Open Standards, Free Geodata and 3D

How can open standards and free geodata contribute to disaster management, even in 3D? Why use open standards in disaster management (DM) at all and, trickier still, why 3D? Others have touched on these questions in this column and I focus here on the reasons for using free geodata for DM, taking as example its usefulness, combination with open standards, and how this applies to 3D-analysis and visualisation.

Emergency Routing
People collect all kinds of data on GeoWeb2.0, usually as Mashups of existing or new data in Google Maps/Earth. Individual efforts are bundled in initiatives such as the OpenStreetMap project, which today deals not only with streets, but maps anything of interest to people. This database has thousands of contributors and is rapidly growing, although not at the same pace everywhere. In Germany the instances of most features doubled in four months. This free data seems useful for DM applications such as routing. Response times are crucial, and rescue teams need to travel quickly and securely, without delays. Prior knowledge of hindrances such as traffic jams or blocks is essential. We developed an Emergency Route Service (ERS) based on the OpenLS Route Service (RS) specification that automatically adds up-to-date situations and thus bypass of certain areas. The ERS interface is identical to the OpenLS RS, thus assuring interoperability.

The service is also used in the OpenRouteService.org project, bringing together web2.0 collaborative projects (Volunteered Geography, Goodchild 2007) and GI standards. Authorities usually maintain information on blocked areas. OpenRouteService.org enables interactive digitisation of areas to be excluded from routing. But imagine locals adding up-to-date knowledge about blocked roads and flooded areas to a geoWeb.2.0 portal, and this information being immediately at the disposal of the ERS! This approach already works for signalling traffic jams, construction works and accidents.

Web Processing Service
A service we called Accessibility Analysis Service (AAS) determines a polygon representing the area accessible within a certain period, based on a street network and a start point. This may support evacuation simulation by determining affected population. The service is also available at OpenRouteService.org. Such GIS-like analysis can now be integrated into OGC architectures through the Web Processing Service (WPS). Scenarios in the DM domain have already been presented. Can these solutions be extended into 3D? In developing SDIs for 3D (www.gdi-3d.de) the OGC Web 3D Service (W3DS) comes into play, providing the means for visualising 3D-data from distributed servers. But what about processing and analysis of 3D-data? This too can be done through WPS, as the specification is still general (for which it is often criticised). An example is a bomb-threat scenario in 3D, with input the 3D position of the bomb and explosive force. The WPS calculates the danger zones, identified by two transparent spheres and visualised in the W3DS client viewer (XNavigator). Buildings are streamed from the W3DS, styled according to building type using 3D Symbology Encoding (SLD-3D). Hospitals and petrol stations are delivered by the OpenLS directory service based on OpenStreetMap data. The building data comes from the City of Heidelberg Department of Surveying, and other data is partially user-generated from OpenStreetMap, which may even act as a cartographic base layer in 3D.

Another example is 3D-gas/smoke emission simulation. The origin of an emission is identified and sent to the WPS, which queries a Sensor Observation Service for the current speed and direction of the wind. WPS then calculates a simplified 3D-object that is returned and visualised in the 3D viewer, along with the other data. (More information at www.geographie.uni-bonn.de/karto) Although open-standard services and open user-generated data were not designed to go together, their combination provides new possibilities too for disaster management.