



CRC for  
Water Sensitive Cities



# Industry Impact of the CaWSC Research Program: insights from five case studies

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**Industry Impact of the CaWSC Research Program: insights from five case studies****Authors**

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## EXECUTIVE SUMMARY

The Cities as Water Supply Catchments (CaWSC) research program brought together lead researchers with the collective aim of understanding how cities can harness the potential of stormwater to ease long-term water shortages, and enhance their liveability by delivering improvements in urban microclimates, waterway health and urban landscaping. This report presents the results of a retrospective evaluation of the CaWSC program, focusing on assessing and characterising the impact pathways that have arisen as a result of the research-industry collaboration.

Five selected case studies, which reflected a change in policy and/or practice (at different scales), were explored for their perceived impacts resulting from the research-industry collaboration as identified by organisational representatives. The objectives of this evaluation were to:

- 1) identify how, and to what extent, the CaWSC research program and industry engagement led to impacts;
- 2) examine the factors critical to establishing and maintaining these impact pathways; and,
- 3) establish the roles and responsibilities of the researcher and industry partners in establishing and maintaining these pathways.

Between April and July 2014, 24 semi-structured qualitative interviews were undertaken with 22 individuals. All interviewees had participated in the CaWSC program as a representative from their organisation. The primary interview data were tested against extensive secondary documentation analysis (i.e. policy and strategic documents; management strategies etc.) to help verify and extend interview insights.

The case studies revealed a suite of common and context specific impacts depending on the nature of the collaboration. Overall, the impacts can be characterised as either tangible or process-related. It should be noted that most of the tangible outcomes could not have been generated if not for the important process-related outcomes.

The study identified complex and varied pathways to achieving impacts, which also underscored where different organisations were at with respect to embracing a transition in urban water policy and practices. The most recognised outcome across all five case-studies was the critical role of the CaWSC program in seeding and strengthening networks and relationships. These networks improved the accessibility of locally-relevant information; facilitated the sharing of knowledge and reciprocal support; created an opportunity to bring others along; and engendered a sense of 'peer pressure' to keep up with other progressive organisations. The evidence also revealed a widespread increase in individual and organisational knowledge and understanding, leading to the synthesis of knowledge to ensure this was relevant to their organisation, informing changes to local government policies, and helping to establish on-ground projects.

Such subtle but significant outcomes from the CaWSC research and research adoption activities that help to maximise research impact, are not conventionally captured in standard economic program evaluations, nor in traditional business case (value proposition) formats, as they are considered less quantifiable in dollar terms. Yet, the legacies of past research activities, such as through the former CRCs for Catchment Hydrology and Freshwater Ecology, continue to have an impact through continued social and institution capital building. This historical context of research-industry partnership has underpinned the success of the CaWSC program in building high-level industry receptivity to a change in practice in urban stormwater management, and for encouraging other industry participants (i.e. local governments, state agencies) to get involved. This is evidenced, for example, where building on the expertise developed over the last 15 years, lead researchers and practitioners in Victoria have engaged in a high-level, inter-organisational policy network, which has helped to influence the strategic policy space. It is reasonable to expect a similarly high level of impact of the CaWSC program in the years ahead.

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# 1 INTRODUCTION

The Cities as Water Supply Catchments (CaWSC) five-year research program began at Monash University in 2010, within the then Centre for Water Sensitive Cities (which is now Monash Water for Liveability Centre). Building on the foundational work of Monash University's Facility for Advancing Water Biofiltration and the National Urban Water Governance Program, this important inter-disciplinary research program brought together a diverse range of research leaders with the aim of understanding how cities can harness the potential of stormwater to ease long-term water shortages, and enhance their liveability by delivering improvements in urban microclimates, waterway health and urban landscaping. The early success of this program was the genesis to the successful bid by Monash University to establish the Cooperative Research Centre for Water Sensitive Cities, which began in July 2012.

The research program was configured with eight sub-projects (Figure 1). A critical component of the research design and program management of CaWSC was to engage and work with industry stakeholders to underpin a broad shift in the planning, design and on-ground practices related to urban stormwater management. This involved designing and undertaking a range of different mechanisms (e.g. workshops, seminars, reports) to support the dissemination of research insights and assist in the translation of knowledge into policy and practice change.

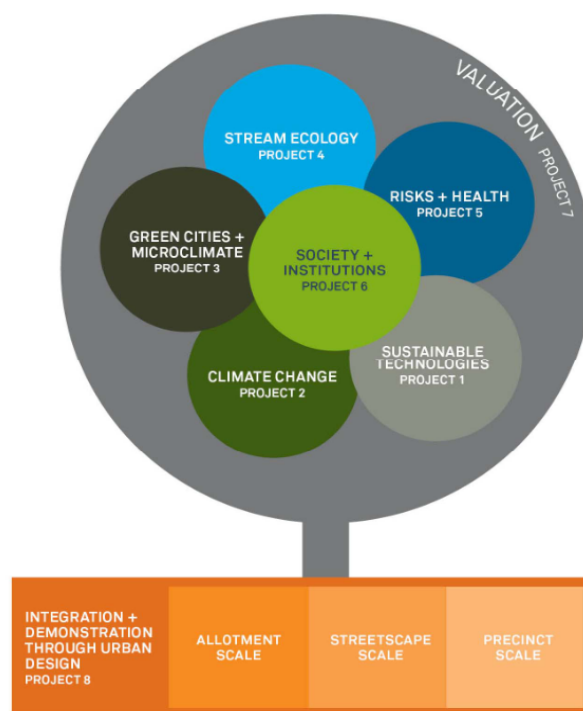
This report presents the results of a retrospective evaluation of the CaWSC research program, focusing on assessing and characterising the impact pathways that have arisen as a result of the research-industry collaboration. This evaluation involved examining five specifically selected case studies (Table 1) which reflect a change in policy and/or practice (at different scales) related to improved urban stormwater management. The objectives of this evaluation were to:

- 1) identify how, and to what extent, the CaWSC research program and industry engagement led to tangible impacts;
- 2) examine the factors critical to establishing and maintaining these impact pathways; and,
- 3) establish the roles and responsibilities of the researcher and industry partners in establishing and maintaining these pathways.

## 1.1 Revealing pathways to impact from research-industry collaboration

In an effort to increase research utilisation and overall impact, it is important to understand how knowledge exchange occurs (i.e. activities/processes/interactions) within the research-industry collaboration. Unpacking the key knowledge exchange mechanisms and pathways will provide insight into how best to support the uptake and replication of research insights to maximise impact in ongoing and future research-industry collaborations.

Innovation and sustainability transitions scholars emphasise that to influence, transform or replace a prevailing socio-technical regime, such as traditional stormwater management practices, actor-networks need to be nurtured, developed, adopted and empowered (Rollfs et al., 2014). While actor networks have several functions in building support for new socio-technical

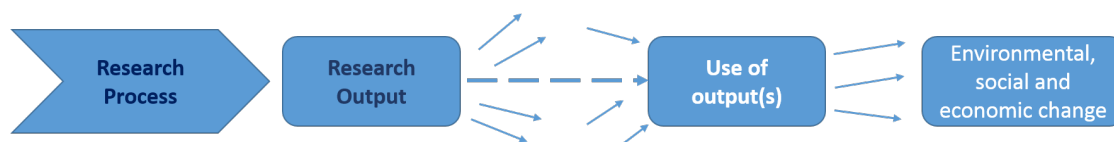


**Figure 1 Overview CaWSC Research Program**

practices, one of their main roles is facilitation of knowledge transfer and exchange. As a result, achieving impacts (i.e. adoption and/or transformation) is a result of interactive and socially-embedded process (e.g. Hall et al., 2003). This implies that creating change and generating impact is a complex process, involving a high degree of non-linearity for it involves interactions among and between many actors (individuals/ organisations).

Therefore, to better understand how research has generated impact, evaluation scholars suggest shifting the emphasis from an impact chain common in traditional technology transfer, towards examining multiple research impact pathways, see Figure 2 (Springer-Heinze et al., 2003). This is necessary for there is rarely a singular, linear chain towards achieving impact, but rather a number of pathways which co-evolve over time as learning increases and greater utilisation and adoption occur.

This learning and utilisation primarily happens among and between combinations of actors involved in the research, which highlights the importance of understanding the intermediary (institutional; organisational; individual) processes influencing change (Hall et al., 2003). Similar insights have been derived within agricultural studies and integrated natural resource management, whereby examining the social and organisational processes have been found to support the replication of technological practice, as opposed to the traditional, linear notion of technology transfer (Sayer and Campbell, 2001).



**Figure 2 Schematic Impact Pathway (Adapted from Springer-Heinze et al., 2003)**

### 1.1.1 Approach to impact analysis

Evaluating research impact requires looking beyond the macro-scale level of expected change, and requires engagement with the intermediary social and organisational processes undertaken by actor-networks, which can produce information relevant to the ongoing and future management of research programs and projects. Five case studies were specifically selected to highlight a suite of policy and practice impacts arising from the CaWSC research program. The impacts varied depending on the organisation and its context (i.e. historical engagement with alternative stormwater practices, and organisational receptivity to new water practices).

Between April and July 2014, 24 semi-structured qualitative interviews were undertaken with 22 individuals. All interviewees had participated in the CaWSC program as a representative from their organisation. The primary interview data were tested against extensive secondary documentation analysis (i.e. policy and strategic documents; management strategies etc.) to help verify and extend interview insights. Questions and the related data analysis focused on:

- (i) understanding the motivations behind the organisation engaging with the CaWSC research program;
- (ii) examining how the different stakeholders interacted with CaWSC researchers and the research insights; and,
- (iii) how the different stakeholders:
  - a. used the information generated from the CaWSC program;
  - b. their perceptions of the value of being associated with the CaWSC program; and,
  - c. their perceptions regarding tangible impacts arising from being involved in the CaWSC program.

**Table 1 Selected Industry Case Studies**

INDUSTRY CASE EXAMPLE	BRIEF DESCRIPTION & PURPOSE OF CASE
<b>Central West Councils Salinity and Water Quality Alliance</b>	A local alliance with representatives from 14 local rural councils in western NSW and the Central West Catchment Management Authority (now the Central West Local Land Services) working together to address salinity and water quality issues in the region. The local government organisations within this Alliance are primarily at the early stages of building momentum for a shift in water management practices.
<b>Warringah Council</b>	A metropolitan NSW local council new to research-industry collaborations and is a member of a larger consortium of local councils participating in the research program. This council has actively drawn in CaWSC researcher support at several stages.
<b>Marrickville Council</b> <i>EcoWest, demonstration project</i>	A metropolitan NSW local council with a long history of engagement in industry-research collaborations. This case examines the impacts arising from their engagement in delivering a demonstration project aligned with the CaWSC program, but also the benefits derived from participating in the broader program of research.
<b>VicUrban (now Places Victoria)</b> <i>Officer, greenfield demonstration project</i>	A State-owned land development agency in Victoria partnered with lead researchers (and associated stakeholders) to deliver a large-scale, greenfield demonstration project in line with the concepts promoted by the CaWSC research program.
<b>Victorian Strategic Policy Space</b>	Examines the influence of research undertaken by lead CaWSC researchers in shaping the strategic water policy arena in Victoria.

Data analysis involved reviewing interview transcripts and secondary data (i.e. policy and strategic documents) to identify common themes regarding the dominant CaWSC inputs and the mechanisms adopted by researchers and key industry collaborators to help achieve impact. Next involved identifying ‘nodes’, which may include events, factors, and activities that were internal or external to the organisation, and were considered critical to the successful utilisation and application of the research insights. These nodes help to connect the pathway(s) and help to identify the influence and dependency between these nodes, which can be regarded as the critical success factors in achieving the overall research impact. Drawing on this analysis, impact pathway maps and case study narratives were developed (see Section 3). To ensure interviewee confidentiality the raw data have been de-identified and whilst not presented in this report, other than interviewee quotes. For further information please contact the authors.

Given the complex system of integrated urban water cycle management and the varying levels of interactions among actors and strategic activities required for change/impact to occur, care has been taken in interpreting attribution of impact from research outputs. While identifying direct linear evidence remains challenging, this approach helps unravel the steps taken to generate a shift in practice across different organisations and reveals the influence and role the CaWSC research program played in achieving this.



## 2 CaWSC IMPACT PATHWAYS

The case studies have demonstrated a suite of common and context specific impacts depending on the nature of the collaborations (i.e. influencing strategic policy; demonstration projects; organisational policy and practice). Overall, the impacts can be characterised as either tangible or process-related. It should be noted that most of the tangible outcomes could not have been generated if not for the important process-related outcomes. This section describes the common insights derived from the five case studies as depicted in Figure 3. Following the logic of Figure 3, the process-related impacts are discussed, followed by the tangible impacts. Next, the roles of research and industry partners in generating these impacts are described, followed by a description regarding how the various CaWSC activities contributed to bringing about these impacts.

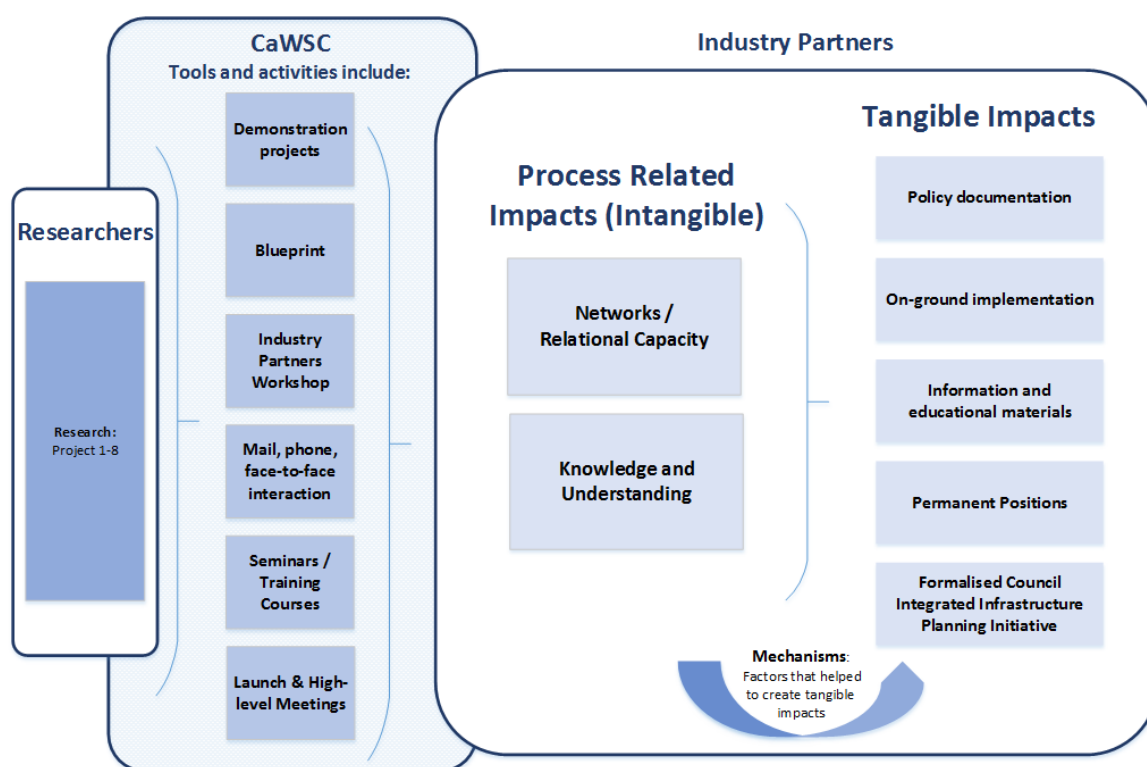


Figure 3 Generic CaWSC Impact Pathway Diagram

### 2.1 Process-related CaWSC Impacts

This sub-section describes the development of network, knowledge and changes in understanding that were generated through the CaWSC program. While separated in this section, these issues are highly interrelated as actor networks are considered vital for facilitation of knowledge transfer to generate impact in socio-technical systems.

#### 2.1.1 Development of networks and relational capacity

The most recognised outcome across all five case-studies was the critical role of CaWSC in seeding and strengthening networks and relationships. The collaborative platform provided by the CaWSC program opened up new channels and opportunities for networking within (intra-organisation) and between many organisations (inter-organisational). Over the years, these networks have begun to function in the area of water sensitive practices independent from the CaWSC. These networks improved the accessibility of locally-relevant information; they facilitated the sharing of knowledge and reciprocal support; they created an opportunity to bring

others along; they engendered a sense of 'peer pressure' to be keeping up with other progressive organisations; and, helped to build formal and informal relationships among peers. These relationships have facilitated the exchange of ideas, information, resources and equipment within these networks and beyond the CaWSC research program. For example, certain networks arranged capacity building activities, such as self-organised bus tours to visit local demonstrations of water sensitive technologies.

These interactive, collective processes, often referred to as social learning, support actors in developing shared meanings, values and understandings for new practice through interaction, which provides the basis for joint future action (Pahl-Wostl et al., 2007; Muro and Jeffrey, 2012). As such, social learning develops and/or strengthens relational capacities between social actors and their sociotechnical systems (Pahl-Wostl et al., 2008). The resulting change in relational capacity is considered a critical element in contributing to the transformation of prevailing socio-technical systems and, by doing so, overcoming system lock in (i.e. institutional and/or technical path dependency).

### 2.1.2 Knowledge and understanding

To achieve fundamental changes in the way urban communities address issues associated with stormwater management, the CaWSC program set out to develop the required capacity among its partners to do so. The case studies revealed there has been a widespread increase in individual and organisational knowledge and understanding regarding technical and non-technical aspects of alternative water practices, and the pathways required to get there (see Box 1 for examples). Interviewees indicated that the changes in understanding were a result of: i) being presented with new content in various forms; ii) being part of a demonstration project which generated extensive process learning; and, iii) being pro-active in taking the new content forward by trying to create an environment in which WSC principles can be applied in practice.

Collectively, this opened individuals and organisations to new ways of thinking and conceptualising the multi-functionality and associated benefits of adopting water sensitive practices. Individual changes in understanding also resulted in the synthesis of knowledge to develop a contextualised narrative relevant to their organisation (see case study descriptions). Furthermore, it has encouraged, empowered and provided confidence to individuals to act, bring others along and implement change.

Overall, changes in understanding among industry partners have helped to build an agenda for alternative water practice that is specific to where that organisation is positioned with respect to its sophistication regarding alternative stormwater

"... the other thing is the link between liveability and the water cycle, the Cities has helped crystallised that thinking."

"Well the capacity-building has been useful 'cause I've attended a number and [name] also attended a number of ones, so it's increased our knowledge not only of what's going on but also our ability to discuss what's going"

"So he was the one who delivered the Master Plan and he really took on-board pretty much everything that was, I think the research outcomes of the CaWSC and obviously our own initiatives that we wanted to incorporate in that Master Plan. So yeah, the program really assisted us in getting that as a core component".

"... they were great in that they were, opened our eyes up to what could be done and what has been done in other areas as well, such as daylighting creeks"

"It was probably a fairly new concept for us and for our Councils and for our organisation... a new concept in terms of thinking about our towns as real impacts on the environment at a bigger picture, but also being a place that can actually provide some benefit, not just the impact. And that was the whole idea, I guess, is about WSC, you can use the cities to be water supply catchments. And that was probably a big change in thinking, whereas towns had been just this sink for resources and then they're only output are bad things, like pollution and heat and stuff like that. We like the idea that they can be more than just a problem; they can be a bit of a solution. Big change for us in our area, probably a big change for catchment management authorities and their way of thinking."

"... but perhaps it is clearer understanding of the interpretation and application of regulation and guidelines relating to alternate water sources".

"And all of the learning around heat and how it operates in the urban environment. Yeah sure I've heard of the urban heat island effect... but the actual detail of how heat is retained in the landscape and the night-time temperatures and the impact of that on even tiny degree changes on human health and really quite extraordinary".

#### Box 1 Evidence of change in knowledge and understanding

management practices. The process of agenda building plays an important part in gaining the attention of key decision makers, and supports the new issue/practice in becoming legitimised within an organisation (Dutton 1997).

Other key in-depth process-learning emerged from undertaking the CaWSC demonstration projects. Within these projects, extensive knowledge was gained regarding how to deliver complex projects with multiple objectives and multiple stakeholders, while attempting to develop a common vision, share responsibility and risk profiles.

## 2.2 Tangible Impacts

CaWSC has supported the development of understandings and relationships that go beyond organisational agenda building. There is ample evidence of tangible impacts that are essential for embedding these new water practice ideologies and practices within formal organisational and institutional structures. One such impact is the development of **policy documentation** which reflects the narrative and principles of the CaWSC (see Box 2 for examples). In particular, the *Blueprint on Stormwater Management in a Water Sensitive City* (Wong et al., 2012) has framed the development of multiple policies, strategies, plans and guidelines in a number of local government organisations. These documents aim to facilitate implementation and practical application of water sensitive practice in both urban and regional town centres. At State level, lead researchers from CaWSC have influenced the strategic policy space (i.e. recent policy documents) through their involvement in a high-level, inter-organisational policy network. The researchers' contribution related to establishing the connection between urban water and liveability, and the important role urban water plays in addressing and/or mitigating urban heat island effects.

Involvement with researchers and the broader CaWSC research program has also led to embedding integrated water practices within organisations through the establishment of **permanent water-related staff positions**. Such positions are an indication of the value-add that councils are beginning to recognise in addressing water in alternative ways.

Furthermore, there are numerous **on-ground projects** that have been or are being implemented, and can be attributed to industry involvement with the CaWSC program (see Box 3 for examples). Some organisations are just starting to value 'stormwater as a resource' and have begun to trial new on-ground practice through local demonstration projects; examples such as vegetated treatment and harvesting systems can be especially found in regional town centres. Organisations that were already implementing water sensitive technologies have begun to recognise the further advantages of green infrastructure (such as micro-climate and associated improvements in liveability), which can benefit the wider community. Some of these on-ground projects have been used as 'demonstration sites' for other organisations which are interested in learning about the processes involved in achieving implementation.

Development of Climate Adaptation Plan (*Marrickville*)  
Marrickville Council Strategy for a Water Sensitive Community 2012 -2021 (*Marrickville*)  
Draft Water Management Policy (*Warringah*)  
Draft IWCM Strategic Plan (*Warringah*)  
Warringah's Design Guidelines Policy (*Warringah*)  
Dee Why Masterplan (*Warringah*)  
Environmental Sustainability Strategy (*Warringah*)  
Stormwater to Smartwater Guidelines (policy and technical information) (*Alliance*)  
Sustainable Development Management Policy for Council Development - Water Conservation and Landscaping Checklist (*Dubbo*)  
Future residential "Eco-Estate" required to have WSUD features (*Parkes*)  
Living Victoria, Living Melbourne Roadmap (*Victoria*)

### Box 2 Example Policy Documents

Cromer Park - sporting field stormwater harvesting, reuse (*Warringah*)  
 Middle Creek Reserve, Narrabeen (bioretention system) (*Warringah*)  
 Collaroy Basin Roads Upgrade - 10 raingardens (*Warringah*)  
 Richmond Avenue, bio retention system (*Warringah*)  
 Dalton St Rain garden, *Parkes*  
 Adventure Playground, Hope Street, *Bathurst*  
 Theatre & Convention Centre rain garden, *Dubbo*  
 Sporting fields stormwater harvesting, *Dubbo*  
 Orange Airport Rain gardens, *Orange*

### Box 3 Example on-ground projects

environmental and social outcomes. This initiative reflects the integrated nature of planning, designing and implementing as advocated in the CaWSC. While engagement with researchers and the wider CaWSC program has not been the only driver for this initiative to materialise, it has been a major one.

Research insights and recommendations from the CaWSC program have also been translated into **educational material and events** across a number of local government organisations. This information serves to educate and engage local communities, and thus contributes to the development of water sensitive communities.

One of the CaWSC partner organisations has embarked on a **council-wide approach (connecting MARRICKVILLE)** that demonstrates how infrastructure can deliver on multiple objectives, and how collaborative planning and design can achieve significant

## 2.3 Roles of Industry and Research Partners in achieving impacts

Creating collaborative relationships between researchers and industry was key to facilitating the transfer of knowledge, and creation of networks to support a shift in policy and practice at varying scales. Formal engagement and involvement of industry partners was facilitated through a range of different activities detailed in the next section. While these activities were important, many of the impacts were often brought about as the result of industry partners who were very active in taking new understandings forward, and purposefully engaging researchers beyond formal channels of engagement. The overarching roles industry and research partners adopted in generating influence and for delivering impacts related to improved urban water practices in the selected case studies are outlined below. As depicted in Figure 4 the roles of industry and research partners require a large degree of interaction.

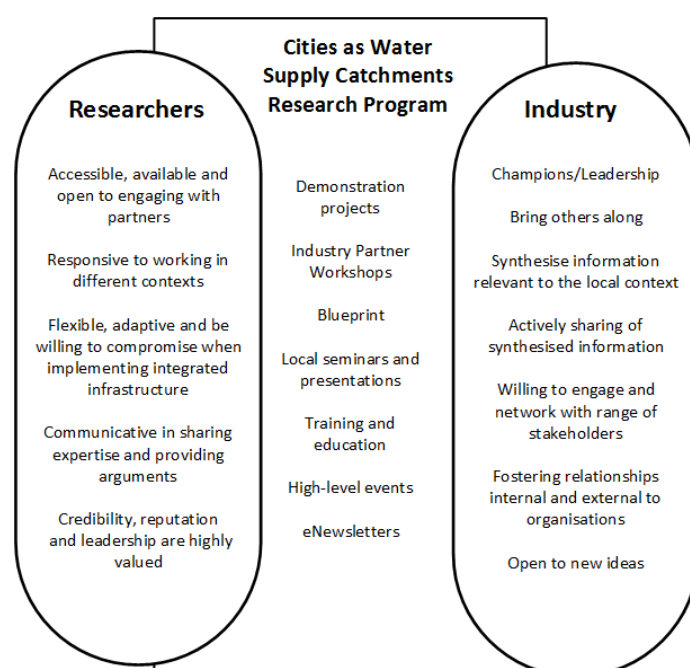


Figure 4 Roles of Research and Industry Partners in Achieving Impact



### 2.3.1 Industry partners

- Individuals representing their organisation demonstrated motivation and willingness to champion change within their organisation by:
  - (i) encouraging key internal colleagues to enrol and actively participate in the CaWSC research program activities;
  - (ii) advocating for a change in internal organisational practices by drawing on the credible evidence produced by researchers (i.e. Blueprint); and,
  - (iii) synthesising and tailoring information to make it relevant to the local context and their organisation.
- At a local government scale, organisational representatives actively engaged with their local communities to raise awareness of various on-ground activities and highlighting their involvement in CaWSC research program.
- Industry partners fostered linkages within and external to their organisation to develop, expand and/or strengthen their associated networks in support of improved urban stormwater management.

### 2.3.2 Research partners

The history, credibility and reputation of lead researchers was considered an important element in encouraging industry partners to join, participate and assist in delivering CaWSC impacts. While this cannot be classified as a 'role', it was considered to be an important quality of lead researchers by industry partners. Beyond this, specific research roles included:

- Willingness to and openness in engaging with industry partners.
- Being responsive (sympathetic) to different contexts (e.g. geographic, organisational, and political).
- Flexible and adaptable when working with on-ground projects.
- Being accessible, available and visible to industry partners. For example, particular researchers were contactable, responsive and willing to travel/visit (where appropriate) with different industry partners, to provide site advice, expertise and research seminars.
- Providing good communication through clear explanations and sound arguments.
- Draw on the credibility of lead researchers to engage with the strategic, executive and political level of decision-making to facilitate change.
- An important design feature of CaWSC research program was the dedicated program focused on Adoption and Demonstration. Lead actors within this program provided an intermediary role between researchers and industry partners which was well-received.

## 2.4 CaWSC activities and their role in generating impact

To deliver on its vision, the CaWSC research program aspired to share key findings and research outcomes through: provision of timely and relevant information; the translation and dissemination of research outputs; opportunities for hands-on learning; and, promotion of the overall program to the wider community. The program also intended to facilitate information and knowledge exchange between the partners and other potential users of the strategies and technologies developed. This section reflects on the suite of activities, tools and mechanisms that were designed and implemented to support this process of knowledge sharing.

### 2.4.1 Industry partner workshops

Industry partners associated significant benefits with the industry partner workshops with regard to developing new insights and understanding. Of note, the workshops appear to have gone beyond their original purpose of being a collaborative platform for dissemination of new research, discussion of findings, and sharing of lessons learnt. The data revealed how the industry partner

workshops were of particular value in facilitating and strengthening networks and relationships. This has seeded new project collaborations and has perceived benefits beyond the CaWSC. Interviewees also indicated that the quality and sophistication of the workshops had improved considerably over the past years.

#### **2.4.2 Blueprint**

The Blueprint is regarded as a tangible product that is easy to access, and provides useful information to draw upon. Industry partners revealed that its language is engaging and that it is an easy instrument to distribute within the organisation. The Blueprint has been of critical importance in helping frame many policy documents that have been recently (re)developed by industry partners.

#### **2.4.3 Seminars and training events**

Seminars and training were valued for their practical application and contributed to the development and deepening of knowledge, skills and networks. Attendance at these events, and the industry partner workshops, have helped to improve the capacity of individuals when speaking on the topic of improved stormwater management practices. The training events provided learning opportunities for industry partners and other water industry professionals to gain access to and help in applying research outcomes. As these events were often held locally, they were also regarded as a useful activity to help enrol other colleagues in learning about supporting a change in stormwater management practices.

#### **2.4.4 High-level events**

A number of high-level events were designed around major milestones or significant achievements throughout CaWSC. For example: to launch the program, to promote achievements and research outcomes, to introduce the program to a new audience, and to engage with potential funding partners or research collaborators. These high-profile events were considered extremely important for local government partners, who would often invite council executives and/or elected council members. The presentations by lead researchers were important in helping secure high-level buy-in, and contributed towards agenda building at the senior/executive level, which in turn helps to create an enabling environment for alternative practice to occur. In addition, high-level strategic meetings were also considered important, whereby the availability and credibility of specific lead CaWSC researchers assisted in engaging and influencing executive and strategic decision-makers (i.e. influencing the strategic policy arena and achieving on-ground impacts in a demonstration project)

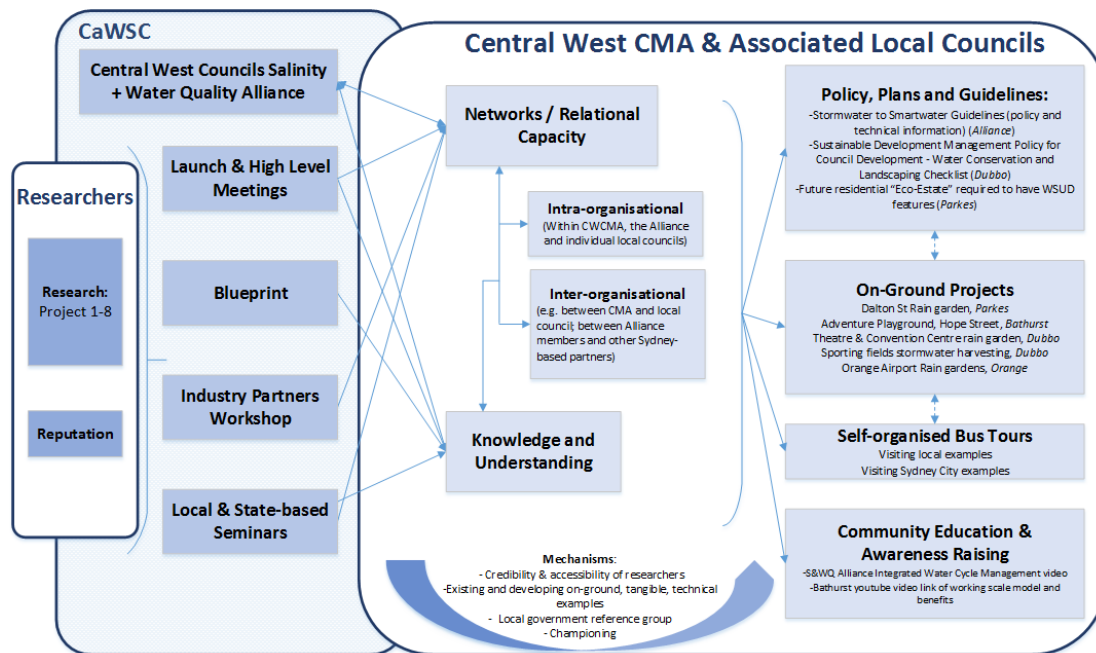
#### **2.4.5 eNewsletter**

E-newsletters outlining the latest news on CaWSC activities were identified by some as a mechanism to stay connected to the CaWSC program.

### 3 CASE STUDY IMPACT PATHWAYS

The following presents a detailed analysis of five case studies outlining the different impact pathways the various research-industry collaborations followed. A map of the impact pathways is presented (Figure 5 - Figure 9) and is the result of condensing a significant volume of rich qualitative (interview and secondary) data regarding the key processes and mechanisms for generating the resultant impacts, as identified by both industry partners and researchers. Accompanying each map is a short analytical, narrative description which provides further details regarding the connections displayed. Collectively, the following impact pathways reveal the important role research-industry collaboration plays in assisting the synthesis and translation of research insights into practical and policy-based change, and that through active involvement in the CaWSC research program, important knowledge networks were built, which has facilitated further dissemination of the Program's insights.

### 3.1 Central West Councils Salinity and Water Quality Alliance



**Figure 5 Central West Councils Salinity and Water Quality Alliance Impact Pathway**

The Central West Councils Salinity and Water Quality Alliance (which has representatives from 14 local councils in the region and the then, Central West Catchment Management Authority) was made aware of the emerging research program through a lead coordinator's existing industry networks in stormwater management. The Alliance joined the CaWSC research program as it was timely given existing local momentum for improving water quality management in the region. In addition, the credibility and reputation of a lead CaWSC researcher, who met with and presented to the Alliance, was also considered critical in helping cement the Alliance's five-year up front relationship with the research program.

Industry representatives indicated they attended and derived great value from all the industry Partner Workshops and Sydney-based events (i.e. launch of the Program and local seminars). The CaWSC events, alongside access to the Blueprint, proved vital for exposure to current knowledge and understanding which informed:

- the synthesis and repackaging of research insights by Alliance representatives to ensure relevancy to the local region;
- new ways of thinking and doing within the Central West Catchment Management Authority (now Central West Local Land Services), the Salinity and Water Quality Alliance and many of the associated local councils (i.e. a shift in thinking from stormwater as waste to resource, and the urban heat cooling effects of water sensitive urban design);
- the development and maintenance of multi-disciplinary collaborations within and outside the organisation (intra- and inter-organisational networks);
- building the capacity of local government officers to generate change within their organisation, by providing technical and non-technical content to draw from; and,
- the evidence for building a suitable business case within the different local Councils to encourage a shift in practice.

The Industry Partner Workshops were cited as being *"just as beneficial to us as being in the Cities project."* This statement reflects the positive outcomes associated with the formation of important inter-organisational networks within NSW as a result of participating in the CaWSC



workshops (see also Warringah case study). Indeed, through the creation of an informal, inter-organisational network, Alliance representatives were able to draw on their Sydney-based peers to arrange a bus tour of leading examples of on-ground improved stormwater practices. This bus tour was designed so individuals of varying seniority from across different local governments and different departments (i.e. planners, engineers, environment officers) could hear not only the positive outcomes, but also how to overcome the challenging aspects of the project(s). According to one interviewee – this provided an opportunity to reinforce *“this is what everyone’s doing, that this is best management practice.”*

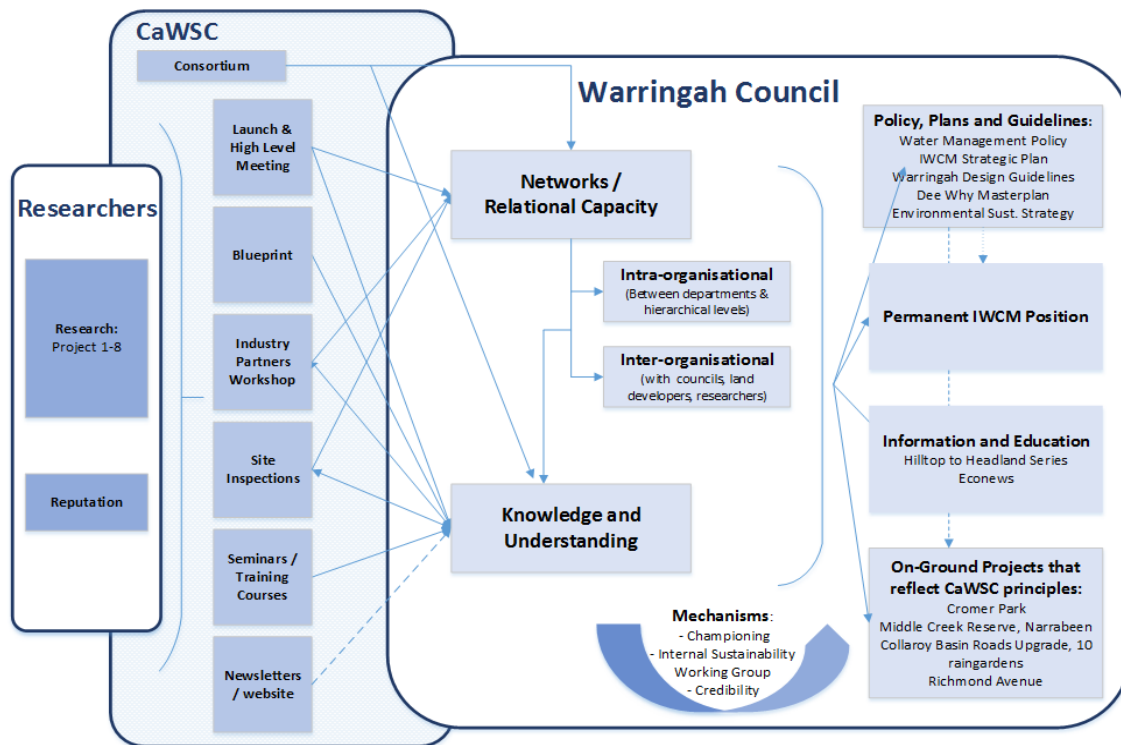
The building of informal networks also led to (i) inter-state and inter-organisational knowledge sharing; (ii) inter-organisational collaboration whereby Alliance members are working with water utilities to collectively meet regional water quality targets; and, (iii) intra-organisational support for the implementation of improved urban stormwater practices.

For many of the Alliance local councils, they are in the early stages of a transition from traditional stormwater practices to incorporating water sensitive urban design; thus, awareness raising and capacity building are crucial. Importantly, a number of on-ground rain gardens have been implemented over the last three years, providing important intra-organisational lessons regarding planning, design and construction, which have also been shared amongst Alliance partners. Of note, the industry representatives acknowledge that even though implementing the rain gardens may have gone *“a bit wrong”*, they accept this is part of the learning experience. In addition, the Central Tablelands Local Land Services is attempting to build greater community awareness and understanding through an [online explanatory video](#) detailing the important role of a recently [constructed vegetated biofiltration](#) system in supporting river health and improving drinking water quality in Bathurst.

A further impact arising from improved knowledge and understanding within and amongst local councils, and the creation of the intra- and inter-organisational networks, has been a shift in a number of local government strategic and policy documents. Within specific local councils (i.e. Dubbo, Parkes and Orange) there are now documents which explicitly require water sensitive urban design to be considered and, where appropriate, incorporated into (re)developments. For example, the *Sustainable Development Management Policy for Council Developments* in Dubbo includes a ‘Water Conservation and Landscaping Checklist’ which requires consideration be given to the need for rainwater tanks, the incorporation of water sensitive urban design, permeable pavements and planting to reduce solar radiation. Also, the Catchment Management Authority produced a *Resource Efficiency Toolkit*, which incorporates a two-page spread on the important role of and benefits of adopting water sensitive urban design for small to medium businesses.

The Alliance’s involvement in the CaWSC research program has been primarily focused on providing the evidence and rationale for making a change in stormwater management practices. As a result, the research program has generated localised impacts through upskilling local council representatives and encouraging a shift in internal policy and practice regarding improving stormwater management and town liveability. Throughout this time period there has been significant effort directed towards relationship building, building the agenda for change and capacity building with relevant stakeholders. Cumulatively, these efforts are beginning to drive change in policies, practices and operations within the rural local councils.

### 3.2 Warringah Council



**Figure 6 Warringah Council Impact Pathway**

Warringah Council joined the CaWSC program as a member of a NSW local government consortium of councils. This consortium formed as a number of local councils ( $n=5$ ) were keen to become involved with the new research program, but felt that raising the financial resources required to become an independent member would be challenging. Given the collective interest, and with support from the then director of the Sydney-based capacity building program for water sensitive urban design (WSUD.org) which was co-located with the former Sydney Metropolitan Catchment Management Authority, the consortium concept was put forward and agreed to by all parties. Although many of the individuals from the different Councils were already engaged in efforts to incorporate improved urban stormwater practices, working collectively in a consortium was perceived as helping defray intra-organisational concerns regarding perceived financial risks and the uncertainty of being involved in a new research program. The consortium, while formalised through their financial contribution to the CaWSC program, remains relatively informal. However, this inter-organisational, informal network, according to one interviewee, was recognised as being *'the least tangible [impact] but probably equally as important as some of the others [impacts]'*. The consortium has proved very successful in building good working relationships; sharing knowledge and resources (i.e. equipment); and, providing a platform for raising questions, discussing project-based challenges and identified regional stormwater priorities. As one interviewee suggested, the consortium has become more than just an access point to new research insights, it has created a *"community of practice."*

Similarly, intra-organisational relationships have developed, stimulated by the involvement of key staff in the CaWSC industry partner workshops. For example, through the motivation, and leadership of specific Council staff who attended the CaWSC workshops, other key actors from different departments and from the executive level within Council (i.e. strategic planners, engineers and the mayor) have been encouraged to attend industry partner workshops and other key local CaWSC program events (i.e. training courses). Bringing other stakeholders along

has consequently enrolled these individuals in the value and credibility of the CaWSC research program, and improved internal knowledge and understanding about improved stormwater management practices and their associated benefits. According to interviewees, this has subsequently led to internal staffing, policy and guideline changes, and on-ground influences.

Within Warringah Council, an established internal sustainability working group, which works across organisational departments and from executive to junior levels, was a key internal mechanism for re-presenting and synthesising the CaWSC material. This helped build internal awareness and understanding about technical components of improved urban water management, but also the need for multi-disciplinary collaborations and the importance having evidence in building momentum for change. The awareness raising also led to individuals engaging in CaWSC training courses related to improved stormwater practices.

Interviewees also identified that information presented at industry partner workshops and made available in the different Blueprints, had informed a number of shifts in internal policy and strategic guidance documents. For example, *Warringah Design Guidelines Policy* (Warringah Council, 2013) explicitly incorporates WSUD elements (biofiltration systems, permeable pavements) recognising that *“treatments in the roadway should be implemented wherever it is deemed appropriate to enhance place making, liveability, aesthetics, urban heat island mitigation, natural corridors, in addition to improving eco-system services.”* (Warringah Council, 2013 p.26). The *Dee Why Town Centre Master Plan* has also embedded WSUD principles, for which the Master Plan has received recognition and won industry awards. The process of getting to this stage is described by one interviewee below:

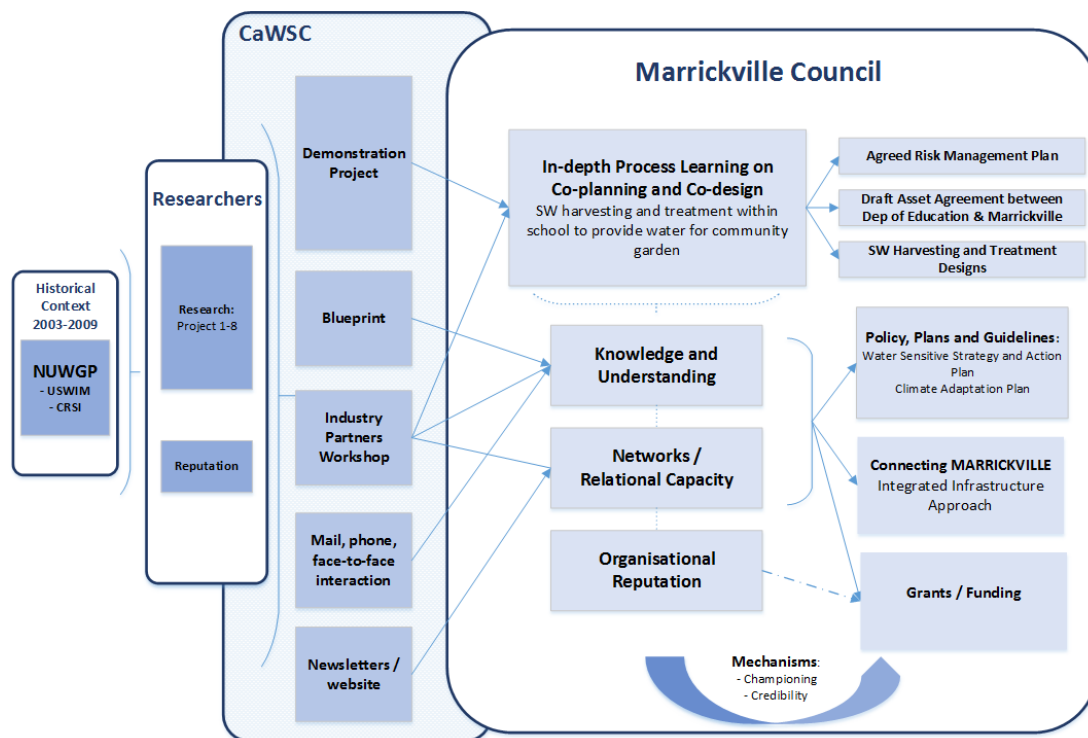
*“...so because of [their] exposure to the research group and plus working with them, talking with them about our work on the strategic plan, there was quite a degree of buy-in from [strategic planner] ... But again having the partnership and us being able to show this is what we’re trying to do, this is our vision for how things should be done, water sensitive urban design has been heavily incorporated into the Dee Why Town Centre Master Plan and the WSUD in particular has been noted as really commendable within a couple of the awards that the Town Centre Master Plan has won.”*

The *Environmental Sustainability Strategy*; the *draft Water Management Policy* and the internal *Integrated Water Cycle Management Plan* all incorporate the importance of addressing urban stormwater management practices for improved urban liveability. Indeed, interviewees highlighted that by developing and applying the internal *Integrated Water Cycle Management Plan*, this helped to build a strong evidence-based regarding how improved water management could value-add to activities across the Council, which consequently led to the contract position becoming a permanent position.

Warringah Council has a number of on-ground projects which reflect the water sensitive city principles of improved urban stormwater management, whereby stormwater is harvested, treated and reused. This is evidenced in the Comer Park sporting field redevelopment. In addition, there are a growing number of on-ground projects (i.e. rain gardens) which aim to improve urban stormwater quality and waterway health. These projects are showcased, alongside the importance of improving stormwater quality through community education and information opportunities, such as the ‘Hilltop to Headland Series’ and in a local newsletter focused on environmental issues.

Overall, reflecting on how the research-industry partnership with the CaWSC program has influenced Council activities, interviewees recognised the increased sophistication of their knowledge and understanding about incorporating and delivering water sensitive urban design, and that their involvement helped to establish important formal and informal, intra- and inter-organisational networks. Cumulatively, this has underscored the ongoing relationship and agenda building activities, as well as supporting considerable internal organisational policy and practice changes.

### 3.3 Marrickville Council



**Figure 7 Marrickville Council Impact Pathway**

Marrickville Council has a long history of collaboration with researchers. Starting in 2003 and borne out of work with one of the lead researchers in the CaWSC team, this cooperation has led to a number of large stormwater related programs, such as the Urban Stormwater Integrated Management project and the Cooks River Sustainability Initiative. This collaboration also enabled, among other things, the establishment of: i) a funded water and catchments team; ii) sub-catchment planning processes; and iii) numerous on-ground water sensitive technologies. Collectively, this developed the capacity, relationships and organisational receptivity for Marrickville to become a full, independent financial CaWSC partner (as compared to joining the NSW Local Government Consortium of Councils - see Warringah case study).

As part of the CaWSC research program, Marrickville hosted a demonstration project entitled 'Marrickville West Eco Water Garden'. This demonstration project was about co-governance of a small-scale stormwater treatment and harvesting scheme located within a primary school, and about providing water for a community garden, also located on the school grounds. While technologically straightforward, the demonstration can be regarded as highly innovative and complex as a variety of stakeholders share responsibility and risk associated with the project. So far, the primary impact associated with this demonstration relates to learning about undertaking a co-planning and co-design process. Throughout the project risk and risk management issues relating to water quality surfaced. Researchers' involvement has been fundamental to "*rescue*" the project. By providing sound arguments and clear explanations regarding the project's risk profile, the concerns held by the NSW Department of Health were allayed. Overall, the project is thought to have provided a clearer understanding of the interpretation and application of regulation and guidelines relating to alternate water sources in NSW. Additionally, the project has revealed ambiguity around council assets being placed on state government land. This complexity is highlighted as Marrickville Council and Marrickville West Public School seek departmental sign off for an agreement for on-going collaboration and management for the



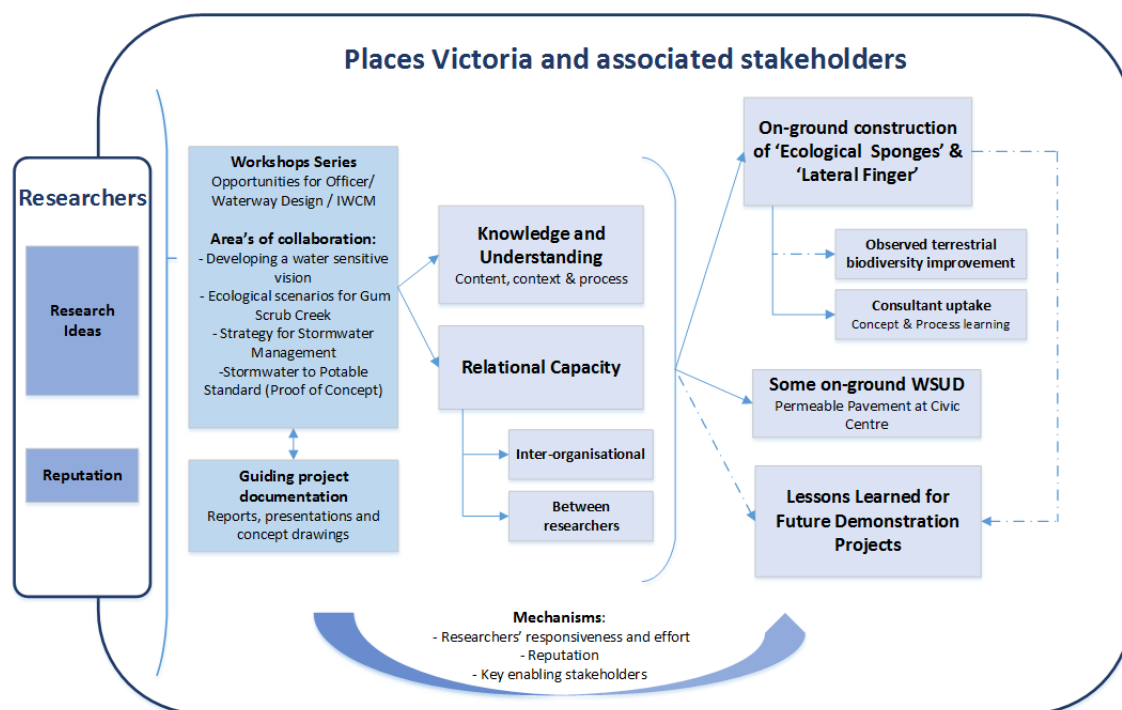
shared use of space between Marrickville Council and the Department of Education and Communities. While the scheme is not yet operational, the project process is providing valuable insights into what the CaWSC (and now the CRCWSC) is seeking to achieve as a water sensitive city. In particular, the need for shared agreements and shared risk around assets, as this is currently not core business of local government and other water sector organisations. Internal champions with determination and vision were recognised as critical in maintaining project momentum and keeping the process true to its original intentions.

Beyond undertaking the demonstration project, interviewees also indicated that their involvement in the CaWSC research program has impacted council practice. While historical collaboration already profoundly influenced Marrickville's operations, CaWSC industry partner workshops, alongside the Blueprint, newsletters and direct interaction with researchers, have further developed and strengthened knowledge and understanding of stormwater, green infrastructure, its multi-functional benefits and governance. CaWSC has provided *"little eye-opening moments of where you could see how that new field of work was going to be relevant to what we are doing."* New understandings obtained through the demonstration project and participation in the overall CaWSC program have led to a sophistication in the narrative around stormwater, which has been translated into the *Marrickville Council Strategy for a Water Sensitive Community 2012 -2021*. The language and aspirations of this strategy incorporates WSC underpinnings, quotes the Blueprint, and reflect inputs that are a direct result of collaboration between the council and researchers. Marrickville Council developed this strategy internally and individuals within the CaWSC team had the opportunity to provide feedback. Councillors recognised that the strategy was a very meaningful outcome for Marrickville: *"the Councillors were thrilled about the strategy. They could recognise that it was built on a long history of research, on good evidence, it was developed in-house which was what they were most thrilled about that we were using local knowledge, local information to develop our own strategy."* As many of Marrickville's strategies are developed by external consultants, and contain information that is not always locally specific or relevant, this internal capacity was considered an important achievement.

Furthermore, an ongoing relationship with researchers has been one of the drivers for the Connecting MARRICKVILLE initiative. This initiative introduced a council-wide approach that demonstrates how infrastructure can deliver on multiple objectives, and how collaborative planning and design can achieve significant environmental and social outcomes. This initiative reflects the integrated nature of infrastructure and connects it to place and community as advocated in the CaWSC. The demonstration project has been, on a micro-level, informing and providing council experience with the processes and activities necessary for implementing such an integrated approach.

Council interviewees indicated that ongoing collaboration with the CaWSC research program and its researchers has helped to foster their organisational reputation as a leader in urban stormwater management practices. This is considered important to Marrickville, whereby their success in sub-catchment planning has contributed to grant-funding successes. In addition, the CaWSC research program further enhanced their individual confidence with regard to decision-making, and provided the motivation to keep going even when the organisational environment challenges alternative water management ideas. Also interviewees identified researcher credibility as very important to help enrol others in the organisation.

### 3.4 Places Victoria and associated stakeholders



**Figure 8 Places Victoria impact pathway**

Places Victoria's<sup>1</sup> Officer Town Centre project was selected as a CaWSC program's precinct scale demonstration project. The Officer Town Centre (Officer) was part of a 340ha greenfield development site, located 50 kilometres south-east of central Melbourne. 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 Officer development was one of 16 international projects selected to be part of the Clinton Climate Initiative. Innovative stormwater management was seen as having the potential to support: i) Places Victoria's vision and aspirations for Officer, and ii) a precinct transition to a water sensitive city. The demonstration project was identified through political and high-level agency representative's connections and relationships. The launch of the Officer project coincided with the CaWSC program launch in February 2010. At the time, the project was politically supported.

The project started out with a visioning workshop with Places Victoria and a number of their stakeholders, including South East Water, Melbourne Water, Cardinia Council, and their consultants to explore water sensitive opportunities for Officer. Following this, the potential for research input was identified and four areas of collaboration were established that contributed to the Officer Master planning and design process. These areas of collaboration were to develop:

1. a water sensitive vision for Officer;
2. ecological scenarios for Gum Scrub Creek;
3. a strategy for stormwater management for Officer; and
4. a business case for stormwater to be treated to potable standard.

As a result, inputs were made in numerous workshops to support these activities, and a series of outputs were developed by the researchers, including the Gum Scrub Creek Scenarios report, an overview concept document for ecological sponges along the Gum Scrub Creek corridor, the

<sup>1</sup> Previously VicUrban

Stormwater Strategies for Officer report, and a draft report on Storm Water to Potable Standard (based on the Victorian Department of Treasury and Finance Investment Management Standard) and a series of presentations and concept sketches.

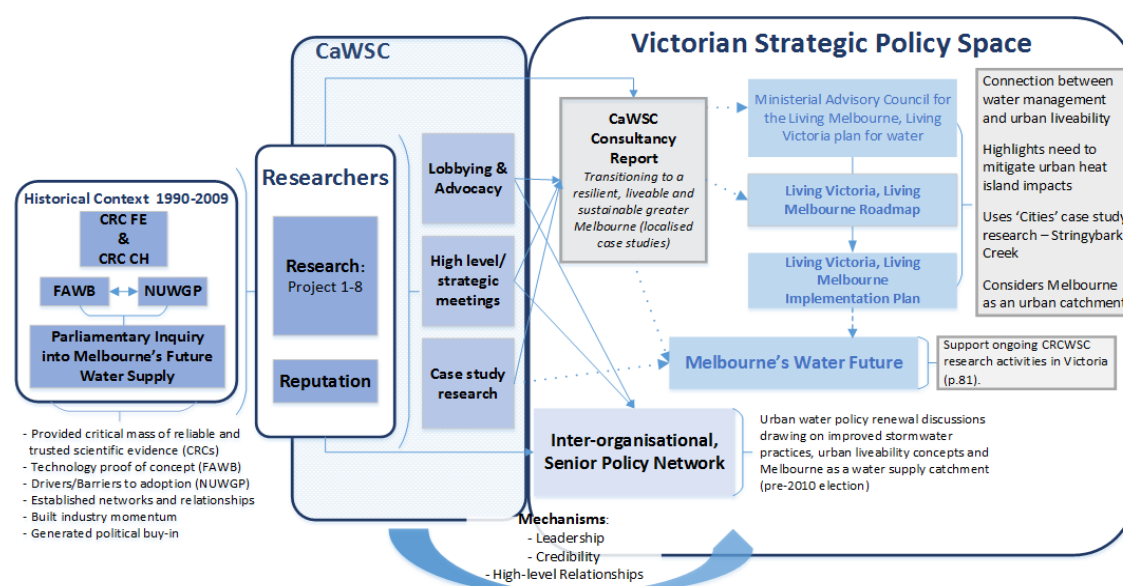
While there was initial alignment between Places Victoria and the CaWSC program, this diminished over time, reflecting a shift in the political landscape and organisational priorities. The availability of recycled wastewater, with the site being within a mandated third-pipe area, meant there was no shortage of water sources to meet the projected water demands. Collectively, this required the researchers to adapt to the context and be flexible to what could be delivered within the demonstration project. Therefore, rather than a water sensitive precinct, the project delivered elements of a water sensitive city – riparian sponges and a lateral finger which contribute to improving the ecological health of Gum Scrub Creek. The limited spatial application of the riparian sponges has meant that no measurable impact on the ecological health of the waterway is likely to be observed. Nevertheless, the project has provided tangible demonstration of what would otherwise have remained an abstract concept to many within the urban water sector. At one point in time incorporation of the ecological sponges may not have occurred. Reputation of CaWSC leaders and good standing with stakeholders overcame this issue. Beyond potential water quality improvements, the project is likely to deliver amenity benefits and terrestrial bio-diversity improvements (first improvements already observed). In other areas of the Officer development there has also been implementation of water sensitive urban design features (i.e. permeable pavement at the Civic Centre). Ongoing and future development with regards to water sensitive technologies remains unclear due to the ongoing institutional challenges around the Officer precinct.

While the demonstration project may not have lived up to the original expectations, the process of engaging with a large variety of stakeholders with varying degrees of commitment and value towards water sensitive principles has resulted in a multitude of process learnings. As this was the first time that the majority of the projects within CaWSC got to work together to synthesise their learnings and to integrate their work into a tangible outcome, researchers learned how to incorporate and adjust their respective solutions in a real-life project: *“It did pull the research team together much better... The other thing that perhaps is intangible is actually the realisation by some researchers that for the ideas to be implemented they do need to make compromises, they do need to respect that there is always competition for the space, in terms of how the space is to be utilised to reflect certain idea.”* The project also facilitated the development of relationships between a number of project stakeholders that were of value within and beyond the demonstration project.

CaWSC involvement in the master planning and design processes for Officer has highlighted a number of potentially important lessons for the success of future science/industry collaboration in demonstration projects. These lessons include:

- Early involvement of researchers in planning processes is crucial.
- Rules of engagement that explicitly state the relationship between researchers and consultants must be developed in very early stages of the project.
- Risks and benefits of research innovation must be explored, articulated and understood by all stakeholders.
- Researchers must acknowledge the context, history and potential limitations of the site and other stakeholders.
- Social innovation is required alongside technical innovation.
- Intermediaries with skills to translate research, deliver projects and connect to both scientists and consultants is key to deliver outcomes
- High transactions costs are to be expected in demonstration projects, where previously untried or untested concepts are being implemented.

### 3.5 Victorian Strategic Policy Space



**Figure 9 Victorian strategic policy influences**

To establish the extent to which lead researchers have contributed to influencing the strategic Victorian policy space requires acknowledging the foundational research programs which have underpinned the design and development of the CaWSC research program. Research programs such as the CRC for Catchment Hydrology (1992-1999 & 1999-2005), the CRC for Freshwater Ecology (1993-1999 & 1999-2005), the Facility for Advancing Water Biofiltration (2005-2009), and the National Urban Water Governance Program (2005-2012) all played an important role in providing trusted scientific evidence and helped to seed important long-held research-industry collaborations. This historical research context has been critical in building high-level industry receptivity to a change in practice, particularly with Melbourne Water, a key industry partner, who invested in many of these research programs and provided significant funds supporting the dedicated capacity building program, Clearwater, during this time. Such collaborations influenced change through: an improved understanding of alternative stormwater management practices; achieving 'proof of concept' of alternative technologies (e.g. biofiltration systems); providing on-ground evidence; and, an understanding regarding the governance challenges in establishing new practices. This significant body of work helped establish the credibility, reputation and leadership of key researchers who were instrumental in forming the CaWSC research program, and also contributed towards building industry momentum for a shift in stormwater management practices.

The credibility and leadership of specific researchers played an important role in informing and supporting the Parliamentary Inquiry into Melbourne's Future Water Supply. Lead researchers provided a submission, and subsequent presentation, to the Parliamentary Inquiry which showcased the breadth of evidence regarding alternative practices and helped to shape the narrative of improved stormwater practices beyond a focus on waterway health, towards an opportunity to also improve supply security. Additionally, a lead CaWSC researcher provided expert advice through their role as lead 'Technical Advisor' to the Parliamentary committee. The involvement of lead researchers in this Parliamentary process generated significant political, bi-partisan interest regarding improved urban water management practices, in particular the role of alternative stormwater practices.



Building on the growing political interest and momentum within the strategic policy space for change, a high-level, inter-organisational network of State-based urban water organisations was formed and tasked with developing a new Victorian urban water management policy which would account for stormwater harvesting and its broader environmental, social and economic benefits within the framework of integrated water cycle management. Key CaWSC researchers participated in these discussions and provided scientific evidence and advice regarding how to frame new urban water policies and pathways forward. These high-level meetings and connections led to securing the support of the then Water Minister, who helped to formally launch the CaWSC research program in February 2010.

Concurrent to this, and in the lead up to the November 2010 Victorian State election, key CaWSC researchers also engaged with the then opposition to present their research insights. Drawing on the insights arising from the Parliamentary inquiry and lobbying activities of key actors, the Coalition released their water policy platform which included a commitment to develop the *Living Melbourne, Living Victoria* plan for more liveable cities focused around water. Drawing on language and narrative that the CaWSC used to promote its research program, there is a connection (link) to the urban heat island and cooling effects of WSUD mentioned (P3: Green Cities and Microclimate). For example,

*Under Living Victoria, the urban heat island effect will reduce through the cooling effects of water sensitive urban design... The heat island effect is where cities have higher temperatures compared to non-urban areas and is brought about by buildings and road materials like concrete capturing and storing more heat during the day than rural areas.* [Liberal National Coalition Water Policy, pg. 9]

Following their election to government, the Coalition convened a Ministerial Advisory Council for Living Victoria which was to produce a roadmap for its new urban water strategy, *Living Melbourne, Living Victoria*. The Council commissioned four foundational reports in the field of urban water management to provide insights regarding how to move ahead. One of these four reports was produced by lead researchers working in the Centre for Water Sensitive Cities at Monash University, where the CaWSC was located. The report, entitled *Transitioning to a resilient, liveable, and sustainable greater Melbourne (localised case studies)* (Wong et al., 2011) provided case study information regarding how integrated urban water management principles are being incorporated and could be extended within existing and emerging urban (re)developments. While this report was an important contribution it should be noted that this was one of a number of other critical (scientific) influences in the urban water policy space at the time.

Direct attribution from CaWSC research in the strategic policy arena is challenging given the significant historical body of research produced, and the build-up of tacit knowledge by lead researchers and Victorian-based industry partners prior to the CaWSC program. This context contributed towards building the required industry momentum for change. Nevertheless, interviewees indicated that the CaWSC research program did exert some influence within this policy space, and that this was reflected in the *Living Melbourne, Living Victoria Road Map* and subsequent *Implementation Plan*. In particular, interviewees commented on the following influences:

- helping to conceptualise how cities can become water self-sufficient;
- making the connection between urban water management and urban liveability; and
- understanding how improved urban water management can contribute to reducing urban heat island impacts.

## 4 Moving forward: lessons for the CRCWSC

The following outlines a series of recommendations for increasing research utilisation and maximising the impact of ongoing and future research-industry collaborations.

- It is important for researchers engaged in ground-breaking research to recognise that industry partners need to be taken along on their journey in order to implement innovations. Even willing and involved organisations are often not able to implement the 'simple stuff' and concern has been voiced with regard to leading too far ahead. Industry partners' desire enhanced practical support from researchers to stay connected.
- A focus on key organisational agenda building activities remains important. This relies on active industry partner representatives who, working alongside engaged researchers, draw from the multiple knowledge exchange activities to help synthesise the organisation's internal narrative for a change in practice. Ongoing support here is critical; while there has been a shift in strategic and policy documentation as a result of dedicated agenda building activities, there remains a lag in achieving this widespread shift in delivering alternative practices on-ground.
- Demonstration projects remain an important mechanism for testing technological feasibility and building practitioner confidence; however, these projects need to be conceived of and designed as much more than just implementing technology on ground. As the cases highlighted, there are significant process-based lessons which emerge from undertaking the planning, design and implementation of such projects. Understanding and characterising these processes will assist in the widespread replication of demonstration projects to generate broader impacts. For example, the conceptualisation and design of demonstration projects can be broader than just technological contexts, and may also include, for example, explicit strategies for enrolling particular actors who may not yet be convinced of the concept.
- The research revealed high dependence on CaWSC lead researchers for achieving impacts in both demonstration projects and organisations. Credibility, reputation and good standing of these individuals are being identified as critical for: i) enrolling high-level decision-makers in the causes of the CaWSC; and ii) overcoming 'road blocks' in on-ground projects. While these individual attributes have built over many years, there are high transaction costs associated with these undertakings. Due to the increased size of the CRC and the likelihood of an increase in demonstration projects, there will be an increased requirement of such tasks. Strategies will need to be developed to sufficiently address this issue.
- An important lesson arising from the selected CaWSC review was the importance industry partners place on having accessible, available and visible researchers. This insight will be of specific importance for future CRCWSC regional-based activities, particularly as the number of industry partners has significantly increased. Activities within these regions need to draw on the researcher leaders, but also ensure they are showcasing the breadth of research activities. A variety of engagement and information exchange activities are also important for helping to reinforce and synthesise the research insights.

Future evaluative work will be required on other CaWSC case studies which aim to capture insights regarding (i) the barriers and challenges certain organisations experienced during their involvement with the CaWSC research program, and (ii) the level of utilisation of key outputs which are not yet widely available (i.e. Toolkit). Understanding these challenges will provide important information for (re)designing CRCWSC knowledge exchange activities (particularly as the number of industry partners increases domestically and internationally), to help provide pathways forward to maximise research utilisation and adoption to generate broad scale impacts.

## 5 Concluding remarks

This retrospective evaluation of five selected CaWSC case studies has revealed a suite of critical process-related and tangible impacts arising from the research-industry collaboration. The data revealed complex and varied pathways to achieving impacts, which also underscored where different organisations were at with respect to embracing a transition in urban water policy and practices. For certain organisations, this reflected the historical connections to the research programs preceding the CaWSC program, which had seeded and cultivated long-held relationships with key researchers, and had generated significant organisational receptivity and capacity to capitalise on the information being generated through the CaWSC program. Whereas other organisations, previously unaffiliated with associated key research programs, were primarily focused on organisational agenda building activities in an effort to generate internal receptivity for a shift in urban water policy and practice.

Such insights highlight not only the ongoing reach and influence of previous foundational research programs, but also the important pathway forward for achieving ongoing impacts arising from CaWSC research. Of note, establishing the appropriate social, cultural and institutional capital will be necessary for realising a sustainability transitions in urban water management practices. However, the significant research outcomes outlined in this report (i.e. network building and strengthening; improved knowledge and understanding), which help to maximise research impact, are not conventionally captured in standard economic program evaluations, nor in traditional business case (value proposition) formats, as they are considered less quantifiable in dollar terms (see e.g. Allen Consulting Group, 2012). Nevertheless, innovation and sustainability scholars have acknowledged that process-related, more intangible impacts are fundamental to achieving socio-technical transformations. Future work will be required to further assess these significant research impacts to determine their economic value, which would provide additional insights regarding the overall value of interdisciplinary, research-industry collaborations.

## 6 References

- Allen Consulting Group (2012) *The economic, social and environmental impacts of the Cooperative Research Centres Program*. Report to the Department of Industry, Innovation, Science, Research and Tertiary Education, Canberra, September. Available online at [[http://www.acilallen.com.au/cms\\_files/acgcrcprogramreview2012.pdf](http://www.acilallen.com.au/cms_files/acgcrcprogramreview2012.pdf)]
- Dutton, J.E. (1997). Strategic agenda building in organizations. In Z. Shapira (Ed), *Organizational Decision-Making*, 81–105. Cambridge, MA: Cambridge University.
- Hall, A., Rasheed Sulaiman, V., Clark, N. and Yoganand, B. (2003) From measuring impact to learning institutional lessons: an innovation systems perspective on improving the management of international agricultural research. *Agricultural Systems* 78: 213-241.
- Muro, M. and Jeffrey, P. (2012) Time to talk? How the structure of dialog processes shapes stakeholder learning in participatory water resources management. *Ecology and Society*, 17(1): 14.
- Pahl-Wostl, C. (2007) The implications of complexity for integrated resources management. *Environmental Modelling & Software*, 22(5): 561–569.
- Pahl-Wostl, C. (2008) Requirements for adaptive management. In: C. Pahl-Wostl, P. Kabat, and J. Möltgen, eds. *Adaptive and integrated water management: Coping with complexity and uncertainty*. Berlin: Springer, 1–22.
- Rolfs, P., Byrne, R. and Ockwell, D. (2014) *Financing Sustainable Energy for All: A socio-technical analysis of the pro-poor potential of new, pay-as-you-go solar finance approaches in Kenya*, STEPS Working Paper 59, Brighton: STEPS Centre.
- Sayer, J. and Campbell, B. (2001) Integrated natural resource management research to integrate productivity enhancement, environmental protection and human development. *Conservation Ecology*, 5(2) (<http://www.consecol.org/vol5/iss2/>)
- Springer-Hienze, A, Hartwich, F., Henderson, J.S., Horton, D. and Minde, I. (2003) Impact pathway analysis: an approach to strengthening the impact orientation of agricultural research. *Agricultural Systems*, 78: 267-285.
- Warringah Council (2013) *Warringah Design Guidelines Policy*.
- Wong, T., Allen, R., Brown, R., Deletic, A., Griggs, D., Hodyl, L., McIlrath, B., Montebello, T. and Smith, L. (2011) *Transitioning to a resilient, liveable and sustainable greater Melbourne (localised case studies)*, report prepared for the Living Victoria Ministerial Advisory Council, March, 2011.