

An urban subsurface in three dimensions, a surveying and modelling concept for the eastern parts of Cologne

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Systematic geological surveys in the past decades more or less excluded the subsurface of urban areas from the investigations, as information of the subsurface are limited and the geo-environment has often been largely modified by anthropogenic-landscaping since pre-historic times. Nevertheless is a detailed geo-scientific knowledge of the shallow and medium deep subsurface in highly populated areas essential for a sustainable urban management and strategic planning, in terms of e.g. revitalisation of contaminated (mega-)locations, groundwater protection, engineering conditions, unstable ground, mining resources, preservation of archaeological sites and brownfield regeneration. 2D geological and geographical information in urban areas is usually given in a wide variety of respective systematic maps and 3D information is restricted to borehole log descriptions taken and interpreted during individual drilling campaigns. These heterogeneous data collections are not a straightforward information pool for decision makers and other end-users, as they have to be re-interpreted by experts for each single purpose.

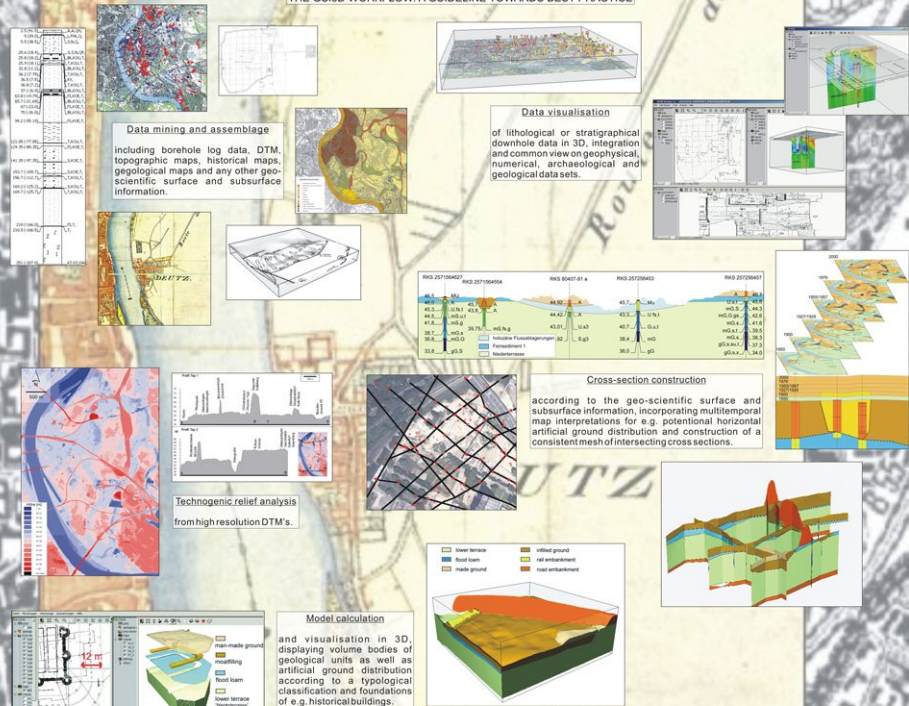
During the current research all available geo-scientific data from the eastern parts of Cologne was collected, ranging from historical to thematic maps as well as from archaeological site descriptions

to borehole logs. The GSI3D (Geological Surveying and Investigation in 3D) methodology and software-tool was used to integrate and visualise all available 2D and 3D geo-scientific data in one software system, generating a ready to use 3D model. All available thematic information can either be analysed in the GSI3D software-tool or interpreted outputs can then be generated to be used in common GIS and 3D formats.

For the area under consideration around 14,000 drill logs have been gathered from the Office for soil and groundwater protection (City of Cologne) and the Geological Survey of Northern Rhine Westphalia and have been integrated into the surveying and modelling process.

With this records, supplemented by map and aerial photograph data, it was possible to address, characterise, quantify and qualify the complex structure of the artificial ground in exemplary sites. This part of the research focused on the detection of distinct geometries and lithological sequences in the man-made ground, with an emphasis on anthropogenic structures and features.

THE GSI3D WORKFLOW: A GUIDELINE TOWARDS BEST PRACTICE



The established 3D model of the eastern parts of Cologne includes detailed information on artificial ground characteristics and distribution as well as on the geological sequence in the shallow subsurface. This homogeneous data pool builds the basement for further analysis, monitoring and forecasts, as a tool to be used by consultants, planners and decision makers for a sustainable environmental management plan, to protect and improve the natural and build environment and the cultural heritage.