

Urban Water Security Research Alliance

Leading water research and knowledge in South East Queensland

Newsletter Issue 4

March 2011

A message from the director



The recent flooding in parts of Queensland has had an enormous impact on the people and infrastructure of the state, and UWSRA's research projects have not been immune from the disaster.

Several areas of our research program have been impacted, including the Water Quality Monitoring Technology and Information Collection System

project. This project has been trialling prototype sensor units at the Bundamba Wastewater Treatment Plant, which was heavily impacted by floodwaters.

We've had significant damage to our prototype monitoring systems as a result but we estimate that we will be up and running again within three months, and the project should be back on track by mid-year for completion early next financial year.

As you will read in this edition's article about the Residential Water End Use Study, the winter data collection of household water use is complete and has returned some fascinating results. However, the summer data collection has been severely impacted by heavy rainfall and flooding.

Estimates indicate that 54 of the 300 data loggers and/or smart water meters installed in households participating in that research project have been damaged and the team is now working to replace these with some equipment held in reserve from previous PhD research.

While we are hopeful that the team will still be able to do an accurate summer read, this project may have to be extended into next year.

Coupled with this are the impacts on the Demand Management and Communication Research project, see also our article in this newsletter featuring an interview with Dr Kelly Fielding.

Of the smart water meters and data loggers that were damaged in the end use study, 23 were situated in households that were also part of the demand management research, so they are a priority for replacement.

At the forefront of our minds is the fact that many of the people who are participating in our research into household water use have been impacted by flooding and we are keen to give them a bit of breathing space as they attempt to rebuild.

This is particularly important with Dr Fielding's project. Some media commentary around the flooding has drawn on the findings from UWSRA's Climate and Water project, led by Dr Wenju Cai from CSIRO.

Dr Cai's work has been quoted in articles in *The Wall Street Journal* and *The Australian* written by science journalist Cheryl Jones and purporting that the flood activity may continue throughout summers over the next decade, due to multi-decadal climate variability.

The articles highlighted that such weather events primarily reflect natural climate variability but that the magnitude of such events over the longer term may increase with climate change.

It is a timely reminder that, whatever the weather, we need to ensure that water security is still firmly on the agenda.

— Donald Begbie

To receive this quarterly newsletter by email, please contact us at urbanwateralliance@csiro.au



About UWSRA

The Urban Water Security Research Alliance (UWSRA) is leading water research and security in South East Queensland (SEQ) through a \$50 million, five-year partnership between the Queensland Government, CSIRO's Water for a Healthy Country National Research Flagship, The University of Queensland and Griffith University.

UWSRA is addressing SEQ's emerging urban water issues through targeted, multidisciplinary research into water security and recycling.

It is Australia's largest, regionally focused urban water research program, contributing to a national effort to research water solutions for Australia.



Board news

The first Board meeting for 2011 was held on 15 February at the new Ecosciences Precinct, Boggo Road, Dutton Park, which houses many of the Brisbane-based UWSRA researchers. A key focus for this meeting was consideration of an extension to the Alliance research program, and reviewing progress and direction of the current program.

While our focus is very much on providing deliverables by the end of this research program, due to finish in June 2012, we must also look to the future to see how the Alliance's work may continue beyond the life of the program.

Effort will be ramped-up over the coming months to enable adoption of the Alliance research results and outcomes. The Board will also lead the development of a business case for continuing the urban water research effort through the Alliance framework for a further two-year period.



Change depends on integrating knowledge

There is a need to bridge the gap between scientific knowledge and its uptake into policy in order to secure sustainable and integrated water management in SEQ, according to CSIRO research scientist Dr Tabatha Wallington.

Dr Wallington is part of the team of researchers who completed UWSRA's Institutional Change for Water Management project at the end of 2010. The project conducted literature reviews and interviews with water management professionals to better understand the institutional requirements of sustainable and integrated water management in SEQ.

Dr Wallington said the ability to continually transfer and integrate knowledge across SEQ's changing water institutions was a key challenge for long-term problem-solving capacity.

"Contrary to what many scientists believe, the production of 'good science' doesn't automatically mean that it will influence policy and decision-making," she said. "Another issue raised in interviews was the need to develop conditions for knowledge sharing, translation and integration in order to integrate the different types of knowledge brought to the table by a diverse range of stakeholders now involved in water planning and management."

Dr Wallington said it was clear that developing an integrated approach to water management required continuing effort to overcome impediments.

"Research internationally has confirmed the capacity for communication and knowledge transfer is vital if advances in scientific and other forms of knowledge such as technical or bureaucratic knowledge are to be translated and integrated into organisational decision-making," she said.

She said because an increasingly diverse range of stakeholders were participating in water-related planning, with an increasingly



diverse range of values and types of knowledge (e.g. about climate forecasting, demand management, demographics, environmental flows, etc.), the first step was often to develop a shared understanding of the problem.

"This is confirmed by the experience in SEQ. Those involved in the Council of Mayors' efforts found this forum useful to achieve a common understanding and analysis of water policy decisions, and to address issues that affected all Councils, such as the development of Total Water Cycle Management strategies," she said.

Dr Wallington said the results of the UWSRA research project pointed to the benefits of 'intermediary' organisations like the Council of Mayors and the Healthy Waterways Partnership, that can communicate and transfer knowledge across organisational boundaries. But there is also a need to understand the roles and limitations of collaborative arrangements for different purposes.

"In the negotiation of the *Water Act 2000*, institutional innovation was achieved through the strategy of cooperation and negotiation amongst diverse organisational players," she said. "Collaboration between councils had been productive in addressing some issues, such as water sensitive urban design, because there was a shared understanding of the problem. But when the drought hit, the first line of defence to meet organisational goals was to consolidate control over water resources."

Dr Wallington said 'hard-wired' structural responses were not sufficient on their own to deal with the uncertainty characterised by social and environmental changes – such as population growth and climate variability – which were increasingly recognised to be the norm rather than the exception.

"Insights from integrated water management (IWM) experiences and analyses show that a strategic response to the co-ordinated development of water, land and related resources cannot be resolved through structural responses alone," she said. "'Soft-wired' responses (communication, information sharing, institutional learning, etc.) are also required to link knowledge with action for sustainable development through participatory and adaptive processes."

"This becomes critical when IWM systems are required to work across scales, or tackle complex issues that often contain high levels of uncertainty."

"Such conditions exist in SEQ, where water policy makers and stakeholders continue to engage in a fluid and often challenging dialogue to align effort and priorities in response to the evidence of impacts caused by recent droughts, as well as the predictions of climate forecasting."

This kind of institutional innovation highlights the dynamic nature of urban water reform in SEQ, which will be key to dealing with the inevitable uncertainties of the future.

Study illuminates end use of water

Households with younger people appear to use less water than those with older people; water wise initiatives are significantly reducing water use; and irrigation for watering gardens and lawns contributes less to demand than previously thought, while taps and leaky toilets contribute more.

These are just some of the preliminary findings of UWSRA's Residential Water End Use study, conducted in winter 2010 and being led by Griffith University's Associate Professor Rodney Stewart.

Professor Stewart's research team is collecting and analysing water consumption data in 252 households in Ipswich, Brisbane, the Gold Coast and Sunshine Coast.

He said the winter 2010 data collection results were based on information gleaned through high-resolution water meters, remote data transfer loggers, household water appliance audits and self-reported household water-use diaries.

"With this type of research we've been able to extract the end uses of households so we know where they're using water and when," Professor Stewart said.

"We've shown that where we can make the most difference with water consumption is in areas that have the highest water use within the household. Generally that starts with the shower (29 percent of water used), then the clothes washer (21 percent), then taps (19 percent) and toilets."

Professor Stewart said water wise initiatives such as switching from top loader to front loader washing machines saved on average 11 kilolitres per household per year (kL/hh/y), while high-efficient showerheads potentially save 13 kL/hh/y. He said further savings could be made by asking householders to check and fix slow leaks from toilets, and to be mindful of tap use.

"Taps account for 19 percent of household consumption, and people probably don't realise the cumulative effect of rinsing dishes and washing

their hands so that could be a significant area to target in future demand management initiatives," Professor Stewart said.

"Leakage is also something people should be aware about, with our study showing an average of 9 litres per person per day (L/p/d) across the SEQ region being lost through leaks and the lions' share of domestic leakage is attributed to toilets. This is something we're now investigating through a separate comprehensive PhD study."

Professor Stewart said that this study found people are watering their gardens a lot less, which supports a trend found in a number of other recent end use studies.

"Historical end use studies showed irrigation to be 30–40 percent of total consumption but what we're seeing now is much less, due to a number of factors driving down irrigation in general," he said.

"The rebate program for water tanks means a lot more homes are using tanks for external use to fill up the pool or water the garden. Also, we're seeing much smaller lot sizes, bigger homes and working families so people have less lawn and are putting in low-maintenance gardens."

Professor Stewart said the statistics indicated that younger families used less water than households with older people in them, especially as families with both parents working meant people were not home as much during the day to use water.

"We've got a PhD student developing statistical models to reveal the determinants of each of those end uses, for example, efficiency of appliances, family characteristics, income, working status and education. We are really trying to establish the most reliable predictors of each residential end use."

He said another interesting aspect of the research was the examination of daily water demand patterns.

"From an engineering point of view, everything is designed to provide a minimum standard of service for the peak hourly water demand in the network and our study is helping water engineers refine



design parameters for infrastructure planning.

"We see that showers are the primary contributor to the morning peak demand, so the advent of smart metering and our intelligent data can be used to create effective education messages or incentive structures to transfer water use outside this peak demand period, or over time, be used to support alternative tariff structures."

Professor Stewart said the study had been somewhat hampered by flooding in South East Queensland but he was confident that they would still have a sufficient sample size to develop a significant summer end use data set.

"We need to see this as a really wet summer and then examine next summer to see any changes evident, especially related to the uptake of irrigation in a dryer period," he said.

Professor Stewart has published a technical report on the end use study, which is available from the [UWSRA website](#). He will present the findings of the study to water industry stakeholders at a UWSRA Stakeholder Forum being held in Brisbane on 5 April. He is also running workshops for water utility personnel on the findings on 21 April.

"Our project is funded until mid-year but ideally we'd like to seek funding from SEQ industry partners to continue this research, because the infrastructure is in place and we have a great database, so it makes sense to expand this into a longitudinal study."

Water facts

1. Baseline data from the Demand Management and Communications project shows families with young children use the least water – an average of 130 litres per person per day compared to 235 litres per person in single person households and 188 litres in two-person households.
2. Household residential water end use data collected by UWSRA researchers shows that high efficiency showerheads can save shower end use consumption by up to 20 percent.
3. For the average Brisbane household, the percentage of water use attributed to leaks is around 9 percent of total water use.
4. Leaky toilets were found in the end use study to account for as much as 50 percent of total water use in some households.
5. A UNESCO statement representing 200 participants from 50 countries acknowledges that institutional challenges are now widely recognised as integral to the 'crisis' of urban water governance.

Meet the researcher

Maria José Farré

**Postdoctoral Research Fellow
Advanced Water Management
Centre, The University of
Queensland (UQ)**

Dr Maria José Farré is an environmental and aquatic chemist originally from Spain and now working at the Advanced Water Management Centre (AWMC) at UQ. Her scientific interests are related to the formation and fate of disinfection by-products (DBPs) during the production and transportation of both drinking and purified recycled water (PRW).

Maria José is chief investigator on various projects on DBPs including UWSRA's N-nitrosodimethylamine (NDMA) formation potential project, which was completed in June 2010, and an assessment of regulated and emerging DBPs in South East Queensland drinking water.

Q. How did your career path bring you to Australia?

A. The implementation of the largest recycled water scheme in the southern hemisphere provided a unique opportunity for the AWMC to take part in cutting-edge research on water recycling processes. I couldn't pass up the chance to work with such a multidisciplinary, intercultural and highly reputable team. I have been in Australia almost three years now and am very happy I made this decision.

Q. How have you come to have an interest in water research?

A. When I started my PhD in Barcelona, I wanted to be involved in environmental research and that is how I started to investigate how to remove recalcitrant compounds from water via oxidative and biological treatments. During my postdoctoral research, I had the chance to move from the wastewater field to purified recycled water and recently to drinking water to investigate topics that concern not only the environment but also public health. I truly believe that water should be safe and readily available for everybody and that is why I have an interest in the formation and behaviour of DBPs in different water production trains.



Q. Your research is highly collaborative. Can you detail how your projects are making an impact here and overseas?

A. Since 2008, we have been investigating the formation of nitrosamines in PRW. Nitrosamines are small, polar compounds that can pass through physical barriers such as reverse osmosis membranes. Understanding the mechanisms of formation and fate of nitrosamines during PRW production was the first step to exploring other emerging and regulated DBPs that may behave similarly. This year, the research on DBPs has been extended to investigate regulated and emerging DBPs, not only in recycled water, but also in drinking water. First, a new project funded by the UWSRA in collaboration with Griffith University, Seqwater, LinkWater, the SEQ Water Grid Manager, Office of the Water Supply Regulator and Queensland Health, aims to understand which emerging and regulated DBPs are generated during the production and distribution of drinking water in South East Queensland. Second, our ongoing collaboration with WaterSecure and Veolia has been leveraged by the USA funded agency WaterResearch Reuse Foundation to investigate the occurrence and fate of regulated and emerging DBPs during the production of PRW in collaboration with Professor Howard Weinberg at the University of North Carolina (US). This will provide critical information for water treatment managers here and internationally.

Collective response necessary for conservation

You get the best water saving outcomes when everyone in the house is committed to water conservation, according to UWSRA project leader Dr Kelly Fielding.

Dr Fielding, who leads the Demand Management and Communication Research project, is from the University of Queensland's Institute of Social Science Research and is a visiting scientist with CSIRO Ecosystem Sciences.

She is currently writing up results from a baseline survey of 1,749 people across the Gold Coast, Sunshine Coast, Brisbane and Ipswich. The survey investigated the key drivers of household water use and conservation.

"Essentially, we wanted to go out into the community and ask people who conserve water, why they conserve water," Dr Fielding said.

"There are the usual reasons, such as that people might have certain infrastructure in their house that means they are saving water, but then there are also demographic, psychological and social reasons."

Dr Fielding said the survey results were linked with six months of actual water-use data from the respondents' households.

"Looking at actual water use data is important because what people actually do is sometimes quite different from what they say they do," she said.

Dr Fielding said water-saving infrastructure made a difference. For example, she said households with plumbed rainwater tanks saved more than 40 litres per person per day compared to households that didn't have them.

There were also regional differences, with households on the Gold Coast and Sunshine Coast using more water per household than Brisbane.

"One explanation for this is that these regions didn't have the same restrictions as Brisbane during the drought period and so they didn't develop the same water-saving habits as Brisbane households," Dr Fielding said.



She said certain water-saving habits, such as only running the washing machine if it was full, were linked to lower household water use.

Dr Fielding said the main psychological driver of water conservation was having a water-conserving culture in the household. She said this was important because one of the most challenging aspects of water use was that unless people lived alone, it was necessarily a collective endeavour.

"You've got to get your kids and your partner in on it too, because if everyone isn't on board you're not going to get those savings. It's not about a lone voice but about household commitment and prioritisation to water conservation."

Dr Fielding said the research pointed to the fact that social and psychological factors really did have an impact on long-term water conservation. The project team is now collating data and analyses from an intervention conducted with a proportion of the households who did the survey.

One of the interventions involved providing people with 'social norm' information. This tells them what other people like them (ie, with small children, or teenagers, or no children) who have low water use do to save water.

"The other intervention provided people with detailed end use information telling them exactly what percentage of water they used in various parts of the household and per person. In all cases we've provided tips for how they can reduce their water use," Dr Fielding said.

"So what we're looking at is if we provide social norm information or end use information does that actually get people to save water over and above what you might get if you simply tell people how to save water.

"Simply providing people with information is usually a relatively ineffective way of changing behaviour."

Conference alert

Below is a list of conferences happening around the world in coming months that may be of interest to people involved in water research or industry.

(UWSRA is not necessarily affiliated with these conferences.)

Ozwater 2011

9–11 May 2011, Adelaide

Water Resources Management 2011

23–25 May 2011, USA

Water Australia Summit 2011

29–21 July 2011, Sydney

International Desalination Association (IDA) World Congress 2011

4–9 September 2011, Perth

RiverSymposium 2011

26–29 September 2011, Brisbane

Water Reuse 2011: International Water Association

26–29 September 2011, Spain

2011 International Water Conference

13–16 November 2011, USA

First International Conference on Water and Society

5–7 December 2011, USA

Diary dates for 2011

5 April (*moved from 15 March*)
UWSRA Stakeholder Forum

17 May, 23 August and 16 November
Board meetings

6 April and 15 November
Research Advisory Committee meetings

6 April
Joint RAC and Management Board Strategic Planning session

14–15 September
UWSRA Annual Science Forum