CRC for
Water Sensitive Cities

ANNUAL REPORT 2013/14

An Australian Government Initiative

Future cities and towns, and their regions, will be sustainable, resilient, productive, and liveable

CRC for
Water Sensitive Cities

A message from the chair

Cheryl Batagol
Chair

Building on firm institutional foundations and the sound governance structure we established in its first year, the Cooperative Research Centre for Water Sensitive Cities (CRCWSC) has developed from strength to strength in its second year. All of our initial tranche of projects are well underway, and interim learnings and recommendations already influence the practice of our participants.

In 2013/14 the CRCWSC operated with its full contingent of ten Board members. Elected by our participants, the members bring to the task a wide diversity of skills and experience – across the many sectors and geographies of our participants. The Board is highly motivated, committed to the vision and mission of the CRCWSC; and it enjoys an excellent working relationship with the executive group.

The Board has reviewed and refined research projects during their early stages to ensure continued alignment with industry needs, while maintaining a stable research environment in the face of shifting government priorities. Our strategic plan for the next three years of operation has a clear focus on ensuring impact: through industry collaboration in research, and adoption of research outputs. We are particularly conscious of the need among participants for partnership and cooperation (the first "C" in the CRC). We are therefore committed to building a partnership culture in which our researchers consult and collaborate with industry partners when they design their research questions and means of delivering outcomes. For their part, our industry partners are proactive in synthesising research outputs to suit their respective organisational needs. The Board continues to schedule its meetings across all its regions, meeting with local participants to understand practical issues that they face in the work of delivering water sensitive cities.

Even as its foundations were being laid, the CRCWSC has maintained a legacy of research insights from the Cities as Water Supply Catchments Program. It is especially pleasing to note how well our partnerships with stakeholders are translating hard science into real practice. Our involvement has already informed development of local government policies – notably at Marrickville Council and Warringah Council in New South Wales, the City of Boroondara in Victoria, and the City of Greater Geraldton in Western Australia.

The Board is delighted to see CRCWSC participant numbers continuing to grow, particularly with the inclusion of a new category for small to medium enterprises. As our second year drew to a close the CRCWSC could boast a participant list of 79 organisations, along with a total of 167 researchers and 49 PhD candidates undertaking 31 research projects – all toward making water sensitive cities a lived reality.

CRC for
Water Sensitive Cities

A message from the CEO

Tony Wong
CEO

The second year of the CRCWSC was about consolidation of research activities, developing productive connections among researchers and government and industry partners, and synthesising interim research outputs. Our Industry Partners' Workshops, held in October 2013 and April 2014, focused on aligning research insights with our industry and government partners; and with over one hundred representatives from participant organisations, these were considered resounding successes. We have also convened a successful Researchers' Workshop in May, at which the majority of researchers came to appreciate more fully the rich interconnectedness of their work – united by a vision of water sensitive cities.

Much media attention focused on the work of our urban microclimate team in highlighting the vulnerability of cities to predicted increases in severe heat events. Development of an index to measure the heat vulnerability of our suburbs, and creation of vulnerability maps for all our capital cities, will help to focus our heat mitigation initiatives through water sensitive urban planning and design on the most vulnerable areas.

We have actively engaged with our industry and government partners in all three of our regions in Australia and convened over 54 stakeholder engagement, research communication and training activities across these regions. In addition, we convened 10 such activities internationally. In our Singapore research hub, we commenced work with the Public Utilities Board and the National University of Singapore. The first project will extend the ground-breaking stochastic-dynamic method for climatic downscaling into regions of tropical climate. The CRCWSC is also leading development of an urban flood resilience framework for the International Water Association, and ran the inaugural workshop in June as part of the Singapore International Water Week. At the water convention it was my pleasure to present a keynote address, and the CRCWSC led three sessions on the theme "Water Management for Resilience and Liveability".

The CRCWSC's international profile was further increased when the City of Kunshan became our first Chinese Incubator City. The city has committed to "extensively using its future projects as incubators of new planning, design concepts, and technologies generated out of the CRCWSC", giving "the opportunity to test research concepts and findings at a city-scale". Two demonstrations of biofiltration swales and wetlands are already being constructed in Kunshan, and a "research synthesis charrette" will help to transform the framing of the city through a network of vegetated (green) and waterway (blue) corridors. This early exposure in China prefigures many new pathways for marketing our approach to urban water management, particularly for commercial partners.

In our third year we look forward to the enhancement of CRCWSC's research activities, research synthesis with industry and government partners, and influencing their policies and practices. Our projects continue their timely delivery of insights and recommendations, and we are scheduled to undertake more research synthesis charrettes on projects across Australia.

Contents

Executive summary

The Cooperative Research Centre for Water Sensitive Cities (CRCWSC) was established in July 2012 to facilitate research and industry partnerships to meet three critical drivers affecting Australian cities and towns: population growth and the subsequent changes in lifestyle and values; climate change and variability; and changing economic conditions. Our vision is for future cities and towns, and their regions, to be sustainable, resilient, productive, and liveable.

Our mission is to *Research*, *Synthesise*, and *Influence*, harnessing our collective cutting-edge research, analytical, and advocacy capabilities, to achieve this vision. In *Research*, we develop knowledge across a broad range of domains; we *Synthesise* the knowledge gained into powerful tools and communications that meet the needs of government, industry, and the community; and we *Influence* those who shape and manage our cities to adopt water sensitive solutions.

The CRCWSC has completed a successful second year – a year building our research capacity and consolidation of our research activities, developing productive connections among researchers and government and industry partners, and synthesising interim research outputs. We also saw the number of CRCWSC participants increase from 71 to 79 organisations.

Research

Our research so far has yielded a new method for refining predicted regional meteorological conditions down to scales of 1 km^2. This stochastic approach provides a level of internal consistency between local and regional simulations of global climate change models (those used in IPCC predictions), so that precinct-scale urban water management strategies developed by industry and governments can be tested for resilience against such global climate change scenarios.

Our stream ecology team has identified major causes of degradation in the ecological health of urban waterways, and has developed measures for their restoration through interventions in built-up catchments. These amount to a fundamental guiding principle for whole-of-water cycle management strategies in precincts and municipalities.

Our urban climatology team has produced evidence that during heat waves, irrigated landscapes and shade from trees can significantly reduce surrounding surface and air temperatures. This will help to reduce mortality and morbidity in urban communities, and ease budgetary pressure on urban health and emergency services.

Our stormwater quality teams have shown that pathogen levels in stormwater are comparable to those in secondary treated sewage, and that stormwater therefore requires tailored treatment before its fit-for-purpose use. The teams are well advanced in developing urban design features, along with soil additives for biofilters to improve their performance in reducing pathogens and micro-pollutants. They have engaged with industry to facilitate industry-wide applications of these innovations.

Techniques we have developed for analysing patterns in big water-consumption data are already bearing fruit for our water utility partners, helping them target water conservation interventions for greatest cost-effectiveness.

In another research breakthrough, we are gaining the ability to model relationships between the social-institutional system and biophysical-infrastructure systems for urban water. Our early version of an agent-based modelling approach of the socio-technical drivers to water infrastructure development was validated using historical data for the Scotchmans Creek catchment in Melbourne. The model, when completed, will aid new policy experimentations, where industry can examine the effectiveness of different policy decisions in facilitating infrastructure development over 50- to 100-year time horizons in response to future scenarios of demographic and development patterns, influenced by society's level of receptivity to socio-technical innovation.

Executive summary - continued

Our research publications in prestigious international journals were strong over the past year and included papers in *Nature* and *Science*; and we anticipate that the number of our publications will grow significantly this year also. Over the last year we published two book chapters, a total of 39 scholarly articles in world-class journals, 25 industry-focused reports and discussion papers, and 17 refereed conference papers. Participation in international conferences is likely to increase in 2014/15, as the solid international profile of CRCWSC activities and achievements results in invitations to present keynote and plenary addresses.

Synthesise

Over the year our research projects have continued their substantial contributions to the stock of knowledge. To assist our industry partners in applying that knowledge, we have initiated a new program of research synthesis. We undertook four synthesis projects, each hosted by one of our participants. These have been a great success for our partner organisations, demonstrating real site-specific adaptations and applications. The four projects' main deliverables are discussion papers, presenting contemporary ideas for water sensitive development practices and increasing the capacity of our industry partners to adapt and synthesis our varied research findings.

As the majority of CRCWSC projects will reach their final stages in 2014/15, we are now planning more research synthesis activities to formulate context-specific applications of new knowledge and innovative practice.

Influence

The CRCWSC aims to play a catalytic role in reshaping how urban form and water are viewed and managed. This agenda spans many sectors, disciplines, and scales; and it will develop the capabilities of organisations and individuals from government (national, state, and local), water utilities, private business, and the community generally. To this end we have successfully convened 64 activities – toward stakeholder engagement, research dissemination, and training – across our three research hubs in Australia, in the Singapore hub, and internationally. More than 1,500 people attended our workshops, regional events, seminars, and other engagement activities.

Across Australia and around the world, 44 NewsFlashes (compared with 7 in the previous year) on key topics and events reached more than 2,400 people (405 more than previously), keeping them up to date and the CRCWSC front of mind.

PhD candidates are an important aspect of the CRCWSC and a major deliverable under the Commonwealth Funding Agreement. Our target – 28 PhD students associated with the CRCWSC by 30 June 2014 – was significantly surpassed, and there are now 49 PhD and other postgraduate students. We anticipate a further increase in our PhD numbers, with around 15 new scholars by June 2015. We aim to develop a group of world-class graduates who excel in their field, are industry-ready, and will be ambassadors for water sensitive cities in Australia and internationally. To help achieve this, we have developed and implemented a PhD Support Program to help students meet their academic, personal, and professional objectives while working in the CRCWSC.

Fourteen students studied the module Designing Urban Water Futures, as part of the Masters in Integrated Water Management (MIWM) of the International WaterCentre (IWC), a CRCWSC participant.

A bright outlook

In FY14/15 we will continue to work actively with our participants to influence their practice through capacity-building and science-policy partnerships. CRCWSC activities will also engage with local communities. A number of community-based envisioning workshops are scheduled as part of one recently commenced project, aimed at integrating the research outputs from CRCWSC projects on building flood resilience in urban areas and two others that are associated with the development of modules in our integrated water management modelling toolkit.

We anticipate an increasing level of involvement from the private sector, including a higher participation of small to medium enterprises – and of the land development industry, both nationally and internationally.

Our research synthesis activities will continue to ramp up, with five design charettes already planned and a likelihood of more being initiated by our participants throughout the year. The quality and the content of these highly focused sessions will continue to increase. So will the calibre of research-industry partnerships within the CRCWSC, as our research projects mature and more research insights and outputs are delivered.

At the beginning of 2015 we will commence stakeholder consultation for the second tranche of CRCWSC projects. This will culminate at the Research Development Workshop in October 2015, followed by up to six months of further scope development for selected projects. The new projects will commence in July 2016.

About the CRC for Water Sensitive Cities

The CRCWSC was established in July 2012 under the Commonwealth Government Cooperative Research Centre (CRC) Program. In collaboration with its 79 participant organisations, the CRCWSC will deliver the socio-technical urban water management solutions, capacity-building programs, and industry engagement required to help towns and cities to become water sensitive. In 2014, the CRCWSC comprised:

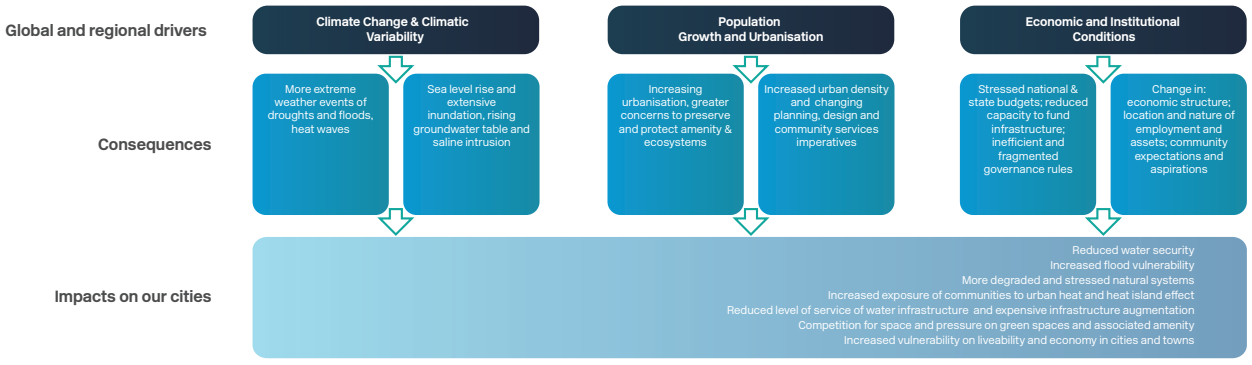
- 31 Australian local governments
- 13 state government departments and agencies
- 11 Australian university, research and training organisations
- 10 water utilities and corporations
- 6 international organisations
- 7 private companies, including 2 small to medium enterprises (SMEs)
- 1 community group

The CRCWSC exists to meet the challenges of three critical drivers affecting Australian cities and towns: population growth and the subsequent changes in lifestyle and values; climate change and variability; and changing economic conditions. Climate change gives rise to more extreme weather events such as droughts, floods, and heat waves.

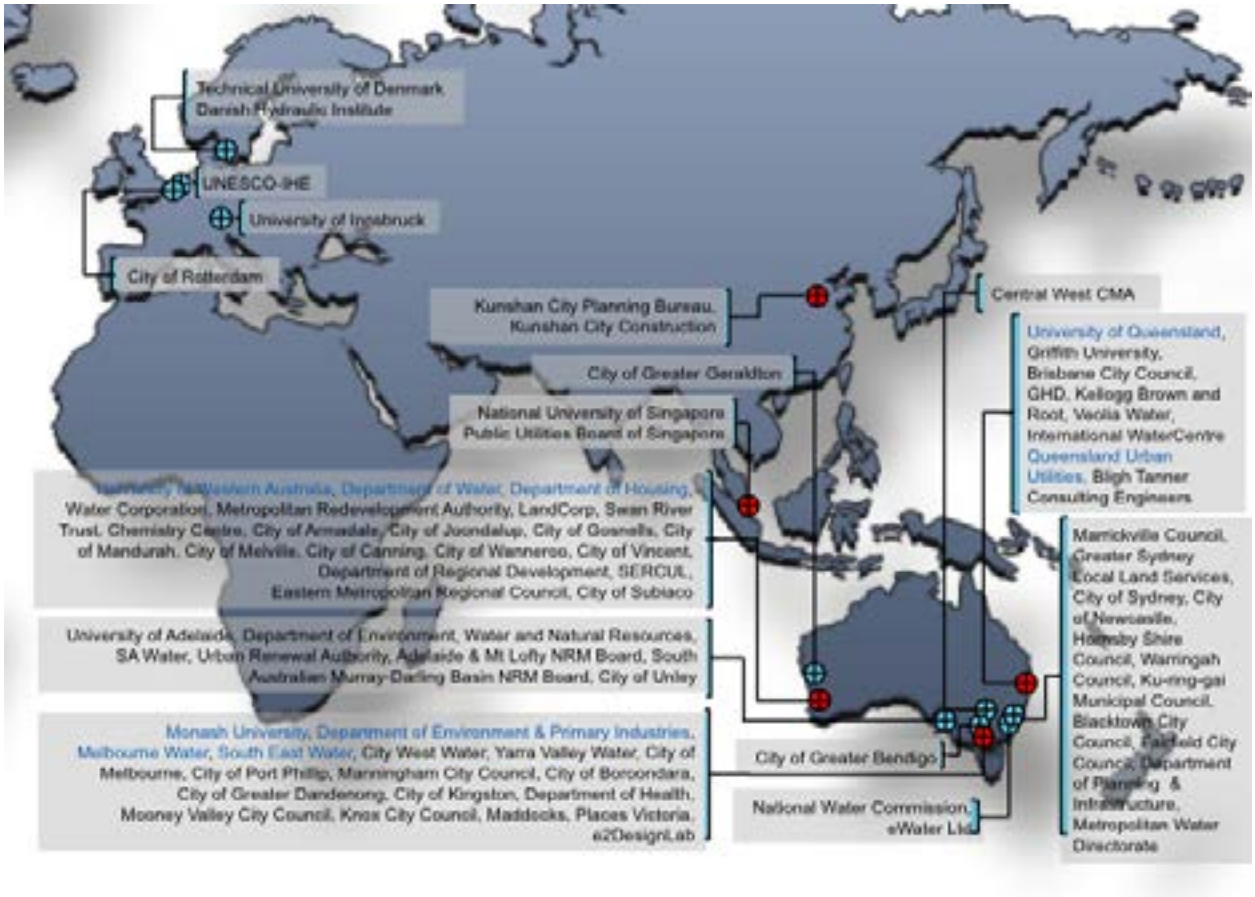
In concert, the three drivers lead to reduced water security, increased flood vulnerability, and more degraded and stressed natural systems. The CRCWSC sees integrated urban water cycle management as an opportunity to address these issues.

A water sensitive city is a city that interacts with the hydrological cycle to provide the water security essential for sustained economic prosperity. This is achieved through the efficient use of resources. A water sensitive city enhances and protects the health of rivers, waterways, and wetlands, and it factors into all of its planning the risk of looming drought and of sudden floods. It creates public spaces that harvest, clean, and recycle water, and its management of water contributes to biodiversity, carbon sequestration, and the reduction of urban "heat islands". In a water sensitive city, water's journey through the urban landscape is managed with regard for its origins and its destinations, and its spiritual and cultural significance is celebrated. It meets challenges to its water environment with integrity (not evasion), breadth of vision (not the expedient perspectives of sectional interests), and evidence-based practice (not slogans from the past, nor borrowings from some imagined future).[1]

[1] Wong, T. (2013). Towards water sensitive cities: A three-pillar approach, in Free flow: Reaching water security through cooperation. Ed. J. Griffiths and R. Lambert (Paris: UNESCO Publishing; and London: Tudor Rose), pp. 275–278.



Our Partners



Our Vision and our Mission

The CRCWSC's vision:

> *future cities and towns, and their regions, will be sustainable, resilient, productive, and liveable*

Our mission is to *Research*, *Synthesise* and *Influence*. Our cutting-edge research, analytical, and advocacy capabilities, along with our cross-sectoral partnerships, enable us to achieve this by:

- Developing *knowledge* across a broad range of relevant domains
- *Synthesising* the knowledge gained into powerful tools and communications that meet the needs of government, industry, and the community
- *Influencing* the key players who shape and manage our cities to adopt water sensitive solutions

Structure of CRCWSC research

The CRCWSC has established a comprehensive range of collaborative research projects. These span approximately 20 disciplines: from the physical sciences, engineering, planning, and climatology to the social sciences (including economics, and political and behavioural sciences). Our investment is in practically integrating these diverse areas to bring about real change and engage with those who ultimately manage the water cycle in our cities.

Our research is organised in four thematic Programs:

Program A: Society – examines how culture, institutions, and human systems affect the adoption of innovation

Program B: Water Sensitive Urbanism – examines how changes in our natural environment will impact on and be affected by different ways of planning and building our cities

Program C: Future Technologies – examines what technologies and information are needed to support the delivery of water sensitive cities

Program D: Adoption Pathways – examines the range and appropriate mix of interventions to translate research outcomes and innovation into practice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Research achievements

The research program of the CRCWSC has had a productive year, and 31 projects are now well underway. With the appointment of many post-doctoral fellows during the last quarter of the year, research resources are approaching their intended capacity. Our cohort of PhD scholars now comprises 41 scholars and is anticipated to grow by a further 15 over the next year. Despite the strategic emphasis on building research capacity, all projects have been successful in the short term and have met their deadlines.

The CRCWSC has established Research Advisory Sub-Committees (RASC), one for each of the four Research Programs. These RASC are an essential part of the CRCWSC, with the specific brief to provide advice to Program leaders on the quality and rigour of the research. In FY2013/14, the RASC of the Programs met formally twice, and several times informally with Program leaders and key researchers.

Our research publications in prestigious international journals were strong over the past year and included papers in Nature and Science; and we anticipate that the number of our publications will grow significantly this year also. Participation in international conferences is likely to increase, as the solid international profile of CRCWSC activities and achievements results in invitations to present keynote and plenary addresses.

Interim findings have been presented to our stakeholders, and were the subject of discussion and synthesis during the two Industry Partners' Workshops. Two Researchers' Workshops also helped to strengthen our cross-disciplinary research linkages.

The Researchers' Workshop convened in June 2014 deserves a particular mention; 107 researchers attended and were joined by a majority of the members of the RASC of the four CRCWSC Programs. The focus was to give researchers an opportunity to examine the adoption pathways and the potential impact of their research, particularly in transitioning cities and towns into water sensitive cities. The workshop was a great success, fostering the integration of all projects toward common objectives and impact. There was a clear sense that researchers left the workshop with a better understanding of what the other research in the CRCWSC was about, and of the contribution their respective lines of research would make toward achieving the mission and critical long-term outcomes of the organisation as a whole.

The Cities as Water Supply Catchments projects are now in their final stages, and we report a number of key achievements from them:

- Our climate modelling team has developed a new method for refining predicted regional meteorological conditions down to scales of 1 km^2. This stochastic approach provides a level of internal consistency between local and regional predictions of global climate change models, enabling precinct-scale urban water management strategies to be tested for resilience against global model predictions of climate change scenarios.
- Our stream ecology team has identified key causes of degradation in urban waterway ecological health and has developed catchment-based intervention measures for ecological restoration of urban waterways in built-up catchments that now forms a fundamental guiding principle for whole-of-water cycle management strategies in precincts and municipalities.
- Our urban climatology team has produced evidence that irrigated landscapes and shade from trees can significantly reduce surrounding surface and air temperatures during heat waves. This will help to reduce mortality and morbidity in urban communities, and ease budgetary pressure on urban health and emergency services.

- Our stormwater quality teams have shown that pathogen levels in stormwater are comparable to those in secondary treated sewage, and that stormwater therefore requires tailored treatment before their fit-for-purpose use. The teams have developed a number of design features and soil additives for biofilters to improve their performance in reducing pathogens and micro-pollutants.
- Techniques developed for analysing patterns in big data of water consumption are already bearing fruits for our water utility partners in terms of targeting water conservation interventions to achieve the highest level cost effectiveness.

Some newer and more-recently commenced projects are also yielding significant insights: for instance, that water-sensitive innovation is hampered by the lack of an effective enabling environment rather than by obstructive regulation.

We have also demonstrated that socio-technical systems can be modelled using an agent-based modelling approach, and validated with historical data for the Scotchmans Creek catchment in Melbourne. The model will aid new policy experimentations, where industry can examine the effectiveness of different policy decisions in facilitating infrastructure development over 50- to 100-year time horizons in response to future scenarios of demographic and development patterns, influenced by society's level of receptivity to socio-technical innovation.

Research adoption

While developing effective research adoption pathways, we have found a consistent need across stakeholder organisations and government agencies for better capacity to make decisions based on the economics of water sensitive approaches. It was clear that if such approaches are to be promoted successfully, adoption and implementation scenarios must take account of costs: who will pay for and maintain them, who will benefit, and what sustainable revenue stream can be made available. A macroeconomic perspective to fostering whole-of-government initiatives for water sensitive cities is required to realise the multiple benefits of such initiatives. New models for institutional governance of urban water systems will be necessary as will the need to building individual and organisational capacity to facilitate collaboration within and across sectors.

Outlook

As the majority of the projects will reach their final stages in 2014/15, we are now planning more research synthesis activities to formulate context-specific applications of new knowledge and innovative practice. Our research publications in prestigious international journals were strong over the past year and included papers in Nature and Science; and we anticipate that the number of our publications will grow significantly this year also. Participation in international conferences is likely to increase, as the solid international profile of CRCWSC activities and achievements results in invitations to present keynote and plenary addresses.

Research Advisory Sub-Committees

The CRCWSC has established RASCs, one for each of the four research programs. These RASC are an essential part of the CRCWSC with the specific remit to provide ongoing advice to the program leaders on the quality and rigour of the research undertaken. In FY13/14, the RASC of the programs met formally twice and several times informally with program leaders and key researchers.

Program A – Society

The Society Program focuses on understanding and delivering the social transformations needed to support water sensitive cities. The aim is to deliver governance models, policy tools, and practical guidance to facilitate reforms that are mutually reinforcing, flexible, and adaptable to different social scales and contexts.

There are twelve projects in this Program, organised under four themes:

- Economic modelling and analysis;
- Societal innovation and behaviour change;
- Governance and regulatory reform; and
- Social-technical transitions.

Two of these twelve are projects from the Cities as Water Supply Catchments program, and commenced before the establishment of the CRCWSC. The Program has achieved substantial outcomes during the past year as summarised below.

Economic modelling and analysis

In the *Economic modelling and analysis* theme, three projects are being undertaken at Monash University and the University of Western Australia. Findings from the projects demonstrate that the value of green infrastructure can increase typical Australian house prices by between 9% (~$32000) and 16% (~$58,000). In Perth, naturalised urban waterways can add approximately $26,000 to the price of a house within 200 metres of the waterways, while the installation of rainwater tanks is having a substantial positive effect on house values.

Findings from research on defining the economic valuation of water sensitive cities initiatives have informed policy decisions of CRCWSC industry participants, and research has been shared with our industry partners, notably the City of Greater Dandenong, Brisbane City Council, and Office of Living Victoria. In the western region, the CRCWSC continues to collaborate with the Water Corporation and has commenced an allocation-planning case study with Western Australia's Department of Water.

Societal innovation and behaviour change

There are also three projects in the *Societal innovation and behaviour change* theme. Research to date in these projects has provided a foundation for strategies to influence community and organisational attitudes and receptivity to water sensitive innovations in urban water practices.

A survey of more than 5,000 Australians explored the social processes that achieve water sensitive futures. Key findings show that water literacy is higher for some issues (including impact of individual behaviours on waterways) than for others (such as water treatment and management), and that higher water literacy is associated with older age, higher household income, and higher education.

A literature review directed at accelerating transitions to water sensitive cities by influencing behaviours has identified four domains that inform strategies to change water use: 1) systems and infrastructure, 2) social and geographic capital, 3) domestic water use contexts and technologies, and 4) everyday practices and values.

Interviews conducted with industry stakeholders have provided an understanding of the strategies that stakeholders consider effective or ineffective for community engagement around water issues. Effective strategies include those that empower people to make choices, positively framed messages, make messages

relevant to the audience, foster collaboration across organisations to ensure consistent messages, and make use of new technologies and social media.

Governance and regulatory reform

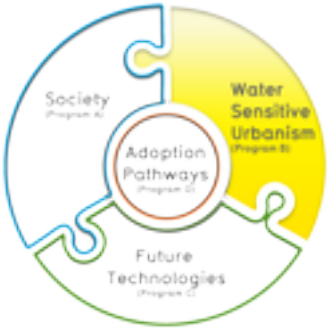
There are three projects in the theme of *Governance and regulatory reform*. In the project directed at developing better governance models for complex decision-making, a review of current practices has found that responsibility for coordination and strategic direction often lacks a central agency, and that collaborative engagement of stakeholders offers the best prospects for evidence-informed change. Another project aimed at establishing better regulatory frameworks for water sensitive cities has determined that regulatory gaps and inconsistencies are widely perceived as obstacles to innovation. To understand these frameworks, researchers have commenced mapping the legislative and regulatory landscape in Victoria and Western Australia. Interview-based case studies, about how water policy decisions are actually made, commenced this year as part of identifying strategies for influencing the political dynamics of decision-making.

Social-technical transitions

Two of the three projects in this research theme are underway: one exploring the institutional perception of risk associated with water technology, and another directed at developing a socio-technical modelling tool to aid policy experimentation. The third project will commence in FY2014/15, toward developing methods and framework for community and organisational envisioning of water sensitive futures.

Mapping water sensitive city scenarios has shown that a city's transition to water sensitive management practices typically proceeds through six distinct phases: 1) emergence of issues, 2) definition of issues, 3) shared understanding and agreement concerning issues, 4) knowledge dissemination, 5) diffusion of policies and practices, and 6) embedding new practice. Enabling factors are established as a city moves through each phase, progressively enhancing the actor networks, bridging organisations and processes, scientific and applied knowledge, on-ground projects, and administrative and practical tools.

A new generation of socio-technical modelling tools to examine urban water-management scenarios are being developed to support strategic planning of integrated water systems that include decentralised water technologies. These tools consider the urban form and water infrastructure as an integrated system, and comprehend the influence of socio-economic dynamics in how the system evolves. To aid the development of a model to simulate socio-economic dynamics, urban water practitioners' perceptions of how "risky" a water technology is are being explored. Findings to date demonstrate that these depend on the practitioners' social and cultural identity – as influenced by their level of knowledge, trust, sense of fairness, perceived control, and other attitudes. Results also show that urban water practitioners perceive stormwater harvesting to be one of the least risky technologies.



Program B – Water Sensitive Urbanism

The Water Sensitive Urbanism Program consists of eleven projects. The projects are organised under five specific themes:

- Catchment-scale landscape planning for water sensitive cities with climate change.
- Planning, design, and management to protect and restore receiving waters.
- Water sensitive urban design and urban microclimate.
- Building socio-technical flood resilience in cities and towns.
- Statutory planning for water sensitive urban design.

Three of the eleven are Cities as Water Supply Catchments projects, and commenced before the CRCWSC was established. Over the year Program B moved into its most productive phase, and all projects are now operational.

Program B is working effectively together toward defining a common vision of *water sensitive urbanism*. Strong direct engagement with industry partners continues across the Program, and efforts continue to improve engagement and communication through the Stakeholders Advisory Sub-Committee.

Catchment-scale landscape planning for water sensitive cities with climate change

There are two projects under this theme: one on downscaling predictions of urban rainfall (a legacy Cities as Water Supply Catchments Program project nearing completion), and another directed at developing a first-order urban metabolism evaluation framework for the city region across urban, peri-urban, and rural landscapes (commenced in FY2012/13).

Funding from CRCWSC Singapore participants will extend the rainfall downscaling modelling work to tropical climatic regions, particularly the city of Singapore.

Comparative assessment has now been completed for the statutory and non-statutory planning systems in South-East Queensland and the Melbourne and Perth metropolitan regions.

Planning, design, and management to protect and restore receiving waters

There are four projects under this theme, one being a legacy Cities as Water Supply Catchments project on stormwater management for enhancing and restoring urban stream ecology. This project is scheduled for completion in December 2014.

The remaining three projects have been organised with a specific focus on understanding the hydrodynamics of the Swan Coastal Plain. There have been some changes to the leadership and composition of these teams, aimed at centring them better on that focus. From the first quarter of 2014/15, the projects on *Planning, design, and management to protect and restore receiving waters* and on *Remediation of urban waterways* will be merged into a single new project led out of Western Australia. It is anticipated that the merged project will enable a critical mass of resources to be directed at developing a conceptual model of hydrogeological responses – of receiving waters (groundwater-dependent wetland and waterways) and their riparian zones – to changes in catchment conditions associated with urban development in the Swan Coastal Plains. The fourth project in this theme studies nutrient transport processes and the hydrology of groundwater/surface-water systems, a predominant character of the Swan Coastal Plain. These three projects (or two, after the

merger discussed above) are combining their efforts in studying the Swan Coastal Plains, and the team leaders are actively working with the Program leadership to forge a research alliance with the CSIRO in this endeavour.

Water sensitive urban design and urban micro-climate

There is one project currently underway in this theme, and one to commence in FY2014/15. Both projects relate to the application of water sensitive urban design to influence urban microclimate. The project currently underway is a legacy Cities as Water Supply Catchments project, which has presented empirical evidence on the significant role of shade, irrigated landscapes, and water features in reducing temperatures in urban environments. Coupled with the development of a heat vulnerability index, this project has provided generous exposure for the CRCWSC in the form of research publications and media releases. One example is a media release on heat vulnerability in Australian capital cities (in January 2013), which resulted in more than 100 pieces of reporting through radio, television, and newsprint, and led to a major ABC Lateline report in June.

From 2015 onward the Cities as Water Supply Catchments project on urban microclimate will transition into a new project directed at the design of the public realm to enhance urban microclimates.

Building socio-technical flood resilience in cities and towns

The two European-based projects aimed at building social-technical flood resilience in cities and towns are making excellent progress in translating the latest European thinking on flood resilience to the Australian context. Members of the project teams contributed to a workshop on building flood resilience in urban areas, held in Singapore as part of the Singapore International Water Week – a joint initiative of the CRCWSC and the International Water Association.

Statutory planning for water sensitive urban design

Finally, there is one project directed at statutory planning for water sensitive urban design. This project is also now fully staffed and on-track, and early literature reviews and industry engagement have been completed.

Program C – Future Technologies

The Future Technologies Program is continuing to expand our knowledge, with substantial outputs over the year. The Program consists of seven projects, organised under five themes:

- Innovative technologies for fit-for-purpose water production;
- Resource recovery from wastewater;
- Managing interactions between decentralised and centralised water systems;
- Integrated multi-functional urban water systems; and
- Intelligent urban water systems.

There are three projects in the theme of innovative technologies for fit-for-purpose water production, two of which are legacy projects from Cites as Water Supply Catchments, while the third has not yet commenced. Each of the remaining four themes has just one project, with each project bearing the same name as its defining theme.

Interactions between members of the Stakeholder Advisory Sub-Committee (SASC) and the researchers have been further enhanced as SASC members directly participate in and contribute their expertise to individual projects.

Innovative technologies for fit-for-purpose water production

Through the two legacy Cities as Water Supply Catchments projects, novel biofilter design has been assessed for treatment of stormwater to achieve removal of pathogens and micropollutants. The research team used copper-coated zeolite in biofilters to achieve substantial reductions in bacteria during short contact times, with minimal metal leaching. Their activities include development and integration of the UrbanBEATS tool as part of the Water Sensitive Cities toolkit (reported in Program D, below) to be used for exploring strategic planning scenarios and decentralised water management.

The projects also examined risk and health implications in using stormwater as an alternative water source for both potable and non-potable purposes. The project directed at understanding the risks associated with pathogens and chemicals has contributed to the development of guidelines for stormwater harvesting and associated management practices for the protection of human health. In this endeavour, stormwater samples from Queensland, NSW, Victoria, and WA were collected and characterised, and a database has been established that will be an important resource across other CRCWSC projects.

The two project teams collaborated with the South-East Queensland Urban Water Alliance in a number of research activities leading to the joint publication of a technical report. The major conclusion was that while sewage ingress into stormwater is a serious concern (as confirmed by sewage markers), chemical contamination is only a concern for a handful of contaminants – including some of the traditionally recognised stormwater pollutants such as heavy metals and PHAs.

Resource recovery from wastewater

The project on resource recovery from wastewater commenced in June 2013. This research develops technologies for wastewater treatment in three major steps: accumulation, release, and recovery. Through modularity and scalability these technologies will be ideal for integration into decentralised systems for wastewater treatment and resource recovery. A review to assess them in comparison to existing treatment options has been performed, with the significant finding that low-strength anaerobic treatment and partition-

release-recover strategies are favourable for recovery of energy and nutrients. Recently the team extended the scope of their research to include assessment of phototrophic bacteria in an accumulation-release-recover strategy, through additional funding awarded from the Smart Water Fund (Victoria, $180,000).

Managing interactions between decentralised and centralised water systems

Another initiative commencing this year was the project on managing interactions between decentralised and centralised water systems. This project will provide an overarching framework and tools, to support decisions against several criteria. The research team is already focused on three areas of concern: balancing centralised and decentralised water supply systems; understanding, predicting, and mitigating blockage and corrosion of sewers; and odour and greenhouse gas emissions as a result of altered water management practice. An integrated on-site facility has been established at a Queensland Urban Utilities site, and is being constructed with the assistance of extra funds awarded by the University of Queensland ($142,000). This will provide pilot-scale sewer lines for the research activities. An exciting and exceptional achievement, involving two members of the research team, highlighted the importance of integrated urban water management: acceptance of a publication in the prestigious journal *Science*.

Integrated multi-functional urban water systems

The focus of the project on integrated multi-functional urban water systems is to develop and optimise stormwater biofiltration and wetland systems for efficient waterway protection and water recycling of multiple urban water sources. Historical datasets from two constructed wetlands in WA have been analysed to enhance the experimental design and focus of the project. The wetland monitoring program is being performed at two chosen systems to determine wetland metabolism under different flow conditions. The research team's activities also include the setup and parameterisation of a wetland ecohydrological model, which will be validated using the project's monitoring data.

Intelligent urban water systems

In this project on intelligent urban water systems, our researchers are developing data-mining algorithms to discover patterns in data from smart water meters, and perform multi-objective optimisation of pumping systems. The team (with new recruits including a research associate and PhD and honours students) has developed and refined a general-purpose model that uses effective data features and analytics to identify water-use activities. They have also commenced a case study at Orange, NSW, to optimise a pumping framework and test trade-offs between pumping costs, energy usage, and greenhouse gas emissions.

Program D – Adoption Pathways

The Adoption Pathways Program ensures that the tools and products developed through the CRCWSC research programs are tested, validated, disseminated, and actively applied by participants and industry stakeholders.

Ultimately successful adoption will mean that:

- Water sensitive city principles and approaches are embedded in all national and state policy, and in management plans for regional population growth.
- Industry leads the on-ground implementation of water sensitive city interventions, and these are underpinned by rigorous industry standards.
- Government and industry have access to a world-class workforce with capacity to develop and implement water sensitive cities.
- Water utilities and water management agencies have capacity and willingness to integrate a range of water sensitive city infrastructure solutions and technologies.

The Program consists of five projects. All of which cut across the four Programs serving a whole-of-CRCWSC function. Four of this Program's projects are active in FY2013/14. Refer to sections on Research synthesis and Building the capacity of our industry leaders, for additional Program D highlights.

Integration and demonstration through urban design

This project is a legacy of Cities as Water Supply Catchments program, with two specific tracks both concerned with the research outputs of that program: the integration of those research outputs, and facilitating an urban design demonstration to showcase their application. In April 2014 the WSC Modelling Toolkit (Version 1) was unveiled and demonstrated, at the CRCWSC Industry Partners' Workshop in Sydney. The toolkit will assist in integrated planning and design of urban development projects, and support the planning and conceptual design of water sensitive places and stormwater harvesting and use systems. Industry training on the toolkit has now commenced, through case studies in Toolern, Aquarevo, and Riverdale in Melbourne, and Noranda in Perth.

Demonstration projects provide opportunities for interdisciplinary research, design, and assessment within the context of urban planning and design; and they give a proof-of-concept (through monitoring and assessment) for the transition to water sensitive cities and towns. Places Victoria's Officer Town Centre project is part of a 340-hectare greenfield developments site. The Victorian Government developers' vision for Officer was to establish new benchmarks in sustainability, residential density, and liveability that could be replicated in urban growth areas. The project has delivered elements of a water sensitive city – including riparian sponges and a lateral finger, both of which contribute to improving the ecological health of the creek. The stormwater management technologies have now been constructed and final evaluations are in progress.

Science–policy partnerships

Science–policy partnerships are a key adoption pathway, targeting the integration of research outcomes into policy to influence and shape water sensitive cities. A long-term objective of these partnerships is to develop the policy capability and capacity of CRCWSC industry partners. This project was first formulated to develop and trial different science–policy partnership models and protocols for different industry and government sectors. Over the year the team worked successfully in three different science–policy contexts. One of these involved assisting Western Australia's Department of Water to strengthen its urban water policy.

Twenty-five Department staff, including senior executives, participated in a one-day workshop to share ideas about future urban water management and opportunities for CRCWSC research to contribute to evidence-based policy. This collaboration led to executive endorsement of an action plan to enhance the partnership, and to commit to guiding and coordinating development of an urban water management policy for Western Australia.

Following a review of the project's scope toward the end of FY2013/14 it has been brought to a conclusion, and science–policy partnership activities have been elevated to a whole-of-CRCWSC platform – for better integration with outputs from our other projects.

Research synthesis

During the past year the CRCWSC initiated a new program of research synthesis, responding to a need in our industry partners to understand the next steps in applying knowledge generated from our four research Programs. Like many other research organisations, the CRCWSC has developed a portfolio of interdisciplinary projects to generate new knowledge, and a program of adoption activities to engage industry to use this knowledge. Research synthesis now aims to build stronger links between the two.

The program will focus on integrating knowledge generated by individual research projects. As these develop new concepts and tools, there is an opportunity to discuss how these fit together to provide context-specific solutions for industry that respond to the opportunities and constraints of individual cases. The research synthesis program will use case studies to achieve this aim.

Why a synthesis program?

We recognise that research synthesis requires its own focus as a CRCWSC activity. This program therefore facilitates discussion of our research using specific case studies nominated by our industry partners, and provides suggestions on how research outputs could be adapted to them. This forces a shift away from generalised concepts and tools, to specific applications that stress-test the knowledge by asking "What does it mean in this situation?" In those cases that involve urban development, the research synthesis activity would often involve a design charrette.

Activities and achievements for the year

The synthesis approach was applied for the first time at the Industry Partners' Workshop held in Adelaide in October 2013. This workshop took a different approach to the usual agenda; instead of presenting a cross-section of the research and industry achievements, it focused on one specific case study. All presentations over this two-day workshop were linked to this case study, and the discussions that followed were designed to explore the application of new knowledge and insights from CRCWSC research to the site.

The case study chosen for the workshop was the Tonsley redevelopment. Managed by Renewal SA, this site is a 61 ha urban redevelopment located 10 km from the Adelaide central business district. Presentations and discussions at the workshop considered the challenges and potential configuration of solutions for this site. Renewal SA had already set high standards for the development; its master plan aimed to achieve the Green Building Council of Australia's Green Star Community certification, to signify its sustainability performance. As a consequence, the masterplan already incorporated many water sensitive features – stormwater being treated by water sensitive urban design, use of alternative water sources to reduce the need to import drinking water from Adelaide's water supply system, and other features to engage local communities and promote energy efficiency.

The CRCWSC workshop contributed a range of additional ideas to improve the water sensitivity of the development. Notable among these was the opportunity to "daylight" the underground stormwater culvert running through the site and create a naturalised waterway as a central landscape feature for the development. The reinstated stream can provide a range of ecosystem services to the community – open space, cool refuge during heat waves, and amenity.

The concept of urban cooling was picked up in the other major initiative of the Tonsley workshop: the use of new water-management techniques to retain water and vegetation in the urban landscape. Green infrastructure can significantly reduce temperatures and is highly suited to a South Australian context. The CRCWSC synthesis process identified the opportunity not only to create this green infrastructure but to optimise it through informed placement and design. Responding to the specific characteristics of the site makes Tonsley a more pleasant, safe, and cool urban environment. These and other designs were collated in the discussion paper *Ideas for Tonsley*, which is currently being considered by Renewal SA as it finalises the Tonsley master plan.

Another research synthesis activity is an urban development project at the site of an old water-treatment plant in Melbourne's south-east. The research synthesis workshop involving South East Water (the key project proponent), together with its development partner (Villawood) and consultant (AECOM), led to the publication of the discussion paper Ideas for Aquarevo. Key ideas included establishing an urban forest within the development, extending the urban forest into green corridors through alternative street design, and applications of contemporary water technologies for stormwater harvesting, flood management, and sewage management. The Water Sensitive Cities Modelling Toolkit was used to compute the expected reduction in surface temperature of the development from conventional urban design of typical residential estates in the region.

Two further research synthesis activities were undertaken this year, with discussion papers pending, i.e.

- The business case for a water sensitive city was the subject of discussions at the Industry Partners' Workshop in Sydney in March 2014 to capture empirical data of the bio-physical and social benefits of a water sensitive approach to the planning and design of urban water systems and explore valuation methods to aid the development of the business case for a water sensitive city.
- A research synthesis workshop sponsored by the City of Kunshan in China exploring opportunities and strategies for developing ecological landscapes along the city ring road corridor as a means of providing the baseline framing of the city's future blue-green network.

Stakeholder engagement

Engaging with industry

Twice a year the CRCWSC brings together all of our research and industry participants for a workshop. These are important occasions for sharing the latest research findings, and interacting face-to-face to develop valuable networks and necessary relationships toward the long-term goal of water sensitive cities.

The 3rd workshop in Adelaide was held from 28 to 31 October 2013. Proceedings were kicked off the evening before with a visit to our case study site at Tonsley; then two days of collaborative workshopping, culminating in the presentation of a range of innovative ideas for Tonsley based on our partners' extensive and varied expertise. Participants enjoyed a congenial atmosphere that stimulated multidisciplinary and integrative thinking.

On 2 and 3 April 2014 the CRCWSC brought together some 135 research and industry participant representatives to begin the collaborative process of building a business case for a water sensitive city. The 4th Industry Partners' Workshop, set against the beautiful backdrop of Coogee Beach in Sydney, began with rousing calls to action: first from Brian Barrett (General Manager of Marrickville Council and a long-time supporter of local government leadership in sustainability), then from Professor John Thwaites (Chair of ClimateWorks Australia, Monash Sustainability Institute, and former Deputy Premier of Victoria) and Professor Robert Skinner (CRCWSC Board Member and Director of Monash Water for Liveability Centre). Attendees drew on ideas from these presentations – along with their own expertise in practice and research, and the scientific evidence presented by researchers on the beneficial effects of a water sensitive approach to urban and water infrastructure planning and design – to develop a business case for a hypothetical case study of their choice. Issues included defining the target audience, identifying challenges in selling the business case, and the costs and benefits (both market and non-market) of the proposal. By the end of the workshop it was clear to all that developing a business case for a water sensitive city takes time and is a complex process involving many disciplines; but it can also be inspiring, as it affords opportunities to reflect on the true value of such work. Developing the necessary elements (a base case, an assessment of the market and non-market costs and benefits) and integrating them into a strong and exciting narrative requires high-order collaboration. The CRCWSC model facilitates this, and our hope is that partners will use connections made at this workshop to progress water sensitive initiatives in their own organisations.

Stakeholder Advisory Sub-Committees

The CRCWSC has established Stakeholder Advisory Sub-Committees (SASCs), one for each of the four research programs. These SASCs are an essential part of the CRCWSC, and a vehicle for world-class research and translation along with adaptation of research outputs for successful use in industry.

In relation to its particular program, each SASC will:

- provide support to the Program Leader to ensure successful delivery of activities;
- provide stakeholder representation according to sectors and geographies;
- provide recommendations and advice in relation to maintaining focus on agreed project outcomes, and adoption and wider application of the outputs of the projects beyond the immediate partnerships in the CRCWSC;
- advise on using outcomes of the projects internally for the program itself;
- monitor, review and assess the relevance and impact of the research projects;
- assist with translation and uptake of outputs and recommendations of the projects within a program by stakeholders both geographically and sectorially; and
- consider such other matters referred to it by the CRCWSC Advisory Committee or the CRCWSC Executive.

Over the year the four SASCs met twice, at industry partner workshops. A special workshop was held on 14 May 2014, to revisit the terms of reference and to reflect on the importance of the role of industry representatives at the research level.

Communicating with CRCWSC stakeholders

Communication with our participants was once again a critical aspect of the work of the CRCWSC. Over the year we distributed three newsletters, offering in-depth insights into research projects and featuring CRCWSC industry partners and researchers. Across Australia and around the world, 44 NewsFlashes (compared with 7 in the previous year) on key topics and events reached more than 2,400 people (405 more than previously), keeping them up to date and the CRCWSC front of mind. At the coalface, more than 1,500 people attended our workshops, regional events, seminars, and other engagement activities: more than 60 events, led by the CRCWSC to promote the value of water sensitive cities.

Much of the information the CRCWSC provides was actively sought out: *blueprint*2013 and other research publications were downloaded more than 3,360 times, and our website received nearly 35,000 hits (approximately 10,000 more than the previous year), reflecting a growing interest in our activities. The CEO and Chair were also kept busy with large numbers of meetings and briefings with participant boards and senior executives.

Highlights from the Western Region

The CRCWSC's Western Region (covering Western Australia) has had an energetic year of engagement, including numerous events with both researchers and industry partners. An active event schedule delivered on a range of topics throughout the year and communicated to all Western Region participants.

We kicked off the year with the Urban Heat and Microclimate workshop in February. Keynote speaker Professor Nigel Tapper from Monash University summarised the work undertaken by the CRCWSC to analyse the relationship between urban heat and human health (Program B – Water Sensitive Urbanism). Researchers and industry leaders then gave a series of presentations before the floor was opened to all attendees to participate in facilitated discussion.

The Western Region's regional advisory panel meetings have received ongoing support from members as well as new representation from the EMRC, the Swan River Trust, and the Department of Planning.

The 9th quarterly Board meeting was held in May in Perth and coincided with the CRC Association conference with the theme "Innovating with Asia". Our CEO was invited to speak at this conference and took the opportunity to reflect on CRCWSC's experience in engaging in Asia, particularly China. CRCWSC events associated with the Board meeting included a dinner with the Board and project leaders in Western Australia, a networking evening with all Western Region participants, and a highly successful meeting with the Hon. Mia Davies, Minister for Water and Forestry. The week concluded with a breakfast of executive representatives from state government agencies. Presentations from Maree De Lacey (Director General at the Department of Water) and Tony Wong led to discussion about the application of research outputs in relevant agencies, and a follow-up meeting with these representatives was scheduled for later in 2014.

As a pioneering CRCWSC partner, the City of Greater Geraldton recently celebrated the endorsement of its Water Planning and Management Strategy (May 2014). The CRCWSC provided input during the strategy's development, having played a key role in a two-day community workshop leading to the development of the strategy in August 2013. On moving the recommendation for Council to adopt the Water Planning and Management Strategy, Councillor Jerry Clune said:

> *I participated as a community member at the Water is Everything Summit. It is clear that Geraldton is on its way to achieving our community's vision towards a water sensitive city with support from the City's partnership with the CRCWSC initiative.*

Highlights from the Eastern Region

The past year has once again been very busy for the Eastern Region of the CRCWSC (covering New South Wales, Australian Capital Territory, and Queensland). It featured a diverse program of events for research, participants, and the broader community of professionals. In addition to many regionally focused events, in April we hosted the National Industry Partners' Workshop in Coogee (Sydney), and in June the Researchers' Workshop on Queensland's Sunshine Coast. Fortuitously, the 8th International WSUD Conference was held on the Gold Coast in November, bringing the very best of the industry to the region.

In New South Wales, we celebrated the transition to a water sensitive city by recognising those organisations in the state that supported the Cities as Water Supply Catchments Program and have shown their commitment to a water sensitive future. The CRCWSC gathered with its New South Wales partners in Sydney to share how the establishment of strong relationships has enabled the CRCWSC to align research outcomes to corporate strategies and add value to our partners' business. Brian Barrett (General Manager, Marrickville Council) discussed how partnering with the Cities as Water Supply Catchments program and subsequently the CRCWSC has made an impact on the Marrickville community and provided the tools to move toward the vision of a water sensitive future. Mike Keegan (General Manager, Greater Sydney Local Land Services) outlined the industry challenges that New South Wales faces in the future, and Kerry Stubbs (member of the CRCWSC Board) shared how strong partnerships that have been formed with the CRCWSC will meet these challenges head on. While celebrating our progress, we also built on our partnerships with local governments in the state and provided "thought leaders" to help them achieve their objectives.

Our focus in Queensland this year was on a similar strategy for building partnerships. Queensland participants and key stakeholders were invited to a discussion forum to expand the reach and relevance of the CRCWSC. The emphasis on *demonstrated value* and *outcomes* across the industry provides the CRCWSC with an opportunity to use current project activities and results to engage with participants and others more strongly. The Queensland State Government released WaterQ: a 30 year water strategy for Queensland with a strong emphasis on economic development and lifestyle. This strategy highlights the urgency of developing regional centres to accommodate much of the expected population growth. This has offered the CRCWSC opportunities to assist with developing a "whole journey" approach, with evaluation from early concept development to implementation and long-term operation of projects at various scales.

Highlights from the Southern Region

The Southern Region of the CRCWSC comprises agencies, local government, private businesses, utilities, and research partners across South Australia and Victoria. During the year, the region welcomed several new participants. These included the City of Unley in South Australia, and SME Associate participants E2DesignLab and DesignFlow which have offices in Melbourne and Brisbane (also Adelaide, in the case of DesignFlow).

The CRCWSC continued its program of local engagement with stakeholders in both states. A number of CRCWSC seminars in Adelaide and Melbourne presented emerging research findings on topics such as stream ecology, legislation, regulation, economics, urban design, and water sensitive urban design.

During the course of the year, the management of the region changed hands. Professor Ana Deletic accepted new academic and research responsibilities at Monash University and handed over the management of the region to Jamie Ewert, who previously had the role of co-leader of Program D – Adoption Pathways.

As it moved into its second year, the CRCWSC shifted its emphasis from establishing to strengthening relationships with its regional partners. In addition to holding regional seminars, the CRCWSC visited a number of industry participants across the region to develop an understanding of their urban water management challenges and how the CRCWSC could support them in converting these into opportunities. As a result, a number of our participants actively sought CRCWSC involvement in their projects during the year. One such example was a number of Victorian local governments who engaged with the CRCWSC to develop their bids for the Victorian Government's Living Victoria Fund. In another example, the City of Boroondara engaged the CRCWSC to provide advice in the development of its integrated water management strategy. The CRCWSC helped Council to integrate water sensitive urban design and flood management approaches into the Strategy. The Integrated Water Management Strategy 2014–2024 was adopted at the Council's May 2014 meeting, and provides a tangible example of partnership opportunities that the CRCWSC can provide.

Following the example of the Western Region, the Southern Region also established regional advisory panels in both South Australia and Victoria. Regional advisory panels give an opportunity for regular dialogue between the CRCWSC and its local partners, which can help, for instance, to shape the regional engagement activities of the CRCWSC. The panels will have an important role in identifying local case study and demonstration opportunities for the CRC. Further seminars, workshops, and regional advisory panel meetings are scheduled for the coming year.

Engaging with Asia

Singapore Hub

The CRCWSC has a growing presence in Singapore – a fourth hub, to add to the CRCWSC's Western, Eastern, and Southern Regions in Australia. A number of key CRCWSC researchers participated in Singapore International Water Week, presenting one keynote lecture, six invited papers, and an invited speaker at the launch of the third edition of the ABC Waters Design Guidelines produced by CRCWSC participant the Public Utilities Board (PUB). CRCWSC researchers also convened a half-day workshop on building flood resilience in cities. The CRCWSC also conducted a guided inspection of some Singapore water sensitive projects for the Hon. Mia Davies (Minister for Water, WA) and her delegation, including Maree de Lacey (Director General of the Department of Water, WA) and Karlene Maywald (Chair of the National Water Commission).

Progress has been made toward getting CRCWSC Singapore-based projects up and running. A project dealing with climate downscaling using a stochastic-modelling approach commenced in April 2014. Its budget is valued at about SG$736,000, with PUB providing approximately $560,000 in cash and the remainder comprising in-kind contributions by the National University of Singapore (NUS) and the CRCWSC (through Monash University). Developed out of a legacy Cities as Water Supply Catchments project on urban rainfall in a changing climate, the project will expand the adaptation of this ground-breaking model to a tropical high-intensity rainfall region. Two researchers from NUS will be located at Monash University for a number of months, to adapt and test the model for application in Singapore.

Kunshan: creating a water sensitive city

On 17 January 2014 the CRCWSC signed a three-party memorandum of understanding (MoU) with the Kunshan City Construction Investment and Development Company (KCID) and the Planning Bureau of the City of Kunshan. The MoU represents a commitment by the two Kunshan City agencies to "extensively use their future projects as incubators of new planning, design concepts, and new technologies generated out of the CRCWSC [...] to test research concepts and findings at a city-scale". As part of metropolitan Suzhou (approximately 60 km west of Shanghai), the urban fabric of the beautiful City of Kunshan is defined by 1000 km of waterways. Over the last 3 years, KCID has begun to adopt a water sensitive approach, ensuring that new development parcels incorporate ecological landscapes for improvement of water quality. A small number of pilot projects have provided early proof-of-concept for the merit of this approach to many of its stakeholders. By coordinating the efforts of KCID with the City's Planning Bureau (and in partnership with the CRCWSC), the City of Kunshan hopes to advance a city-wide initiative to systematically transform the city into a water sensitive city.

The first demonstration of WSUD in the City of Kunshan was the development of the Kunshan Culture and Arts precinct, where a series of constructed wetlands were smartly integrated into the public realm landscape setting. These sculptural and functional urban wetlands demonstrate the integrated design response by a multi-disciplinary team consisting of engineers, ecologists, and landscape designers – from early planning to project-conception stage, and through to implementation. This provided the initial catalyst to awaken the city's interest in further advancing the application of WSUD through its partnership with the CRCWSC.

The CRCWSC held its first incubator workshop with the City of Kunshan in March 2014. During the four-day intensive workshop, the CRCWSC team inspected key sites and developed a conceptual, city-wide open space strategy (the "Urban Mosaic") to introduce ecological landscapes for ecosystem services to the city. This strategy involved improving water quality, enhancing landscape connectivity, flood detention and safe conveyance, creating biodiversity, introducing food production into the landscape, and influencing the urban microclimate. The strategy addresses current and emerging issues in Kunshan that are typical of many Chinese cities: the degrading ecological health and biodiversity of urban open spaces and waterways, increased urgency in the progressive loss of arable land, cultural disconnect of local food production and water environment, and increasing vulnerability to floods and urban heat. A CRCWSC idea series for Kunshan is being prepared, to document the workshop outcome.

Following the CRCWSC workshop in Kunshan in March 2014, the city has agreed to fund a two-week design studio in the city as part of the Masters program at Monash University School of Architecture. The immediate purpose is to continue development of water sensitive urban design ideas, in one of the largest land parcels identified in the Urban Mosaic strategy.

Building the capacity of our industry leaders

The CRCWSC aims to play a catalytic role in reshaping how urban form and water are viewed and managed. This agenda spans many sectors, disciplines, and scales; and it will rely on developing the capability of organisations and individuals from government (national, state, and local), water utilities, private business, and the community generally. The CRCWSC has a number of new and exciting initiatives specifically designed to build leaders in water and urban planning for today and tomorrow.

Water leaders of the future

CRCWSC masters coursework modules will build the capacity of urban professionals to stimulate and drive innovation toward creating water sensitive cities. The learning processes will be offered by the International WaterCentre and the UNESCO-IHE Institute for Water Education, as new modules and programs for mid-career Postgraduate Masters candidates. They will also be delivered through specific training courses throughout Australia.

In 2013/14, 14 students studied the module Designing Urban Water Futures, as part of the Masters in Integrated Water Management (MIWM) of the International WaterCentre (IWC), a CRCWSC participant. Maria Brusher is an IWC Scholarship recipient who graduated with this degree from the University of Queensland in July 2014. Maria comments:

As a Masters student of the International WaterCentre's Master of Integrated Water Management, I had an opportunity to join the social science research team at Monash University for my final project placement. Joining this team for six months was an incredible learning experience. Not only was I able to learn more about how Melbourne has adapted its urban water system to be more water sensitive ... but I also had the opportunity to see firsthand how the CRC operates. ...

Producing a Masters-level research project under the guidance of a strong research team helped me to understand how important social science research is to fast-tracking change; and I have walked away from the MIWM with a better understanding of current socio-technical transition theory. Having experienced the learning process in a rich research environment, I now appreciate the role of academic theory and applied research in shaping institutions and governance frameworks needed for 21st-century urban water management.

Creating industry-ready PhD graduates

PhD candidates are an important aspect of the CRCWSC and a major deliverable under the Commonwealth Funding Agreement. Our target – 28 PhD students associated with the CRCWSC by 30 June 2014 – was significantly surpassed, and there are now 49 PhD and other postgraduate students. The CRCWSC has high expectations for its PhD cohort. It is aiming to develop a group of world-class graduates who excel in their field, are industry-ready, and will be ambassadors for water sensitive cities in Australia and around the world.

To help achieve this, we developed and implemented a PhD Support Program; and the first workshop was held on the Sunshine Coast in June 2014. Run by Dr André Taylor, Leadership Specialist with the International WaterCentre, it focused on enabling students to meet their academic, personal, and professional objectives while working in the CRCWSC. The workshop particularly sought to develop leadership skills: time management, building personal resilience, social networking, leadership development methods, and linking leadership to personal values. Fiona Chandler, Leader Communications and Adoption Pathways and the primary contact for the Program, is developing an action plan in conjunction with the students to encourage PhD candidates as active participants in its development and implementation. Peter M. Bach, graduating with his PhD in October 2014, comments very positively:

Throughout the four years of my PhD research, I had the privilege of experiencing the CRC's journey from ... a modest Victorian project in 2010 to an incredible Australian and international endeavour several years later. This journey ... has greatly influenced my research with innovation, creativity, and confidence. The opportunity to collaborate with an interdisciplinary team of experts allowed me to critically reflect upon my work in various ways and strengthen not only the scientific aspects, but also its applicability in practice.

Dr Yvette Bettini, who graduated in October 2013, makes a similar assessment:

I started my PhD in 2009, just as the drought was breaking. Having worked in a State Government water department on the catchment management side ... I was keen to understand how long-held legislative frameworks, conventions of practice, and attitudinal norms can be adapted to suit new conditions.
I was very fortunate that my PhD had some industry support behind it. ... This enabled me to get a real understanding of the problems faced by practitioners, and approach my research with a number of different disciplinary perspectives. Such a situation is rare for a PhD, but I believe it is critical for research to be truly multi-disciplinary and translate into applicable knowledge and tools for overcoming the real-world problems we face.

In addition to the focus on the education programs, CRCWSC researchers and industry participants engage regularly with the broad water, local government and land development sectors to help influence change and build capacity. In 2013/14, the CRCWSC had a significant presence at the *8th International WSUD Conference on the Gold Coast. Around 23 affiliated CRCWSC researchers, including numerous PhD candidates, presented papers; and four CRCWSC PhD candidates won awards for best young presenter.*

Governance

The CRCWSC is a company limited by guarantee, incorporated and domiciled in Australia. It was incorporated on 17 May 2012 and is registered as a charity. The governance structure is shown in Figure 3.1 (right).

Board

At the end of FY2012/13 the term of office of the four initial directors nominated by the Essential Participants was completed. Two initial directors, Shaun Cox and Greg Davis, chose not to stand for re-election and we thank them for their valuable contributions to establishing the CRCWSC.

Nominations were sought for all four positions: the Research Essential Participants nominated Rob Skinner and John Dell, while the Non-Research Essential Participants nominated three candidates. Our constitution permitted the Board to vary the number of directors, and it decided to increase the allowed maximum number from nine to eleven to allow for two additional appointments at its discretion. This decision was supported by all but one of the Essential Participants. The Constitution was amended accordingly and the anomaly remains within the Essential Participants Agreement, allowed for in its drafting. Greg Claydon was appointed directly by the Board, and Mike Waller and Barry Ball now occupy the positions nominated by the Non-Research Essential Participants. The Board therefore has one vacancy for a director appointed by the Board, which it could fill if it saw the need.

The terms of appointment of all directors have been adjusted, by extending them so that they finish the day before the first meeting in the financial year that follows. This will ensure continuity and enable all vacancies to be filled simultaneously. Terms of individual directors are shown after their names, below. Since the end of 2013/14, Kerry Stubbs and Dominic Dolan have each been re-appointed for three-year terms.

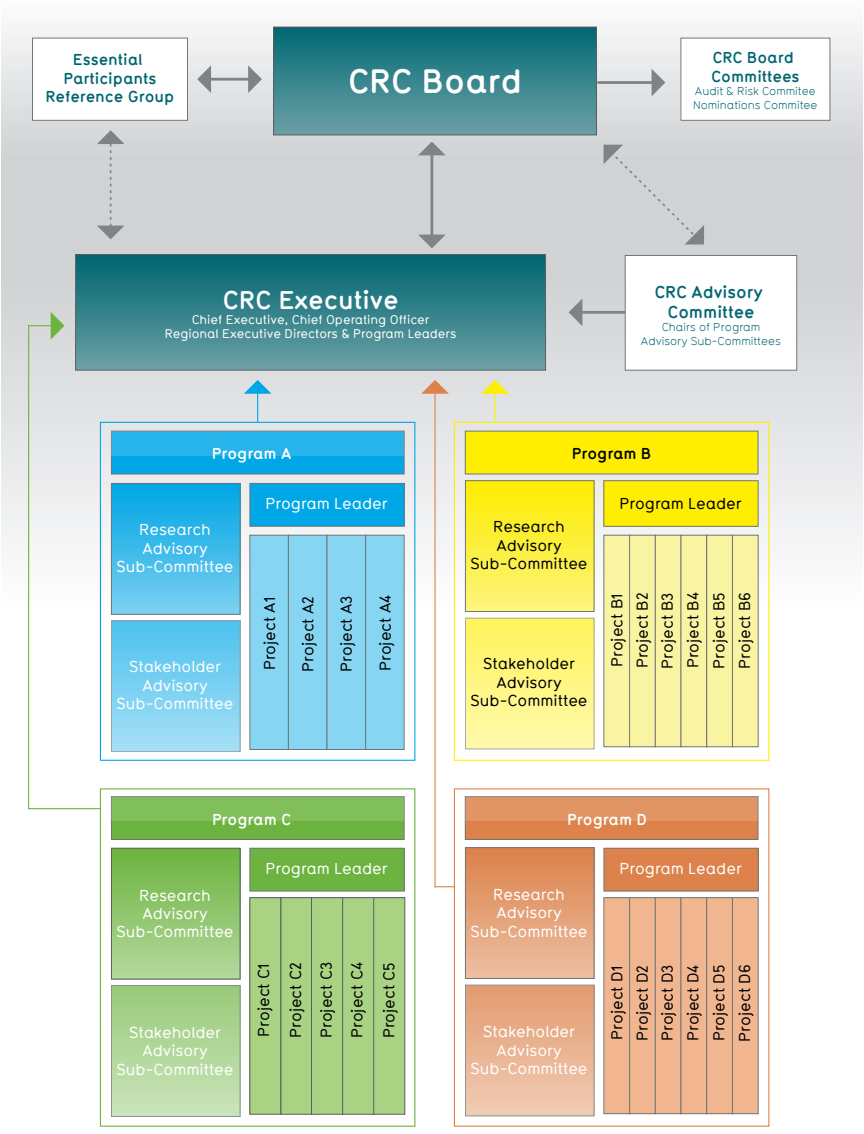


Figure 3.1: Governance structure of the CRCWSC

CRCWSC Board Members

Cheryl Batagol – Chair (July 2012 for 5 years)

Ms Cheryl Batagol chairs the CRCWSC Board. With more than 40 years of experience in environmental leadership, Ms Batagol brings governance skills through her numerous roles on a range of government and commercial boards, currently including Chair of the Environmental Protection Authority. Ms Batagol is a past recipient of the Centenary Medal (Australian Government) for her services to the water industry (City West Water) and sustainability (EcoRecycle Victoria), and the John Guice Award (Australian Waste Management Association) for service to the waste management industry. Her career has encompassed broader environmental matters with a focus on water.

Robert Skinner – Director and Deputy Chair (July 2013 for 2 years)

Professor Robert Skinner is Director, Monash Water for Liveability Centre, at Monash University. He has been a board member of the Water Services Association of Australia, and is a Fellow of the International Water Association and a leading figure in the Association's Cities of the Future Program. While Managing Director of Melbourne Water, Professor Skinner initiated a number of collaborative relationships between Melbourne Water and agencies in Singapore, the UK, and Timor Leste.

John Dell – Director (July 2013 for 3 years)

Professor John Dell is Dean of Engineering, Computing and Mathematics at the University of Western Australia. He has both industry and academic experience at senior levels and has worked in Australia and Europe as an engineer and collaborated around the world as an academic. He has expertise in research management, sensing, and sensing systems – as well as in high-technology for industry. Professor Dell has a BE and a PhD (Engineering) from the University of Western Australia, and is a Fellow of the Institution of Engineers Australia.

Mike Waller – Director (July 2013 for 3 years)

Mr Waller is Chairman of Basslink Ltd. He has held senior roles in the Australian and United Kingdom Public Service and the resources sector. From October 2012 to July 2014, he was the Chief Executive Officer of the Office of Living Victoria. He is a former Chief Economist for BHP Billiton, previous board member of EPA Victoria (2009–2012), and Chair of Sustainability Victoria (2008 – 2011). In 2011 Mr Walker chaired the Living Victoria Ministerial Advisory Council, which recommended transformational reforms to Victoria's urban water planning and management.

Barry Ball – Director (July 2013 for 2 years)

Mr Barry Ball is the Director, Strategy and Translation of the Global Change Institute at the Global Change Institute at the University of Queensland. Part of his role is to work with the International WaterCentre as Manager, Water Policy. He has held positions on the Urban Water Advisory Committee for the National Water Commission and board positions on the CRC for Catchment Hydrology and CRC for Coastal Zone, Estuary and Waterway Management. In 2010 Mr Ball was awarded an Australian Public Service Medal for his achievements in water policy.

Kerry Stubbs – Director (November 2012 for 2 years)

Ms Kerry Stubbs has undergraduate and postgraduate Arts degrees (with honours) from the University of Sydney, majoring in Government and Public Administration. In 2008 she commenced as CEO and Managing Director of Northcott Disability Services. Ms Stubbs is currently Chair of the National Accreditation Authority for Translators and Interpreters Ltd, and a Director of The Health Services Association of NSW Ltd, Cerebral Palsy Australia Ltd, and Ability First Australia Ltd.

Dominic Dolan – Director (February 2012 for 2 years)

Mr Dominic Dolan is currently the Business Manager and Company Secretary at eWater Ltd. He has built up a uniquely broad range of experience working as a Chief Financial Officer and subsequently Chief Operating Officer in manufacturing, information technology, computer games, and biotechnology companies. He has a degree in Economics and a Masters of Business Administration from Warwick Business School (UK). Mr Dolan is also an Associate of the Chartered Institute of Management Accountants.

Nick Apostolidis – Director (November 2012 for 3 years)

Mr Nick Apostolidis has over 37 years of international experience in the water industry. He has an honours degree in Civil Engineering and a Masters of Engineering Science. A keen student of global water issues and sustainable development, he has authored more than 100 technical publications. Prior to his retirement, Mr Apostolidis was Global Water Leader at GHD and served on GHD's Board for 11 years.

Stephen Frost – Director (November 2012 for 3 years)

Mr Stephen Frost has over forty years of experience in civil engineering, working in stormwater management, floodplain risk management, urban stream restoration, and natural resource management. He holds a certificate in Engineering Surveying, an Advanced Diploma in Contract Management and Project Management, and a Graduate Diploma in Local Government Management from the University of Technology, Sydney.

Greg Claydon – Director (July 2013 for 3 years)

Mr Greg Claydon has extensive water industry experience from his roles as a senior executive with Queensland's and Western Australia's water, environment and natural resources agencies. He was awarded a Public Service Medal (PSM) by the Governor-General of Australia in the 2009 Australia Day Honours Awards for outstanding public service in natural resources management and water reform.

Executive

Tony Wong	The CRCWSC	Chief Executive	100%
Robyn McLachlan	The CRCWSC	Chief Operating Officer and Company Secretary	100%
Rebekah Brown	Monash University	Program Leader of the Society Program	51%
Nigel Tapper Darryl Low Choy	Monash University Griffith University	Joint Program Leaders of the Water Sensitive Urbanism Program	60%
Zhiguo Yuan	The University of Queensland	Program Leader of the Future Technologies Program	51%
Fiona Chandler	International WaterCentre and the CRCWSC	Program Leader of the Adoption Pathways Program	51%
Jamie Ewert	Melbourne Water	Regional Executive Director: Southern Region	51%
Anas Ghadouani	The University of Western Australia	Regional Executive Director: Western Region	55%
Jurg Keller	The University of Queensland	Regional Executive Director: Eastern Region	51%

In 2013/14, Ana Deletic stepped down as Regional Executive Director: Southern Region and we thank her for her terrific efforts in establishing and effectively running the regional activities.

CRCWSC Board Committees

Audit and Risk Committee
The Audit and Risk Committee assists in the discharge of the Board's responsibility to exercise due care and diligence in relation to the CRCWSC's corporate governance, financial reporting, and risk management.

Nominations Committee
The Nominations Committee oversees the nomination and selection of acceptable candidates for director positions and makes recommendations about the Board's succession plans.

Performance Review Committee
The Performance Review Committee provides advice to the Board about governance responsibilities on matters relating to board and Chair performance and recommends performance targets for the CRCWSC and the CEO. It also oversights performance evaluations of the Board and the CEO and performance-based remuneration of the CEO.

Essential Participants Reference Group
The Essential Participants Reference Group (EPRG) discusses with the CRCWSC Board its views on the performance of the CRCWSC, and the meetings provide an opportunity to raise any issues of concern. The EPRG is made up of one representative from each of the CRCWSC's nine Essential Participants.

CRCWSC Advisory Committee
The Advisory Committee provides advice on research proposals and project performance, as well as on the effectiveness of program and project linkages, and on stakeholder needs. It comprises the Chairs of the Research Advisory Sub-Committees and the Stakeholder Advisory Sub-Committees.

Research Advisory Sub-Committees
These provide independent appraisal of the research projects, and advice as to whether they are meeting participants' expectations. One is associated with each of the four research programs, and the Chair of each Research Advisory Sub-Committee is a member of the CRCWSC Advisory Committee, which reports to the CRCWSC Executive.

Stakeholder Advisory Sub-Committees
These conduct liaison with stakeholders and provide support to the program leaders and the CRCWSC Advisory Committee. They enable participants to influence the focus and progress of research projects, and the Chair of each Stakeholder Advisory Sub-Committee is a member of the CRCWSC Advisory Committee, which reports to the CRCWSC Executive. A Stakeholder Advisory Sub-Committee is associated with each of the four research programs.

Outlook FY2014/15

The CRCWSC will place increased emphasis on research synthesis and influencing activities in FY2014/15, as research projects continue to yield new knowledge and research teams formulate recommendations from them. The majority of the Cities as Water Supply Catchments projects will be completed by June 2015. The Water Sensitive Cities Conference in October 2014 will feature presentations on research findings from the 31 projects currently underway. These interim research findings and associated recommendations, together with the depth and strength of the tacit knowledge of our thought-leaders, will form the foundation to our research synthesis activities. We have already identified six case studies – five across Australia and one overseas – that will provide the integrative platforms for synthesising our research outputs.

We will continue to work actively with our participants to influence their practice through capacity-building and science-policy partnerships. CRCWSC activities will also engage with local communities, and a number of community-based envisioning workshops are scheduled as part of one recently commenced project. This project will integrate the research outputs from CRCWSC projects on building flood resilience in urban areas and two others associated with the development of modules in our integrated water management modelling toolkit.

In the coming year, we anticipate an increasing level of participation from the private sector, including a higher participation of small to medium enterprises and of the land development industry both nationally and internationally. As the majority of the projects will reach their final stages in 2014/15, we are now planning more research synthesis activities to formulate context-specific applications of new knowledge and innovative practice. Four such activities have already been scheduled for 2014/15 and we anticipate that there will be more as more of our industry partners nominate their projects to be included in this activity. We also anticipate working in collaboration with other CRCs, notably the CRC for Low Carbon Living and Bushfire and Natural Hazard CRC, to jointly undertake synthesis of research outputs from across CRCs.

Our international profile will be further enhanced through a range of practice-based initiatives; and our contributions to international practitioner and academic communities will continue through important conferences in Australia and overseas. The CRCWSC and the CRC for Low Carbon Living will co-host the International Water Association's Cities of the Future Conference in Sydney, in February 2015. In addition to our projects in Australia, we anticipate that some of our projects will lead to on-ground works in our incubator cities in China, Singapore, and the Netherlands.

At the beginning of 2015, we will commence stakeholder consultation toward development of the second tranche of CRCWSC projects. This process is scheduled to culminate at the Research Development Workshop in October 2015, followed by up to six months of further scope development of selected projects. The new projects will commence in July 2016.

As we approach the conclusion of three years of operation, the Commonwealth Government will undertake a performance review of the CRCWSC. The review will take place in May 2015, and preparation is already underway. Based on the substantial outcomes we have achieved to date, we anticipate a very positive review that will highlight the depth and extent of our stakeholder engagement in delivering the value proposition of the Government's investment in the CRCWSC.

This year is the 25th anniversary of the CRC Programme, and the Australian Government is undertaking a review of the Programme and its role in supporting business and researchers working together in industry-led partnerships. The CRCWSC will contribute to this review, by providing substantial evidence of the value of our activities to industry and government.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Appendix 1 – Membership of CRCWSC Committees

CRCWSC Board Committees

Audit and Risk Committee

Name	Commencement	Organisation (or independent)
Kerry Stubbs (Chair)	01/11/2012	Independent
Cheryl Batagol	17/05/2012	Environment Protection Authority (VIC)
Dominic Dolan	28/02/2013	eWater Pty Ltd

Nominations Committee

Name	Commencement	Organisation (or independent)
Cheryl Batagol (Chair)	17/05/2012	Environment Protection Authority (VIC)
John Savell	17/05/2012	Department of Housing (WA)
Simon Want	17/05/2012	Office of Living Victoria (VIC)

Performance Review Committee

Name	Commencement	Organisation (or independent)
Michael Waller (chair)	21/11/2013	Independent
Cheryl Batagol	21/11/2013	Independent
Barry Ball	21/11/2013	University of Queensland
Steve Frost	21/11/2013	Independent
Rob Skinner	21/11/2013	Monash University

Essential Participants Reference Group

Name	Organisation (or independent)
Sara Harbidge	Department of Sustainability and Environment (VIC)
Peter Morrison	Melbourne Water (VIC)
Ian Johnson (Chair)	South East Water (VIC)
Paul Belz	Queensland Urban Utilities (QLD)
Ian Harris	The University of Queensland
Antonietta Torre	Department of Water (WA)
John Savell	Department of Housing (WA)
Pauline Nestor	Monash University
Peter Davies	The University of Western Australia

Advisory Committees

CRCWSC Advisory Committee

Name	Organisation (or independent)
Chris Cocklin	James Cook University
Ian Johnson	South East Water (VIC)
Peter Newton	Swinburne University
Malcolm Robb	Department of Water (WA)
Paul Greenfield	Australian Nuclear Science and Technology Organisation, Australia
Leah Wheatley	Department of Sustainability and Environment (VIC)
Andre Taylor	Andre Taylor Consulting
Paul Belz	Queensland Urban Utilities (QLD)

Research Advisory Sub-Committees

Program A: Society - Research Advisory Sub-Committee

Name	Organisation (or independent)
Chris Cocklin (Chair)	James Cook University, Australia
Geoff Syme	Edith Cowan University, Australia
David Sunding	University of California, Berkeley, USA

Program B: Water Sensitive Urbanism - Research Advisory Sub-Committee

Name	Organisation (or independent)
Peter Newton (Chair)	Swinburne University, Australia
Glenn McGregor	University of Auckland, NZ
Nancy Grimm	Global Institute of Sustainability, Arizona University, USA

Program C: Future Technologies - Research Advisory Sub-Committee

Name	Organisation (or independent)
Paul Greenfield (Chair)	Australian Nuclear Science and Technology Organisation, Australia
Gustaf Olsson	Lund University, Sweden
David Sedlak	University of California, Berkeley, USA

Program D: Adoption Pathways - Research Advisory Sub-Committee

Name	Organisation (or independent)
Andre Taylor (Chair)	Andre Taylor Consulting, Australia
Kevin Collins	The Open University, UK
David Perry	Bureau of Meteorology, Australia
Carol Howe	ForEva Solutions, USA

Appendix 1 – Membership of CRCWSC Committees – continued

Stakeholder Advisory Sub-Committees

Program A: Society - Stakeholder Advisory Sub-Committee

Name	Organisation (or independent)
Ian Johnson (Chair)	South East Water (VIC)
Peter Morison	Melbourne Water (VIC)
David Bell	Warringah Council (NSW)
Catrin Jones	Department of Planning and Infrastructure (NSW)
Ed Hauck	Department of Water (WA)
Martin Allen	Department of Environment and Natural Resources (SA)
Emma Bishop	Office of Living Victoria (VIC)
Mike Mouritz	City of Canning (WA)
Pat Bourke	Brisbane City Council (QLD)

Program B: Water Sensitive Urbanism - Stakeholder Advisory Sub-Committee

Name	Organisation (or independent)
Malcolm Robb (Chair)	Department of Water (WA)
Amelia Tendler	Office of Living Victoria (VIC)
Ben Fallowfield	Warringah Council (NSW)
Melanie Davies	City of Subiaco (WA)
David Mitchell	Department of Planning and Infrastructure (NSW)
Erin Sellers	Fairfield City Council (NSW)
Graham Brook	Department of Environment, Water, and Natural Resources (SA)
Jennifer Stritzke	Swan River Trust (WA)
Paul McAllister	City of Gosnells (WA)
Rhys Coleman	Melbourne Water (VIC)

Stakeholder Advisory Sub-Committees - cont.

Program C: Future Technologies - Stakeholder Advisory Sub-Committee

Name	Organisation (or independent)
Leah Wheatley (Chair)	Office of Living Victoria (VIC)
David Hardy	Melbourne Water (VIC)
Garry Henderson	Kellogg Brown & Root Pty Ltd
Jeff Foley	GHD Pty Ltd
Krishna Seewraj	Department of Water (WA)
Olof Jay Jonasson	Ku-ring-gai Council (NSW)
Andrew Chapman	South East Water (VIC)
Peter Adkins	Swan River Trust (WA)
Peter McCafferty	ChemCentre (WA)
Yvan Poussade	Veolia Water Australia

Program D: Adoption Pathways - Stakeholder Advisory Sub-Committee

Name	Organisation (or independent)
Paul Belz (Chair)	Queensland Urban Utilities (QLD)
Greg Ingleton	South Australian Water Corporation (SA)
Ashis Dey	eWater Pty Ltd
Tim Sparks	Department of Water (WA)
Jacquie White / Rachelle Adamowicz	Melbourne Water (VIC)
Andrew Allan	Office of Living Victoria (VIC)
Phil Birtles / Natalia Payne	Blacktown City Council (NSW)
Sophia Findlay	Ku-ring-gai Council (NSW)

Appendix 2 – Summary of key training, capacity building and communication activities in 2013/14

Key training activities 2013–14

Date	Region	Activity
5 July 2013	Southern	CRC Partners were invited to the launch of the new stormwater modelling Toolkit *(beta)* in Melbourne. The full-day event showcased the model's current capabilities as well as the research that underpins it, with opportunities for participants to understand and discuss potential model applications.
30 June – 3 July 2014	National	The CRC for Water Sensitive Cities and the Monash Water for Liveability Centre co-hosted the 2014 Winter School in Melbourne. The Winter School was a unique opportunity to hear from Australia's foremost researchers and thought-leaders about actions being taken to deliver water sensitive cities.

Key stakeholder engagement and communication activities 2013/14

Date	Region	Activity
15–17 July	Asia	Singapore Workshop (Singapore)
23 July	Southern	Hub Seminar – Waste to Resource (Melbourne)
1 Aug	Eastern	NSW Participant Consortium Meeting (Sydney)
13 Aug	Southern	Hub Seminar held in Adelaide to highlight recent advances in stormwater management, including opportunities and changes that SA industry is facing in the implementation of WSUD
22 Aug	Eastern	NSW CRCWSC Participants Meeting (Sydney)
1 Oct	Southern	CRCWSC local Government consortium meeting (City of Boroondara)
10 Oct	Southern	Hub Seminar – Climate Ready and Water (Melbourne)
28–31 Oct	National	2nd CRCWSC Industry Partners' Workshop, Adelaide. Collaborative table-based workshops on application of research to case study site "Tonsley".
2 Dec	Western	End of year workshop and summary of Industry Partners' Workshop (Perth)
9 Dec	Eastern	Water Sensitive City Champions Forum – SEQ (Brisbane)
12 Dec	Eastern	NSW Participant Consortium Meeting (Blacktown City Council)
12 Dec	Eastern	Hub seminar and end of year workshop – NSW (Blacktown City Council)
10 Jan	Western	Meeting with CSIRO to develop Swan Coastal Plains Research Alliance (Belmont WA)
16 Jan	Southern	City of Kingston – participant liaison
16 Jan	Asia	Southeast University, China – CRCWSC and Southeast University road demonstration project discussion for Nanjing Olympic Youth Game Village
17 Jan	Asia	Signing of Memorandum of Understanding with the City of Kunshan to become CRC Incubator City in China
23 Jan	Southern	CRCWSC Briefing for South East Water executives
5 Feb	Southern	Local government consortium participant meeting – City of Melbourne
6 Feb	Western	Hub seminar – Urban heat and microclimate workshop (Perth)
8–9 Feb	Asia	City of Kunshan, China – First CRC Incubator project discussion

Key stakeholder engagement and communication activities 2013/14 – cont.

Date	Region	Activity
13 Feb	Western	Seminar Series – Economic Modelling and Analysis (Perth)
24 Feb	Southern	City West Water – Workshop on CRCWSC modelling toolkit and application to City West Water pilot
25 Feb	Eastern	NSW CRCWSC participant consortium (Sydney)
26 Feb	Southern	Office of Living Victoria – meeting to discuss CRCWSC progress (Melbourne)
26 Feb	Southern	City West Water – Workshop on CRCWSC Modelling toolkit and application to City West Water pilot
1 Mar	Southern	City West Water – overview of urban beats, Dance4Water, and discussion of pilot opportunities (Sunshine)
5–6 Mar	Southern	Ideas for Evergreen Pre-workshop Site Tour, CRC Workshop – Evergreen Project, Melbourne. Resulted in "Ideas for AquaRevo" publication to share research innovation and application to real development context.
6 Mar	Western	Hub workshop – The Economics of Water Sensitive Cities and Towns (Perth)
8–10 Mar	Asia	CRCWSC Incubator City Workshop on Ring Road Ecological Restoration in China
11 Mar	Southern	City of Knox – meeting to discuss CRCWSC progress
12 Mar	Eastern	Meeting with SEQ Healthy Waterways Partnership to discuss participant options (Brisbane)
13 Mar	Western	Hub Seminar – Water in WA Cities of the Future (Perth)
21 Mar	Western	Blueprint2013 Western Region launch and Workshop (Perth)
24 Mar	Western	Swan Coastal Plains Water Research Alliance meeting (Perth)
24 Mar	Eastern	Meeting with Brisbane City Council to discuss value proposition for renewing membership
28 Mar	Southern	GHD – meeting to discuss CRC progress (Melbourne)
2–3 April	National	3rd CRCWSC Industry Partners' Workshop held in Sydney. The focus of the workshop was to collectively build a business case for a water sensitive city. A number of different hypothetical case studies were used to provide focus for group discussions.
4 April	Eastern	"Celebrating the transition to a Water Sensitive City" (Sydney)
9 April	Western	Presentation to The Western Suburbs Regional Organisation of Councils (WESROC) for potential partnership with CRCWSC
30 April	Southern	Melbourne Water – overview of Dance4Water
1 May	National	Presentation to inbound China water business delegation organised by AusTrade
1 May	Western	Workshop – Western Region Perth Post Industry Partners' Workshop
2 May	Eastern	Meeting with Stockland Pty Ltd (Sydney)
6 May	Southern	Hub workshop – Advances in stream ecology (Adelaide)
6 May	Southern	SA Participants' Advisory Panel (Adelaide)
13 May	Eastern	CRCWSC participant and state government representative meeting – Building QLD Partnerships for Water Sensitive Cities (Brisbane)
15 May	Eastern	SME Associate Participant Launch recognise the first SME signing up – Bligh Tanner, a Brisbane-based SME

Appendix 2 – Summary of key training, capacity building and communication activities in 2013/14 - continued

Key stakeholder engagement and communication activities 2013/14 - cont.

Date	Region	Activity
19 May	Western	Meeting to discuss Swan Coastal Plain collaboration (Perth)
20 May	Southern	Meeting with CRC Bushfire & Natural Hazard (Melbourne)
22 May	Eastern	Presentation to Central West NSW Councils on Water Security (Sydney)
23 May	Western	Executive Breakfast co-hosted by CRCWSC, Department of Water and Department of Housing (Perth)
23 May	Western	New WAter Ways Presentation on "CRC for Water Sensitive Cities: Recent highlights from the CEO" at Department of Water (Perth)
28 May	Southern	CRCWSC & GHD participant update (Melbourne)
29 May	Southern	Victoria Participants Advisory Panel (Melbourne)
1 June	International	International Workshop on Adapting Cities for Flood Resilience – led jointly by CRCWSC and the International Water Association at the Singapore International Water Week
3–4 June	International	Singapore International Water Week Water Convention – CRCWSC led Theme 3 on Water for Liveability and Resilience
10 June	Eastern	The Fourth Revolution in Urban Water: Options for Water Scarce Cities – Prof David Sedlak, University of California, Berkeley (Brisbane)
11–12 June	National	The CRCWSC Research Workshop, focus of the workshop was to commence discussions on the development of an impact framework for the CRCWSC
19 June	Asia	Presenting to KCID to secure additional research funding for integrated water management study (Kunshan, China)
23 June	Asia	CRCWSC seminar with Sichuan University (Chengdu) to promote CRCWSC and discuss potential research collaboration (China)
24 June	Eastern	Developing a Value Proposition for Brisbane City Council
25 June	Asia	CRCWSC seminar with Sun Yat-Sen University (Guangzhou) to promote CRCWSC and discuss potential research collaboration (China)


CRC for
Water Sensitive Cities

Appendix 3 – CRCWSC publications

Book Chapters

Kenway, S.J., Pamminger, F., Priestley, A., Wolff, G., Gardner, T., Hermanowicz, S., and Rosenblum, E. (2014). Urban Metabolism: A Way to Make Cities More Efficient? In Made in Australia: The future of Australian Cities, R. Weller and J. Bolleter (eds). UWA Press: Perth, pp. 247–248.

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de Haan F.J., Ferguson B.C., Deletic A., Brown R.R., (2013). A socio-technical model to explore urban water systems scenarios. Water Science and Technology. 68(3), pp. 714–721.

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Appendix 3 – CRCWSC publications - continued

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Cooperative Research Centre for Water Sensitive Cities

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

info@crcwsc.org.au

www.watersensitivecities.org.au