CRC for Water Sensitive Cities

CRCWSC Future Technologies

Program C meeting

Tuesday, 6th September 2016, 8:30am to 12:30pm

Parkside Room 4/5, Bayview Eden Hotel, Melbourne

The aim of this meeting is to highlight Program C achievements. For the presentations we will map significant achievements to date, elaborate on the results obtained since the Researchers Workshop in Brisbane, September 2015, and then briefly describe the key remaining work. The CRCWSC Summary of Research Outputs will provide additional reference for this meeting in considering our achievements and contribution to the CRCWSC strategic vision. The Tranche 1 Program C outputs were nominated by our team of researchers at a previous Researchers Workshop. We will also discuss how outputs from Program C may be further developed in Tranche 2.

For each 30 min session allow 20 min presentation and 10 min discussion.

Agenda

No.	Time	Activity	Presenter
1	8:30 – 8:45 AM	Welcome & Introduction	Zhiguo Yuan
2	8:45 – 9:15 AM	C1.3 Fit-for-purpose water production	David McCarthy
3	9:15 – 9:45 AM	C4.1 Integrated multi-functional urban water systems	Ana Deletic
4	9:45 – 10:15 AM	C5.1 Intelligent Urban Water Systems	Rachel Cardell-Oliver
5	10:15 – 10:45 AM	Morning tea	
6	10:45 – 11:15 AM	C3.1 Managing interactions between decentralised and centralised water systems	Zhiguo Yuan
7	11:15 – 11:45 AM	C2.1 Resource recovery from wastewater	Damien Batstone
8	11:45 AM – 12:30 PM	Discussion & Wrap-up	Zhiguo Yuan

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Summary of Research Outputs – Program C		Advice	Guidelines	Training	Literature	Case studies	Technology	Data / database	Model / framework
1. Enabling Structures	**b. Evaluation frameworks: Instruments to facilitate coordination towards desired outcomes**								
UrbanBeats conceptual representation of WSUD systems within a city-wide model (Sustainable technologies - Project C1.1)	Allows for the setup of virtual case studies for assessment of performance of decentralised water infrastructure								X
Integrated model components that can assess performance of WSUD systems for pollution, flooding and stormwater harvesting (Sustainable technologies - Project C1.1)	Model components included in UrbanBEATS, WSC Toolkit (D1.1) and DAnCE4Water (A4.3)								X
2. On-ground practices	**b. Urban and landscape design: Designing urban environments for integrated and multi-function water service delivery**								
GREEN SPACES AND GREEN INFRASTRUCTURE									
New green technologies performance (Integrated multi-functional urban water systems - Project C4.1)	Results from monitoring new technologies including living walls and green walls for greywater treatment and stormwater treatment				X				
Adoption guidelines for the design, maintenance and operation of new green technologies (Integrated multi-functional urban water systems - Project C4.1)	Design, maintenance and operational guidelines for green and living walls technologies		X						
2. On-ground practices	**c. Water systems design: Designing and implementing water service infrastructure**								

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POLLUTANTS									
Chemical and microbial characteristics of stormwater (Risk and health: understanding stormwater quality hazards - Project C1.2)	Characterisation of the chemical and microbial qualities of untreated stormwater				X				
Prioritisation of human health risks associated with untreated stormwater (Risk and health: understanding stormwater quality hazards - Project C1.2)	Prioritisation of human health risks associated with chemical and microbial hazards in untreated stormwater				X				
Description of the influence of catchment characteristics on untreated stormwater quality (Risk and health: understanding stormwater quality hazards - Project C1.2)	Advice on the influence of catchment characteristics on the chemical and microbial quality of untreated stormwater	X			X				
Recommendations for undertaking risk assessment of untreated stormwater (Risk and health: understanding stormwater quality hazards – Project C1.2)	Recommendations for assessing risks associated with untreated stormwater including the role of chemical surrogates	X							
Model to simulate micropollutant behaviour in WSUD systems (Sustainable technologies - Project C1.1)	Model to simulate the key treatment processes within stormwater biofilters/ wetlands and bio-chemical degradation. Coupled with MUSIC hydraulic model (insitu tested)								X
Development of a new method to identify which microbial pollutants are present and viable in stormwater before and after treatment (Fit-for-purpose water production - Project C1.3)	• Development and validation of a molecular-based method to determine microbial pollutants viability and risks to public health that combines next generation sequencing techniques with the chemical propidium monoazide – PMA • Assessment of health risks using PMA method						X	X	
WETLAND AND BIOFILTER DESIGNS									
Guidelines for the adoption (design, maintenance and operation) of biofiltration	Revised version of the FAWB guidelines focused on design for harvesting,		X						

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systems for stormwater treatment and harvesting (Sustainable technologies - Project C1.1) (Hydrology and nutrient transport processes - Project B2.4)	plant selection and maintenance (PENDING) • Guidelines for WSUD design in urban areas with shallow water tables (PENDING)								
New designs for passive filters and biofilters to removal pathogens from urban stormwater (Sustainable technologies - Project C1.1)	New generation biofilters to remove more pathogens						X		
New hybrid biofiltration technologies (green and living walls) for greywater and/or stormwater treatment (Integrated multi-functional urban water systems -Project C4.1)	• T1 - Living walls for greywater treatment: Prototype of green technology that treats greywater while improve micro-climate and provide amenity to public space • T2 - Green walls for greywater treatment: Prototype of green technology that treats greywater while improve micro-climate and provide amenity to public space • T3 - Living walls for stormwater and greywater treatment: Prototype of green technology that treats greywater and stormwater (two different sources of water) while improve micro-climate and provide amenity to public space						X		
Model to predict faecal microorganism removal in existing stormwater biofilters (Sustainable technologies - Project C1.1)	A very simple algorithm that can predict removal of most widely used pathogen indicator E.coli.								X
Model to simulate vegetation responses and quantify wetland ecosystem function (Integrated multi-functional urban water systems -Project C4.1) (Hydrology and nutrient transport processes - Project B2.4)	A wetland eco-hydrological model to simulate vegetation response to water balance variability and associated changes in biogeochemical cycles, and validated against above data. This will lead to better understanding and								X

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	modelling of the operation of urban wetlands influenced by shallow groundwater systems (PENDING)								
SMART INFRASTRUCTURE									
Model to allow rapid analysis from smart meter datasets (Intelligent urban water systems - Project C5.1)	• A suite of novel algorithms that enable rapid analysis of "big data" on water usage derived from smart meters – significant demand management tool (COMPLETED) • Industry guidelines for applying the smart metering algorithms with examples from two case study populations in Karratha and Kalgoorlie.(COMPLETED) • Web-based software application for visualising the results of the smart metering algorithms. (COMPLETED)		X			X	X		X
Decision support tools for pumping optimisation with multiple water sources (Intelligent urban water systems - Project C5.1)	• Development of generalised decision support tools for multi-objective optimisation of pumping with multiple water sources (including a user friendly Excel Use Interface for ease of use by industry end users). (COMPLETED) • Development of case study simulation and optimisation software tool (based on the NSGA-II multi-objective optimiser) for Orange Council, NSW accounting for alternative sources of water – natural catchment, stormwater, groundwater and imported water from an adjacent catchment. Optimised for the multi-objectives of pumping cost,				X	X			X

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	environmental flows and minimising reservoir spills. (COMPLETED) • Development of an extended toolbox for EPANET (a water distribution system and pumping simulation tool) that allows complex rule based decisions to be optimised. We are the first research group that has been able to achieve this. This enables extensive exploration of optimisation of pumping especially in multiple tank and multiple pump station systems. (COMPLETED								
RECYCLED WATER / WASTEWATER									
Literature review of current and novel treatment technologies for recycling water treatment identifying benefits and limitations of both (Fit-for-purpose water production - Project C1.3)	Examination of the benefits and limitations of existing and possible future systems for treatment of recycling water. Key factors considered include: installation and operating costs, energy consumption, scalability, maintenance requirements, environmental and other external benefits, novelty, etc.				X				
Development and demonstration of novel urban wastewater resource recovery technologies (Resource recovery from wastewater - Project C2.1)	• Proof-of-concept in novel resource recovery – potential for further development of commercial outputs. • Demonstration site now secured with Queensland Urban Utilities					X	X		
Development of novel treatment systems for reclaimed water (Fit-for-purpose water production - Project C1.3)	Low-cost and low-energy consuming filtration systems for treatment and reuse of reclaimed water						X		
Guidelines for the use and application of novel wastewater treatment systems (Fit-for-purpose water production - Project C1.3)	Supporting technical information for novel treatment system		X						

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CENTRALISED AND DECENTRALISED SYSTEM INTERACTIONS									
Characterisation of the interactions between centralised and decentralised water delivery systems (Managing interactions between decentralised and centralised water systems - Project C3.1)	Literature review/report on centralised and decentralised water delivery systems documenting the risk factors affecting a decentralised wastewater recycling schemes				X				
Recommendations for modelling and integration of decentralised systems (Managing interactions between decentralised and centralised water systems - Project C3.1)	• Three models considered - Water distribution network model EPAnet, SewerX, wastewater treatment plant (IWA's ASM, ADM) • Case studies provided on the application of the linkages of the various model	X				X			
Models to assess the impacts of changes in water use practice on downstream collection system (odour and corrosion, GHG emissions and sedimentation)(Managing interactions between decentralised and centralised water systems - Project C3.1)	• Models (based on SewerX model) to describe the impacts of implementation of decentralised systems on centralised systems. The models will provide support minimising the impacts and optimising function of the sewer networks. • Due late 2015								X
Decision support platform to integrate models to assist decision making (Managing interactions between decentralised and centralised water systems - Project C3.1	A platform for integrating the three models (Water distribution network model EPAnet, SewerX, wastewater treatment plant - IWA's ASM, ADM) to aid decision making								X
2 On-ground practices	**d. Operation and maintenance: integrating and managing green infrastructure as part of an asset portfolio**								
RAINFALL DATA									
Validation and operational monitoring methodologies for passive water treatment systems (Fit-for-purpose water production - Project C1.3)	This output aims to provide: 1) validation methodologies to ensure natural treatment systems perform their desired function and								X

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	2) operational monitoring regimes which demonstrate performance								