University of Stuttgart
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Institute for Sanitary Engineering, Water Quality and Solid Wastemanagement | ISWA

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The city – a hydrological system in change
Steps towards an adaptive management of the urban water cycle(SAMUWA)
Project homepage: www.samuwa.de

samuwa

In the future urban infrastructure will be exposed to changing boundary conditions. Large-scale trends like climate change and demographic change will coincide with local developments like changes in urban structure. In this context we have to rethink concepts and structures of urban infrastructure. In the field of urban drainage this is particularly important as the current systems are highly static and inflexible.

The joint research project SAMUWA is one of 13 projects of the German BMBF (Federal Ministry of Education and Research) program "Intelligent and multifunctional infrastructure systems for a sustainable water supply and wastewater disposal" (BMBF-INIS) that will be executed in the years 2013-2016.

The project was initiated and is coordinated by the department of urban drainage at the ISWA. Solutions leading from the static approaches in planning and operation of the urban drainage system to an adaptive and dynamic management shall be developed. The implementation of the research project will be realised on four pilot areas in Wuppertal, Münster, Gelsenkirchen and Reutlingen that are characterised by different conditions with regard to urban drainage and to topographic, geologic and urban conditions. In these areas the development of the cities and their infrastructure will be analysed in order to prepare a Best-Practice catalogue for water sensitive urban design. Other partners will develop guidelines as well as a simulator for discharge control in separate and combined sewer systems. The approach of planning urban drainage will be extended by considering moreover the urban water balance as well as assessing interactions of urban drainage and ground water. Another project will combine urban drainage with urban and landscape planning and will produce a guideline for stormwater management and flood protection. Measures for the retention and infiltration of stormwater will be integrated into the development of urban and landscape planning in order to achieve a water-sensitive development of cities. Another focus will be to analyse the organization of planning processes as well as their institutional framework critically in order to develop adaptation options for planning practice and operational structures and processes. One result shall be a guideline concerning organisation and governance for planners and administration in municipalities and authorities. Considering the communication of the project a pavilion will be designed and used at different events to get into contact with citizens and various stakeholders within the project areas with the aim of overcoming barriers between urban drainage, urban planning and urban development.

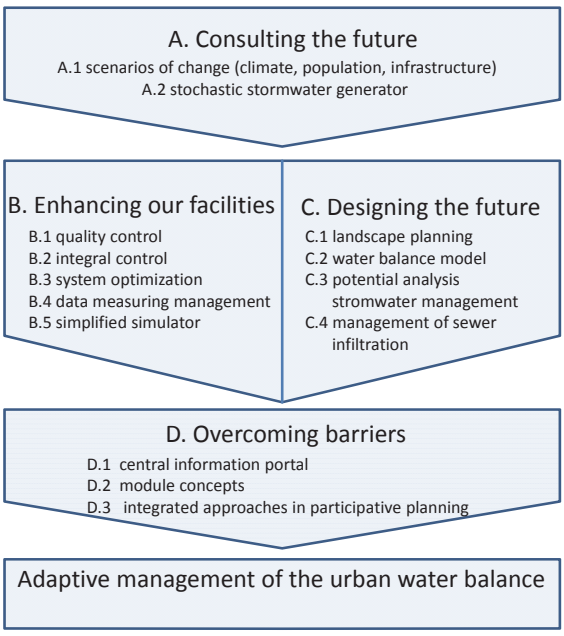

Figure: Topics and sub-projects of the joint project SAMUWA

Chair of Sanitary Engineering and Water Recycling
Dr. Harald Schönberger

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In addition to the management and coordination of the research project, the ISWA is involved in two sub-projects:
The ISWA is active in the subproject for implementing a prototype of a global real time control of the sewer system in Reutlingen. The ISWA supports the subproject leader InfraConsult with quality measurements in two combined sewer overflow tanks (CSO) in the combined sewer system. Since August 2014 UV / Vis spectrometer probes are installed to gather online-quality data in the feed channel of the flow dividing structure of the CSO tanks (see figure 2). In 5-minute measurement intervals suspended solids (TSS), chemical oxygen demand (COD, filtered and total) and nitrate are measured. The data is checked, processed and archived in data management software. The aim of the measurements is a better understanding of the load specific processes in CSO tanks, support for the development of the control algorithms and an estimation of reduced emissions into the receiving water body. This will ensure a long-term functional verification of the global real time control of the sewer system.
Furthermore the ISWA is working on a subproject infiltration and groundwater management in urban areas.
Defective sewer pipes often have a draining effect on groundwater and lower the groundwater level permanently. After reduction of infiltration into sewer pipes as a result of sewer rehabilitation critical increases in groundwater levels can occur. This may lead to waterlogging and therefore cause damage of infrastructure and buildings. To prevent these possible negative effects of sewer system rehabilitation, areas in risk of waterlogging should be identified before implementation of rehabilitation measures. Thus, a methodology should be developed to identify areas in risk of critical groundwater rises after sewer system rehabilitation in order to give the municipalities the opportunity to plan alternative drainage measures before waterlogging occurs. In close cooperation with the Emschergenossenschaft a methodology which enables municipalities to carry out preliminary investigations with existing data without having to build expensive and very costly and time consuming groundwater models was developed. The methodology was elaborated based on modelling results of a model area in the Emscher region. All operations are simple geostatistical and mathematical operations that can be carried out in geographic information systems (GIS) (see figure 3). Result of this project is an expert tool for municipalities how to carry out a first preliminary assessment of critical areas.

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Project partner:
Research Partners: Bergische Universität Wuppertal, Lehrstuhl Städtebau (LS SB); FH Münster, Institut für Wasser · Ressourcen · Umwelt (IWARU); Institut für Automation und Kommunikation, Magdeburg (ifak); Universität Stuttgart, Institut für Landschaftsplanung und Ökologie (ILPÖ); Universität Stuttgart, Institut für Wasser- und Umweltsystemmodellierung (IWS) Practice Partners: aqua_plan Ingenieurgesellschaft für Problemlösungen in Hydrologie und Umweltschutz GmbH, Aachen Dr. Pecher AG, Erkrath Emschergenossenschaft/ Lippeverband, Essen (EGLV); InfraConsult Gesellschaft für Infrastrukturplanung mbH, Stuttgart Stadt Münster; Stadtentwässerung Reutlingen (SER); Wuppertaler Stadtwerke Energie Wasser AG (WSW)
Duration:
07/2013 – 06/2016

Process flow simplified GIS-Methodology

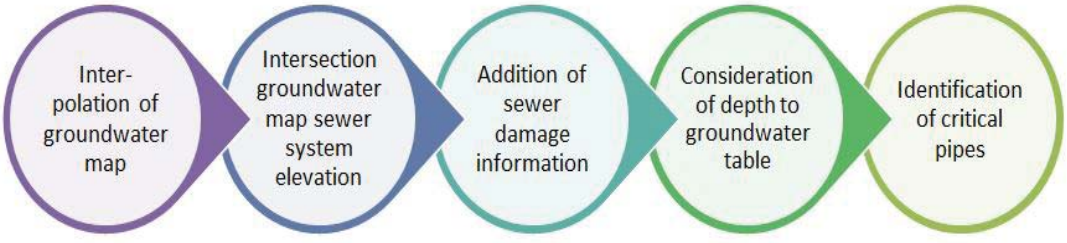

Figure 3: Process flow GIS-methodology for identification of sewer pipes which could cause a critical rise of groundwater level in consequence of sewer system rehabilitation (Bachmann et al. 2015b)