



## Modelling transitions in urban drainage management

W. Rauch<sup>1</sup>, P. M. Bach<sup>2</sup>, R. Brown<sup>2</sup>, A. Deletic<sup>2</sup>, B. Ferguson<sup>2</sup>, F.J. de Haan<sup>2</sup>,  
D. T. McCarthy<sup>2</sup>, M. Kleidorfer<sup>1</sup>, N. Tapper<sup>2</sup>, R. Sitzenfrei<sup>1</sup>, C. Urich<sup>1</sup>

<sup>1</sup> Unit of Environmental Engineering, University of Innsbruck, Technikerstr. 13, Innsbruck 6020, Austria

<sup>2</sup> Centre for Water Sensitive Cities, Civil Engineering Department, Monash University, Australia

### EXTENDED ABSTRACT

Conventional urban water systems have served society well in industrialized countries for more than 150 years, but the fundamental concept is becoming compromised by climatic and urban changes. The main problem is that conventional water infrastructures (especially the transportation networks with its long life capacities) are highly unsuited to address future challenges (Ashley et al., 2005). To make our urban water systems more sustainable and adaptable for future challenges, the development of new water management strategies is vital. In the last 20 years, many new decentralised technologies have emerged, especially in storm water management (Low Impact Development LID in the United States or Water Sensitive Urban Design WSUD) in Australia). Most importantly, these concepts integrate stormwater management into urban design. But, as highlighted in Wong and Brown (2009), not only a technical overhaul of the conventional system is required, but it is likewise necessary to question the existing social-political environment to enable sustainable and water sensitive decision making and behaviours. To deepen our understanding of the interactions on the city scale and to identify possible transition strategies, new analysis tools are required. Therefore, the DAnCE4Water (Dynamic Adaptation for eNabling City Evolution for Water in the EU-framework project PREPARED) Framework was developed; a decision-support tool for urban planners, government, watershed managers, and local councils.

Within the framework (see Figure), three major modules are interconnected under consideration of the complex interactions and rules to simulate an evolving city over the course of 50 years. In general, the DAnCE4Water Framework is based on a grid representation of the urban environment of similar sized blocks. As input data, GIS information is used, including: land use, population densities, topography, soil character, natural and man-made water systems.

The *societal-transition module* models the consequences of societal dynamics for the urban water system by applying an agent-based model from (technology) transition theory.

In the *urban development module* the urban environment is evolved down to a very detailed level of individual households, by integrating UrbanSim - an agent-level (households) urban simulation model (Waddell et al., 2008).

The *bio-physical module* uses the information provided above by first mapping the changes induced by the urban development. Second, the adaptation of the infrastructure is computed based on a) the necessities of water management and b) on the (simulated) preferences of the stakeholder towards decentralized solutions. Finally, the performance of the urban water system is computed by means of standard model and software concepts.

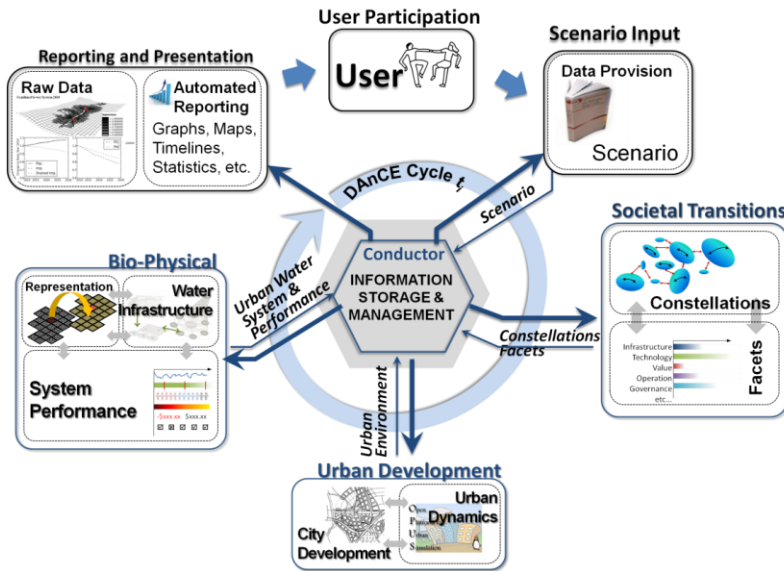


Figure 1. DANCE4Water Model Framework

These three modules are orchestrated by defining the storyline for the urban development and strategies for the infrastructure adaptation as well as climate change scenarios.

The aim of this paper is to present an approach for modelling the transition towards sustainable solutions in urban water management. This is done by integration of transitions theory, urban planning and population dynamics, infrastructure adaptation, decentralized sustainable solutions in a modelling framework. In this paper, it is pointed out how the different sub-modules are orchestrated and preliminary results are shown.

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