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MODELLING-CONCEPT FOR ARTIFICIAL GROUND
EXAMPLES FROM THE EASTERN DISTRICT OF COLOGNE

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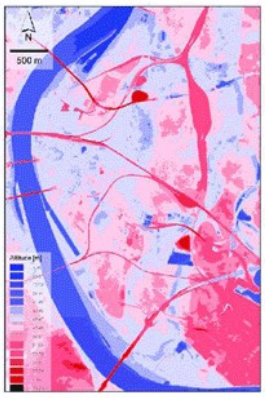
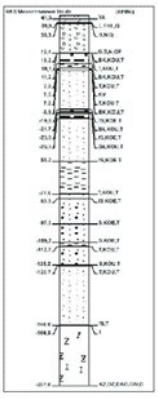
The shallow subsurface of urban areas has been modified by anthropogenic landscaping since pre-historic times. These changes in the geoenvironment are represented by artificial ground showing a complex and heterogeneous distribution and structure. This anthropogenic heritage has to be systematically addressed, characterized, quantified and qualified in order to understand the complexity of the urban subsurface in needs for a sustainable city planning and management, environment protection and urban engineering.
Artificial landscaping activities in the Eastern Districts of Cologne can be traced back into roman times. Theoretically, man-made ground can be dealt with like geological ground for its deposition lead to distinct geometries and lithological sequences.
Anthropogenic elements in the geoenvironment are recorded in structures and features as:

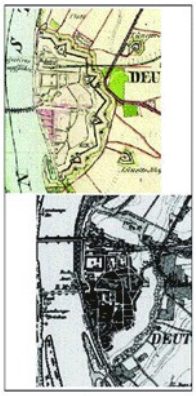
- terraces and irrigation-canals from farming,
- cuttings and embankments from railway- and road-engineering,
- landfills for relief levelling,
- quarries, pits and dumps from mining-activity,
- dikes and channels for flood defence,
- as well as banks and ditches from military constructions and fortifications.

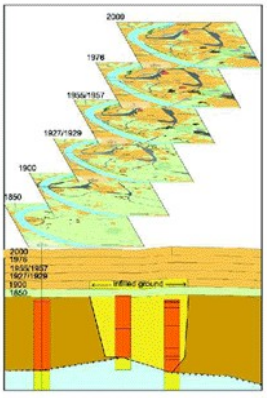
Datasets & Datainterpretation



Integration of a high resolution Digital Terrain Modells for technogenic relief analysis


Integration of bohrlogs

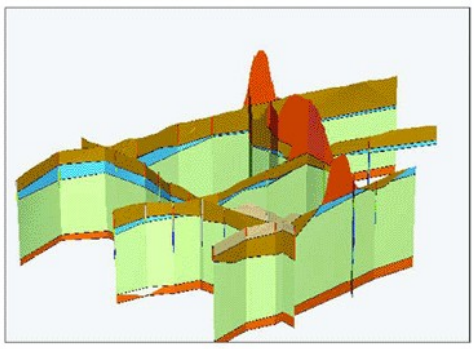

Integration of topographic maps

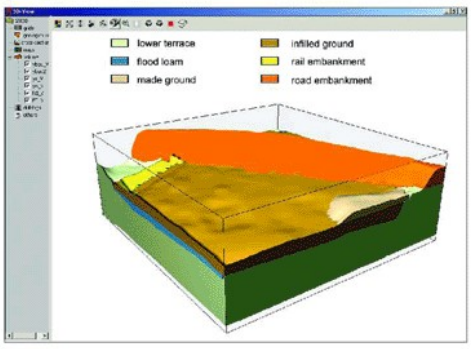


Multitemporal map interpretation for potential horizontal artificial ground distribution

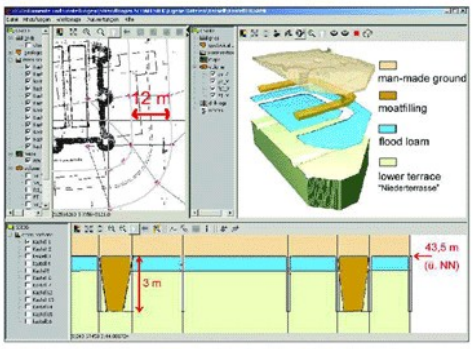
Focus of the current research is to establish a detailed guideline on how to locate and characterize units of artificial ground, using historic-geographical techniques and the latest surface- and subsurface geoscientific-information-systems. Historical land-use sequences are constructed from historical maps and drawings, historical reports, archaeological excavations as well as from aerial photographs. Structures deriving from this classic cartographical work provide the potential distribution, boundaries and outcrops of artificial ground units.
These data-sets, combined with borehole information, are integrated into a subsurface modelling software (GSI3D: **G**eological **S**urveying and **I**nvestigation in **3-D**imension).
This methodological approach allows a more detailed interpretation and subdivision of man-made ground units by means of their 3-dimensional relationship, regarding textural, lithological, morphological as well as genetical features and properties.

Visualisation and Modelling


Construction of a consistent mesh of crosssections



Modelsection from an idustrial site



Modelsection in the area of the of roman settlement

The presented integrated and multidisciplinary methodological approach, combining surface and subsurface data sets of geology, geomorphology and historical geography as well as archaeology provides information for a sustainable city management in terms of land use planning, groundwater protection, brownfield regeneration (to limit urban sprawl and greenfield consumption), exploration of resources (mainly sand and gravel) as well as (mega-) site investigation strategies.

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