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Data Model for Multi Hazard Risk Assessment Spatial Support Decision System

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The goal of the CHANGES Spatial Decision Support System is to support end-users in making decisions related to risk reduction measures for areas at risk from multiple hydro-meteorological hazards. The crucial parts in the design of the system are the user requirements, the data model, the data storage and management, and the relationships between the objects in the system.
The implementation of the data model is carried out entirely with an open source database management system with a spatial extension. The web application is implemented using open source geospatial technologies with PostGIS as the database, Python for scripting, and Geoserver and javascript libraries for visualization and the client-side user-interface. The model can handle information from different study areas (currently, study areas from France, Romania, Italia and Poland are considered). Furthermore, the data model handles information about administrative units, projects accessible by different types of users, user-defined hazard types (floods, snow avalanches, debris flows, etc.), hazard intensity maps of different return periods, spatial probability maps, elements at risk maps (buildings, land parcels, linear features etc.), economic and population vulnerability information dependent on the hazard type and the type of the element at risk, in the form of vulnerability curves. The system has an inbuilt database of vulnerability curves, but users can also add their own ones. Included in the model is the management of a combination of different scenarios (e.g. related to climate change, land use change or population change) and alternatives (possible risk-reduction measures), as well as data-structures for saving the calculated economic or population loss or exposure per element at risk, aggregation of the loss and exposure using the administrative unit maps, and finally, producing the risk maps. The risk data can be used for cost-benefit analysis (CBA) and multi-criteria evaluation (SMCE). The data model includes data-structures for CBA and SMCE. The model is at the stage where risk and cost-benefit calculations can be stored but the remaining part is currently under development. Multi-criteria information, user management and the relation of these with the rest of the model is our next step.
Having a carefully designed data model plays a crucial role in the development of the whole system for rapid development, keeping the data consistent, and in the end, support the end-user in making good decisions in risk-reduction measures related to multiple natural hazards.
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