TWIST++

Paths of transition for water infrastructure systems

Adapting to new challenges in urban and rural areas

BACKGROUND

The necessity to adapt urban and rural water infrastructure systems in the face of the grad challenges is obvious. At the end of the transition pathway stand sustainable infrastructures with a high degree of flexibility and more efficient water, energy and resource use. In consequence, the collaborative research project TWIST++ is concerned with the development of new and sustainable concepts of urban water infrastructure systems, together with the relevant technical components; the development of a planning support and data maintenance system as well as the design of a serious game (simulation game), which also includes an evaluation tool to assess the sustainability of water infrastructure systems. The planning tools support renewal and conversion planning to make the transition from today's infrastructure concepts towards innovative and more sustainable integrated ones. As an additional tool, the serious game offers an opportunity to get to learn about and understand such new infrastructure system concepts intuitively. Using these tools, sustainable concepts will be developed and assessed specifically for three model areas. Additionally, drivers for and obstacles to the implementation of these innovative concepts, will be identified based on the analysis of the institutional context and the transferability of the concepts to other sites will be evaluated and assessed.

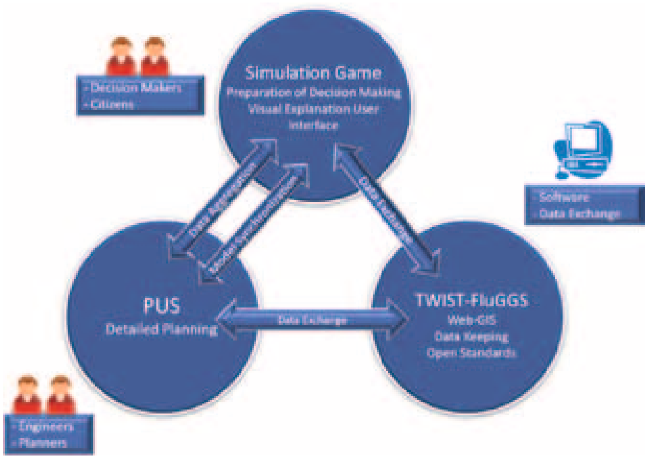

Figure 1: Interaction of the different software products in TWIST++. Graphics: Own representation

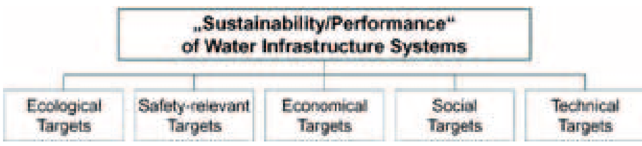

Figure 2: Target system of the evaluation process for multi-criteria evaluation. Graphics: Own representation

INTERIM RESULTS

Figure 3 shows several components of a future water supply and wastewater disposal infrastructure. These include upgradeable vacuum sewer systems of the right size for households or catchment areas; fit-for-purpose treatment of different types of raw water using membrane technology; domestic greywater treatment with heat recovery; anaerobic blackwater treatment and nutrient recovery from blackwater and urine and from suitable commercial and industrial wastewater, including appropriate pre- and post-treatment technologies; and solutions for alternative provision of water for fire-fighting and the hydraulic adjustment of drinking water networks in the event of substantially lower drinking water demand. All the necessary technical developments are currently in the laboratory or semi-technical test phase.

The most important software products, whose interactions are shown in Figure 1, are the central data maintenance platform TWIST-FluGGS, the planning support system (PUS) and the simulation game. The data collected for each of the three model areas were integrated into TWIST-FluGGS. A first version of PUS was made available and the technical integration of the two basic software packages and the possibility of data exchange with the TWIST-FluGGS platform were validated. Additionally, innovative technical elements (e.g. greywater filter, parameterisable network) were incorporated. An initial version of the simulation game has also been developed. It offers users to gather experience with innovative concepts and technologies for water infrastructure systems in concrete case studies. Evaluation of the game has commenced.

The three TWIST++ model areas were Lünen in North Rhine-Westphalia (urban area with trade and industry, a population of 87,000, steady drop in population and falling demand for drinking water); Wohlsborn-Rohrbach in Thuringia (two villages in a rural area with district sewerage mostly in need of rehabilitation, population 500 and 200 respectively) and the former colliery

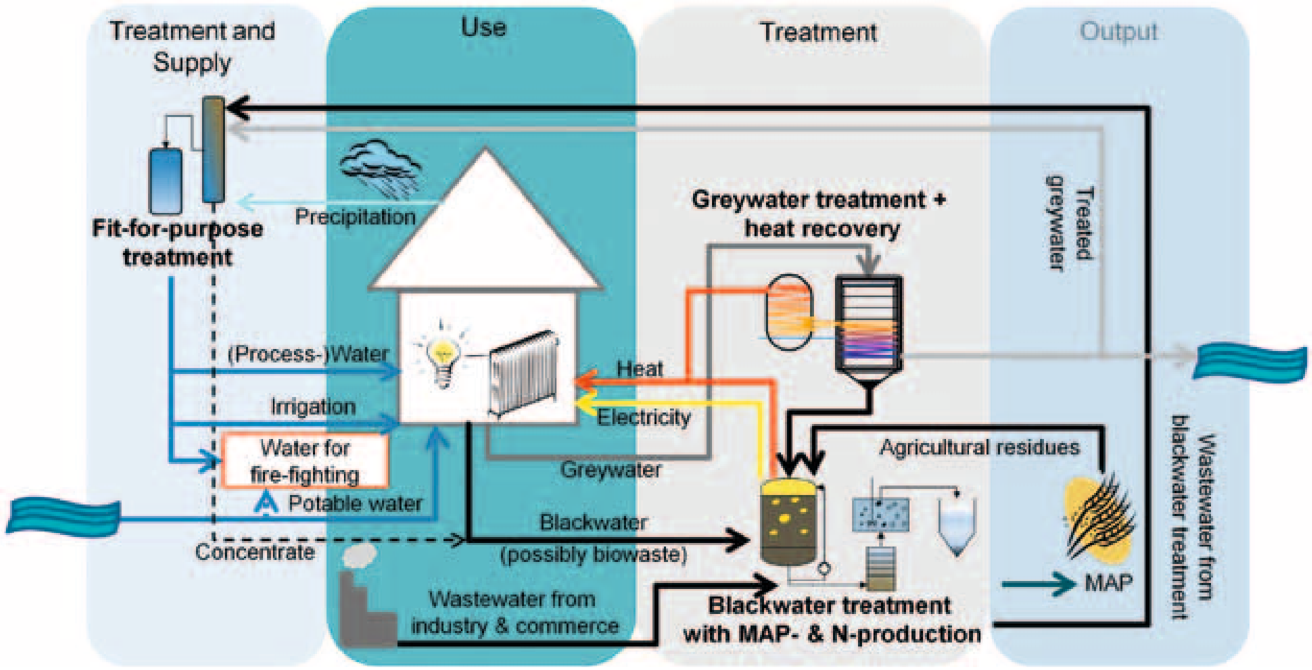

Figure 3: Interaction of water supply, greywater treatment/recycling, blackwater treatment, nutrient recovery, fit-for-purpose processing and industrial/commercial wastewater treatment in an optimised and integrated overall concept for water supply and waste water management. Graphics: Own representation

Lippe-Westerholt in North Rhine-Westphalia (land development and conversion area of 32 ha). The very different areas were examined for baseline and boundary conditions plus possible future developments. Different water infrastructure concepts and possible transition pathways were developed for each model area, based on its specific baseline situation. These are currently being debated and discussed with local decision-makers and will be further elaborated and adapted depending on the results of technical R&D work.

In order to assess and evaluate the infrastructure concepts developed for the three model areas a multi-criteria method is developed which takes into account the specific aspects of the long technical life time of water infrastructure systems in the sustainability assessment of these systems.

The assessment method's target system consists of five major groups of objectives (Figure 2). Based on the "List of Criteria for the Evaluation of Sanitary Systems" from the DWA-A 272 worksheet, specific evaluation at total of 22 criteria was formulated. The criteria were tested for independence, indifference, congruency, and relevance and finally, appropriate indicators representing these criteria were defined

OUTLOOK

According to the planned schedule, apart from continuing the research on the various TWIST++ components (development of single technologies and software, evaluation methodology and conceptual work), the information from the different work packages was shared and exchanged and the results were pooled. This is done in concrete terms based on the example of the three model regions.

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