


CRC for
Water Sensitive Cities

Program C: Future Technologies | Project C3.1 | Project duration: January 2014 - December 2016

Managing interactions between decentralised and centralised water systems

Overview

Water strategies in all Australian cities include initiatives to reduce water consumption and supplement water supplies with decentralised systems that produce water with fit-for-purpose quality from locally available sources such as stormwater and greywater. The use of decentralised systems will not only reduce the demand for centrally supplied water, but also change both the flow and composition of wastewater discharged to sewer networks that collect and transport wastewater to centralised wastewater treatment facilities. The latter will potentially have very significant implications on the management of corrosion, odour and greenhouse gas emissions in sewer networks.

This project aims to assess the interactions between decentralised water treatment and reuse systems and central infrastructure to support and optimise the integration of decentralised and centralised systems.

Key outcomes

The key outcomes of the project are decision-support tools and guidelines to support state and local governments and water utilities in managing water demand and the interactions between centralised and decentralised systems. One important outcome is the enhanced SeweX model. The current model, developed by The University of Queensland, describes in-sewer physical, chemical and biological processes. The enhanced SeweX model will be able to predict the effect of reduced sewer flow and changed wastewater characteristics on sewer management.

In addition, a methodology for improving financial and environmental performance forecasting (including water balance) of decentralised systems will be developed which addresses uncertainty in climatic conditions, urban growth and end use demand. This will aid in improving the integrated design and operation of multiple-source water supply systems applicable to greenfield developments and city infill rehabilitation.

Early insights into factors impacting on a decentralised system's performance

Decentralised water schemes, such as rainwater and stormwater harvesting and wastewater recycling, have been implemented at various scales in Australia over the past decade. Some schemes have been largely successful in demonstrating performance and sustainability attributes, though some have encountered compounding technical, financial, social and/or environmental challenges. Such schemes have subsequently been decommissioned, including Inkerman D'Lux greywater recycling in Melbourne and Pimpama Coomera dual reticulation at the Gold Coast in Queensland, which were considered too expensive to continue operating.

One of the major factors impacting on the performance of integrated decentralised and centralised water management schemes for residential purposes in urban areas is the development of a scheme on the basis of demand projections which do not eventuate. Water demands vary dependent on a number of factors including population changes, climatic conditions and water conservation behaviours and attitudes, and are often exacerbated by the time delay between planning and implementation of a scheme.

Uncertainty analysis on climatic conditions, urban growth characteristics, behavioural changes of end users and technical failures of system components can be incorporated into the long-term performance forecasting of a decentralised system to enable improved estimates of the supply, demand, and financial and environmental performance of integrated urban water management schemes. Integrating uncertainty into the decision-making process may reduce initial capital expenditure and enable decision-makers to learn more about system requirements during the lifetime of a project.

An Australian Government Initiative

CRC AUSTRALIA

Project design

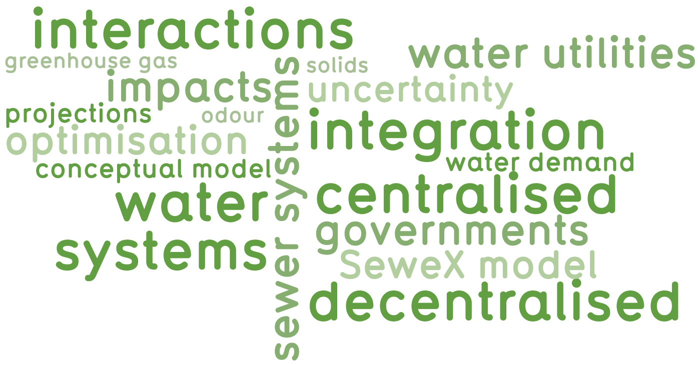
One of the sub-project gains an understanding of the impact of reduced sewer flow and increased solids concentration in sewage on solids sedimentation in sewers through designing a model and testing it in the field on selected sewers. Another sub-project will look into the impact of reduced sewer flow, more concentrated sewage and the discharge of waste sludges from various types of decentralised water production systems on the corrosion of, and odour and greenhouse gas emissions from sewer networks. This will be delivered through integrated laboratory studies, field measurements and trials, and mathematical modelling that will enhance the SeweX model by using experimental and field data. The model will then be calibrated for various flow, wastewater and solids discharge conditions to support the water industry to manage corrosion and odour problems as well as greenhouse gas emissions in future scenarios.

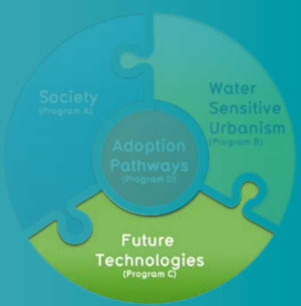
A third sub-project will develop a methodology for improving performance forecasting of decentralised systems that addresses uncertainty in climatic conditions, urban growth and water end use demand. This will be achieved through a case study which will identify major uncertainties and risk characteristics, develop a tool to assess the long-term performance of decentralised systems, and apply improved performance forecasting to an integrated decentralised and centralised water scheme in a greenfield or infill development.

Outlook

Next steps are to complete the case study investigation to understand the risk factors affecting the performance of integrated decentralised and centralised schemes, and to incorporate the findings within a framework that enables improved long-term performance forecasting of schemes.

A conceptual model on sedimentation and erosion will be developed and laboratory and field studies will be conducted. This will feed into the enhancement of the SeweX model, which, in its current form, is already being used by many water utilities in Australia. It is envisioned that the enhanced model will be made available to end users either through specialised consulting service or through commercially available software licenses. Similarly, the decision-support framework for incorporating uncertainty and risk analysis into long-term performance forecasting of integrated decentralised and centralised schemes will also be made available to end users, primarily water utilities. In addition, training workshops will be offered for the use of such tools.





About the Cooperative Research Centre for Water Sensitive Cities

The Cooperative Research Centre for Water Sensitive Cities (CRCWSC) brings together interdisciplinary 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

Level 1, Building 74
Monash University, Clayton
Victoria 3800, Australia

Professor Zhiguo Yuan
z.yuan@awmc.uq.edu.au

info@crcwsc.org.au

www.watersensitivecities.org.au

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