater vulnerability maps and hazard maps to produce groundwater pollution risk assessment maps for a chalk aquifer in Belgium.

References:

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