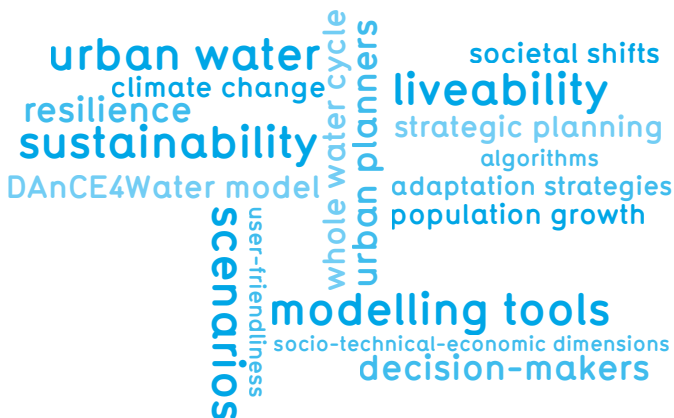


# Socio-technical modelling tools to examine urban water management scenarios

## Overview

Urban water systems are complex and dynamic, constantly evolving and adapting to changes in society and the urban environment. New management approaches use this complexity to their advantage to increase urban liveability, sustainability and system's resilience by combining a portfolio of strategic measures. These include integrating centralised and decentralised infrastructure systems, embedding technologies into the urban landscape and introducing planning regulations and financial incentives. To understand and test the performance of possible water management strategies, new computer-based models are required. This project takes groundbreaking steps toward the next generation of water modelling tools to address this gap.

The project will develop a user-friendly computer-based modelling platform to inform planning and decision-making about water management and adaptation strategies at the city or regional scale. The model, known as DAnCE4Water (Dynamic Adaptation for enabling City Evolution for Water), simulates technical, social and economic dimensions of a city's integrated urban water system as it changes over time in response to water management strategies and drivers such as climate change, societal shifts and population growth. By using the model to explore many future scenarios, users can identify strategies that result in resilient urban water outcomes, as well as strategies that will most effectively achieve transition to a water sensitive city.



## Key outcomes

A key outcome from this project is a decision-support tool that supports the strategic planning of integrated water systems. The development of DAnCE4Water's algorithms will produce detailed insight into the dynamic feedbacks between the socio-economic system, urban form and water infrastructure in response to water management strategies. The project will produce guidance and recommendations on how to develop water management strategies that are effective and robust under a variety of climate change, population growth and societal change scenarios.

Outputs from the project will be consolidated in a user-friendly web-based modelling platform designed to facilitate collaborative planning and decision-making processes. Users from different organisations will be able to access common sets of urban data, future scenarios and management strategies via the DAnCE4Water platform, enabling planners and decision-makers to explore water management opportunities and implications across organisational boundaries and at multiple scales.

## Early insights into the development of DAnCE4Water

Insights into the development of DAnCE4Water to date include:

- A new generation of decision-support tools is required to support strategic planning of integrated water systems that include decentralised water technologies. These tools need to be capable of considering the urban form and water infrastructure as an integrated system, as well as understanding the influence of socio-economic dynamics in how the system evolves. DAnCE4Water is one of the first modelling tools of this kind.
- Infrastructure planning is typically based on assumptions about future dynamics in population, climate and urbanisation patterns; however, the significant uncertainty that comes with long-term projections means strategies that are optimised for a given set of assumptions may fail if these assumptions do not eventuate. Planning decisions should therefore be based on strategies that are robust against many different future conditions, rather than optimised. DAnCE4Water provides insight into the effectiveness and implications of possible decisions to inform the selection of water management strategies that increase water system's resilience.
- DAnCE4Water is designed as an integrating platform that allows existing tools, as well as new models developed in this project, to be integrated within a single computer-based environment that accesses common sets of data and input scenarios. This type of platform provides the flexibility for tools and data to be utilised in the combinations that make most sense for the planning question being asked.



## Project design

The project builds on previous research undertaken by Monash University in partnership with Innsbruck University and Melbourne Water which developed DANCE4Water as a scientific prototype for stormwater management. Research in this current project improves the model by extending the algorithms to simulate the whole water cycle incorporating economic dimensions and developing a user-friendly web platform.

Following these developments, DANCE4Water will be able to be used to test the effectiveness of different water management strategies under a wide range of future scenarios by modelling the:

- likelihood of different water servicing options being taken up as societal needs change
- development and redevelopment of urban form as population and demographics change
- dynamic placement of water infrastructure systems as the urban form and preferred water servicing solution changes
- performance of integrated water systems, in terms of the water services provided (for example, supply security, flood protection, pollution control) and economic benefits and costs.

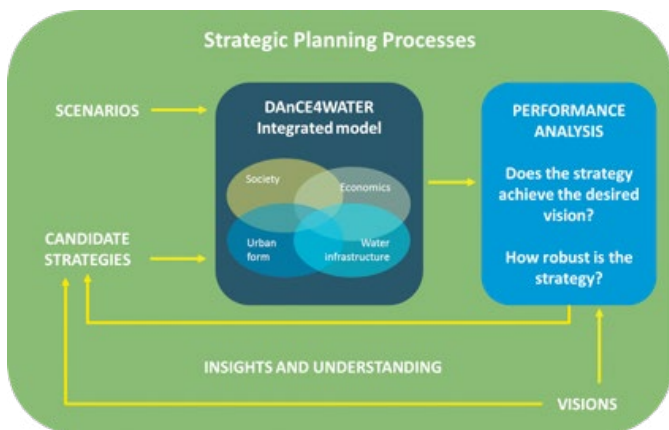


Figure 1. Strategic planning processes with DANCE4Water

## Outlook

In 2015 DANCE4Water will be applied to a case study in the south east of Melbourne to test the algorithms and gain insight into the dynamic feedbacks between the socio-economic system, urban form and water infrastructure in response to water management strategies.

The software will be issued on a rolling release basis once it is operational as a full prototype, so that industry partners have the opportunity to explore the tool in its early development phase. By June 2016, the project will deliver the guidance materials needed to support industry take-up of DANCE4Water, including a software manual, tutorials and short courses. It will be developed as an open source product and will incorporate interfaces with commonly used water industry models (e.g. MUSIC, SWMM) to complement and add value to the existing set of tools available to support decision-makers in the Australian water industry.



## About the Cooperative Research Centre for Water Sensitive Cities

The Cooperative Research Centre for Water Sensitive Cities (CRCWSC) brings together inter-disciplinary research expertise and thought-leadership from Australia and the world to address current urban water management challenges facing our cities and regions. In collaboration with over 80 research, government and industry partners, it develops and synthesises knowledge into powerful tools and influences key players aiming to achieve sustainable, resilient and liveable water sensitive cities.

## Further information

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