CRC for Water Sensitive Cities

CRC for Water Sensitive Cities
Regional Advisory Panel Meeting – WA

28 March 2018 9.00am -11:00am

UWA CBD Office

WA Trustees Building, Level 2, 133 St Georges Terrace, Perth

Board Room

AGENDA

Chair: Mike Mouritz
Minutes: Su Boyd

Item No.	Topic	Whom	ATT#
5 mins	**INITIAL PROCEEDINGS**		
1.	**Welcome and apologies**	Mike Mouritz	
2.	**Acceptance of previous minutes**	Mike Mouritz	**Att 1**
3.	**Actions from previous minutes**	ALL	**Att 2**
4.	**Correspondence**	Mike Mouritz	
	CRC WATER SENSITIVE CITIES UPDATES		
5.	**Executive Update** • Research and adoption action plan	Barry Ball	**Att 3**
6.	**Participant Update** • Board • Advisory Committee • EPRG meeting	Mike Mouritz / John Savell	
7.	**Regional Manager Report** • WRAP budget • TAPs Project Steering Committee member update	Emma Yuen TAPS PSC members	**Att 4 - RM update** **Att 5 - RM value proposition** **Att 6 Transition strategy** **Att 7 - EOI consultants** **Att 8 – Amaravati proposal** **Att 9 - Developer Brochure**
	ITEMS FOR DISCUSSION		
8.	**Case studies**	Shelley Shepherd	**Att 10 – D1.4 project update**
9.	**WSC stakeholder Groups**	Antonietta Torre	
10.	**Resources** • Proposal for LGA forum using WRAP budget • Ongoing Admin support	Emma Yuen	**Att 11– LGA proposal**

11.	**IRP4 Update** • Knutsford project overview and links to CRC Low carbon living • Update on Site Visit, meetings 6/7 March and participant session on 8 March	Mike Mouritz / Greg Ryan	
12.	**IRP5** • Update on Report and Expert Panel	Antonietta Torre/ Nick Deeks	
13.	**IRP1** • Update on Transition Network, strategy and new subcommittees	Antonietta Torre / Shelley Shepherd	
14.	**IRP2** • Reflections on participant session on 8 March	All	
15.	**IRP3** • Recent Progress	Shelley Shepherd	
	UPCOMING EVENTS		
16.	**Calendar of Events WA CRCWSC**	Mike Mouritz	**Att 12**
	OTHER BUSINESS		
17.	**Other Business**	Mike Mouritz	
18.	**Meeting close and next meeting:** Wednesday, May 30, 2018	Mike Mouritz	

CRC for Water Sensitive Cities

Regional Advisory Panel Special Meeting – Western Region

Meeting No. 29	Meeting Minutes	WA Trustees Building, L2, 133 St Georges Tce Board Room @ 9:30am
25/01/18		

Attendees		
John Savell – DoC/CRCWSC EPRG Mike Mourtiz – CRCWSC Board Emma Yuen – CRCWSC Regional Manager Antonietta Torre – DWER/CRCWSC EPRG	Shelley Shepherd – New WAter Ways Inc. Sergey Volotovski – Water Corporation Greg Ryan – LandCorp Max Hipkins – City of Nedlands	Ben Harvey – DPLH Emma Monk – DBCA Joanne Woodbridge – EMRC Loretta van Gasselt – DPLH
Apologies		
Nick Deeks - GHD Ajay Shah – KBR	Bruce Young – Spatial Property Allison Hailes - UDIA Giles Pickard – City of Subiaco	Neil Burbridge – City Of Armadale

Item No.	Agenda Topic	ATT
1.	**Welcome & Apologies** • Mike opened the meeting at 9:30 am.	
2.	**Acceptance of Minutes** Minutes from previous meeting were accepted with no changes.	
3.	**Actions from previous minutes** • Still pending are 1, 6, 8, B, D, E, F, G, H, I • Change 6 to Emma Yuen to explore replacing Giles position on the TAPs PSC with someone from Malcolm's group (eg. Joel Hall) • Change A to EY to send latest developer brochure to Shelley	
4.	**Correspondence** There were no correspondence.	
5.	**Executive Update** Unavailable on the day.	
6.	**Regional Managers Report** • The Wanju demonstration project with Krish Seewraj from DWER was the only demo project to get up. • Opportunity for IRP4 to provide presentation to water organisations on 8 March the day after the site visit. • IRP5 workshop planning group will be Ant, John, Nick and Emma.	

Item No.	Agenda Topic	ATT
	• Others to send in name of participants for IRP5 planning workshop. • 16th Feb there is a joint meeting.	
7.	**Tony's meeting with DGs** • EY to send Tony's agenda with updated the messages attached • Should update DGs on what has been achieved and how the CRCWSC through their RM helps • To get Mike and Paul to promote METRONET at the DGs meeting • Ant and Don to feed up to Mike to achieve this discussion at the DGs meeting • Ant to get RSVP list for DGs meeting	
8.	**Opportunities** • Emma to meet with Department of Industry and Trade to discuss Andra Pradesh • Ant to provide names. There is an event in early February.	
9.	**Update on LGA** • Update once per quarter – confirm if in person or via email • Face to face would be a larger forum once per year • Get benchmarking councils to join TN • Send LG emails more broadly or ask them to be the conduit for their organisation • LGA sustainability plan should follow: • Provide text that they can use in their plans including sustainability approaches and list of WSC Index goal indicators. Work with WALGA to get the key messages out there. EY to use Joanne, Emma M, Mac and Adele as a sounding board for this	
10.	**Future budgets** • Can stage agencies park underspend for following year RM role? • EY to develop value proposition for the role of the RM and notify them that without the RM they will lose money as not valuing the CRCWSC • EY to ask BB what is the capacity building budget for next year	
11.	**Calendar of Events** **Action:** • Su to proactively search he NWW site for activities to add to the calendar.	
12.	**Other business** • All to send issues for EPRG and AC before the February meeting • Changes in RAP membership including Ben being replaced by Loretta. Sergey may move to different role.	
13.	**Meeting close and next meeting** Next meeting 28 March 2018.	

CRC for Water Sensitive Cities

WESTERN Regional Advisory Panel

ACTIONS

Legend
Done
Not Done
Deferred
On Agenda

Actions	Description	Who	When
	Actions from Meeting No. 29		
1.	Emma Y to send Tony's agenda with updated messages attached	Emma Y	
2.	Emma Y to meet with Department of Industry and Trade to discuss Andhra Pradesh.	Emma Y	
3.	Emma Y to develop value proposition for the role of the RM and notify them that without the RM they will lose money as not valuing the CRCWSC	Emma Y	
4.	Emma Y to ask Barry Ball what is the capacity building budget for next year.	Emma Y	
5.	Su to search the NWW site for activities to add to the calendar of events.	Su Boyd	Ongoing
6.	All to send issues for EPRG and AC before the February meeting	All	Feb.
	Actions from Meeting No. 28		
1.	Sayed will contact Shelley to see if it is possible to give a talk on the New WAterways series before Christmas on either Work Plan 1 or Work Plan 3. Sayed to keep in touch with Emma Y to provide further update on IRP2 next year.	Sayed	

Actions	Description	Who	When
2.	Mat Hipsey to provide a hands on session in June 2018	Mat Hipsey	June 2018
3.	Make the following changes to minutes: • October 11 2017 (Optional Meeting) Item #7 - Update list of demo sites. • September 20 2017 (Meeting #27) – Item #9 - dot point 2 change "Regional Development" to "MRA".	Su	
4.	Emma to coordinate a LGA meeting that will address outstanding actions and consider the involvement with WRAP	Emma Y	
5.	**Meeting #26 Item 3 –** Greg Claydon and Mike Mouritz will take the issue of urban water reform on the national agenda to the board	Greg C & Mike M	27 Nov
6.	Emma Y to explore replacing Giles' position on the TAPs Project Steering Committee with someone from Malcolm Robb's ground (eg. Joel Hall)	Emma Y	
7.	Regional Manager's report to include time for Project Steering Committee members for IRPs to report back.	Emma Y	
8.	Mike M and Greg C will raise the proposal of IRP3 at the Board meeting in November	Greg C & Mike M	27 Nov
9.	ALL to provide suggestions on questions to IRP4 to Greg Ryan by the end of the week.	ALL	17 Nov
10.	Make the following changes to the ToR: • **Role item 2**: change "oversee" to "liaise with respect to" • **Role item 5**: change "provide direction" to "provide advice" • **Membership 3rd paragraph**: amend sentence "The Chair of each Regional Advisory Panel will be elected by majority vote from its members for an agreed term. They will not be from a research provider and will provide WA representation on the CRCWSC Advisory Committee."		
	Actions from Meeting No. 27		
5.	Barry to circulate the paper on utilities for the future	Barry	

Actions	Description	Who	When
7.	Emma Y to finalise the 4 pager development sector brochure for HIA event and ask for help from CRCWSC Communications	Emma Y	
11.	*LGA engagement and participation meeting to occur with Giles Pickard, Max Hipkins, Joanne Woodbridge, Emma Y.* (May be addressed at the October RAP workshop)		
	Actions from Meeting No. 26		
3.	Sharon Dignard suggests that CRCWSC should advocate for urban water reform on the national agenda. John Savell to write a letter to the CRCWSC Executive regarding this.	John Savell	Not relevant
Standing Item	All WRAP members to forward to Su details of events that would be of interest to Western Region WSC and Su will keep the calendar up to date	All	ongoing
Standing Item	The Panel to share experiences from meetings and engagements with others in the industry.	All	ongoing
	Actions from Special RAP meeting – 30 Aug		
1.	WRAP to provide detail on currently known limitations or difficulties of application of existing TAPS to WA conditions to Nick Deeks, Giles Pickard and Matt Hipsey.	All	Ongoing
2.	WRAP to recommend that the TAPs project proposal incorporates an item in each TAP project to review the current level of integration of GW issues into the particular tool/product. This should be someone with software development skills (eg Kelly Norris, Joel Hall) as well as a strong understanding of WA hydrology.	All	ASAP
3.	WRAP to recommend a case study which can be used for beta testing of current TAPs. This should be an existing project so that results of application of the TAPs can be compared with known outcomes. This project could also explore and highlight gaps in the TAPs re consideration of groundwater (including servicing and surface water iterations). Suggestions include Wungong (which has a benefit of re-engaging with MRA) or Byford, as both have pre and post development monitoring information.	All	ASAP

Actions	Description	Who	When
4.	TAPS PSC and Christian to provide detailed proposals to WRAP for comment prior to submission to executive within 2 months.	Christian Urich and Nicholas Deeks, Giles Pickard and Matt Hipsey.	October
5.	All to provide suggestions for additional representatives on the project groups for TAP2 and TAP3 if required. Currently Giles and Nick (TAP2) and Matt (TAP3 and overall).	All	ASAP
6.	Optimise opportunities for IRP3 & 4 case studies to test TAPs. This is built into both project proposals. Will need transparent scopes/budgets to allocate clear responsibilities for budget expenditure and delivery.	Shelley Shepherd, Ben Harvey, Greg Ryan and Geoffrey London	Ongoing
7.	Nick and Ant to provide linkages from IRP5 with TAPs. Consider opportunities to leverage testing of TAP at Brabham (IRP5 case study).	Nick Deeks & Antonietta Torre	Ongoing
8.	All to think about the value of the urban metabolism model as a component in TAPs acknowledging it is already embedded in IRP4. Then communicate this via the PSC to Christian.	All	ASAP
9.	Identify opportunities for knowledge transfer and training/testing of beta versions and refined modules in WA. Budget exists for at least 1 workshop per year in WA.	Christian Urich	Ongoing
10.	Christian to consider a process for integrating WA conditions into TAPs. Options are (and are recommended to include) all of the below: a) Utilise Matt Hipsey and existing PSC members – Giles Pickard and Nicholas Deeks (insufficient on its own) to provide comment at SC meetings b) Bring TAPS team over to Perth for intensive GW TAPs discussions to showcase the models currently being used (e.g. PRAMS) and consider opportunities for hard integration or "soft handshake" approaches with existing models. c) Provide a project resource (action b above) through either: i. dedicated resources for TAP2 and TAP3 and relevant individual components within TAP2 and 3 to consider groundwater surface water interactions; or	Christian Urich	ASAP

Actions	Description	Who	When
	ii. employ a dedicated groundwater/surface water interactions person with a holistic view over all interactions across TAPs		

CRC for
Water Sensitive Cities

Draft Research Adoption Portfolio Action Plan (2018-2019)

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

Version date	Comments	Modified by

Disclaimer

Introduction

The CRCWSC has commenced its second tranche of activities and have moved to a much stronger focus on practical adoption to influence real world outcomes. This shift in focus will ensure that the knowledge attained so far is applied and the experience of that application and adaptation informs future research.

Backed by a science-based, multi-disciplinary and integrated approach, the CRCWSC has added unique value to a national and global water sensitive movement: we catalyse change by connecting organisations, people and research to unify otherwise disparate efforts and foster synergistic efforts.

This Research Adoption Action Plan represents the third iteration of an adaptive management framework for adoption. It builds on the first two documents that were aligned to achieve the CRCWSC Strategic Plan :2014/15 – 2016/17), namely:

- The Adoption Strategy (Tranche 1 – Version 1 and 2); and
- Research Adoption Strategy (Tranche 2 – Version 1).

The purpose of this document is to identify the adoption activities that must be implemented to achieve the Strategic Plan 2016/17 – 2020/21. These activities are coordinated through the CRCWSC Research Adoption Portfolio that reports via the CRCWSC Operational Plan to the CRCWSC Board, Participants, SME Associate Partners, and other potential collaborating partners and investors (refer to Figure 1).

The Strategic Plan 2016017 – 2020/21 documents the agreed vision, mission, and outcomes that will be achieved over the remaining four years of the CRCWSC. The outcomes will be delivered through nine identified objectives and a range of actions and indicators of success grouped under three themes of Research, Adoption, and Commercial Development (refer to Table 1).

Figure 1. Implementation Framework for delivering the CRCWSC Research Adoption Portfolio activities

Approach to adoption

Our approach to research adoption is underpinned by a conceptual framework informed by the needs and vision of industry partners for a water sensitive city. It relies on the successful implementation of both tranche 1 and 2 research outputs. Both are core to the successful delivery of the outcomes and objectives identified in the CRCWSC Strategic Plan. outcomes, and long-term policy change. Figure 2 presents the conceptual framework for adoption.

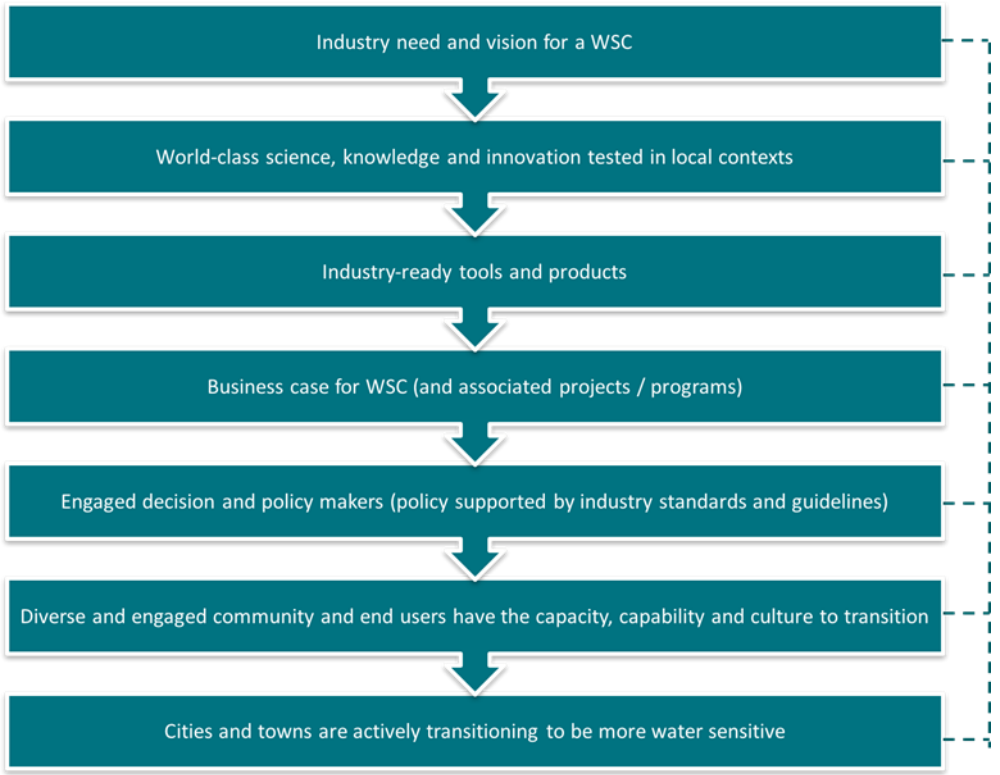

Figure 2. Conceptual framework for CRCWSC communication and adoption (Tranche 2: 2016/17 – 2020/21). The framework is not meant to imply a linear process but rather recognises pre-conditions that are required to achieve sustainable and mainstream adoption.

Table 1. CRCWSC program logic and evaluation framework

Strategic Plan 2016/17-2020/21	
Vision and legacy	The worlds cities are liveable, resilient, sustainable and productive
Outcomes and Objectives	
Long term outcomes (2021 Measures of Success)	• Industry is leading the on-ground implementation of WSC interventions because all parties recognise a water sensitive approach as the best way to manage water in an era of urban growth and climate change • Government and the industry workforce has adopted WSC principles and is developing implementation capability • Water utilities, local governments, and private operators are equipped and motivated to operate WSC infrastructure and technologies • Australia is recognised as a world-class provider of WSC research and development, education, technology, capacity building, and advice • Enduring WSC partnerships and active national forums between government, industry, and research institutions are established and flourishing • All major Australian cities are aspiring to be water sensitive, and at least one is recognised as a world leader in water sensitive urban design
Intermediate outcomes (Objectives)	• National, state, and local government policy and plans recognise water sensitive city (WSC) principles and approaches • Communities have the capacity and are empowered to collaborate with: – City policy makers to develop a shared WSC vision and the policies and priorities to support its delivery – Water and urban planners to develop strategies and plans to achieve that WSC vision • To advise government policy makers so that national, state, and local policy and plans recognise WSC principles and approaches • The rules and regulations by which our cities are planned and developed actively support application of WSC principles • Investment and decision-making (business case) processes for urban development and water management adopt WSC principles and research • WSC best practice is implemented in the practices (tools and techniques) used by urban planning, architecture, water management practitioners, and the development sector to deliver WSC strategies and create the physical, social, and biological form of cities • Water cycle technologies are in use, and guidelines for their design, operation, and asset management ensure that WSC benefits are realised • Urban water services are provided in a more integrated, efficient, and effective way through practical demonstration of WSC principles and research • Public health and other benefits of WSC principles are demonstrated and communicated, together with lessons learned and future research needs

Portfolio Plans	
Portfolio Outcomes (Measures of success)	
Research	1. Cities/towns across Australia have WSC transition strategies and implementation plans that are informed by a broad range of scientific disciplines, and which are generating evidence of impact 2. Research is incorporated into city-shaping decision support tools and products that aid city planners at all levels of government, as well as publicly owned water business and the private sector, to optimise local, regional, and city-wide investment and ensure sustainable growth (including urban infill) 3. Integration of decision support tools has led to investment decisions that better reflect direct, indirect, and longer term community and environmental costs and benefits 4. Local and state governments, utilities, private sector partners and the broader community have the new knowledge, tools, and guidance needed to plan, design, and deliver integrated WSC-based solutions in a practical, cost-effective way 5. The benefits of innovative, whole-of-water-cycle technologies are demonstrated to support wider application or adoption 6. There is conclusive scientific evidence on the public health benefits of applying WSC approaches
Adoption	7. The CRCWSC provides thought leadership to national and international water policy and community debate through policy blueprint papers, advocacy, communications, and stakeholder engagement (including ministers, policy advisors, and key executives) 8. WSC submissions are made to urban growth plans to influence and inform urban growth planning at state, city, and municipal levels 9. State-based Regional Advisory Panels influence policy, build capacity, deliver transition strategies, inform future research, and support collaboration on local adoption of WSC principles 10. A national mechanism (such as an internet portal and community of practice) is in place for the ongoing dissemination and application of WSC knowledge and research outputs 11. A nationally coordinated and funded WSC Capacity Building Forum is in place for developing guidelines and training packages 12. A WSC capacity and research adoption mechanism has been established to support urban communities across the Asia-Pacific region 13. An enduring legacy exists to lead ongoing research, knowledge translation, and adoption of WSC principles
Commercial Development	14. The CRCWSC has developed a portfolio of services that benefit its partners and stakeholders-at-large, and its commercial activities (national and international) have added unique value to the understanding and application of WSC principles 15. CRCWSC participants, national peak industry bodies, the private sector, and government agencies understand the CRCWSC fee-for-service offerings available to support WSC projects 16. Pathways are established for CRCWSC activities to impact developing countries and the aid sector; new incubator cities are established and host proof-of-concept WSC implementations that deliver applied insights for Australian practice 17. By partnering with Australian government and multilateral organisations, the CRCWSC extends its influence and market reach in the international arena 18. Research organisations see even greater value in partnering with the CRCWSC by enjoying increased visibility in its work and achievements, and through the CRCWSC's activities to secure new research funding and expand pathways for international impact 19. The CRCWSC continues to create business opportunities for partners and industry, and supports emerging technologies and innovation

Project outputs and inputs (Actions to be implemented) Refer to Table 2 below.

Action Plan

Table 2 identifies the adoption-related actions and their associated performance targets, responsibility, timeframe, and status, that must be delivered to achieve the Strategic Plan objectives and their measures or indicators of success (see above). This ensures that all activities and resources required to achieve the long term uptake or adoption of the CRCWSCs knowledge, products and tools are coordinated and implemented in a timely and resource efficient manner. It is recognised that many of the actions will contribute to one or more performance measures and outcomes, however actions have not been duplicated where this is the case.

This table does not identify other tasks and actions that must be undertaken in order to also deliver on the measure of success for example, delivering research excellence as these are managed through other Portfolio Plans and Research Project Plans.

Legend:
R = Research Indicators of Success
A = Adoption Indicators of Success
C = Commercial development Indicators of Success

CEO – Chief Executive Officer
RAE – Research Adoption Executive
RAP RM – Regional Advisory Panel Regional Manager
CRO – Chief Research Officer
COFO – Chief Operations and Finance Officer
NEM – National Engagement manager
CS – Commercial Services Manager
CM – Communications Manager

Italic text represents the actions identified in the Research Adoption Strategy Version 1. In terms of their status, actions have been categorised as being:

- *Remain – some rewording to better align with current strategic directions*
- *Achieved – these actions will ultimately be removed*
- *Replaced – these actions have been reviewed and replaced to better align with the current strategic directions and will be removed*

Table 2. CRCWSC research adoption measures of success and their associated actions and performance targets

Action & description	Performance target	Responsibility	Timeframe & status
R1. Cities/towns across Australia have WSC transition strategies and implementation plans that are informed by a broad range of scientific disciplines, and which are generating evidence of impact			
The RAP in collaboration with the IRP1 Project Leader identifies and implements the agreed research methodology to test and develop WSC Transition Strategies.	(5) WSC Transition Strategies are implemented and endorsed by the host organisation/s and RAP (Townsville, Ballarat, Perth, Melbourne, Adelaide)	CRO	June 2018 On track
RAPs identify and determine an agreed scope of work for delivery of WSC Transition Strategies. The implementation of the work may be delivered in collaboration with CRCWSC participants and partners.	(1) WSC Transition Strategy per year is identified, delivered and endorsed by host organisations for each state (in addition to the IRP1 projects)	RAP RM	Annually
Develop a program of candidate international cities appropriate for undertaking WSC Transition Strategies.	(1) WSC International Transition Strategy delivered collaboratively with partners each year	CM	Annually
Face-to-face briefings post-delivery of the WSC Transition Strategy are held with relevant state and local government policy advisors to discuss potential opportunities for influencing state and local government policy reform and investment planning.	Follow up briefings with key advisors are undertaken for all WSC Transition Strategies in collaboration with the host organisation to identify and incorporate policy reform activities in RAP Business Plans	RAP RM	One month post each WSC Transition Strategy
WSC Transition Strategies are co-developed with RAPS for Perth, Melbourne, Brisbane, Sydney and Adelaide by mid 2017	*WSC Transition Strategy process developed and tested through the IRP1: WSC Transition strategies, are commenced in mid 2016*	*CRO*	*Replaced*
	Lead the development and implementation of endorsed WSC Transition Strategies with RAP	*RAE*	*Replaced*
Opportunities to influence state-level policy reform are identified in all WSC Transition Strategies	*Each WSC Transition Strategy incorporates an action plan to influence and inform future policy initiatives*	*RAE*	*Replaced*
	Design and develop key communication resources and tools from the WSC Transition Strategies (e.g. policy notes, research synthesis reports, case studies and success stories), including an 'elevator pitch' that includes snippets of relevant facts, key messages, in appropriate language and aligned to hot topics – i.e. government not specifically talking about WC – but have interest in climate adaptability, heatwaves, liveability, employment etc.	*RAE*	*Replaced*
	Create a cohort of CRCWSC champions through the WSC Transition process (across participant organisations) who have the capacity and capability	*RAE / RM*	

	to disseminate key WSC messages at points of key decision-making.		
R2. Research is incorporated into city-shaping decision support tools and products that aid city planners at all levels of government, as well as publicly owned water business and the private sector, to optimise local, regional, and city-wide investment and ensure sustainable growth (including urban infill)			
IRP Research Leaders liaise with all RAPs to develop and implement clear actions for disseminating and facilitating the adoption of knowledge and research outputs e.g. seminars, capacity building programs, policy and industry notes and user friendly technical guidelines.	All IRP proposals include clear actions and accountabilities for disseminating and facilitating the adoption of knowledge and research outputs by industry users.	CRO	On-going
	CRCWSC participants rate the quality of dissemination of research outputs as being high or very high in the annual participants survey	RAE	Annually
TAP Project Leaders liaise with all RAPs to develop and implement clear actions for disseminating and facilitating the adoption of CRCWSC tools and products including the establishment of R&D user groups, training programs supported by user manuals and guides, and case studies.	All TAP proposals include clear actions and accountabilities for disseminating and facilitating the adoption of knowledge and research outputs by industry users.	CRO / TAP PL	By June 2018
	CRCWSC participants rate the quality of dissemination of TAP activities and outputs as being high or very high in the annual participants survey	RAE	Annually
Appropriate business case frameworks are considered in the analysis of all case study analyses and learning framework of new demonstration projects	All case studies and demonstration projects incorporate a clear business case framework supported by evidence.	RAE	
Develop a template REG project proposal / plan that demonstrates how a business case framework could be integrated into the project outputs.	An appropriate business case framework is tested and validated as part of the learning framework for at least one REG in each state each year.	RAE / CRO	Annually
RAPs to develop a rolling prioritised list of potential Research Synthesis workshop opportunities and host organisations and work via the RAP RM to progressively implement the program in collaboration with the CRCWSC IRP and TAP teams.	10 Research Synthesis workshops are undertaken each across Australia that builds on the knowledge, tools and products developed from the IRPs, TAPs, REGs and participant experience.	NEM / RAP RM	Annually
Strategies to build awareness and capacity of the urban development sector are included in local RAP adoption work plans	*Ensure key champions and representatives within regulatory and approval agencies have access to regular briefing notes / material either via CRCWSC executives or RAPs. Communication materials to be written in an appropriate language and target key information that provides the evidence to back up WSC strategies and technologies*	*RAP RM*	Annually
R3. Integration of decision support tools has led to investment decisions that better reflect direct, indirect, and longer term community and environmental costs and benefits			
	First cohort of accredited users trained	RAE	February 2018

The WSC Index tool is available for use by CRCWSC participants to enable the tool to be further refined and enhanced.	A targeted marketing and communication plan is developed to support increased adoption of the tool across Australia and internationally.	??	June 2018
	A R&D plan is developed to support the ongoing refinement and enhancement of the WSC Index	??	June 2018
RAP members are invited to support individual TAP project user or 'sandpit' groups	Each state-based RAP is represented on all TAP projects	TAP PL	June 2018
WSC Business Case framework and valuation tools are accessible by industry	*Complete research project Comprehensive Economic Valuation Framework (Project IRP2)*	*CRO*	
Knowledge on business case application is integrated into all CRCWSC case studies and demonstration projects	*Appropriate business case frameworks are considered in the analysis of all case study analyses and learning framework of new demonstration projects*	*CRO / RAE*	*Replaced*
CRCWSC Business Case frameworks are tested and validated in at least one REG in each state.	*Identify at least one REG in each state that can support the application and evaluation of business case frameworks as part of the Learning Framework.*	*CRO*	*Replaced*
The WSC Index tool is available for use by CRCWSC participants to enable the tool to be further refined and enhanced	*Project specific communication and adoption plan is developed and implemented as part of the T2 TAP portfolio*	*RAE/ CRO*	*Achieved*
The WSC Index tools is used to underpin the development of the city-region based WSC Transition Plans	*IRP1 incorporates the use of the WSC Index*	*CRO*	*Achieved*
R4. Local and state governments, utilities, private sector partners and the broader community have the new knowledge, tools, and guidance needed to plan, design, and deliver integrated WSC-based solutions in a practical, cost-effective way			
Industry end users representing a diverse range of state and local government, and private business are represented on the RAPs and actively engaged in disseminating and validating research outputs.	All IRP and TAPs project steering committees are established and have representation from RAPs and other relevant key industry stakeholders where appropriate.	CRO	December 2018
	Industry end-users are making a significant contribution to delivering agreed project outcomes, and advising on the development of industry relevant tools and products, along with an identified pathway for adoption.	IRP PL	Annually
Ensure CRCWSC ambassadors, and participant organisation liaison staff have access to regular briefing notes and material. Communication materials will be written in an appropriate language and target key issues and hot topics identified by industry, e.g. evidence to drive best practice, appropriate costs and benefits to inform the development of business cases,	80% of industry participants rates the quality and usefulness of CRCWSC communications as high or very high in the annual participants survey.	RAE	Annually

how to manage risk and liability, and how to facilitate efficient development approval processes.			
All IRP proposals to ensure priority industry end-users (at least 1 for each IRP) are identified and are making a significant contribution to delivering agreed project outcomes and advising on the development of industry relevant tools and products, along with an identified pathway for adoption.	*All IRP proposals provide detailed communication and engagement requirements to ensure strong industry ownership and active contribution*	*CRO*	
	All project-level industry advisory groups are establish for IRPs	*CRO*	*Replaced*
RAPs and industry participants identify priority opportunities for practical application of tranche 1 and tranche 2 knowledge.	*At least five research synthesis workshops are undertaken for Participants per year aimed at applying and validating research knowledge in real industry contexts.*	*CEO*	*Replaced*
RAPs work with Project Leaders and industry end users via the CRCWSC IP Management Framework to identify priorities for knowledge translation and development.	*Prioritised list for knowledge translation updated by September annually (from T1 and T2)*	*CRO*	
Develop targeted Adoption Plans and user manuals for priority CRCWSC tools and products, provides clear guidance and which includes a range of marketing, capacity building and evaluation actions.	*Industry end users are actively using a range of knowledge products and services with positive outcomes.*	*CRO*	
	Develop user manuals for priority CRCWSC tools and products that provides clear guidance on use, background evidence and science that has informed the tool development and support mechanisms	*CRO*	
Provide guidance and targets in the project proposal template for use by project teams in the development of all Tranche 2 research projects	*All IRPs to incorporate key roles and accountabilities to include activities that will support the dissemination and application of related knowledge to industry end users.*	*RAE*	*Replaced*
Position descriptions for REDs and/or Regional Managers incorporate roles and activities that will support the dissemination and application of all knowledge and research outputs to industry end users.	*Review the position descriptions to ensure key industry liaison roles have appropriate capacity and capability to support knowledge sharing and to provide advice for industry end users.*	*RAE*	*Achieved*
Ensure EP boards and executive are briefed on CRCWSC achievement against the value proposition and strategic plan, and to identify water sensitive city policy reform opportunities	*EP organisations, and their relevant Board Chairs / Ministers, are briefed annually by CRCWSC Executive and/or Board representatives*	*CEO*	
Ensure EPRG members have access to key communications materials that EPs can use to internally influence better e.g. quarterly reports, research reports and key findings.	*Annual briefing program of relevant Ministers, policy advisors, Chairs and key Executives in EP organisations is in-place on CRCWSC outcomes and progress*	*Essential Participants Reference Group (EPRG)*	

Identify existing or create new forums to effectively share CRCWSC knowledge resources and findings	*Staff from EP organisations' internal technical experts are members of project steering committees and attend CRCWSC project workshops*	*EPRG*	*ongoing*
	Capacity building needs identified and integrated into CRCWSC capacity development programs at the local and national level.	*RAE*	
R5. The benefits of innovative, whole-of-water-cycle technologies are demonstrated to support wider application or adoption			
Potential CRCWSC Case study and demonstration sites are identified for priority locations by RAPs, and implemented along with a learning and evaluation framework that represent a range of scales, development types, interventions and socio-institutional contexts.	3 Case studies and/or demonstration projects nationally are developed and promoted each year via the website and via other channels appropriate for different tarte audiences.	RAP RMs	Annually
Lessons from the CRCWSC Case studies and demonstration projects are reviewed and integrated into a Management Action Module in the Knowledge Translation Platform.	Management Action Module version 1 is developed and tested by industry end users	RAE	July 2018
Industry-led REG projects are identified and developed as a demonstration project that incorporates a learning and evaluation framework and will result ultimately in a CRCWSC case study at the projects completion.	Each RAP identifies and commences 1 REG in collaboration with the research project 'Learning through demonstration and integration (D1.4).	RAP RMs	July 2018
At least three CRCWSC case studies per year are developed and disseminated for priority locations and that represent a range of scales, development types, interventions and socio-institutional contexts.	*Research project 'Learning through demonstration and integration' (Project D1.4) leads the identification, analysis and dissemination of WSC learning case studies.*	*RAE/ CRO*	*Replaced*
At least one RAP identified REG project incorporates a learning and evaluation framework[1] that will inform the development of a CRCWSC case study at the projects completion.	*Research project 'Learning through demonstration and integration' (Project D1.4) supports the development of a Learning and evaluation framework for a RAP selected REG prior to project commencement*	*RAE/ CRO*	*Replaced*
R6. There is conclusive scientific evidence on the public health benefits of applying WSC approaches			
n/a		CRO	
A7. The CRCWSC provides thought leadership to national and international water policy and community debate through policy blueprint papers, advocacy, communications, and stakeholder engagement (including ministers, policy advisors, and key executives)			
Develop and maintain a list of key policy reform / review opportunities and 'hot' topics that would be appropriate for developing CRCWSC Policy (Industry) Notes.	Each state-based RAP establishes a priority list of policy reform / review opportunities in consultation with lead researchers and reviews it ever 6 months.	RAP RM	By June 2018 (reviewed every 6 months)

Develop Policy (or Industry) Notes aimed at industry audiences that provide a synthesis of key policy reform opportunities on key issues, are developed in collaboration with appropriate industry stakeholders, and is underpinned by evidence (i.e. through the translation of IRP outcomes and findings).	(2) Policy or Industry Notes are developed every year on priority or key issues identified by at least one RAP.	RAE	Annually 21 Industry Notes developed up to 12/2017
Identify and maintain regular communication with key policy advisors and executives to discuss how CRCWSC activities can help influence current and future policy issues and strategic issues.	Briefings are held with at least (2) key state-level policy advisors and (3) senior executives from relevant government, and private industry organisations every six months	RAE	Every six months
Host 'think-tanks' on nationally strategic policy challenges that bring together national and international thought leaders and key industry stakeholders, potential topics to be sourced via the RAP, CRCWSC Board and Essential Participants Group. As an output of the think tank develop a policy blueprint paper that synthesises the challenge, recommendations for the future, and evidence.	(1) Think tank per year supported by the release of a policy blueprint or position paper.		Annually 1st think tank by end 2018
Develop Industry or policy notes and guidance (e.g. synthesis report on key policy challenges) that support the translation of IRP outcomes and findings for policy-makers	*Work with Regional Executive Directors, regional advisory panels, project leaders and knowledge brokers to identify priority topics and industry needs by Sept annually*	*RAE*	*Replaced*
A8. WSC submissions are made to urban growth plans to influence and inform urban growth planning at state, city, and municipal levels			
Key urban development peak industry bodies and relevant planning departments are represented on the RAPs and play a key role in identifying opportunities for policy and planning reform.	Every RAP has representation by at least one urban development organisation or peak body, and the state-based planning department.	RAP RM	By June 2018
Identify opportunities to present key 'urban growth for water sensitive cities' concepts at relevant planning and urban development conferences, seminars and workshops including UDIA, PIA, local government associations, Property Council etc.	An initial list of opportunities is developed and prioritised in collaboration with the RAP and reviewed every 6 months.	RAP RM	By June and reviewed every six months
	The CRCWSC responds to at least (3) priority policy initiatives through the provision of formal submission and briefings.	RAP RM	Annually
	At least (2) conferences / seminars targeting urban development and urban planning audiences are presented at in each state	RAP RM	Annually
CRCWSC participants have access to a team of experts in influencing policy and planning outcomes. This service would include support to develop the evidence base as sell as the 'policy' influencing strategy to ensure implementation.	Strategy and funds for the CRCWSC to engage team of policy experts endorsed and accessible by participant organisations	RAE	December 2018
CRCWSC identifies and proactively supports up to 3 policy influence priority initiatives (for example a new state-based water or urban growth policy)	*A short list of priority policy initiatives are identified by the RAPs and considered for further influence strategy development by the Science-Policy research*	*RAE*	*Replaced*

	team (currently funded through IRP1) and the Executive by Sept annually		
CRCWSC participants have access to a team of experts in influencing policy and planning outcomes. This service would include support to develop the evidence base as well as the 'influencing' strategy to ensure implementation	*Funds are allocated in 2016/17 budget to support access to policy experts and advisors and to develop specific influence and policy support processes.*	*RAE*	*Replaced*
Key urban development peak industry bodies are represented on the RAP	*Identify priority peak industry bodies such as UDIA, Property Council, HIA and the private consulting industry etc., along with communication opportunities (e.g. conferences, seminars and newsletters) and consider the value of including them on the relevant RAP or sub-group by Dec 2018*	*RAPs*	*Replaced*
A9. State-based Regional Advisory Panels (RAPs) influence policy, build capacity, deliver transition strategies, inform future research, and support collaboration on local adoption of WSC principles			
Chairs and Regional Managers are appointed for each RAP to coordinate endorsed CRCWSC-related activities.	RMs are financially secure and have clear position descriptions that incorporate responsibilities of knowledge dissemination and facilitation of industry adoption	RAE	By June 2019
Ensure strategies to maintain funding for RM positions are incorporated into annual CRCWSC and partner budgets as appropriate	RMs are actively supporting the dissemination and facilitating the application of all knowledge and research outputs to industry end users	RAE	
RAPs with endorsed Terms of Reference are established and focus on building strong collaboration with Participant and Partner organisations and key regional stakeholders to deliver regionally-important activities that support the long term adoption of CRCWSC knowledge, tools and products efficiently and effectively.	Terms of Reference endorsed by RAP	RAE	By June 2016 Completed
	RAP members report their satisfaction in the operation and effectiveness of the RAP as high or very high in an annual participants survey.	RAE	Annually
Local four-year RAP Work Plans that identify capacity building, influence and policy reform priorities are developed in collaboration with the RAP representatives and progressively implemented. Local costed RAP Work Plans will be used to inform budget decisions and resource allocation. Strategies to build awareness and capacity of the urban development sector are included in the Work Plans	Local four-year RAP Work Plans endorsed by the RAP.	RAP RMs	By June 2018 and annually
RAPs have developed a local work plans that identified priorities for building skills and capabilities for priority industry end users by Sept annually	*Work with RAPs and state-based capacity building programs and providers to plan and fund local activities (consistent with the CRCWSC Communication and Adoption Strategy for tranche 2) to build skills and capacities in priority areas and for priority end users*	*RAE*	*Replaced*

RAPs endorse a Terms of Reference and strategy to build strong collaboration	*Regional Managers are appointed to coordinate RAP activities and development and implementation of the WSC Transition Plan*	*RAE*	*Achieved*
Key champions and representatives from the urban development sector have access to regular briefing notes / material. Communication materials to be written in an appropriate language and target key issues such as evidence to drive innovation/best practice, appropriate costs and benefits to inform the development of business cases, how to manage risk and liability, and how to facilitate efficient development approval processes	*Strategies to build awareness and capacity of the urban development sector are included in local RAP adoption work plans including the implementation of appropriate communication material*	*RAE / RAPs*	*September 2018*
A10. A national mechanism (such as an internet portal and community of practice) is in place for the ongoing dissemination and application of WSC knowledge and research outputs			
A CRCWSC website is developed and maintained to ensure easy access to CRCWSC knowledge, tools and products.	Website developed and 80% of the CRCWSC participants in the annual participants survey rate the website of being high or very high quality in enabling accessing to CRCWSC knowledge, tools and products	COFO	Annually
	All T1 outputs and knowledge assets are accessible on the CRCWSC website using Transition Pathways	RAE	June 2018
	Key T2 IRP knowledge outputs are accessible through the website within 3 months of the projects completion	CRO	
The CRCWSC website is reviewed to facilitate the inclusion of a 'Knowledge Translation Platform'.	Knowledge Translation Platform beta version developed.	RAE	June 2018
RAPs regularly review the content available on the Website and recommends to the RAP RM on priority knowledge access opportunities	All RAPs are actively using the CRCWSC website and engaged in website enhancement	RAP RM	Annually
IRP Project Leaders liaise with the *Communications Team* to ensure latest knowledge and research outputs are accessible through the website. The website is promoted as the primary knowledge access tool to relevant participants and other stakeholders.	All IRPs knowledge outputs are made available within 3 months of them being approved for publication.	CM	
Identify a cohort of CRCWSC industry 'ambassadors' or champions across participant organisations and industry sectors to support the dissemination of WSC messages and integration into key decision making and policy reform activities in their sector and / or organisation.	At least one ambassador is identified for each industry sector.	RAE	June 2018
A11. A nationally coordinated and funded WSC Capacity Building Forum is in place for developing guidelines and training packages			
A collaborative forum or network is established to enable the various local RAP Work Plans to be better coordinated at a national level and ensure the efficient delivery and implementation of activities. This network will make	A national capacity building network is established and a Chair/ Lead coordinator identified.	RAE	By June 2018 An interim forum has met in 2017

recommendations to the CRCWSC on priority strategies to deliver cost effective capacity building and training activities. The network should also support the coordination of related capacity building activities led by other organisations and programs.	Costed recommendations on priority capacity building activities are forwarded to the CRCWSC.	RAE	Annually
	The quality of capacity building and training activities associated with the CRCWSC are rated as high or very high in the annual participants survey.	RAE	Annually
	An MoU in support of facilitating a national coordinated capacity building forum is agreed with state-based capacity building organisations.	RAE	June 2018
Develop a business model and strategy to support the roll out of the short course 'Building a strong business case for WSC projects and programs'	The short course, and other courses delivered are accessible by multiple regional stakeholders and rated as being of high or very high in meeting course participant needs.	RAE	By December 2018
Identify strategies to develop additional courses identified as being a priority in 'Strengthening educational programs to foster water sensitive cities leaders (Program D4.1).			
Capacity building programs are accessible to industry end users	*Develop a business model to support the roll out of the short course 'Building a strong business case for WSC projects and programs' and other structured capacity building programs as appropriate.*	*RAE*	*Replaced*
	Work with RAPs to identify local priorities for developing skills and capacity to use appropriate business case frameworks	*RAE*	*Replaced*
A12. A WSC capacity and research adoption mechanism has been established to support urban communities across the Asia-Pacific region			
The CRCWSC website is reviewed to ensure it meets the needs of international stakeholders and a program of updates developed to implement enhancements aimed at international audiences, including but not limited to relevant case studies, training and capacity building programs for international audiences, research synthesis offerings, and study tours.	Usage of the CRCWSC website by international users increases each year. (Plus another Performance target)	CS	By December 2018
Liaise with DFAT and ADB to develop a virtual Water Sensitive Cities Hub to enable direct access to CRWSC knowledge, tools and products including experience and expertise offered by CRCWSC participants and partners.	A concept to facilitate increased engagement with industry representatives from the Asia-Pacific region is developed	CEO	By December 2018
A13. An enduring legacy exists to lead ongoing research, knowledge translation, and adoption of WSC principles			
Host a national forum of key university, tertiary-level capacity building organisations to develop a roadmap and business model for embedding WSC principles and activities into university curriculum and research programs.	Each of the CRCWSC university partners have a roadmap (and funding model) that outlines their continuing their role in WSC-related education programs and research agendas.	RAE (with support of CRO)	By December 2018 First workshop held in 2015 with University reps
	University curriculum review submissions commenced	RAE	By July 2019

Host state-based and/or a national forum of key professional capacity building and training providers, including peak industry bodies, to develop a roadmap and business model for embedding WSC principles and activities into professional accreditation and capacity building programs	Each State / RAP has a roadmap (and funding model) that outlines how the CRCWSC can continue support the inclusion of WSC related knowledge in professional accredited training programs.	RAE (with RAP RMs)	By December 2018
Priority water sensitive city principles are considered by The University of Queensland, Monash University and The University of Western Australia (as a minimum) in undergraduate and post graduate curriculum review	*Consult with CRCWSC university and training provider organisations to identify, plan and prioritise training and education programs.*	*CRO*	*Replaced*
Develop a business plan to design and implement priority education and training programs that foster water sensitive leaders in a cost-effective manner	*An Education and Training plan is developed and approved by the CRCWSC Executive, by Dec 2018, that includes a business development plan for ensuring cost effective delivery of capacity building activities*	*RAE*	*Draft developed waiting for CRCWSC advice*
C14. The CRCWSC has developed a portfolio of services that benefit its partners and stakeholders-at-large, and its commercial activities (national and international) have added unique value to the understanding and application of WSC principles			
Undertake an annual survey of participant and potentially external stakeholders to determine awareness and utilisation of CRCWSC services and research outputs.	Participants survey conducted annually	RAE	December 2019 Participant survey conducted in 2016 and 2017
C15. CRCWSC participants, national peak industry bodies, the private sector, and government agencies understand the CRCWSC fee-for-service offerings available to support WSC projects			
A Marketing and Communication plan is developed and implemented that targets potential non-CRCWSC participant national and international end users	Marketing and Communication Plan developed and endorsed	CS	Dec 2018
The CRCWSC website is reviewed to ensure is clearly communicates the commercial services available to CRCWSC participants and non-participants	CRCWSC website reviewed for commercial service arrangements	CS	Dec 2018
C16. Pathways are established for CRCWSC activities to impact developing countries and the aid sector; new incubator cities are established and host proof-of-concept WSC implementations that deliver applied insights for Australian practice			
Undertake regularly briefings with key Australian and State Government agency staff including DFAT and AusTrade to showcase CRCWSC research outputs and service offerings, including those of its Participants and SME Associate Partners	Briefings with DFAT and AusTrade staff undertaken annually	CEO	Annually
Identify opportunities to brief and discuss collaboration with international development banks such as the World Bank and Asian Development Bank	A program of international briefings developed and reviewed every 6 months	CEO	June 2018
C17. By partnering with Australian government and multilateral organisations, the CRCWSC extends its influence and market reach in the international arena			
Refer to C15 and C16.		CEO	

C18. Research organisations see even greater value in partnering with the CRCWSC by enjoying increased visibility in its work and achievements, and through the CRCWSC's activities to secure new research funding and expand pathways for international impact			
Ensure key EP organisations and their relevant Boards / Chairs, Ministers are briefed by CRCWSC executives or Board representatives to report on achievement against the value proposition and strategic plan, and to identify water sensitive city policy reform opportunities.	All EP organisations are briefed yearly.	CEO	Annually
C19. The CRCWSC continues to create business opportunities for partners and industry, and supports emerging technologies and innovation			
n/a		CEO	

CRC for
Water Sensitive Cities

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Western Region Manager Update

WRAP 28th March 2018

Activity title	Outcomes achieved	Priority going forward	Items for RAP to advise upon
CRCWSC executive	Tony Wong visited WA and noted the support at the higher levels but challenges at the mid-level. At the DGs meeting, Eric Lumsden reported potential to use the Metropolitan Regional Improvement fund for water sensitive developments. Emma Yuen met with Paul Mercer and David McCulloch from DJTSI. Funding opportunities for Andra Pradesh were circulated to the private participants. CRCWSC is recruiting a Commercial Manager – EOI closed 16 March New Policies approved for communications, consultants and fraud and available on the website New Collaborative Activity Project Schedule (CAPS) will list upcoming projects and will help with allocating internal and external resources.		
CRCWSC Board	Meeting on 28 February with Board, EPRG and AC		
CRCWSC AC	Annual strategic planning session 28 February with Board, EPRG and AC		
EPRG	Annual strategic planning session 28 February with Board, EPRG and AC		
Tranche 1	Draft Water Words and Visuals Database is on the website but is currently being reviewed.		
General operations and Regional Manager	Draft Value proposition for the Regional Manager proposition is attached We have money left in RAP budget		Discussion: approval of proposal Information: Copy of RM value proposition attached Information: please do website survey https://www.surveymonkey.com/r/crcwsc-website-feedback
Adoption - IRP1	TN subgroups have met • Policy • Community engagement • Technical • Research Chair of committees met with TN Chair on 9 March Shelley Shepherd is the new WA member of the IRP1 PSC. Antonietta Torre is the interim Executive Officer for the TN while DWER finds an alternative	Finalise Implementation Plan in May 2018. Community Engagement group to develop a one page overview.	Information: Subcommittees will consolidate and prioritise actions for Implementation Framework All WSTN members were asked to provide any further feedback on the draft document to Shelley Shepherd (attached)
IRP2	WA update to be held 8 May for all participants. PSC meeting was held 19 December IRP2 overview flyer & IRP2 stakeholder engagement factsheet/industry note now available on website. Benefit Cost Analysis Tool -– document to guide the inputs to the spreadsheet tool has been drafted	Jamie Ewert and Emma Yuen are working with Water Corporation on a follow up for Subiaco strategic resource precinct	On agenda: update
IRP3	unknown		On agenda: update
IRP4	WA update to be held 8 May for all participants. Case study visit and researchers meeting on 7 and 8 March following a trip to SA on 6 March	Build collaboration with Curtin Uni and CRCLCL around Knutsford	On agenda: update
IRP5	Draft report released early February IRP5 Workshop held 23 February Mini Brabham workshop held 1 March Ideas for Brabham planned over next few months If the project proposal is to meet the last Board meeting for this FY we would need to have a draft proposal finalized by mid-April.		On agenda: update
Opportunities – policy	Request put out to participants for key priority areas for the CRCWSC to address related to SPP 2.1, 2.9 and 2.10. No comments received before deadline but the opportunity remains for input into the finalized issues paper and options paper which will be circulated amongst participants and CRCWSC exec.	Sample text to be developed for councils for use in their sustainability plans	

Opportunities - Projects	Regional Project – combining Sediment Taskforce, Green Walls at Bentley and Eric Singleton Wetland Hackathon – Unicity" a sustainable development around Curtin and Bentley was presented to the Ministers for Housing and Water 21 February. Highlighting the importance of innovation in the area. METRONET – proposal developed Subiaco Oval – First joint project between Landcorp and MRA	Develop clear value proposition for economics for METRONET with UWA.	Information: "Liveable METRONET" needs to gain support from Dept of planning to co-fund and host the Ideas workshop. Information: there may be opportunities coming up with Subiaco Oval.
Grants	<u>Australia India Council grants</u> Collaboration between institutes on capacity building and WSUD http://dfat.gov.au/people-to-people/foundations-councils-institutes/australia-india-council/grants/Pages/grants.aspx		
TAP1 - WSC index	Urbaqua (Shelley and Helen) and JBA (Melissa) attended training on 6 Feb (Cockburn) and 22 February (Melbourne). These 3 are now trained to deliver.	The second cohort will occur later in the year dependent on demand for Index workshops.	
TAP2 – planning scale	Contract has been awarded to Matt Hipsey for WA TAPS integration		
TAP3 – detailed	As above for TAP2.		
Adoption - WA Research and Adoption Plan	IRP2 and IRP4 workshops held 7 March	Barry has cancelled the workshop on Research Adoption for February 1 and instead will provide a first draft of the plan to the March RAP for feedback.	Information: Research Adoption plan on agenda
KAT – capacity building	March 21 national capacity Building meeting		
Analysis: Evaluation	Potentially only one demo project nationally will be funded Kim Markwell is finalizing a technology based list of case studies		on agenda: case study list will be tabled
Conferences	WSUD 2018 saw many CRCWSC participants and projects receive prizes. See full list of upcoming events		Information: Copy of events attached
Media	Adelaide Airport Heat mitigation Ted Talks https://www.youtube.com/watch?v=nKtwitvoRIg		
Stakeholder engagement by Regional Manager	Held a meeting and sent out an EOI for consultants to assess skills and capacity to undertake projects that the CRCWSC is unable to do internally. Submissions closed 16 March. Also national EOI sent to all participants for Andhra Pradesh specifically. Developed table of stakeholder groups (Ant will provide slides) Emma Yuen attended the Perth NRM Implementation Plan and workshop on ecological linkages that includes green infrastructure. Many participants attended WSUD2018 see WaterSENSE article Meetings with: • Rob Breden AWA/ Waterwest • Joondalup Council including Graham Withers, Ruth March, Michelle Meuwese, Lucy Sheehy • Various meetings during Tony's visit	Re-engage with UWA (and potentially Curtin) re their campus planning	Opportunities to bring in Katie Stubley into the TN and to deliver a session at the social Impact festival. On agenda: Table of stakeholder groups Information: EOI for consultants (attached)
Development sector engagement	Finalise the 2 pager FAQs brochure for Developers	Lunch and learn at Cedar woods.	Information: Copy of 2 pager for developers attached
Local Government sector engagement	Lindsay held a Q & A with LGAs on the WSC Index February 7	Possible meeting with Technical Western Suburbs Group in 2018. Waiting on communications to finalise a 2 page brochure on value proposition for LGAs LGA specific update quarterly.	
Water utility engagement		Follow up on Subiaco ideas: • Curtin master plan • Possible "innovation shed" • Water management strategy	

Value Proposition for the Regional Manager

Background

In Western Australia, a window of opportunity is open with a wide range of stakeholders seeking to drive a Water Sensitive Agenda. While the Departments (DWER, DBCA and DPLH) and UWA have long been supporters of water science and policy, finalisation of the Transition Strategy for Perth provides additional opportunities. At the same time:

- the Water Corporation board has set ambitious targets around Perth becoming a Water Sensitive City;
- Communities and Landcorp are undertaking innovative developments in Brabham and Knutsford; and
- local governments are increasingly undertaking Water Sensitive Cities index workshops which lead on to a shared vision and priority areas to be incorporated into local sustainability and other strategies.

At the same time as this window opens, the state government is operating in a resource constrained environment resulting in a shrinking public sector which makes collaboration more difficult. In order to harness the momentum from the Transition strategy, and fill gaps left by under-resourced agencies, a WA based Regional Manager (RM) is essential.

The CRC Water Sensitive Cities will continue until mid-2021 while the Regional Manager position is only funded until the end of the 2018 calendar year. This document will describe the value provided by this WA based role.

What value does the Regional Manager provide?

The RM role is essential for maintaining the momentum of a transition to a Water Sensitive Perth. It enables stakeholders to take off one of their “many hats” and enables them focus on their core areas of influence. The RM can more efficiently take on the coordination, facilitation, advocacy and communications roles for the water sensitive community as well as ensuring the smooth delivery of the water sensitive program and stakeholder forums.

Delivery of Water Sensitive programs

Key Water Sensitive projects and programs need to be linked with local stakeholders to achieve outcomes on the ground. Activities including connecting key individuals or organisations, convening meetings in a way that creates a neutral space for collaboration and removing barriers or filling gaps during delivery. Key projects and activities of the Regional Manager include:

- Delivery of the Transition Strategy and Implementation Plan needs to interact with the Transition Network as well as subcommittees for Policy, Community engagement, Technical and Research. The RM facilitates these connections as well as with information from Tranche 1 and 2 research, tools, products and capacity building activities.
- Integrated research projects (Economics, Planning, Infill, Groundwater) need to be connect to Industry through both the PSC and RAP. The RM supports information flows between these and other related projects as well as ensuring key roles are filled.
- Stakeholder Workshops including Synthesis or "Ideas for" Workshops currently planned for METRONET and Brabham. The RM garners stakeholder support, facilitates the planning, implementation as well as following up key opportunities identified at the workshop.
- WSC index Workshops that benchmark councils, set targets, prioritise actions and foster industry collaboration. The RM provides a point of contact for Councils interested in undertaken benchmarking workshops, provides information on the process, consultants and promotes uptake. They also advocate for accreditation of local facilitators so that Councils have cost effective, and local options.
- Transition Strategy and Implementation Plan for Perth. The RM ensures that feedback is provided and organisations are aligned with the strategy and actions.
- Tools and Products platforms which is a computer based tool for making decisions and designing for urban heat, hydrology, etc. The RM ensures that this meets the needs of the local WA community by convening sessions to define and share these needs while identifying resources to fill gaps around how TAPs apply in high groundwater contexts.
- Database of community friendly water terminology. The RM will circulate this through participants and the community engagement subgroup to ensure that communications hit the mark.
- Knowledge and Translation Tools and Servers including:
  - New WAterways Capacity Building Program
  - Expert Input into guidelines, State Planning Policies, or other policies.

  The RM ensures that stakeholders are engaged through the design and delivery of these and other adoption and knowledge translation approaches.

Participation and facilitation of forums

The Regional Manager helps facilitate dialogue with stakeholders so that they have input into design, can participate in project activities and facilitate uptake of outputs and knowledge across their organisations. To achieve this the Regional Manager needs to provide support through various forums:

- Regional Advisory Panel where partners can influence current research programs, policy and showcase projects. The RM follows up on actions and ensures active participation by participants.
- Transition Network is a stakeholder network supporting implementing of the transition strategy on the ground. The RM ensures that key roles are undertaken and that communications channels remain open between the Transition Network, the RAP and the Transition Network sub-groups.
- Integrated Research Project related events including case studies or events around key deliverables. The RM helps coordinate invitees and helps resolve barriers as they emerge. For IRP5 this included significant support during project planning of Stage 1 and Stage 2.
- Local and National conferences where the priority areas, research or projects can be communicated. The RM uses these forum to advocate for WSUD to a broader group of stakeholders.

Influencing others

Another key role of the Regional Manager is to influence both participants and non-participants (eg UDIA, Department of Planning). Key sectors critical over the next few years are:

1. Development sector;
2. Local government sector; and
3. Water utilities.

Key mechanisms for influence are:

Coordination - The Regional Manager brings together partnerships where resources can be pooled or external grant applications coordinated across multiple partners. One example was where the Regional Manager supported the early stages of Urban Monitor database for local governments while a longer term lead organisation was being identified.

Independent Facilitation - The Regional Manager plays an independent facilitation role and creates a neutral space for stakeholders with diverse interests to come together and deliberate over the best way forward. Examples include facilitation undertaken for Montario/ Subiaco Strategic Resource Precinct or framing of the High Groundwater project (IRP5) prior to being approved.

Advocacy - The Regional Manager advocates for WSUD in WA and encourages stakeholders through supporting collaboration and linking the evidence base to support water sensitive polices. Examples include facilitating stakeholder input into the review of water related State Planning Policies and establishment of the IRP5 project.

Informing others

CRCWSC research has delivered over 1000 publications, including guidelines and industry reports that provide benefits, risks and the evidence base for decisions. The Regional Manager is a knowledge broker linking information needs with information sources and supporting stakeholders to access existing information including that on the CRC Water Sensitive Cities website. Examples include information sessions with local governments and other key stakeholders.

Key deliverables
Implementing CRCWSC programs • IRP5 • IRP1 • IRPs 2,3,4 • TAP platform • KAT • Ideas/Synthesis • CRC forums
Regular meetings with participants and stakeholders to influence and inform
Influencing and informing all sectors including: • Local government, • Development, and • Water utilities
Influencing and informing transition and adoption opportunities including • Policies and guidelines • Strategic direction for TN • Linkages between TN subcommittees. • demonstration projects • Strategic direction for capacity building program • Community engagement

Vision, Transition Strategy and Implementation Framework for a Water Sensitive Greater Perth

IRP1 WSC Visions and Transition Strategies

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

Vision, Transition Strategy and Implementation Framework for a Water Sensitive Greater Perth
Water Sensitive City Visions and Transition Strategies (IRP1)
IRP1 – 2 - 2017

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ABOUT THIS REPORT

The Cooperative Research Centre for Water Sensitive Cities (CRCWSC) has undertaken significant research and investigations in Perth and other regions of Australia in order to develop new knowledge to support the transition of Australian cities and towns to more water sensitive practices.

This report aims to consolidate much of this knowledge in order to provide guidance on how to enable and drive Perth's transition towards an aspired water sensitive future. This is done through a consolidation of a number of elements including the way in which water has shaped the development of Perth; the way in which water system services are delivered today; a vision for how water services might be delivered in the future; and a pathway for transitioning from the present to the aspired future city. Together, these elements set out a broad scope of action for coordinating and steering the transition and for guiding Perth's urban water, planning, environment and development sectors.

This document and the actions it describes have no organisational commitment or status in government policy. However, it is intended to be used by many different stakeholders as a sector-wide strategic framework to inform the development of intra- and cross-organisational policies, strategies, and programs.

The findings presented in this document reflect the findings from multiple projects across each of the CRCWSC's research areas including society[1], water sensitive urbanism, future technologies, and adoption pathways. The individual methodologies underpinning these research projects are outlined in the appendices.

The following sections are outlined in this document:

Part A: Vision and Transition Strategy

Section 1 An analysis of the local historical, social, cultural, ecological and geographical context for water in Perth, as well as current and future drivers that articulate a clear rationale for change

Section 2 Benchmark of Greater Perth's current water sensitive performance

Section 3 A vision for Perth as a water sensitive city in 2065 including a set of vision elements and associated principles for practice

Section 4 A strategic transition framework for delivering the vision, including identification of strategies that are considered critical to pursue

Part B: Implementation Framework

Section 1 A compilation of actions and ideas that would help implement the strategies and achieve the vision

Section 2 A framework to support monitoring of transition progress

Section 3 An agreed upon approach for how the Water Sensitive Transition Network will be organised to implement the strategies and actions

[1] This transition strategy builds on supersedes the CRCWSC A4.2 report, "Shaping Perth as a Water Sensitive City"

PART A:
VISION AND TRANSITION STRATEGY

1. UNDERSTANDING PERTH'S WATER STORY

1.1 A short water history

The climate of Perth is changing, becoming drier and hotter. Annual rainfall has fallen significantly since the 1970's and consequently, Perth's water supply has probably been more affected by a changing climate that any other major city in the world. This creates the formidable challenge of providing reliable water for an increasing population while maintaining Perth's status as one of the world's most liveable cities.

The people of this remote part of south-west Australia have always had to adapt to the unique environment of the region.

Long before Europeans arrived in Australia, the Swan Coastal Plain was roamed and cherished by myriad Noongar tribes. The Aboriginal people relied on the rivers and estuaries for food and other resources, however also nurtured a spiritual connection to both the land and water. According to Noongar culture, the rivers, valleys, and landforms were carved out by the *Waugal*, a serpent-like dreamtime spirit who watches over the land and punishes transgressors.

European settlers brought with them different values and perspectives regarding the natural landscape. From its beginnings in 1829, the Swan River Colony struggled to become established. The British settlers were faced with isolation, an unfamiliar environment, unreliable climatic conditions, and disputes with Noongar tribes.

The Mediterranean climate yielded wet winters and hot, dry summers and the settlers soon realised that without storage, the amount of rainfall during the winter months was insufficient to supply the city with water throughout the summer.

Settlers turned from relying on surface water to collecting and storing water from local natural springs, which was the major water source until the end of the 19th century. As Perth continued to grow, especially with the discovery of gold in 1885, the city was forced to increase its water supply infrastructure to cope with the increasing population. Construction of dams began at the turn of the century to capture and store surface water supply.

After World War II, the city began to rely more heavily on the extraction of groundwater, initially from the shallow superficial aquifers of the Gnangara mound and later to the deeper confined aquifers. Extraction from the Gnangara mound proved to be relatively easy, cheap, and reliable for many decades. However, groundwater systems are complex and the consequences of cumulative impacts of extraction, recharge and a drying climate were not well understood until the 1990s.

Perth's unique environment has shaped how urban water is managed and the institutions that are present within Perth's urban water sector today.

The following timeline outlines more recent major events in Perth's urban water sector that lead up to present day.

1975 - 2000 Reduced inflow to surface water dams. Various demand management measures (e.g. water restrictions) implemented and groundwater extraction is increased to meet supply demands

1994 Guidelines for implementing Water Sensitive Urban Design (WSUD) are released in Western Australia

1996 Following the Council of Australian Government reforms, the WA water sector is restructured into a services utility (Water Corporation), water resources

development and conservation agency (Water and Rivers Commission) and regulatory body (Office of Water Regulation)

2001 - 2010 Surface water storage inflows continue to decline, reaching a record-breaking low in 2010

2001 Seasonal water sprinkler rosters introduced

2003 Then Premier Hon Geoff Gallop MLA hosted a three day Water Symposium drawing together community leaders and government representatives to develop a response to the decline in rainfall; as a result, the State Water Strategy was developed and released, setting a broad agenda for sustainable water management

2004 Kwinana recycling plant opens to supply fit-for-purpose recycled wastewater for industrial use. The Water Corporation adopts a 'Security through Diversity' approach to water management which includes plans for desalination, development of groundwater sources, and further demand management campaigns

2005 - current Mining resource boom drives high economic and population growth, thus increasing land development

2005 Dedicated water policy agency, the Department of Water, is created

2006 Australia's first desalination plant, the Perth Seawater Desalination Plant at Kwinana, is brought online to supply 45 GL (approximately 17%) of Perth's annual potable water supply

2007 State Water Plan released. Provides strategic framework for water resources planning and management

2008 Better Urban Water Management released. Provides guidance on incorporating WSUD into land development through State Planning policies

2009 Water Corporation's water supply management plan, Water Forever, released. Includes plans for reducing water demand, increasing water recycling, and developing new water sources

Four-year trial of a groundwater replenishment scheme of the Gnangara Mound led by the Water Corporation begins

2010 Further significant water restrictions imposed

2011 The Southern Seawater Desalination Plant at Binningup brought online, supplying 50 GL of potable water annually

The WA Local Government Association (WALGA) develops an investment plan for the Swan-Canning Catchment, raising issues and options for drainage governance

2013-2015 The State government announces plans to amalgamate Perth's 30 local governments to 16 but ongoing opposition from many local councils led to this being removed from the State's agenda in 2015

2014 State Government approves a 14 GL Groundwater Replenishment Scheme, the first indirect potable recycling scheme in Australia, after a successful three-year trial

2016 State Government announces plans to expand the Groundwater Replenishment Scheme, doubling its capacity to 28 GL of water recycled each year

1.2 Why aspire to a water sensitive Perth?

This section narrates the rationale for why Perth needs to transition to a water sensitive city. It is based on qualitative and quantitative evidence from a review of literature, participant interviews and workshop discussions (further specific details can be found in Appendix B). It was iteratively developed during the workshop series, with refinements by workshop participants.

Greater Perth is now at an important juncture in its development as a major Australian city. Planning is underway to accommodate a projected 3.5 million people for Perth and Peel by 2050, requiring significant consumption of resources and urban expansion and densification. The impacts of climate change on Perth's rainfall patterns, temperatures and sea level are already being felt and will be exacerbated into the future. Against this backdrop, the community's growing aspiration for Perth to be recognised as one of the world's most liveable cities sets a clear agenda for the city's future. It is therefore critical that today's planning, design and infrastructure decisions are made with reference to the long-term liveability, sustainability and resilience of Greater Perth.

The management of water is fundamentally linked to Perth's broad goals. The city's water servicing has been traditionally based on large-scale centralised infrastructure that supplies surface and groundwater resources to urban areas and discharges treated sewage and untreated stormwater runoff into waterways and the ocean. This system has a strong legacy in meeting the city's basic needs for water supply, safe sanitation and flood protection but it is has also led to deteriorating waterway and wetland health and has been vulnerable to the drying climate of Western Australia. Persisting with the traditional water management approach will mean these challenges become more pressing with each passing year.

Poor waterway health has long been identified as a challenge for Perth, with the majority of wetlands along the Swan Coastal Plan having been filled, drained or cleared and many inland waterways showing indications of poor ecosystem health. As Greater Perth becomes more populated and urbanized hydrological changes will impact on the health of wetlands and waterways. Pollution from human activities will increase, causing even higher nutrient loads to enter surface, ground and coastal waters. This poorer water quality will result in more frequent algal blooms, intensified by the warmer air and water temperatures and drier climate predicted for the region. The resultant ecological impacts will be significant, reducing the biodiversity of Perth's iconic coastal and inland water systems. Algal blooms also disrupt people's access to waterways for swimming and other recreational pursuits.

Climate change will affect the water quality of Greater Perth's aquatic environments in other ways too. The Swan Canning River System is expected to experience increased saltwater stratification due to sea level rise and decreased streamflow, depleting the amount of oxygen available to aquatic species in the lower layers of water. Coastline aquifers are also vulnerable to saltwater intrusion from sea level rise and intensified storm surges; this intrusion changes the ecosystem functioning and can lead to contamination of important freshwater resources. People and property are also at risk from increased storm surge and sea level rise, causing more frequent and severe coastal and inland flooding, impacts that are already being experienced in some areas (e.g. Fremantle, see Appendix A).

The extreme weather events predicted as the climate changes also include longer and more intense heatwaves, which will have severe health impacts for both Perth's people and its wildlife. Combined with patterns of urban development that do not incorporate green space, trees or water bodies, the urban heat island effect is expected to significantly increase the incidence of heat-related illnesses and deaths during extreme heat events. People's physical and mental wellbeing is also affected by urbanisation approaches that do not prioritise public open space, green landscapes and recreational opportunities.

Land clearing for urban development has led to the widespread depletion of endemic vegetation and natural wetlands. A large number of species in the Wheatbelt and Swan Coastal Plain have become extinct and significant changes have occurred to the ecosystems and habitats of native flora and fauna, threatening Perth's rich biodiversity. Reduced availability of fresh, locally grown food is also likely, as land development encroaches on traditional agricultural areas and rainfall decreases with climate change.

Reduced rainfall also impacts on the availability of water resources for Greater Perth. The average annual streamflow into Perth's dams is now one quarter of the long-term average to 1974. Water levels in aquifers such as the Gnangara Mound have dropped significantly, exacerbated by land use changes and over-abstraction and with major consequences for nearby ecosystems as well as water supplies. As described in the previous section, Perth has responded to these water resource challenges by constructing two seawater desalination plants and, more recently, a scheme to replenish groundwater with wastewater treated to drinking water quality. While these solutions have markedly improved Perth's water security, they are costly and energy intensive. As climate change impacts worsen and urban development expands and intensifies in areas with limited or fully allocated groundwater resources, Perth's reliance on highly treated seawater and wastewater risks the affordability of water supplies being compromised, particularly for non-drinking purposes such as the irrigation of private gardens and public open space.

Greater Perth is not alone in grappling with water management complexities and uncertainties such as those described above. There is now recognition globally that significant shifts in urban water management are required for a city's long-term aspirations to be realised. In response, the concept of the water sensitive city has emerged in scientific, policy and practice domains, representing an alternative vision for urban water servicing based on principles of flexibility, diversity and integration.

2. UNDERSTANDING PERTH'S CURRENT WATER SENSITIVE PERFORMANCE

2.1 What is a water sensitive city?

As cities around the world face challenges related to climate change and urbanisation, there is an increasing demand on cities to be able to support their growing populations while adapting to rapidly changing conditions in order to deliver a high quality of life for people and sustain a healthy urban environment.

Water servicing within cities has traditionally focused on meeting the basic needs of society (sustenance, health, and safety) through essential service provision (drinking water, sanitation, and drainage). However, there is now a growing emphasis on the importance of water system services in enhancing a city's liveability, sustainability, productivity and resilience. This notion entails realigning the conventional water services approach by transitioning towards a more water sensitive approach, which includes integrated management of the whole water cycle, consideration of water systems as an integral part of the urban landscape, and engagement with citizens as active stewards of a city's water resources and environments (Wong & Brown, 2009).

The aspirational concept of a water sensitive city has emerged as an urban water management approach that not only meets a city's basic water needs, but also delivers a range of benefits to enhance liveability and resilience. Water sensitive cities strive to enhance biodiversity, encourage connected communities, and foster cultural significance. They also strive to protect the health of waterways, reduce flood risk, and create multi-functional public green spaces. Ultimately, a water sensitive city recognises how water can both meet the basic needs of society and also contribute to the creation of connected, vibrant and liveable communities.

As the Australian urban water sector seeks to adopt this approach, it is important that a city both understands its present status with regard to urban water management and defines its short and long-term sustainability goals. An analytical tool has been developed specifically for this purpose: The Urban Water Transitions Framework (Brown, Keath & Wong, 2009). The framework identifies six distinct developmental states that cities may move through on their path toward increased water sensitivity. It can, therefore, help urban water strategists define the attributes of more sustainable cities and identify the capacity needs and institutional changes required for more sustainable water management[2]. Figure 1 presents the Urban Water Transitions Framework, while Figure 2 describes each of the city-states in more detail:

[2] Project A4.1 Cities as water supply catchments: Society and institutions

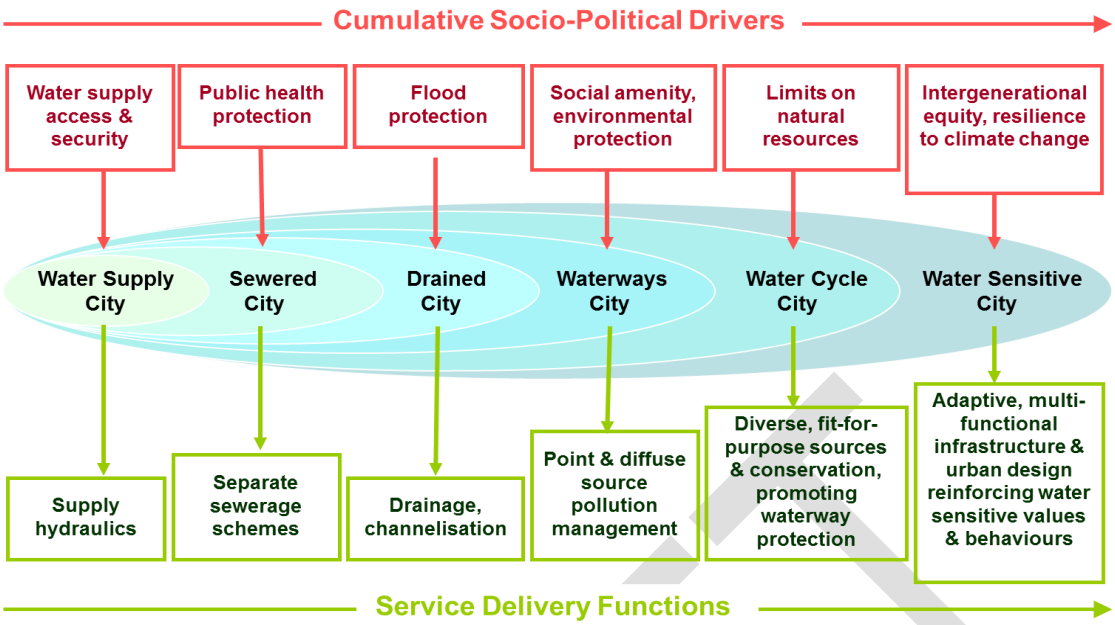


Figure 1: Urban Water Transitions Framework. Source: Brown et al., 2009

Water supply city

The most basic state of modern water management, whereby a centralised system provides water to a growing urban population that expects cheap and equitable water for all. Large quantities of water are extracted from the environment using infrastructure such as pipes and dams. The public expects that water is cheap, harmless to the environment, and limitlessly available.

Sewered city

Building on the previous state, the Sewered City is driven by a desire for better public health and hygiene. Diseases caused by domestic and industrial waste effluent leads to the development of sewerage systems that divert effluent away from housing and into waterways outside of cities. As in the earlier state, it is assumed that the discarding of effluent does not harm the environment.

Drained city

A need to protect homes and infrastructure from flooding is the driver behind the Drained City. The channeling of rivers enables the development of floodplains for housing and rapid urban growth. Like effluent, stormwater is directed away from urban areas and into waterways, generally thought of as dumping grounds for waste. The community expects water supply, sewerage and drainage services to be provided cheaply.

Waterways city

The environmental impacts of both water extraction and waste processing are taken into account for the first time. As the social and aesthetic values of clean waterways are extolled, urban planning begins to integrate water as an important consideration. The unfettered extraction of fresh water is now being curbed, and receiving waterways are protected by filtering stormwater through bio-filtration systems such as rain gardens and artificial wetlands distributed throughout the city.

Water cycle city

In this state, water is actively conserved and supplies from diverse sources such as stormwater, greywater, and recycled wastewater are used in a fit-for-purpose manner. Sustainability is now widely embraced, and the former hydro-social contract, in which government was expected to deliver risk-free water supply services, has been replaced with co-management arrangements between government, business, and community.

Water sensitive city

Based on holistic and integrated water cycle management that meets the city's water needs while also delivering a range of associated liveability benefits. A Water Sensitive City manages water in a way that protects the health of receiving waters, mitigates flood risk and creates green public spaces that also harvest and recycle water. Infrastructure, technology, and urban design will be flexible, recognising the link between society and technology. The community is actively engaged with water, through recreational enjoyment of irrigated green spaces throughout the city, and have opportunities for more active involvement in the water system.

Figure 2: Descriptions of each of the city-states in the Urban Water Transitions Framework. Source: Brown et al., 2016

The ultimate aspiration in this scale is a water sensitive city. The water sensitive city can be described by three pillars of practice, which collectively enhance urban liveability, sustainability and resilience:

1. *Cities as water supply catchments*, in which all the available water resources within an urban footprint are considered valuable supply sources. This includes sewage, rainwater, stormwater and groundwater, and infrastructure systems integrate both centralised and decentralised technologies to utilize these resources at different scales in fit-for-purpose applications.

2. *Cities providing ecosystem services*, in which water infrastructure and the urban landscape are designed both functionally and aesthetically. These integrated systems provide multiple benefits, including stormwater treatment, flood protection, heat mitigation, ecological health and landscape amenity.

3. *Cities with water-conscious citizens and communities*, in which people appreciate the many values of water, feel connected to their local water environments and engage in water-conscious behaviours. Organisations and professionals that influence water management exhibit policies and practices that lead to water sensitive outcomes.

These pillars of practice represent the foundations of a water sensitive city in a general sense. However, their application is highly context-specific and depend on local characteristics, conditions and perspectives. The following section translates this framework for the Greater Perth context and analyses Perth's current status on its transition to a water sensitive city.

2.2 Benchmarking with the WSC Index

WSC Index Background

Water sensitive cities (WSCs) are resilient, liveable, productive and sustainable. They interact with the urban hydrological cycle in ways that: provide water security for economic prosperity through efficient use of diverse water resources; enhance and protect the health of watercourses and wetlands; mitigate flood risk and damage; and create public spaces that harvest, clean and recycle water. Its strategies and systems for water management contribute to biodiversity, community health and wellbeing, carbon sequestration and reduction of urban heat island effects.

Through the planning and delivery of a WSCs conceptual framework, urban areas can exploit the synergies between local water management and urban greening while creating resilient and liveable neighbourhoods. This is achieved by strengthening governance arrangements, building community capital, and investing in multifunctional adaptive infrastructure. This is complemented by the provision of high quality and connected open spaces, protecting and enhancing the ecological values of the urban landscape, providing a diversity of water supply options and recreating a more natural water cycle that restores soil moisture while reducing stormwater runoff.

The purpose of the WSC Index is to guide governments and organisations to transition cities into liveable, resilient, sustainable and productive places through water related actions.

The WSC Index aims to:

- Provide a communication tool for describing key attributes of a WSC.
- Articulate a shared set of goals of a WSC.
- Provide benchmarking for a city's water-sensitive performance.
- Measure the progress and direction towards achieving WSC goals.
- Assist decision-makers prioritise actions, define responsibility and foster accountability for water-related practices.

The WSC Index has been co-designed with industry partners and its application relies on cross-organisational knowledge sharing and collaboration that strengthens broader industry relationships to deliver commitment to action.

The WSC Index consists of seven goals and assesses 34 indicators that represent important attributes of a water sensitive city. A three-step method for scoring each indicator was used:

1 Live polling to gauge individual participants' perspectives on the score for the indicator in question,

2 Interactive discussion to uncover evidence and justification to inform the indicator's score, and

3 Reach consensus amongst the participants on the score to be assigned.

The live polling used a web-based tool that participants accessed through their mobile devices to score 1-5. The collective results were then showed in real-time. These results were discussed, with evidence identified (e.g. policy documents, organisational materials, expert views, etc.) before reaching consensus on a given rating and level of confidence.

Benchmarking Perth's current performance

Greater Perth's transition towards a water sensitive city requires the general principles stated in the previous section to be translated in order to have specific meaning and relevance for its unique ecological, geographical, cultural and institutional context. Greater Perth was benchmarked against the Urban Water Transitions Framework to analyse the status of current practice along with aspired future urban water management practices[3].

Figure 3 shows the benchmarking results for Greater Perth. It depicts the percentage attainment of each of the city states. Greater Perth has fully achieved a Water Supply, Sewered, and Drained City, and has begun to make strides in a Water Sensitive City. The section below provides some further analysis and justification of these rankings.

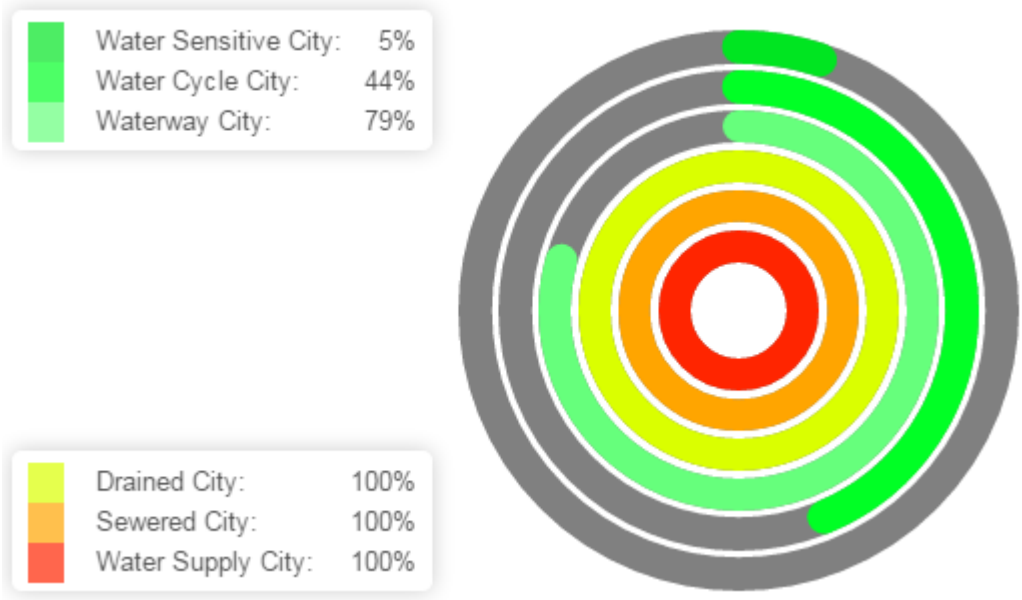


Figure 3: Benchmark of Greater Perth against the Urban Water Transitions Framework

[3] Project D6.2 WSC Index

100% attainment of Water Supply, Sewered and Drained City

The Water Corporation in Perth has been successful in providing secure water supply, sewerage and drainage services to residents of Greater Perth in the face of a drying climate. Record-breaking low dam levels in 2001 led to the construction of two desalination plants and a step towards a climate-resilient water supply. The Water Corporation's Groundwater Replenishment Scheme is currently recharging up to 14 billion litres of recycled water into groundwater supplies each year, with plans to double the capacity by 2019. These alternative water sources ensure safe and reliable water supply for Perth residents, even in the face of a drying climate.

The Water Corporation also operates three major wastewater treatment plants in Greater Perth which treat about 80% of Western Australia's wastewater. Wastewater is treated to a high standard for reuse (agriculture, managed aquifer recharge) and additional resources are beginning to be recovered.

The Department of Water and Environmental Regulation (DWER) has done extensive flood planning and mapping and has created floodplain management plans for areas across the state. Because of Western Australia's drying climate, there has been relatively little major flooding. There are ongoing issues with inundation in some parts of Perth that have high groundwater tables.

79% attainment of Waterway City

Greater Perth ranked 79% as a Waterway City due to the growing attention on health of receiving waterways and surrounding environments. Point source pollution is well regulated and controlled, while urban runoff and diffuse-source pollution (especially from agriculture) continue to contribute to high nutrient loads in the Swan and Canning Rivers. There have been historic challenges in relation to responsibility for water quality in drainage assets, however the recent Drainage for Liveability program which is a collaboration between the Water Corporation and DWER, designed to enhance the value to the community of stormwater drains and basins.

The Swan-Canning river system is a significant asset in Perth and people value it for recreational opportunities. Several recent toxic algal blooms and a series of dolphin deaths in 2009 have brought the health of the rivers to public attention.

44% attainment of Water Cycle City

Greater Perth has made significant advancements in alternative water supply sources such as desalination and groundwater replenishment. Many residents in Perth utilise private groundwater bores, however these are not monitored resulting in overextraction in many areas. Resource recovery is beginning to be looked at by the Water Corporation, however is not yet implemented broadly or connected to a strong local narrative.

The Perth community is largely disconnected from the water issues facing the region. Despite the extreme decline in traditional surface water resources resulting from climate change, the cost of water has remained relatively low and water restrictions have been mild and short-lived, which has meant that the community has not needed to adopt significantly different water practices. Households continue to value green European-style gardens, maintaining them through the use of backyard bores.

On the other hand, Perth's citizens feel some connection to their waterways and regard the Swan River as an icon. They value the river for its recreation and amenity benefits, and recognise that water quality and ecological health play a role in this. Several toxic algal blooms and the death of dolphins in the river in 2009 sparked awareness and led to the creation of community volunteer groups such as the River Guardians and Dolphin Watch. These programs aim to engage the public and increase custodianship of the Swan and Canning Rivers and have had local success in increasing community participation in waterway protection. There is some broader public recognition that Perth's ground and

surface water sources need to be protected but, overall, engagement with issues of water quality and supply constraints is limited.

In addition, there is still limited understanding and awareness of the impact of people's everyday behaviours on the water cycle. A national survey of Australians' water knowledge and literacy[4] conducted in 2015 demonstrated how Western Australian's water literacy compared to that of other Australian states. They have a high knowledge of factors that can negatively or positively impact on waterway health, reflected by the value they place on the Swan River, but little awareness of where their household water comes from or which catchment their household is in.

There is also limited engagement with Aboriginal communities on water-related issues. Policies are in place, but engagement generally happens at the consultation level rather than with the aim of long-term partnering and incorporating Aboriginal knowledge and values into water planning and decision-making.

5% attainment of Water Sensitive City

To achieve a Water Sensitive City, Greater Perth will need to fulfil the multiple objectives of ecosystem protection and restoration, security of supply, flood control, public health, amenity, liveability and economic sustainability, among others. While Perth has begun to make strides towards a Water Sensitive City, significant efforts will be needed to transition to water sensitive technologies and practices.

The WSC Index allows for more specific analysis of the benchmark across seven goals related to governance, community capital, equity, productivity and resource efficiency, ecological health, quality urban space, and adaptive infrastructure. Figure 4 below shows the footprint of Greater Perth in relation to each of the WSC Index goals. The figure also displays the typical or idealised goal scores (footprint) of a waterways city (purple dashed line) and water cycle city (green dashed line).

[4] Project A2.3 Engaging communities with water sensitive cities

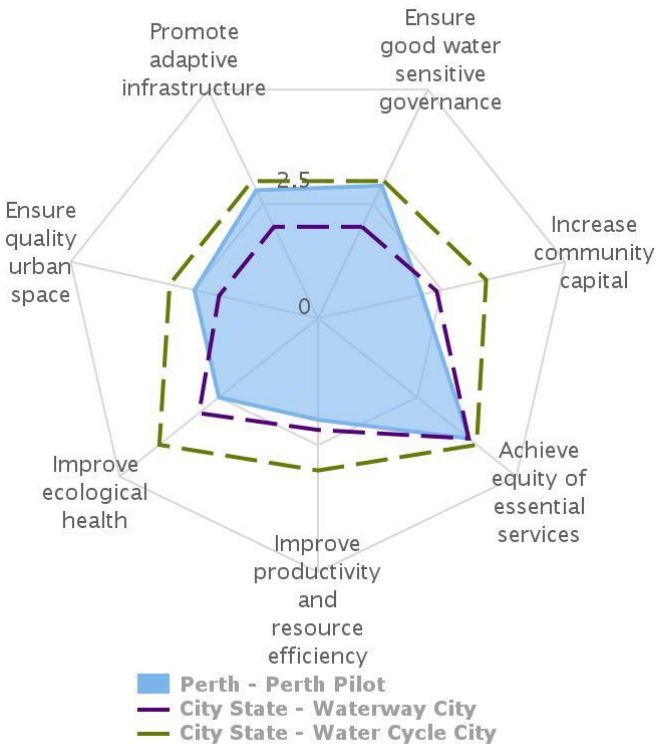


Figure 4: WSC Index goal results for Greater Perth

Table 1 below details the individual indicator scores for each WSC Index goal.

Table 1: WSC Index goal and indicator scores for Greater Perth

WSC Index Goal and Indicators	Score /5	WSC Index Goal and Indicators	Score /5
1. Ensure good water sensitive governance	**2.9**	**4. Improve productivity and resource efficiency**	**2.0**
1.1 Knowledge, skills and organisational capacity	3.0	4.1 Benefits across other sectors because of water-related services	3.0
1.2 Water is key element in city planning and design	3.0	4.2 Low GHG emission in water sector	1.0
1.3 Cross-sector institutional arrangements and processes	3.0	4.3 Low end-user potable water demand	2.0
1.4 Public engagement, participation and transparency	2.5	4.4 Water-related commercial and economic opportunities	2.0
1.5 Leadership, long-term vision and commitment	4.0	4.5 Maximised resource recovery	2.0
1.6 Water resourcing and funding to deliver broad societal value	3.0	**5. Improve ecological health**	**2.5**
1.7 Equitable representation of perspectives	2.0	5.1 Healthy and biodiverse habitat	2.0
2. Increase community capital	**2.1**	5.2 Surface water quality and flows	3.0
2.1 Water literacy	2.0	5.3 Groundwater quality and replenishment	2.0
2.2 Connection with water	2.0	5.4 Protect existing areas of high ecological value	3.0
2.3 Shared ownership, management and responsibility for water assets	2.0	**6. Ensure quality urban space**	**2.5**
2.4 Community preparedness and response to extreme events	2.0	6.1 Activating connected urban green and blue space	3.0
2.5 Indigenous involvement in water planning	2.5	6.2 Urban elements functioning as part of the urban water system	2.0
3. Achieve equity of essential services	**3.8**	6.3 Vegetation coverage	2.5
3.1 Equitable access to safe and secure water supply	5.0	**7. Promote adaptive infrastructure**	**2.8**
3.2 Equitable access to safe and reliable sanitation	4.0	7.1 Diverse fit-for-purpose water supply system	3.0
3.3 Equitable access to flood protection	4.0	7.2 Multi-functional water system infrastructure	3.0
3.4 Equitable and affordable access to amenity values of water-related assets	2.0	7.3 Integration and intelligent control	3.0
		7.4 Robust infrastructure	3.0
		7.5 Infrastructure and ownership at multiple scales	2.5
		7.6 Adequate maintenance	2.5

The WSC Index also filters the 34 indicators to assess how a city is performing against each of the water sensitive outcome areas: resilience, liveability, sustainability and productivity. Figure 5 below shows that the expected outcome scores for a waterways city (pink circles) are largely being achieved within Greater Perth, but the expected scores for a water cycle city (green diamonds) are yet to be achieved.

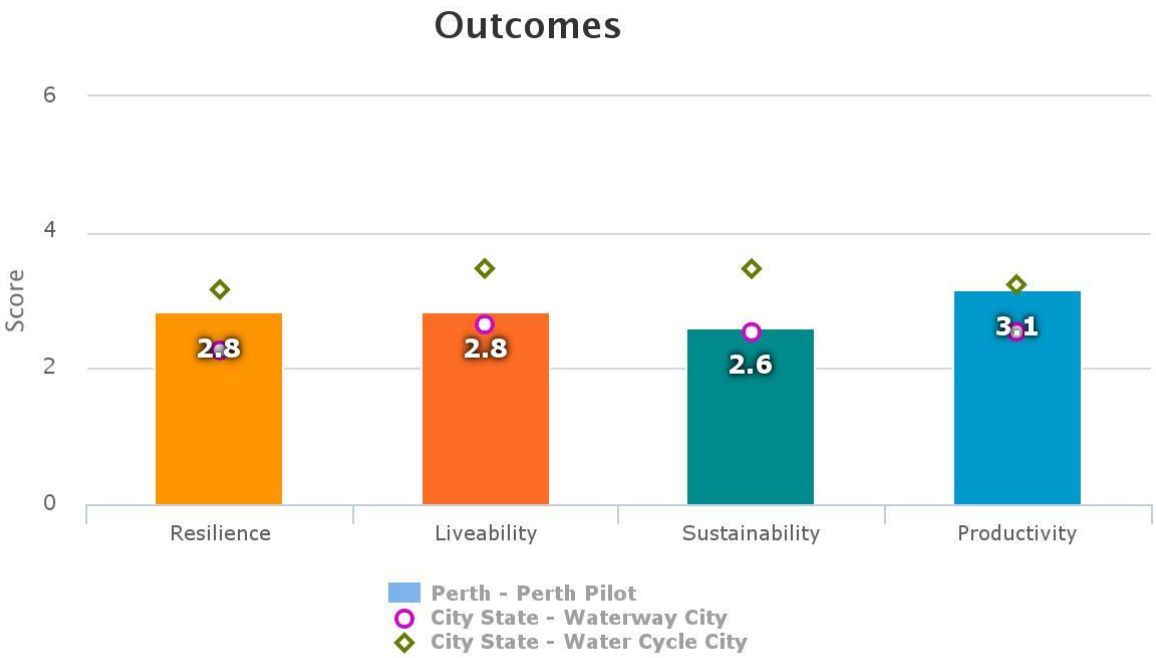


Figure 5: Greater Perth's performance against water sensitive outcome areas

3. ENVISIONING PERTH'S WATER SENSITIVE FUTURE

The benchmarked results for Perth's current state provide a foundation for considering the city's desired future directions. This section presents the vision of Greater Perth as a water sensitive city in 2065 that was developed by leaders and strategic thinkers across Perth's water, planning, community, urban development, and other related sectors[5]. Figure 6 below describes the four themes of the vision, desired outcomes and how they are interconnected.

3.1 Vision for a water sensitive Perth

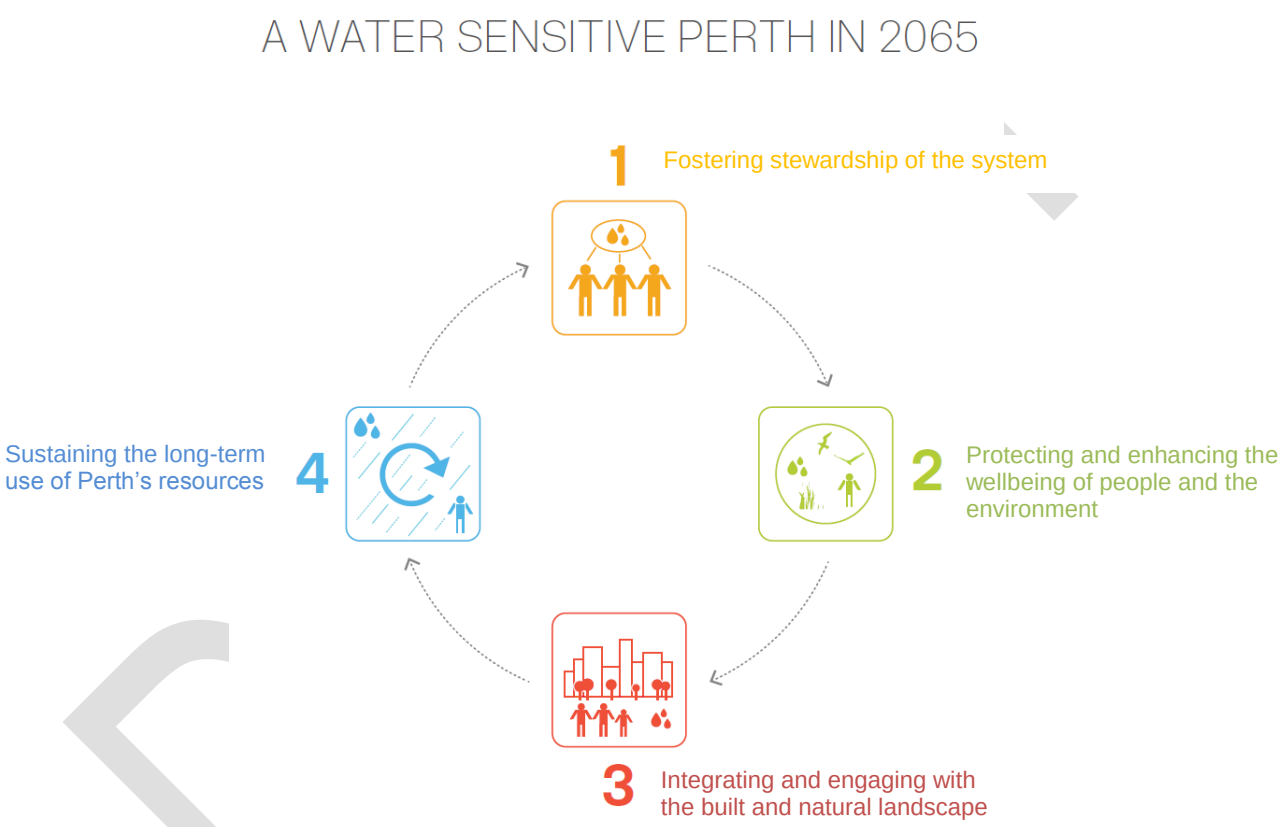


Figure 6: Themes of Perth's water sensitive city vision

Fostering stewardship of the system

People understand the entire water cycle and recognise the need to adapt to uncertain and changing conditions. They feel connected to water and are committed to looking after it over the long-term. This refers to everything from the groundwater sources, to how water is supplied and managed, to wastewater treatment and resource recovery. Climate change is acknowledged and people recognise the need to proactively adapt in response.

People feel a sense of belonging in Perth, identify with its evolving water story and connect with Nyoongar water knowledge and values. They understand the cultural dimensions of Perth's

[5] Project A4.2: Mapping water sensitive city scenarios

water, which involve the historical movement of water in the environment along with Aboriginal connections to water. There is a sense of belonging and connection to this story, even amongst diverse cultural communities. The built form supports this connection by reflecting the historic and natural landscape and waterscape.

People are appropriately engaged in open and inclusive decision-making processes that are informed by comprehensive information and transparency in people's priorities. The costs, benefits and risks of different options are transparently considered and communicated to stakeholders, including the community, to inform strategic decision-making. Economic benefits are displayed through demonstrated efficiencies and local Perth projects. Aboriginal knowledge, values and way of thinking inform water planning and decision-making.

There is continuous investment in developing necessary knowledge, skills and capacity across water-related professions, sectors and the community. The community is educated about demonstrations and water-related decisions through capacity-building and education programs at various levels. Innovations are encouraged in an enabling environment and driven by both collaboration and competition throughout the sector. Business and commercial opportunities are created and pursued through a holistic and innovative approach to water and resource management.

Protecting and enhancing the wellbeing of people and the environment

Water is valued and managed with respect for the interdependent and dynamic relationship between people and the environment. The public is protected from potential health risks through effective water and related environmental management. Waste management handles pathogens and other hazards in a safe and reliable way.

Perth's coastal and inland water ecosystems are protected and thriving with biodiversity. The rivers, wetlands, estuaries, and coastline are alive and healthy. The air and water quality levels are exceptional and attract birds and other wildlife to the area. The Swan and Canning rivers are viewed as iconic symbols of Perth that are valued both locally and internationally. Perth is also recognised for its unique extensive network of groundwater aquifers. People are conscious that these iconic natural features need to be preserved – therefore water is adequately allocated and land uses are undertaken for their protection.

Flood and inundation risks are managed in harmony with local conditions to minimise impacts on and embrace opportunities for the city. People understand these risks and also see them as opportunities for the city. There is widespread community acceptance that some inundation naturally occurs and is an important part of the natural water system, and thus the built form is responsive to shallow groundwater with scientifically-supported design features that minimise the impacts when inundation occurs.

Integrating and engaging with the built and natural landscape

Perth's urban character reflects its unique landscape and water environments. The presence of water is integrated within the public realm in a way that is creative, innovative and sustainable. This creates a beautiful city through considered urban structure, built form and multifunctional spaces that reflect Perth's unique environmental qualities. Features such as the Swan River and the coastline, the wetlands, damplands and dune chains are celebrated and showcased through good planning and design of the built form that encourages greater awareness of water. This gives people the opportunity to connect with all aspects of the water cycle during wet and dry periods and emphasises that water exists as an ephemeral and vital element within our community, supporting Perth's comfort, amenity and resilience.

The urban environment is comfortable, safe, and promotes health and wellbeing. The city feels cool and convenient for people to walk through. Landscape elements are well-integrated within the built environment including water-harvesting green roofs, green walls, and shaded streets. Innovations in materiality and the built form have reduced the urban heat island effect to minimise heat-related deaths and stress incidents. A network of high quality spaces is prevalent throughout the city and connected to pedestrian infrastructure to promote healthy living, not only because of the

physical health benefits provided by the urban environment, but also the mental wellbeing and social amenity they offer. It is commonly recognised that these spaces contribute to public health, so they are valued, well cared for and maintained and the importance of effective water management to support this is recognised.

The city is filled with a network of beautiful, well-designed and high quality places that are diverse, accessible, loved and enhanced by effective water management. These places provide a sense of place and social cohesion, allowing community members to connect with their environment and one another. The city offers intact ecosystems, playground areas, sport spaces, walking paths, and other features that suit the needs for all people at different ages and stages of life. In addition to being diverse, the spaces are responsive to trends in sport and recreation and to the changing needs of the community. Existing natural features such as the coastline, wetlands and rivers are made accessible so people can enjoy them for their health benefits.

Infrastructure planning and development is coordinated and integrated to deliver multiple benefits. Value, performance, and community and environmental impacts are considered holistically. Functional service delivery systems are also designed to be beautiful and aesthetic. Movement networks integrate both grey and green infrastructure systems, which are demonstrated through the narrowing of some roads to allow space for green corridors. Service delivery systems are seen as opportunities to integrate multi-functional green networks. Water is also an active and considered transport mode for Perth, and Swan River ferries are accessible and used.

Sustaining the long-term use of Perth's resources

Water is available to equitably meet the needs of people and the environment both now and in the future. Water is not wasted and demand is well managed in order to sustain the water sources of the region. Water is available for food production in all urban and peri-urban communities so people have access to locally grown fresh produce. Larger agricultural areas are strategically located next to water sources to minimise transport and irrigation costs.

Fit-for-purpose water is supplied through adaptable systems that work across multiple scales. Users understand the concept of fit-for-purpose and there are clear water quality targets for different types of usage. Fit-for-purpose schemes integrate with the broader water system to provide reliable and adaptable configurations to suit different contexts and conditions.

Efficient use and recovery of resources is ensured through innovative water cycle management. Wastewater is recycled and utilised as a valuable source of water and other resources, such as nutrients, biosolids and energy. These resources, amongst others, are efficiently recovered through innovative water cycle management. Water supply systems are efficient in delivering services for all water purposes. Renewable energy is used where possible for energy-intensive water systems.

3.2 Guiding principles for water sensitive practice in Perth

Accompanying the vision is a set of principles to guide water sensitive practice in Greater Perth[6]. These principles were developed by exploring the principles of practice that would be needed to achieve the desired water sensitive outcomes expressed in the vision. The guiding principles are designed as a coherent, collective set; individual statements should not be read in isolation.

Type of practice	Guiding principles for water sensitive practice in Greater Perth
Urban and water systems planning *Strategic and statutory planning of the greater metropolitan region, including its land use zones, development policies, water resources and water infrastructure systems.*	1. **Water systems planning and urban planning are integrated** and consider both local and regional objectives and priorities 2. Urban and water systems planning is **conducted with a long-term view** that accounts for current and future water-related needs of people and the environment, resource availability and ecological limits 3. Urban and water systems planning is **conducted within an overarching policy framework** that reflects a locally defined vision for a water sensitive Perth 4. Urban and water systems planning is **guided by outcome-focused standards** that match the scale of the target area 5. Urban and water systems planning **ensures public open space and the public realm** is of sufficient quantity and quality to support human wellbeing in existing and developing areas
Decision-making and investment *System-wide governance approaches, involving formal and informal structures and processes, that inform water-related planning and investment decisions*	6. Decision-makers across water-related sectors are fundamentally aligned and make decisions in the context of a **shared vision and evolving narrative** for a water sensitive Perth 7. **Clear governance arrangements** clearly define roles and responsibilities for all aspects of the water cycle 8. Governance arrangements **encourage innovation while ensuring social, environmental and economic sustainability** in all decisions and investments 9. Decisions about water are made pursuant to **reliable evidence, transparent planning and highest community value**
Stakeholder engagement *Engagement with community, business, industry and government stakeholders to influence water sensitive outcomes*	10. All stakeholders are **actively engaged and supported with targeted information and educational support** to encourage shared knowledge of Perth's water narrative and to promote individual and collective responsibility and capacity as water stewards 11. The inputs of different stakeholders into water-related initiatives are **facilitated with appropriate timing and with respect for their influence, capacity and needs** 12. **Clear and consistent messages are communicated** to the community and other stakeholders 13. The community is **involved in and has the opportunity to influence decision-making about water** through transparent and disclosed processes
Water systems and urban design	14. **Water sensitive principles, local characteristics and informed community values guide holistic site-specific designs** that make water sensitivity physically and

[6] Project A4.2: Mapping water sensitive city scenarios

Type of practice	Guiding principles for water sensitive practice in Greater Perth
Design of buildings, public and private spaces, urban landscapes, and water, transport and other urban infrastructure systems	conceptually legible in the built environment and ensure multiple benefits are delivered over the long-term 15. Water system and urban design **connects all elements of the water cycle and considers whole-of-life costs and benefits**, including broad social and environmental impacts 16. Water sensitivity is encouraged through **design practice that continually innovates, adapts and improves** as conditions and objectives evolve
Management and operation of water systems *Management and operation of the integrated water system and its individual infrastructures, including traditional technologies, green technologies and natural environmental features*	17. Overarching governance arrangements for water management ensure **coordination and consistency with mutually reinforcing approaches** across stakeholder organisations 18. Water management approaches are **flexible and inclusive to provide opportunity and mechanisms for involvement** by all interested and relevant stakeholders 19. Water systems are **managed as part of the whole water cycle** within their catchment and the broader urban system 20. Water infrastructure is managed according to reliable and well-resourced asset management regimes that **protect the integrated system's long-term integrity**

4. TRANSITIONING TO A WATER SENSITIVE PERTH

This section presents background on the Transition Dynamics Framework, followed by discussion of the practice change, current enabling conditions and corresponding priority objectives and strategies based on each of the WSC Index goals.

4.1 Transition Dynamics Framework

The Transition Dynamics Framework sets out five types of enabling factors that need to be present throughout a transition: champions, platforms for connecting, science and knowledge, projects and applications, and practical and administrative tools. Together, these five types of factors create an enabling environment for a WSC transition and, mapped against the six transition phases, create a tool that can be used to diagnose a city's enabling environment and priorities for advancing through the transition.

Transition phase	People and organisations	Platforms for connecting	Knowledge	Projects and applications	Tools and instruments
1. Issue emergence	Issue activists		Issue highlighted	Issue examined	
2. Issue definition	Individual champions	Sharing concerns	Causes and impacts examined	Solutions explored	
3. Shared understanding & issue agreement	Connected champions	Sharing ideas	Solutions developed	Solutions experimented with	Preliminary practical guidance
4. Knowledge dissemination	Influential champions	Building support	Solutions advanced	Solutions demonstrated at scale	Early policy
5. Policy and practice diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Formal practical guidance and early regulation
6. Embedding new practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

This section analyses Perth's current enabling environment for each of the vision themes to identify its current phase(s) of transition and a corresponding suite of strategies that should be addressed in the short to medium term to accelerate further progress.

4.2 Fostering stewardship of the system

People understand the entire water cycle and recognise the need to adapt to uncertain and changing conditions. *They feel connected to water and are committed to looking after it over the long-term. This refers to everything from the groundwater sources, to how water is supplied and managed, to wastewater treatment and resource recovery. Climate change is acknowledged and people recognise the need to proactively adapt in response.*

People feel a sense of belonging in Perth, identify with its evolving water story and connect with Nyoongar water knowledge and values. *They understand the cultural dimensions of Perth's water, which involve the historical movement of water in the environment along with Aboriginal connections to water. There is a sense of belonging and connection to this story, even amongst diverse cultural communities. The built form supports this connection by reflecting the historic and natural landscape and waterscape.*

People are appropriately engaged in open and inclusive decision-making processes that are informed by comprehensive information and transparency in people's priorities*. The costs, benefits and risks of different options are transparently considered and communicated to stakeholders, including the community, to inform strategic decision-making. Economic benefits are displayed through demonstrated efficiencies and local Perth projects. Aboriginal knowledge, values and way of thinking inform water planning and decision-making.*

There is continuous investment in developing necessary knowledge, skills and capacity across water-related professions, sectors and the community. *The community is educated about demonstrations and water-related decisions through capacity-building and education programs at various levels. Innovations are encouraged in an enabling environment and driven by both collaboration and competition throughout the sector. Business and commercial opportunities are created and pursued through a holistic and innovative approach to water and resource management.*

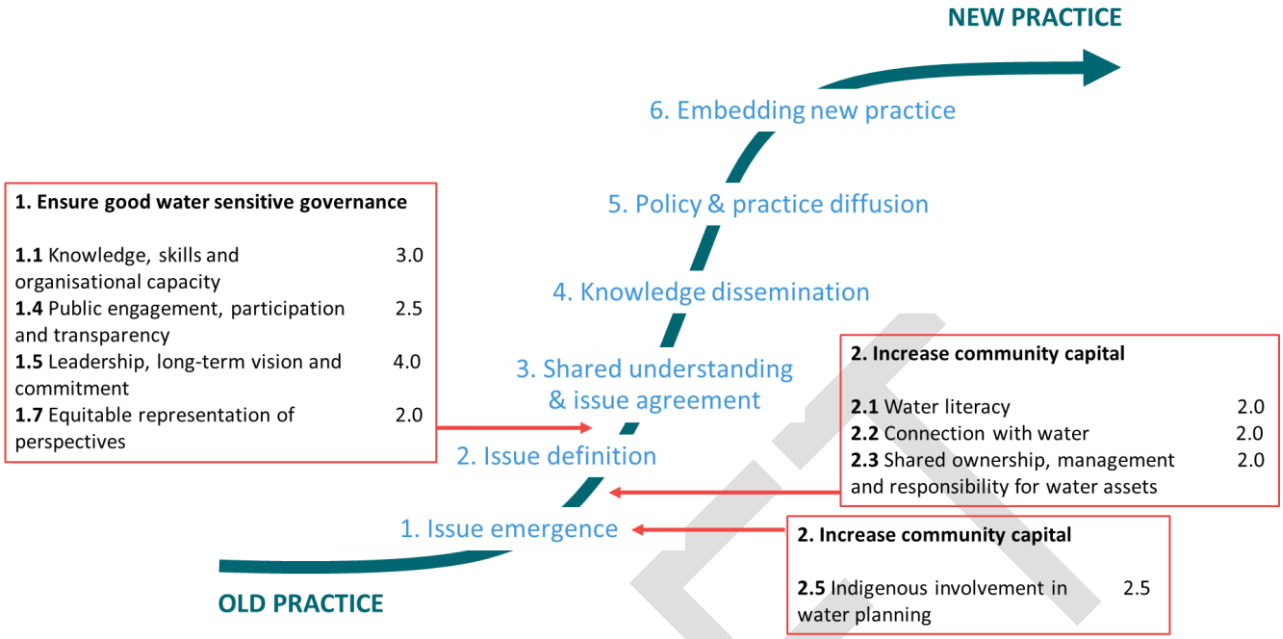
Changes in practice required

Perth's vision for stewardship of its water system will need to be built on a foundation of people having a good knowledge of, strong connection with, and deep sense of responsibility for water. This means expanding beyond the current conception of communities as customers who pay for water system services such as water supply, sanitation and drainage. While this relatively simple transaction between provider and end-user has been effective for services delivered through large-scale centralised infrastructure, it will be inadequate to achieve Perth's water sensitive city vision. Growing the required foundation will require community engagement practices to be meaningful and transparent, focused on empowering people to have the interest, capability and opportunity to be active stewards in achieving Perth's water sensitive city vision. This approach to engagement will need to be embedded within governance systems and processes that enable and drive integrated, long-term, cross-sector, and inclusive planning and design decisions that influence water's role in Perth.

The Perth community generally has low understanding of or connection to water and how their behaviours impact the surrounding environments. A national survey of Australians' water knowledge and literacy[7] conducted in 2015 demonstrated how Western Australian's water literacy compared to that of other Australian states. They have a high knowledge of factors that can negatively or positively impact on waterway health, reflected by the value they place on the Swan River, but little awareness of where their household water comes from or which catchment their household is in.

[7] Project A2.3 Engaging communities with water sensitive cities

Status of current enabling conditions



There are a few individual champions within the water sector who are advocating the importance of this issue (e.g. the WSTN Communications Subgroup, Josh Byrne and Associates). This advocacy message is getting stronger as these individuals increasingly connect and work together. However, there is a vulnerability of their voices not being heard, so champions from both inside and outside the water sector should be further nurtured to ensure the issue remains firmly in the sector's awareness.

As described in Section 3.2 Perth's current water sensitivity, the Perth community generally has low levels of awareness and knowledge of water issues in the region. These insights indicate that Perth is relatively early in its transition towards a community that has the levels of awareness, knowledge, connection and responsibility aspired to in the city's water sensitive vision. Initiatives to increase these dimensions should be informed by knowledge on *why* there is currently low community capital so that the solutions that are explored and developed can be most effectively targeted. It is therefore important to **invest in social science to clarify why Perth has low community capital.**

In addition, there is emerging knowledge about solutions for building community capital in fields outside of urban water but there has been limited application of this knowledge to the context of urban water in Perth. This means there is little available evidence or guidance for Perth professionals to inform and support the uptake of the associated practices. A stronger collective voice is therefore needed to advocate for local solutions that will improve community capital. This can be driven by initiatives to **advance platforms for champions to get clarity around the issue of low community capital and explore potential solutions**.

Water system stewardship for Perth will mean engaging with Traditional Owners as active and meaningful partners in water planning and decision-making. There are currently policies that require consultation on projects involving Aboriginal heritage sites, but this tends to be done as isolated engagements rather than long-term partnering. Generally in Perth, the importance of involving Traditional Owners and Indigenous knowledge and values in water planning and decision-making is not recognised within the sector.

Like most places in Australia, Perth's engagement with Traditional Owners as part of water stewardship is in its infancy and requires greater focus and attention. To better recognise and value the role of Traditional Owners in water planning and decision-making, as well as the role of community more broadly, initiatives are needed to **support champions to advocate for greater community and Traditional Owner involvement** in water governance processes**.**

While the current water governance arrangements for Perth have enabled a stable institutional environment for reliable provision of traditional water services, innovation in governance will be needed to establish inclusive and integrated structures and processes for achieving Perth's water sensitive city vision. While there are champions advocating for a more integrated and cross-sectoral governance approach, proposed solutions have tended to focus on current pressing issues (e.g. drainage management) and as such, do not yet address the full range of water sensitive aspirations expressed in the Perth vision. Therefore, **champion networks and platforms for collaboration should give focus to developing a suite of potential governance and engagement solutions** that would support Perth to become a water sensitive city, bringing in diverse people and perspectives to reflect the many different outcomes expressed in the vision.

The recently established Drainage for Liveability program, a collaboration between the Water Corporation and Department of Water and Environmental Regulation, is a promising example of an innovative governance solution aimed at a more integrated, long-term and cross-sectoral approach to drainage infrastructure management. Further **trials and demonstrations of governance and engagement solutions for achieving Perth's vision of water stewardship** are needed. Trials and demonstrations with a governance or engagement focus would help to build an evidence base of the costs, benefits and risks of potential new solutions, as well as provide insight into the capabilities needed for their effective implementation.

In summary, Perth's progress in its transition to the vision of fostering water system stewardship is generally in Phase 2 (issue definition), with some aspects slightly more advanced and some slightly less. Further progress would be driven by the strategies described above in bold and summarised in the table below.

Transition Phase	Strategies	Purpose
Community capital		
Issue definition (2)	1.1 Invest in social science to clarify why Perth has low community capital	To inform the development of solution options for increasing the community's awareness, knowledge, connection and sense of responsibility in relation to water
Issue definition (2)	1.2 Advance platforms for champions to gain clarity around the issue of low community capital and explore potential solutions	To begin building a collective voice that can advocate for solutions to improve community capital
Inclusive and collaborative governance		
Issue emergence (1)	1.3 Support champions inside and outside the water sector to advocate for greater community and Traditional Owner involvement in water planning and decision-making	To ensure the role of community and Traditional Owners in water stewardship is recognised and valued
Shared understanding and issue agreement (3)	1.4 Expand existing champion networks to integrate a greater diversity of perspectives and extend the focus of platforms for collaboration to consider	To develop a full suite of potential governance and engagement solutions for delivering the many different dimensions of Perth's water sensitive city vision

	governance and engagement solutions	
Shared understanding and issue agreement (3)	1.5 Implement trials and demonstrations of governance solutions for achieving Perth's vision of water stewardship	To explore and demonstrate how potential governance and engagement solutions can be delivered; evidence of costs, benefits and risks; learning about the capabilities needed for their effective implementation

4.3 Protecting and enhancing the wellbeing of people and the environment

Water is valued and managed with respect for the interdependent and dynamic relationship between people and the environment. *The public is protected from potential health risks through effective water and related environmental management. Waste management handles pathogens and other hazards in a safe and reliable way.*

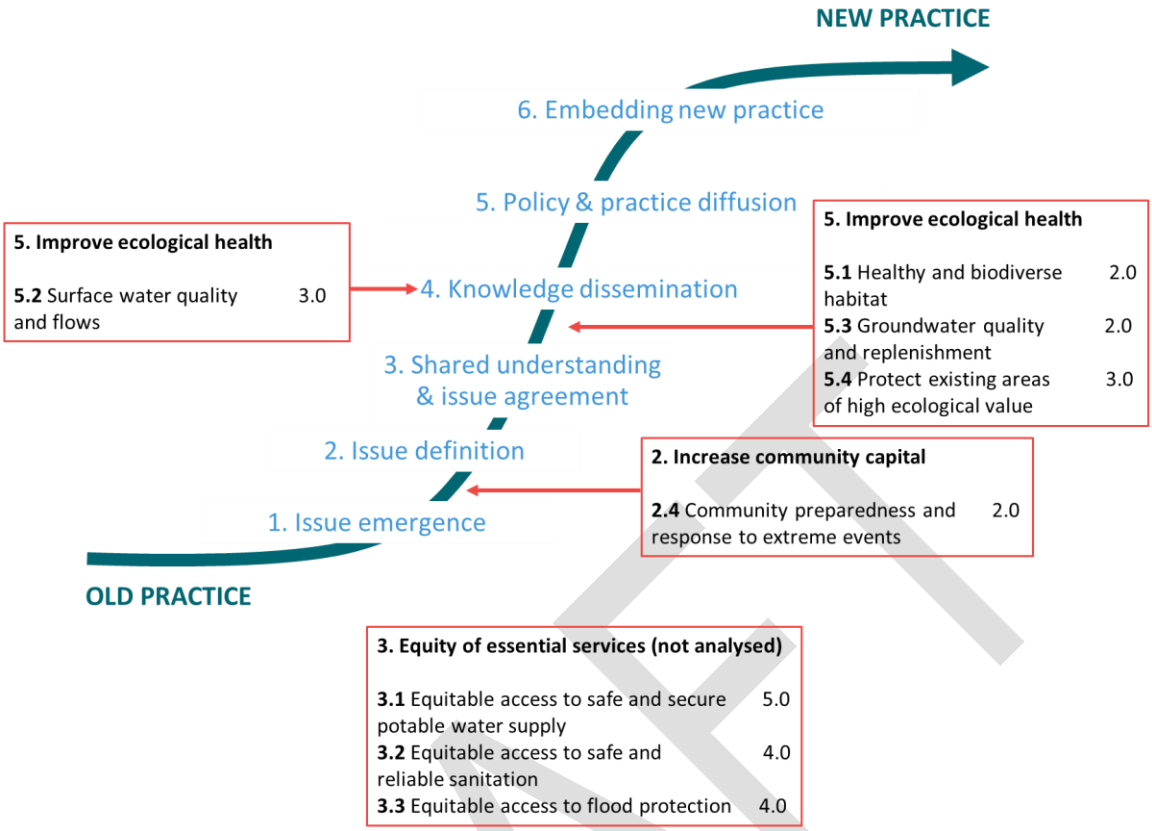
Perth's coastal and inland water ecosystems are protected and thriving with biodiversity. *The rivers, wetlands, estuaries, and coastline are alive and healthy. The air and water quality levels are exceptional and attract birds and other wildlife to the area. The Swan and Canning rivers are viewed as iconic symbols of Perth that are valued both locally and internationally. Perth is also recognised for its unique extensive network of groundwater aquifers. People are conscious that these iconic natural features need to be preserved – therefore water is adequately allocated and land uses are undertaken for their protection.*

Flood and inundation risks are managed in harmony with local conditions to minimise impacts on and embrace opportunities for the city. *People understand these risks and also see them as opportunities for the city. There is widespread community acceptance that some inundation naturally occurs and is an important part of the natural water system, and thus the built form is responsive to shallow groundwater with scientifically-supported design features that minimise the impacts when inundation occurs.*

Change in practice required

Perth's aspiration for protecting and enhancing the wellbeing of people and the environment will require substantial shifts in water management practice. The characteristics, functions, conditions and values of ecosystems and urban environments need to be understood and respected, and controls need to be in place to manage the impacts of urbanisation, resource extraction and pollution. Achieving these outcomes will require natural assets to be integrated into the water management system so their management can be adequately planned and resourced.

Status of current enabling conditions



While there is general agreement throughout the sector that environmental health is an issue, there is not yet broad support for implementing system-wide solutions. There are individual and organisational champions present who have influence within their sectors, however they are generally operating under their own organisational agendas. It is therefore important to build a collective voice amongst these champions so that it can become influential and effective amongst broad audiences in promoting the importance of water system services in delivering community and environmental wellbeing. Initiatives are therefore needed to **advance collaboration platforms to strengthen the alignment and coordination of voices across sectors that highlight environmental and human wellbeing as a valuable outcome of water system services**.

There are not yet organisational champions influencing the broader regulatory space and fostering organisational alignment. Support amongst the authorising environment therefore needs to be built through the **development and communication of a narrative for the importance of water system services in delivering environmental health outcomes**.

There is a good understanding of environmental issues affecting Perth across the sector because of the Department of Water and Environmental Regulation's extensive ecological monitoring program (wetland vegetation, water quality, macroinvertebrate, etc.). Water Quality Improvement Plans also help identify water quality issues and outline strategies for their improvement. Individual solutions for ecological health are being experimented with, including wetland restoration projects, the Drainage and Nutrient Intervention Program project sites, oxygenation of the Swan and Canning rivers, and the groundwater replenishment scheme. While there are numerous localised solutions, they are not being embedded within a system-wide approach and do not include an explicit learning agenda. In order to demonstrate how innovative solutions can be delivered and to build an evidence base of their costs, benefits and risks, there needs to be **implementation of significant trials and demonstrations of both technical and governance solutions that aim to improve environmental health**.

While there are policies for protecting the natural environment (e.g. state and local government policies to improve urban stormwater quality through water sensitive urban design), they are not

always effective. There is a lack of defined goals and service standards beyond traditional water, sewerage and drainage services, which has resulted in poor outcomes for the receiving environments. Similarly, the threats to community wellbeing resulting from Perth's rising temperatures and drying climate are not addressed by current policy or guidance on service levels. In order to progress Perth's transition to its vision for human and environmental wellbeing, effort is needed to **translate policy goals into system-wide standards and programs of implementation** that clarify organisational roles and responsibilities and improve their effectiveness. This is particularly necessary for water quality policy.

In summary, Perth's progress in its transition to the vision of healthy people and environments is in Phase 4 (knowledge dissemination) for ecological. Further progress would be driven by the strategies described above in bold and summarised in the table below.

Transition Phase	Strategies	Purpose
Environmental health		
Knowledge dissemination (4)	2.1 Develop and communicate a narrative for the importance of water system services in delivering environmental outcomes	To harness authorising environment support for water system initiatives that aim to improve the health of the environment
(Not analysed)	2.2 Develop and communicate a narrative for the importance of water system services in delivering community well-being outcomes	To harness authorising environment support for water system initiatives that improve the health of the community
Knowledge dissemination (4)	2.3 Strengthen the alignment and coordination of voices across sectors that highlight environmental and community health as an outcome of water system services	To build a collective voice that is influential and effective amongst broad audiences in promoting the importance of water system services in delivering environmental outcomes
Knowledge dissemination (4)	2.4 Implement significant trials and demonstrations of both technical and governance solutions that aim to improve environmental health, including an explicit learning agenda	To demonstrate how innovative solutions can be delivered; evidence of their costs, benefits and risks; learning about the capabilities needed for their effective implementation
Policy and practice diffusion (5)	2.5 Translate policy goals for environmental health (in particular water quality) into system-wide standards and programs of implementation	To improve the implementation of policies and clarify organisational roles and responsibilities for managing, protecting and enhancing environmental outcomes

1.6 Integrating and engaging with the built and natural environment

Perth's urban character reflects its unique landscape and water environments. *The presence of water is integrated within the public realm in a way that is creative, innovative and sustainable. This creates a beautiful city through considered urban structure, built form and multifunctional spaces that reflect Perth's unique environmental qualities. Features such as the Swan River and the coastline, the wetlands, damplands and dune chains are celebrated and showcased through good planning and design of the built form that encourages greater awareness of water. This gives people the opportunity to connect with all aspects of the water cycle during wet and dry periods and emphasises that water exists as an ephemeral and vital element within our community, supporting Perth's comfort, amenity and resilience.*

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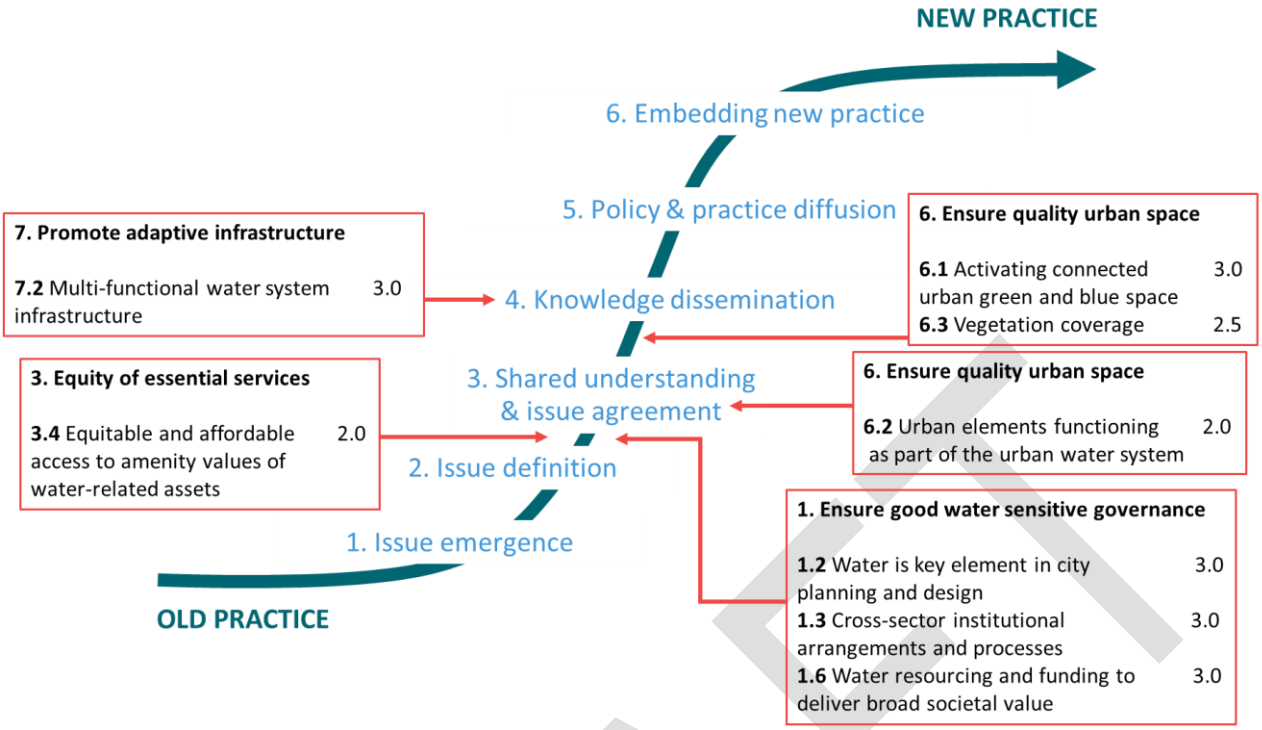
The city is filled with a network of beautiful, well-designed and high quality places that are diverse, accessible, loved and enhanced by effective water management. *These places provide a sense of place and social cohesion, allowing community members to connect with their environment and one another. The city offers intact ecosystems, playground areas, sport spaces, walking paths, and other features that suit the needs for all people at different ages and stages of life. In addition to being diverse, the spaces are responsive to trends in sport and recreation and to the changing needs of the community. Existing natural features such as the coastline, wetlands and rivers are made accessible so people can enjoy them for their health benefits.*

Infrastructure planning and development is coordinated and integrated to deliver multiple benefits. *Value, performance, and community and environmental impacts are considered holistically. Functional service delivery systems are also designed to be beautiful and aesthetic. Movement networks integrate both grey and green infrastructure systems, which are demonstrated through the narrowing of some roads to allow space for green corridors. Service delivery systems are seen as opportunities to integrate multi-functional green networks. Water is also an active and considered transport mode for Perth, and Swan River ferries are accessible and used.*

Change in practice required

Achieving Perth's vision for an urban environment that is well-designed and delivers multiple benefits, including public and private spaces that are green, cool, aesthetic and utilised, will require the practices of water system planning and urban planning to be more integrated and collaborative to achieve standards and service outcomes that link to a broader vision of urban liveability, human wellbeing and environmental health.

Status of current enabling conditions



There are many champions in Perth advocating for a more collaborative and integrated approach to city planning and design (for example, the Green Space Alliance, Josh Byrne and Associates, the Australian Institute of Landscape Architects and the Water Sensitive Transition Network). The influence of these networks with decision-makers and the community would increase with **a narrative for the importance of integrated solutions that both shape a desired urban form and function as part of the water system**. This would help to create an authorising environment that supports integrated water and land-use planning for multiple benefits.

Broad support for water-related outcomes through city shaping interventions also needs to be built within the urban planning, design and development sectors, as some urban professionals are not yet aware of the benefits of an integrated and collaborative approach to urban and water planning and design. Initiatives are therefore needed to **build understanding amongst urban planning, design and development professionals about their role in delivering water outcomes**.

There has been some participation of these broader (non-water) urban professionals through the CRCWSC A4.2 visioning and WSC Index processes, and in the ongoing Water Sensitive Transition Network (WSTN). This network can be strengthened and expanded to grow the community of practice focused on improving the quality of urban space through water sensitive approaches, and thereby increase its influence and ability to work together to deliver innovative water sensitive solutions. This would be well supported by initiatives that aim to **build capacity of planning, design, development and water professionals to deliver solutions for multi-functional urban spaces**.

Awareness raising and capacity building is helped by on-ground demonstrations that showcase the types of solutions needed. There are currently significant demonstrations of integrated, multi-functional urban spaces and infrastructure, including the White Gum Valley development, projects that are part of the Water Corporation and DWER's Drainage for Liveability program, and the Water Corporation's Groundwater Replenishment Trial and Subiaco Wastewater Treatment Plant buffer zone project. There are also many small-scale demonstrations across local councils. While this significant activity in the innovation and demonstration space will help support Perth's transition towards its vision for the built and natural environment, there will need to be more processes to **capture the lessons from these individual projects and use them to inform guidelines, policies and standards to encourage broad application of these solutions across different sectors.**

State agencies such as the Department of Planning, Lands and Heritage and the Department of Water and Environmental Regulation (DWER) are beginning to champion the desired practices by embedding a more integrated approach to city planning and design into state policies (e.g. Liveable Neighbourhoods, Better Urban Water Management, State Planning Policy 2.9 Water Resources). Further progress is needed to improve the effectiveness of these existing policies and remove implementation barriers. Attention is therefore needed to **consolidate and align policy and regulatory tools for water and urban planning and design**. This can initially be supported through some easy wins, such as releasing the new version of Liveable Neighbourhoods and embedding water sensitive principles in State Planning Policy 2.9.

Implicit in Perth's water sensitive city vision is that amenity values of the city and its water-related assets are accessible to everyone, regardless of their socio-economic position. However there is not yet a shared understanding of this aspiration and its potential benefits. It would therefore be important to **undertake a system-wide assessment to understand the full range of amenity values of water-related assets** that can contribute to improving access for all of Perth's communities. This could inform the **development of a narrative for the importance of equitable and affordable access to water-supported amenity** that would help to articulate a collective voice around the issue and attract support for the implementation of solutions from the authorising environment.

In summary, Perth's progress in its transition to the vision of integrating and engaging with the built and natural environment is generally between Phase 3 (shared understanding and issue agreement) and Phase 4 (knowledge dissemination). Further progress would be driven by the strategies described above in bold and summarised in the table below.

Transition Phase	Strategies	Purpose
Amenity of water related assets		
Issue definition (2)	3.1 Undertake system-wide assessment to understand the full range of amenity values of water-related assets and to appreciate the complex picture	To understand the extent and potential benefits of improving access to amenity values of water-related assets to inform advocacy and potential solutions
Shared understanding and agreement (3)	3.2 Develop a narrative for the importance of equitable and affordable access to water-supported amenity	To articulate a collective voice advocating for equitable access to amenity values of water-related assets and attract support for the implementation of solutions from the authorising environment
Built form and urban spaces		
Shared understanding and agreement (3)	3.3 Develop a narrative for the importance of integrated solutions that both shape a desired urban form and function as part of the water system	To ensure the authorising environment supports integrated water and land-use planning for multiple benefits
Shared understanding and agreement (3)	3.4 Build understanding amongst urban planning, design and development professionals about their	To ensure broad support for water-related outcomes across

	role in delivering water outcomes	urban planning, design and development sectors
Knowledge dissemination (4)	3.5 Build capacity of urban and water professionals to create pathways for implementing solutions for multi-functional urban spaces	To ensure professionals across planning, design and development have the ability to work together to deliver innovative water sensitive solutions that create high quality, socially inclusive urban spaces
Knowledge dissemination (4)	3.6 Learn from and showcase new and existing projects that demonstrate solutions for multi-functional, quality urban spaces	To inform the development of comprehensive guidelines, policies and standards
Policy and practice diffusion (5)	3.7 Consolidate and align policy and regulatory tools for water and urban planning and design	To improve the effectiveness of existing policies and remove implementation barriers for strengthening the role of water in delivering quality and multi-functional urban spaces

3.8 Sustaining the long-term use of Perth's resources

Water is available to equitably meet the needs of people and the environment both now and in the future. *Water is not wasted and demand is well managed in order to sustain the water sources of the region. Water is available for food production in all urban and peri-urban communities so people have access to locally grown fresh produce. Larger agricultural areas are strategically located next to water sources to minimise transport and irrigation costs.*

Fit-for-purpose water is supplied through adaptable systems that work across multiple scales. *Users understand the concept of fit-for-purpose and there are clear water quality targets for different types of usage. Fit-for-purpose schemes integrate with the broader water system to provide reliable and adaptable configurations to suit different contexts and conditions.*

Efficient use and recovery of resources is ensured through innovative water cycle management. *Wastewater is recycled and utilised as a valuable source of water and other resources, such as nutrients, biosolids and energy. These resources, amongst others, are efficiently recovered through innovative water cycle management. Water supply systems are efficient in delivering services for all water purposes. Renewable energy is used where possible for energy-intensive water systems.*

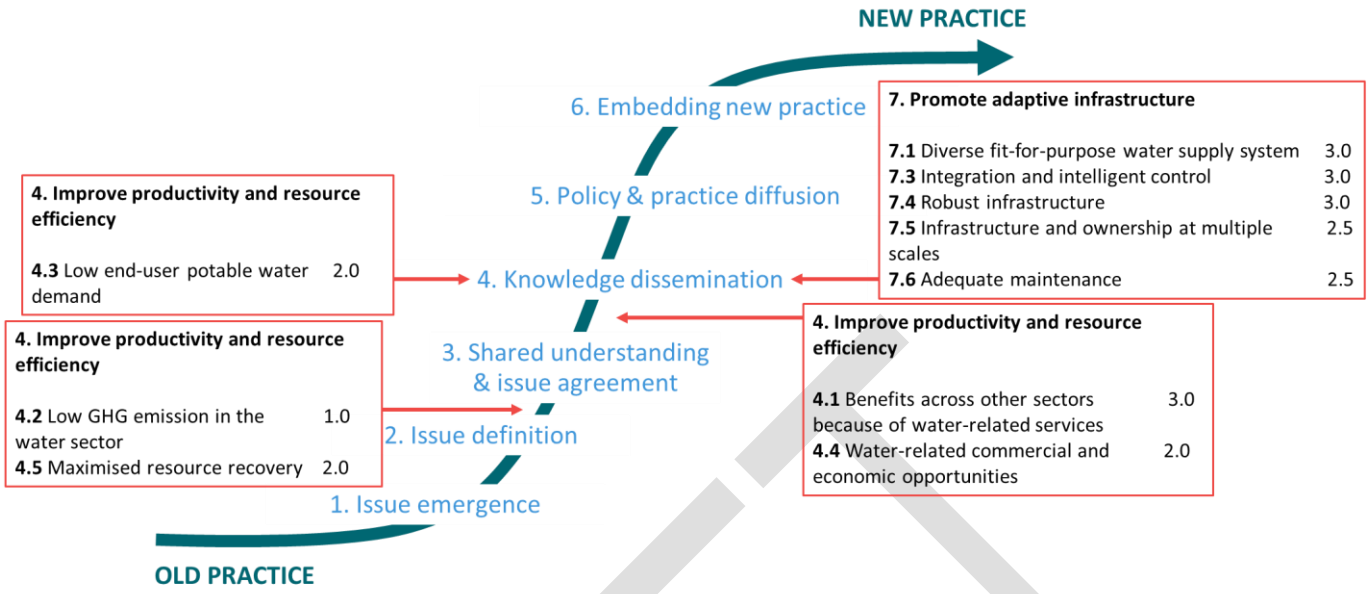
Change in practice required

Traditional water system services are generally designed to meet singular objectives (e.g. water supply, sanitation, drainage) and have tended to prioritise cost efficiency over resource efficiency and to externalise environmental costs. As the impacts of human activity on planetary health are recognised, the community has become more aware of the natural limits in the availability of water, energy and other resources and the need for more sustainable water systems.

For Perth to realise its vision of sustaining the long-term use of its resources, and the broader benefits this could provide, alternative modes of service provision will need to be explored, some of which have been largely incidental to traditional approaches to water system services. This includes taking greater advantage of the synergies and connections between water, energy, food and land resources.

It will require a gradual transition to a more adaptive water servicing approach, involving greater integration of multi-functional systems across scales, supplying more diverse fit-for-purpose water resources and possibly providing greater customer choice of services and service levels. This may mean individuals and businesses are able to provide infrastructure and services at property and precinct scales, which can be integrated with centralised systems through flexible regulation and intelligent control. The planning, design, management and maintenance practices to deliver such an approach will need to be highly collaborative, with systems and process in place to enable the sharing of risks, costs, benefits, data and lessons between infrastructure providers and operators, including individual properties owners.

Status of current enabling conditions



The need for smart, multi-functional and robust infrastructure is well understood amongst Perth's water sector champion networks, however **the narrative explaining why such an approach is important and valuable needs better articulation** in order to build broader support and to develop pathways for their implementation.

The commitment for emissions reduction and resource recovery (beyond recycled water) is largely driven by international and national agendas, which have not yet been translated to provide significance for the local Perth context. National targets exist for greenhouse gas emissions but local commitment to meet these targets is limited.

In contrast, local support for low end-user potable water demand is high, with wide acknowledgement of the issue across the sector and demand measures in place. Champions are experimenting with technical solutions to substitute potable water with non-potable supplies, and they are beginning to implement them at scale. Wastewater recycling in particular has some early large-scale demonstrations (e.g. the Water Corporation's Managed Aquifer Recharge project and the White Gum Valley development). However, there is a need to **increase knowledge about adaptive, multi-functional and integrated solutions beyond wastewater recycling** so that technical opportunities and governance arrangements needed for their implementation can be developed. This is particularly the case for solutions that aim to recover resources beyond wastewater (stormwater, nutrients, biosolids, heat and energy).

The Water Corporation is beginning to harness and recover these resources from wastewater treatment plants for large-scale re-use for purposes such as fertilizers for agriculture and horticulture. Practical experience of such approaches is needed by Perth practitioners more broadly, which can be built through **implementing trials and demonstrations of innovative adaptive, multi-functional and resource efficiency solutions.** Such projects should involve an explicit learning agenda to examine what makes them successful or unsuccessful and to understand how solutions can be applied in the field, forming the basis of new and refined practical guidelines. They would also help to build an evidence base of costs, benefits and risks that can inform the development of a value proposition and business case.

These insights, as well as system data, should be readily shared through **strengthened collaboration platforms focused on delivering adaptive infrastructure and resource efficiency solutions across organisations and sectors**. This knowledge sharing would help lessons be applied to other projects of different scale, resource type, end-use and governance model to further advance solutions and develop application guidance. It would also help build cross-sectoral

commitment and encourage people and organisations to adopt the necessary collaborative, innovative and risk management behaviours needed to achieve sustainable resource outcomes.

Lessons from scientific developments and on-ground trials and demonstrations should then be translated to **strengthen policy to support the further implementation of adaptive infrastructure and resource efficiency solutions**.

While not an explicit part of Perth's vision for long-term sustainable resource use, there is potential for commercial opportunities as the city pursues this agenda through adaptive, integrated and multi-functional water systems. This is in terms of the direct supply of resources and greater environmental health, as well as the potential business that can be generated as Perth becomes established as an innovative water city. Some people in the water sector recognise the potential for multiple benefits across different sectors, however it is not yet broadly acknowledged and there is not yet a system-wide approach for pursuing water-related economic and commercial opportunities. To support an investment planning and decision-making approach that accounts for the broader benefits of innovation in delivering water system services, effort should go into **developing a business case and strategy for pursuing water-related economic and commercial business opportunities**.

In summary, Perth's progress in its transition to the vision of sustaining the long-term use of its resources ranges between Phase 2 (issue definition) and Phase 4 (knowledge dissemination). Further progress would be driven by the strategies described above in bold and summarised in the table below.

Transition Phase	**Strategies**	**Purpose**
Adaptive infrastructure systems		
Knowledge dissemination (4)	4.1 Increase knowledge about adaptive, multi-functional and integrated solutions beyond wastewater recycling (e.g. stormwater, nutrients, biosolids, heat and energy)	To develop technical opportunities and governance arrangements needed for their implementation
Knowledge dissemination (4)	4.2 Share knowledge through strengthened collaboration platforms focused on delivering adaptive infrastructure and resource efficiency solutions across organisations and sectors	To share lessons and apply insights to other projects, to build cross-sectoral commitment and encourage people and organisations to adopt the necessary collaborative, innovative and risk management behaviours
Shared understanding and issue agreement (3)	4.3 Develop a narrative for the importance and value of an adaptive, integrated, multi-functional infrastructure approach	To build broad support amongst policy-makers and across sectors so that pathways for solution implementation can be pursued
Shared understanding and issue agreement (3) Knowledge dissemination (4)	4.4 Implement trials and demonstrations of innovative adaptive, multi-functional and resource recovery solutions, including an explicit learning agenda	To understand how solutions can be applied in practice to inform the development of practical guidelines; to build an evidence base of costs, benefits and risks that can inform the development of a

		value proposition and business case
Policy and practice diffusion (5)	4.5 Strengthen policy to encourage and enable adaptive infrastructure and resource recovery solutions to be adopted	To remove barriers and improve implementation of adaptive infrastructure and resource recovery solutions
Broader economic and commercial value		
Issue definition (2)	4.6 Develop a business case and strategy for pursuing water-related economic and commercial business opportunities	To support an investment planning and decision-making approach that accounts for the broader economic and commercial benefits of innovation in delivering water system services

4.7 Summary of strategies for Perth's WSC transition

Comparing across vision outcomes in Section 4 reveals that similar strategies appear multiple times, which would require similar strategies to be implemented. It is therefore helpful to identify the different types of strategies that would need to be pursued collectively across all vision outcomes as part of Perth's transition strategy. In this section, the strategies are reorganised in this way. This will inform the development of actions to achieve the vision outcomes.

Strategies to increase awareness and understanding

Strategy	Focus	#
Develop new knowledge	About why Perth has low community capital to inform the development of solution options for increasing the community's awareness, knowledge, connection and sense of responsibility in relation to water	1.1
	About the full range of amenity values of water-related assets and to appreciate the complex picture to understand the extent and potential benefits of improving access, in order to amenity values of water-related assets to inform advocacy and potential solutions	3.1
	About adaptive, multi-functional and integrated solutions beyond wastewater recycling (e.g. stormwater, nutrients, biosolids, heat and energy) to inform the development and implementation of trials and demonstration projects	4.1
Examine and evaluate evidence	For pursuing economic and commercial business opportunities related to water sensitive cities to inform the development of a business case to support investment planning and decision-making that accounts for the broader economic and commercial benefits of innovation in delivering water system services	4.6
Build understanding	Of urban planning, design and development professionals about their role in delivering and maintaining water outcomes, in order to ensure broad support for water-related outcomes across urban planning, design, construction and maintenance sectors within both development industry and local government	3.4
Build capacity	Of urban and water professionals to implement and maintain solutions for multi-functional urban spaces to ensure professionals across planning, design, construction and maintenance have the ability to work together to deliver innovative water sensitive solutions that create high quality, socially inclusive urban spaces	3.5
	Of champions to advocate for greater community and Traditional Owner involvement in water planning and decision-making to help the role of community and Traditional Owners in water stewardship to become recognised and valued	1.3

Strategies to harness leadership and community support

Strategy	Focus	#
Develop and communicate a compelling narrative	About the importance of water system services in delivering environmental outcomes in order to harness authorising environment support for water system initiatives that aim to improve the health of the environment	2.1
	About the importance of water system services in delivering community well-being outcomes in order to harness authorising environment support for water system initiatives that improve the health of the community	2.2
	About the importance of equitable and affordable access to water-supported amenity in order to develop a collective advocating voice and attract support from the authorising environment for the implementation of solutions	3.2
	About the importance of integrated solutions that both shape a desired urban form and function as part of the water system in order to attract authorising environment support for integrated water and land-use planning to achieve multiple benefits	3.3

	About the importance and value of an adaptive, integrated, multi-functional infrastructure approach in order to build broad support amongst policy-makers and across sectors so that pathways for solution implementation can be pursued	4.3

Strategies to test new solutions in real world settings

Strategy	Focus	
Implement pilot-scale trials	Of governance solutions for achieving Perth's vision of water stewardship in order to explore and demonstrate how solutions can be delivered; evidence of costs, benefits and risks; learning about the capabilities needed for their effective implementation	1.5
	Of innovative adaptive, multi-functional and resource recovery solutions, including an explicit learning agenda in order to understand how solutions can be applied in practice and inform the development of practical guidelines; to build an evidence base of costs, benefits and risks that can inform the development of a value proposition and business case	4.4
Implement significant demonstrations	Of both technical and governance solutions that aim to improve environmental health, including an explicit learning agenda in order to demonstrate how innovative solutions can be delivered; evidence of their costs, benefits and risks; learning about the capabilities needed for their effective implementation	2.4
Learn from and showcase new and existing projects that demonstrate solutions	For multi-functional, quality urban spaces in order to understand how solutions can be applied in practice to inform the development of practical guidelines; to build an evidence base of costs, benefits and risks that can inform the development of a value proposition and business case	3.6

Strategies to enable and encourage people to collaborate and innovate

Strategy	Focus	#
Advance and expand existing platforms for connecting champions	To gain clarity around the issue of low community capital and explore potential solutions in order to begin building a collective voice that can advocate for solutions	1.2
	To extend their focus to governance and community engagement solutions and integrate a greater diversity of perspectives in the consideration of a full suite of potential governance and engagement solutions for delivering the many different dimensions of Perth's water sensitive city vision	1.4
	To strengthen the alignment and coordination of voices across sectors that highlight environmental and community health as an outcome of water system services in order to build a collective voice that is influential and effective amongst broad audiences in promoting the importance of water system services in delivering environmental outcomes	2.3
	To strengthen collaboration for delivering adaptive infrastructure and resource efficiency solutions across organisations and sectors in order to build cross-sectoral commitment and encourage people and organisations to adopt the necessary collaborative, innovative and risk management behaviours	4.2

Strategies to embed solutions in policy and regulation

Strategy	Focus	
Improve implementation of existing policies and programs	For protecting environmental health (in particular, water quality) in order to enable better coordination across governments, industry and the community, strong compliance levers and effective asset management systems to deliver ecosystem health protection	2.5
	For integrated water and urban planning and design in order to remove implementation barriers for strengthening the role of water in delivering quality and multi-functional urban spaces	3.7
Improve policy and regulatory frameworks	To encourage and enable adaptive infrastructure and resource recovery solutions to be adopted so that barriers are removed and implementation of adaptive infrastructure and resource recovery solutions is improved	4.5

5 CONCLUSION

A historic fragmented approach to water management and uncertainty in the face of a drying climate have characterised Greater Perth's water system. Now, there is a broad recognition that better collaboration and integration are needed to ensure Perth's liveability, productivity, resilience and sustainability.

To explore opportunities for a more collaborative and integrated approach to water management, leaders and strategic thinkers from across Perth's water, planning and development sectors came together through multiple CRCWSC-led projects to explore how this can be achieved. Perth's historic, current and future water story was explored and informed the development of a transition strategy that structures and makes sense of the change processes that will be required to achieve their vision. The results provide a framework for prioritising and designing strategic action across the many stakeholder organisations that will need to work in a collaborative and coherent manner to facilitate Perth's water sensitive city transition.

The insights presented in this transition strategy show that Perth has strong foundations and many opportunities to leverage off in accelerating Perth's transition towards its envisioned water future. Its strong vision, leadership and network of champions provide opportunities for agreeing on shared aspirations and exploring more integrated solutions. The network of water champions was identified and first brought together in July 2015, and have demonstrated a commitment to continue meeting to ensure strategies for achieving the vision are implemented. This dedication is an important foundation for Perth's transition and creates a strong enabling environment for rapid adoption of water sensitive city principles.

Critical focus areas for advancing Perth's WSC transition include the need for inclusive and collaborative water governance arrangements that take into account the entire water cycle. Attention will also need to be given to existing platforms for collaboration to expand their focus and incorporate all elements of a water sensitive city. There is a need to increase collaboration across agencies and organisations to ensure integrated solutions that deliver multiple benefits for the city.

Perhaps most importantly, the benefits of a water sensitive city need to be understood and appreciated throughout the Perth community so that initiatives to drive change are welcomed and endorsed. This requires a compelling narrative of the value of Perth's water sensitive future to be developed to give stakeholders, decision-makers and the community members focus and clarity around their priorities and aspirations for the city.

The current champion network and momentum in Perth is promising for establishing the environment needed to transition. With ongoing commitment from stakeholders to implementing these identified strategies, Perth will be in a strong position to achieve its vision of being a liveable, sustainable, productive and resilient city.

PART B:
IMPLEMENTATION FRAMEWORK

1. INTRODUCTION

This forthcoming section will introduce the Implementation Framework.

2. ACTIONS FOR ACHIEVING THE VISION

The following section presents recommended actions within each priority strategy. Accompanying these strategies and actions are tangible ideas for implementation which have been drawn from the A4.2 *Shaping Perth as a Water Sensitive City* process, workshop discussions with the Water Sensitive Transition Network and CRCWSC knowledge. These ideas are meant to be seen as a starting point for implementation of strategies and will evolve with emerging local opportunities.

Vision theme 1: Fostering stewardship of the system

Outcomes:

1. People understand the entire water cycle and recognise the need to adapt to uncertain and changing conditions
2. People feel a sense of belonging and connection with Perth and identify with its evolving water story
3. People are appropriately engaged in open and inclusive decision-making processes that are informed by comprehensive information and transparency in people's priorities
4. There is continuous investment in developing necessary skills, knowledge and capacity across water-related professions, sectors and the community

Vision theme 1: Fostering stewardship of the system	
Strategy 1.1: Invest in social science to clarify why Perth has low community capital	**Purpose:** To inform the development of solution options for increasing the community's awareness, knowledge, connection and sense of responsibility in relation to water
Actions	**Ideas for Implementation**
Develop a scientific research plan in collaboration with research organisations to consolidate existing knowledge and address gaps about Perth's Indigenous knowledge and community capital	• Undertake social research projects (e.g. surveys, focus groups) to identify community values in relation to water sensitivity e.g. "Save the crabs, then eat them" campaign • Facilitate community visioning processes in target areas of Greater Perth • Engage with students • Engage with organisations for funding and buy-in

Vision theme 1: Fostering stewardship of the system	
	• Document water cycle knowledge from Aboriginal groups
Learn from other Australian and international cities that have successfully improved community capital about water	
Strategy 1.2: Advance platforms for champions to gain clarity around the issue of low community capital and explore potential solutions	**Purpose:** To begin building a collective voice that can advocate for solutions to improve community capital
Actions	**Ideas for Implementation**
Review existing community engagement programs and incorporate WSC concepts	•
Establish a working group to drive discussions that develop clarity around the issue of low community capital and explore potential solutions for improving it	• Expand the focus of the existing communications subgroup
Review Perth's water sensitive cities capacity building program to identify how its focus could expand to become an effective platform for getting clarity around the issue of low community capital, explore solutions and build a collective voice	• Consider other capacity building programs in other jurisdictions • Consider innovative engagement ideas e.g. games for sustainability
Secure sustainable funding for Perth's water sensitive cities capacity building program and give it focus on building capacity of professionals to improve community capital	• Consider funding models in other jurisdictions • Incorporate consistent messages in a range of agency champions
Hold an annual symposium or conference that brings academics and professionals together to explore emerging knowledge and solutions for building community capital	• Support students to become WSC champions • Use scholarships to attend conferences/symposiums as incentives and awards • Form partnerships to hold symposium • New Waterways to emphasise importance of educating clients and the community
Strategy 1.3: Support champions inside and outside the water sector to advocate for greater community and Traditional Owner involvement in water planning and decision-making	**Purpose:** To ensure the role of community and Traditional Owners in water stewardship is recognised and valued
Actions	**Ideas for Implementation**
Invest in growth and capacity of individuals to become effective champions	• Link with WA's capacity building program • Draw on scientific knowledge about leadership and capacity development • Establish a mentoring program, leveraging off of existing mentoring programs
Provide opportunities for both professional and community champions, including Traditional Owners, to have a voice	• Hold symposiums or other events and invite champions • Involve champions in formal planning processes

Vision theme 1: Fostering stewardship of the system	
Identify and connect champions from beyond the water sector, including the community and existing networks	• Explore potential for involvement in a working group • Look beyond typical water sector champions
Develop a long-term strategy or framework for engaging Traditional Owners that is consistent and coordinated across regional and water plans and initiatives	• Look at the Water Corporation's Reconciliation Action Plan • Engage with RMIT work • Engage with Traditional Owners to share knowledge and water stories
Strategy 1.4: Expand existing champion networks to integrate a greater diversity of perspectives and extend the focus of platforms for collaboration to consider governance and engagement solutions	**Purpose:** To develop a full suite of potential governance and engagement solutions for delivering the many different dimensions of Perth's water sensitive city vision
Actions	**Ideas for Implementation**
Establish a working group to review Perth's water sensitive city vision against current governance arrangements and existing legislative and policy frameworks to identify opportunities for influencing their implementation, development, or reform	• Engage with CRCWSC research
Consolidate existing knowledge on best-practice governance and how it can be applied to the Perth context	•
Strategy 1.5: Implement trials and demonstrations of governance solutions for achieving Perth's vision of water stewardship	**Purpose:** To explore and demonstrate how governance and engagement solutions can be delivered; evidence of costs, benefits and risks; learning about the capabilities needed for their effective implementation
Actions	**Ideas for implementation**
Develop a clear learning agenda that scopes the governance lessons to be learned across technical, social and risk management domains	• Emphasise learning from failures • Readily available life cycle cost/benefit information for a range of outcomes at a range of scales • Industry-supported (by local government and insurance agencies) risk profiles of WSUD solutions
Invest in collaborations between industry and research to conduct pilot-scale and demonstration-scale experiments of collaborative and innovative governance arrangements	• Co-governance models
Partner with developers, universities, councils, communities etc. to trial different aspects of governance solutions	• Develop engagement tools to improve their understanding of the water system and its role in delivering the urban liveability outcomes they value

Vision theme 1: Fostering stewardship of the system	
Develop a dissemination plan for sharing data and communicating lessons from trials and demonstrations to different audiences	• Catchment report cards • Smart meters in houses
Strengthen relationships and capabilities across research, policy and practice to pursue the learning agenda and incorporate new knowledge into solutions	• Strengthen capacity building organisations to provide case studies and practical training sessions • Regulatory systems review to support innovation • Stronger links between industry and research (universities) to optimise opportunities for industry-supported research

Vision theme 2: Protecting and enhancing the wellbeing of people and the environment

Outcomes:

1. Water is valued and managed with respect for the interdependent and dynamic relationship between people and the environment

2. Perth's coastal and inland water ecosystems are protected and thriving with biodiversity

3. Flood and inundation risks are managed in harmony with local conditions to minimise impacts on and embrace opportunities for the city

Vision theme 2: Protecting and enhancing the wellbeing of people and the environment	
Strategy 2.1: Develop and communicate a narrative for the importance of water system services in delivering environmental outcomes	**Purpose:** To harness authorising environment support for water system initiatives that aim to improve the health of the environment
Actions	**Ideas for Implementation**
Build a broad network of champions across sectors focused on environmental outcomes	• Establish a working group • Identify champions across sectors to work with • Start developing a shared understanding around solutions and pathways for implementation
Understand the community's values, priorities and aspirations in relation to environmental health outcomes	• Conduct local visioning processes • Engage with Nyoongar people to understand their knowledge, values and priorities in relation to ecosystem health • Engage with local communities to explore values of their local environments
Develop narratives in relation to community values	•

Vision theme 2: Protecting and enhancing the wellbeing of people and the environment	
Develop and implement a communications plan to communicate the narrative to different audiences	• Engage communication and media professionals • Trial a range of strategies for communicating the narrative to target a range of organisations and demographics • Develop a communication toolkit for practitioners
Build support from the authorising environment for ecosystem health outcomes	• Engage with political leaders • Identify champions who can engage with community and government leaders • Run a policy influence workshop (CRCWSC training) to build champions' capacity for influence
Review narrative over time to ensure it remains relevant	•
Strategy 2.2: Develop and communicate a narrative for the importance of water system services in delivering community well-being outcomes	**Purpose:** To harness authorising environment support for water system initiatives that improve the health of the community
Partner with researchers to strengthen relationships between water system services and mental and physical health (e.g. urban heat)	• Compile relevant research on community health benefits
Develop a communications plan to communicate the narrative to different audiences	• Engage communication and media professionals • Trial a range of strategies for communicating the narrative to target a range of organisations and demographics • Develop a communication toolkit for practitioners
Strategy 2.3: Strengthen the alignment and coordination of voices across sectors that highlight environmental and community health as an outcome of water system services	**Purpose:** To build a collective voice that is influential and effective amongst broad audiences in promoting the importance of water system services in delivering environmental outcomes
Actions	**Ideas for Implementation**
Develop a cross-sectoral working group focused on and committed to the role of water system services in ensuring environmental and community health as an outcome	• Identify champions in other sectors • Look for opportunities to work with champions
Disseminate the narrative for improved ecosystem health outcomes through professional networks	•
Strategy 2.4: Implement significant trials and demonstrations of both technical and governance solutions that aim to improve	**Purpose:** To demonstrate how innovative solutions can be delivered; evidence of their costs, benefits and risks; learning about the

Vision theme 2: Protecting and enhancing the wellbeing of people and the environment	
environmental health, including an explicit learning agenda	capabilities needed for their effective implementation
Actions	**Ideas for Implementation**
Develop a clear learning agenda that scopes the lessons to be learned across technical, social and risk management domains	• Engage an expert panel • Review existing social and technical projects, demonstrations and lessons learned
Establish an innovation program that implements strategic trials and demonstrations of innovative solutions in collaboration between lead agencies and organisations developers, and research organisations	• Identify opportunities to trial and demonstrate solutions • Engage the Minister for Innovation • Incorporate monitoring and evaluation to learn from projects and to inform policy and regulation
Develop and implement a dissemination plan for sharing data and communicating lessons from trials and demonstrations to different audiences	•
Identify opportunities for significant demonstration projects	•
Strategy 2.5: Translate policy goals for environmental health (in particular water quality) into system-wide standards and programs of implementation	**Purpose:** To improve the implementation of policies and clarify organisational roles and responsibilities for managing, protecting and enhancing environmental outcomes
Actions	**Ideas for Implementation**
Establish a working group including regulatory agencies and industry to review existing and recommend new standards for environmental health outcomes and programs of implementation, including how they influence other policies (e.g. open space, public health)	• Review visioning outputs • Engage an expert panel to advise the working group • Establish an adaptive program of monitoring and performance review
Seek opportunities to influence and uptake policies and regulation	• Look globally for effective best practice examples
Continually review and update policies and guidelines with contemporary science and evidence and outcomes from trials and demonstrations	•
Recognise and celebrate good trials and demonstrations	• Project awards • 5 star WSC accreditation/recognition rating • Develop a national program

Vision theme 3: Integrating and engaging with the built and natural landscape

Outcomes:

1. Perth's urban character reflects its unique landscape and water environments
2. The urban environment is comfortable, safe, and promotes health and wellbeing
3. The city is filled with a network of beautiful, well-designed and high quality places that are diverse, accessible, loved and enhanced by effective water management
4. Infrastructure planning and development are coordinated and integrated to deliver multiple benefits

Vision theme 3: Integrating and engaging with the built and natural landscape	
Strategy 3.1: Undertake system-wide assessment to understand the full range of amenity values of water-related assets and to appreciate the complex picture	**Purpose:** To understand the extent and potential benefits of improving access to amenity values of water-related assets to inform advocacy and potential solutions
Actions	**Ideas for Implementation**
Develop a research plan in collaboration with research organisations to consolidate existing knowledge and address data and knowledge gaps	• Strengthen associations with CRC's and universities on research projects
Undertake social research to understand community values, benefits, and people's connection to local water assets	•
Document and quantify benefits of public and private open space and green infrastructure including and maintenance costs to support ongoing maintenance commitments from local governments	• Life cycle cost/benefit information for a range of treatments at various scales is readily accessible
Strategy 3.2: Develop a narrative for the importance of equitable and affordable access to water-supported amenity	**Purpose:** To articulate a collective voice advocating for equitable access to amenity values of water-related assets and attract support for the implementation of solutions from the authorising environment
Actions	**Ideas for Implementation**
Develop a communication plan and targeted materials for disseminating a clear narrative about water and the city form (with a focus on equitable and affordable access) that Perth's communities connects with	• Map and analyse Perth's communities to understand the diversity of target audiences • Undertake market research to identify community values in relation to water • Learn from the narratives and communications in other Australian and international cities that have successfully raised awareness and built support for water innovations

Vision theme 3: Integrating and engaging with the built and natural landscape	
	• Engage communication and media professionals to support
Embed Perth's water narrative in the curriculum of primary and secondary schools	• Develop a water sensitive cities education toolkit, content modules, and dissemination strategy • Include local Perth content in addition to general principles and concepts • Consider a wide range of innovative engagement strategies (e.g. blogs, social media, school competitions, local newspapers)
Conduct local visioning processes with communities to harness grassroots support	• Review existing local Government systems, frameworks and processes to identify pathways for encouraging and requiring visioning processes • Support local Governments with tools, processes and funding for co-creating local water sensitive visions with community • Develop ideas for harnessing local community champions that may emerge from visioning processes
Strategy 3.3: Develop a narrative for the importance of integrated solutions that both shape a desired urban form and function as part of the water system	**Purpose:** To ensure the authorising environment supports integrated water and land-use planning for multiple benefits
Actions	**Ideas for Implementation**
Develop a communication plan and targeted materials for disseminating a clear narrative about water and the city form (with a focus on urban form and function) that Perth's communities connects with	• Map and analyse Perth's communities to understand the diversity of target audiences • Undertake market research to identify community values in relation to water • Learn from the narratives and communications in other Australian and international cities that have successfully raised awareness and built support for water innovations • Engage communication and media professionals to support
Embed Perth's water narrative in the curriculum of schools and universities	• Develop a water sensitive cities education toolkit, content modules, and dissemination strategy • Include local Perth content in addition to general principles and concepts • Consider a wide range of innovative engagement strategies (e.g. blogs, social media, school competitions, local newspapers)
Conduct local visioning processes with communities to harness grassroots support	• Review existing local Government systems, frameworks and processes to identify pathways for encouraging and requiring visioning processes • Support local Governments with tools, processes and funding for co-creating

Vision theme 3: Integrating and engaging with the built and natural landscape	
	local water sensitive visions with community • Develop ideas for harnessing local community champions that may emerge from visioning processes
Strategy 3.4: Build understanding amongst urban planning, design and development professionals about their role in delivering and maintaining water outcomes	**Purpose:** To ensure broad support for water-related outcomes across urban planning, design, construction and maintenance sectors within both development industry and local government
Actions	**Ideas for Implementation**
Strengthen and expand Perth's water sensitive cities capacity building program, New WAater Ways	• Target initiatives at urban planning, design and development professionals not traditionally engaged with water • Secure a sustainable funding source, potentially beyond Government • Collaborate with professional bodies and industry groups (e.g. PIA, AILA, AIA, ASBEC) to develop training programs for urban professionals
Strengthen and expand university curriculum for urban planning and design courses to give multi-disciplinary focus to water	• Work with relevant academics to review gaps in current curriculums • Advocate to universities for proposed revisions to curriculum
Embed collaborative water sensitive evidence-based and design-led processes in planning, design and development frameworks	• Review existing systems, frameworks and processes to identify pathways for encouraging and requiring approaches such as charrettes and strategic design workshops focused on water sensitive outcomes
Strategy 3.5: Build capacity of urban and water professionals to implement and maintain solutions for multi-functional urban spaces	**Purpose:** To ensure professionals across planning, design, construction and maintenance have the ability to work together to deliver innovative water sensitive solutions that create high quality, socially inclusive urban spaces
Actions	**Ideas for Implementation**
Strengthen and expand Perth's water sensitive cities capacity building program, New WAter Ways	• Target initiatives at urban planning, design and development professionals not traditionally engaged with water • Target initiatives at building urban and water professionals' skills to develop advocacy messages about the role of water in improving quality urban space • Secure a sustainable funding source, potentially beyond Government • Collaborate with professional bodies and industry groups (e.g. PIA, AILA, AIA, ASBEC) to develop training programs for urban professionals
Embed collaborative evidence-based and design-led processes for water sensitive	• Review existing systems, frameworks and processes to identify pathways for encouraging and requiring approaches

Vision theme 3: Integrating and engaging with the built and natural landscape	
outcomes in planning, design and development frameworks	such as charrettes and strategic design workshops focused on water sensitive outcomes
Identify, develop, and utilise modelling tools that support water sensitive planning and design to improve quality urban spaces	• Review existing integrated modelling tools to identify their potential for demonstrating the value of urban planning and design solutions in delivering water outcomes • Where there is a lack of availability, develop new modelling tools
Strategy 3.6: Learn from and showcase new and existing projects that demonstrate solutions for multi-functional, quality urban spaces	**Purpose:** To inform the development of comprehensive guidelines, policies and standards
Actions	**Ideas for Implementation**
Develop a clear learning agenda that scopes the lessons to be learned from trials and demonstrations across technical, social and risk management domains	• Establish mechanisms and financial incentives to encourage risk sharing and collaboration towards innovation for water sensitivity
Establish a working group to consolidate learnings and knowledge across demonstrations	•
Strategy 3.7: Consolidate and align policy and regulatory tools for water and urban planning and design	**Purpose:** To improve the effectiveness of existing policies and remove implementation barriers for strengthening the role of water in delivering quality and multi-functional urban spaces
Actions	**Ideas for Implementation**
Review existing and recommend new policies and standards for water sensitive outcomes and programs of implementation, drawing on the latest knowledge and evidence	•

Vision theme 4: Sustaining the long-term use of Perth's resources

1. Water is available to equitably meet the needs of people and the environment both now and in the future

2. Fit-for-purpose water is supplied through adaptable systems that work across multiple scales

3. Efficient use and recovery of resources is ensured through innovative water cycle management

Vision theme 4: Sustaining the long-term use of Perth's resources	
Strategy 4.1: Increase knowledge about adaptive, multi-functional and integrated solutions beyond wastewater recycling (e.g. stormwater, nutrients, biosolids, heat and energy)	**Purpose:** To inform the development and implementation of trials and demonstration projects
Actions	**Ideas for Implementation**
Review and consolidate existing knowledge to identify gaps and areas for investment	• Strengthen associations with CRCs and universities on research projects
Develop a science and research plan that is reported against	•
Fund research and its translation to address unresolved scientific questions and key knowledge gaps important for achieving the vision of a water sensitive Perth	• Engage with CRCWSC
Strategy 4.2: Share knowledge through strengthened collaboration platforms focused on delivering adaptive infrastructure and resource efficiency solutions across organisations and sectors	**Purpose:** To build cross-sectoral commitment and encourage people and organisations to adopt the necessary collaborative, innovative and risk management behaviours needed
Actions	**Ideas for Implementation**
Strengthen and expand Perth's water sensitive cities capacity building program, New WAter Ways	• Develop case studies, presentations and practical workshops to demonstrate advances in alternative source and supply options
Identify a range of champions to foster, endorse and communicate the vision, particularly to target industry, community and government members who are not yet engaged	•
Provide incentives and rewards for achieving water sensitive outcomes	• Community water sensitive city award under the annual AWA/Stormwater Industry awards • Increase the capacity of sub-regional NRM groups that have established networks and community credibility • Waterwise Councils
Establish advocacy networks with representatives from government, industry and the community for ongoing collaboration and commitment	•
Establish a working group to develop a knowledge sharing strategy that drives an open and collaborative approach to share data and knowledge for coordinated decision-making	•
Identify and pursue tangible opportunities for collaboration and alignment to deliver water sensitive city outcomes	•

Vision theme 4: Sustaining the long-term use of Perth's resources	
Strategy 4.3: Develop a narrative for the importance and value of an adaptive, integrated, multi-functional infrastructure approach	**Purpose:** To build broad support amongst policy-makers and across sectors so that pathways for solution implementation can be pursued
Actions	**Ideas for Implementation**
Develop a communication plan and targeted materials for disseminating a clear narrative about water and the city form (with a focus on fit-for-purpose water availability and water needs of the environment) that Perth's communities, policy makers and private sector connect with	• Map and analyse Perth's communities to understand the diversity of target audiences • Undertake market research to identify community values in relation to water • Learn from the narratives and communications in other Australian and international cities that have successfully raised awareness and built support for water innovations • Engage communication and media professionals to support • Identify language that communities connect with (i.e. water wise, water smart, water sensitive)
Embed Perth's water narrative in the curriculum of primary and secondary schools	• Develop a water sensitive cities education toolkit, content modules, and dissemination strategy • Include local Perth content in addition to general principles and concepts • Consider a wide range of innovative engagement strategies (e.g. blogs, social media, school competitions, local newspapers)
Conduct local visioning processes with communities to harness grassroots support	• Review existing local Government systems, frameworks and processes to identify pathways for encouraging and requiring visioning processes • Support local Governments with tools, processes and funding for co-creating local water sensitive visions with community • Develop ideas for harnessing local community champions that may emerge from visioning processes
Strategy 4.4: Implement trials and demonstrations of innovative adaptive, multi-functional and resource recovery solutions, including an explicit learning agenda	**Purpose:** To understand how solutions can be applied in practice to inform the development of practical guidelines; to build an evidence base of costs, benefits and risks that can inform the development of a value proposition and business case
Actions	**Ideas for Implementation**
Establish mechanisms for funding and supporting alternative source and supply options including governance arrangements and risk management	• Do demonstrations in partnership with research organisations to secure investment from lead organisations • Public/private partnerships • Grants from water industry • Grants from other industries
Develop a clear learning agenda that scopes the lessons to be learned from trials and demonstrations across technical, social and risk management domains	• Establish mechanisms and financial incentives to encourage risk sharing and collaboration towards innovation for water sensitivity
Establish an innovation program that implements strategic trials and demonstrations of new water sensitive approaches	• Support the joint Drainage for Liveability program including with dedicated funding for implementation

Vision theme 4: Sustaining the long-term use of Perth's resources	
Develop a dissemination plan for sharing data and communicating lessons from trials and demonstrations to different audiences	•
Strengthen relationships and capabilities across research, policy and practice to pursue the learning agenda and incorporate new knowledge into solutions	•
Establish a working group to consolidate knowledge from existing projects and identify opportunities for expansion	• Engage a peer-review panel
Strategy 4.5: Strengthen policy to encourage and enable adaptive infrastructure and resource recovery solutions to be adopted	**Purpose:** To remove barriers and improve implementation of adaptive infrastructure and resource recovery solutions
Actions	**Ideas for Implementation**
Review existing guidelines and tools to identify gaps and identify opportunities for establishing shared water sensitive objectives across water, planning, development, environment, community and economic services	•
Review national and international best practice examples of jurisdictions that have established planning and design standards that reflect aspirational outcomes related to water sensitive cities	•
Strategy 4.6: Develop a business case and strategy for pursuing economic and commercial business opportunities related to water sensitive cities	To support an investment planning and decision-making approach that accounts for the broader economic and commercial benefits of innovation in delivering water system services
Actions	**Ideas for Implementation**
Establish a working group to drive the consolidation of evidence for, and evaluation of, the business case and develop a strategy	• Review evidence in other jurisdictions and sectors • Understand economies of scale and feasibility of alternative source and supply options
Conduct systemic analyses of the economic value of water-related commercial opportunities	•

3. ACTIONS FOR IMPLEMENTING THE STRATEGIES

Strategies to increase awareness and understanding

Strategy	Focus	#	Actions
Develop new knowledge	About why Perth has low community capital to inform the development of solution options for increasing the community's awareness, knowledge, connection and sense of responsibility in relation to water	1.1	• Develop a research plan in collaboration with research organisations to consolidate existing knowledge and address data and knowledge gaps l • Learn from other Australian and international cities that have successfully improved community capital about water
	About the full range of amenity values of water-related assets and to appreciate the complex picture to understand the extent and potential benefits of improving access, in order to amenity values of water-related assets to inform advocacy and potential solutions	3.1	• Develop a research plan in collaboration with research organisations to consolidate existing knowledge and address data and knowledge gaps • Undertake social research to understand community values, benefits, and people's connection to local water assets • Document and quantify benefits of public and private open space and green infrastructure including and maintenance costs to support ongoing maintenance commitments from local governments
	About adaptive, multi-functional and integrated solutions beyond wastewater recycling (e.g. stormwater, nutrients, biosolids, heat and energy) to inform the development and implementation of trials and demonstration projects	4.1	• Review and consolidate existing knowledge to identify gaps and areas for investment • Develop a science and research plan that is reported against • Fund research and its translation to address unresolved scientific questions and key knowledge gaps important for achieving the vision of a water sensitive Perth
Examine and evaluate evidence	For pursuing economic and commercial business opportunities related to water sensitive cities to inform the development of a business case to support investment planning and decision-making that accounts for the broader economic and commercial benefits of innovation in delivering water system services	4.6	• Establish a working group to drive the consolidation of evidence for, and evaluation of, the business case and develop a strategy • Conduct systemic analyses of the economic value of water-related commercial opportunities

Build understanding	Of urban planning, design and development professionals about their role in delivering and maintaining water outcomes, in order to ensure broad support for water-related outcomes across urban planning, design, construction and maintenance sectors within both development industry and local government	3.4	• Strengthen and expand Perth's water sensitive cities capacity building program, New WAter Ways • Strengthen and expand university curriculum for urban planning and design courses to give multi-disciplinary focus to water • Embed collaborative water sensitive evidence-based and design-led processes in planning, design and development frameworks
Build capacity	Of urban and water professionals to implement and maintain solutions for multi-functional urban spaces to ensure professionals across planning, design, construction and maintenance have the ability to work together to deliver innovative water sensitive solutions that create high quality, socially inclusive urban spaces	3.5	• Strengthen and expand Perth's water sensitive cities capacity building program, New WAter Ways • Embed collaborative evidence-based and design-led processes for water sensitive outcomes in planning, design and development frameworks • Identify, develop, and utilise modelling tools that support water sensitive planning and design to improve quality urban spaces
	Of champions to advocate for greater community and Traditional Owner involvement in water planning and decision-making to help the role of community and Traditional Owners in water stewardship to become recognised and valued	1.3	• Invest in growth and capacity of individuals to become effective champions • Provide opportunities for both professional and community champions, including Traditional Owners, to have a voice • Identify and connect champions from beyond the water sector, including the community and existing networks • Develop a long-term strategy or framework for engaging Traditional Owners that is consistent and coordinated across regional and water plans and initiatives

Strategies to harness leadership and community support

Strategy	Focus	#	Actions
Develop and communicate a compelling narrative	About the importance of water system services in delivering environmental outcomes in order to harness authorising environment support for water system initiatives that aim to improve the health of the environment	2.1	• Build a broad network of champions across sectors focused on environmental outcomes • Understand the community's values, priorities and aspirations in relation to environmental health outcomes • Develop narratives in relation to community values • Develop and implement a communications plan to communicate the narrative to different audiences

			• Build support from the authorising environment for ecosystem health outcomes • Review narrative over time to ensure it remains relevant
	About the importance of water system services in delivering community well-being outcomes in order to harness authorising environment support for water system initiatives that improve the health of the community	2.2	• Partner with researchers to strengthen relationships between water system services and mental and physical health (e.g. urban heat) • Develop a communications plan to communicate the narrative to different audiences
	About the importance of equitable and affordable access to water-supported amenity in order to develop a collective advocating voice and attract support from the authorising environment for the implementation of solutions	3.2	• Develop a communication plan and targeted materials for disseminating a clear narrative about water and the city form (with a focus on equitable and affordable access) that Perth's communities connects with • Embed Perth's water narrative in the curriculum of primary and secondary schools • Conduct local visioning processes with communities to harness grassroots support
	About the importance of integrated solutions that both shape a desired urban form and function as part of the water system in order to attract authorising environment support for integrated water and land-use planning to achieve multiple benefits	3.3	• Develop a communication plan and targeted materials for disseminating a clear narrative about water and the city form (with a focus on urban form and function) that Perth's communities connects with • Embed Perth's water narrative in the curriculum of schools and universities • Conduct local visioning processes with communities to harness grassroots support
	About the importance and value of an adaptive, integrated, multi-functional infrastructure approach in order to build broad support amongst policy-makers and across sectors so that pathways for solution implementation can be pursued	4.4	• Establish mechanisms for funding and supporting alternative source and supply options including governance arrangements and risk management • Develop a clear learning agenda that scopes the lessons to be learned from trials and demonstrations across technical, social and risk management domains • Establish an innovation program that implements strategic trials and demonstrations of new water sensitive approaches • Develop a dissemination plan for sharing data and communicating lessons from trials and demonstrations to different audiences • Strengthen relationships and capabilities across research, policy

			and practice to pursue the learning agenda and incorporate new knowledge into solutions • Establish a working group to consolidate knowledge from existing projects and identify opportunities for expansion

Strategies to test new solutions in real world settings

Strategy	Focus	#	Actions
Implement pilot-scale trials	Of governance solutions for achieving Perth's vision of water stewardship in order to explore and demonstrate how solutions can be delivered; evidence of costs, benefits and risks; learning about the capabilities needed for their effective implementation	1.5	• Develop a clear learning agenda that scopes the governance lessons to be learned across technical, social and risk management domains • Invest in collaborations between industry and research to conduct pilot-scale and demonstration-scale experiments of collaborative and innovative governance arrangements • Partner with developers, universities, councils, communities etc. to trial different aspects of governance solutions • Develop a dissemination plan for sharing data and communicating lessons from trials and demonstrations to different audiences • Strengthen relationships and capabilities across research, policy and practice to pursue the learning agenda and incorporate new knowledge into solutions
	Of innovative adaptive, multi-functional and resource recovery solutions, including an explicit learning agenda in order to understand how solutions can be applied in practice and inform the development of practical guidelines; to build an evidence base of costs, benefits and risks that can inform the development of a value proposition and business case	4.4	• Establish mechanisms for funding and supporting alternative source and supply options including governance arrangements and risk management • Develop a clear learning agenda that scopes the lessons to be learned from trials and demonstrations across technical, social and risk management domains • Establish an innovation program that implements strategic trials and demonstrations of new water sensitive approaches • Develop a dissemination plan for sharing data and communicating lessons from trials and demonstrations to different audiences

			• Strengthen relationships and capabilities across research, policy and practice to pursue the learning agenda and incorporate new knowledge into solutions • Establish a working group to consolidate knowledge from existing projects and identify opportunities for expansion
Implement significant demonstrations	Of both technical and governance solutions that aim to improve environmental health, including an explicit learning agenda in order to demonstrate how innovative solutions can be delivered; evidence of their costs, benefits and risks; learning about the capabilities needed for their effective implementation	2.4	• Develop a clear learning agenda that scopes the lessons to be learned across technical, social and risk management domains • Establish an innovation program that implements strategic trials and demonstrations of innovative solutions in collaboration between lead agencies and organisations developers, and research organisations • Develop and implement a dissemination plan for sharing data and communicating lessons from trials and demonstrations to different audiences • Identify opportunities for significant demonstration projects
Learn from and showcase new and existing projects that demonstrate solutions	For multi-functional, quality urban spaces in order to understand how solutions can be applied in practice to inform the development of practical guidelines; to build an evidence base of costs, benefits and risks that can inform the development of a value proposition and business case	3.6	• Develop a clear learning agenda that scopes the lessons to be learned from trials and demonstrations across technical, social and risk management domains • Establish a working group to consolidate learnings and knowledge across demonstrations

Strategies to enable and encourage people to collaborate and innovate

Strategy	Focus	#	Actions
Advance and expand existing platforms for connecting champions	To gain clarity around the issue of low community capital and explore potential solutions in order to begin building a collective voice that can advocate for solutions	1.2	• Review existing community engagement programs and incorporate WSC concepts • Establish a working group to drive discussions that develop clarity around the issue of low community capital and explore potential solutions for improving it • Review Perth's water sensitive cities capacity building program to identify how its focus could expand to become an effective platform for getting clarity around the issue of low community capital, explore solutions and build a collective voice

			• Secure sustainable funding for Perth's water sensitive cities capacity building program and give it focus on building capacity of professionals to improve community capital • Hold an annual symposium or conference that brings academics and professionals together to explore emerging knowledge and solutions for building community capital
	To extend their focus to governance and community engagement solutions and integrate a greater diversity of perspectives in the consideration of a full suite of potential governance and engagement solutions for delivering the many different dimensions of Perth's water sensitive city vision	1.4	• Establish a working group to review Perth's water sensitive city vision against current governance arrangements and existing legislative and policy frameworks to identify opportunities for influencing their implementation, development, or reform • Consolidate existing knowledge on best-practice governance and how it can be applied to the Perth context
	To strengthen the alignment and coordination of voices across sectors that highlight environmental and community health as an outcome of water system services in order to build a collective voice that is influential and effective amongst broad audiences in promoting the importance of water system services in delivering environmental outcomes	2.3	• Develop a cross-sectoral working group focused on and committed to the role of water system services in ensuring environmental and community health as an outcome • Disseminate the narrative for improved ecosystem health outcomes through professional networks
	To strengthen collaboration for delivering adaptive infrastructure and resource efficiency solutions across organisations and sectors in order to build cross-sectoral commitment and encourage people and organisations to adopt the necessary collaborative, innovative and risk management behaviours	4.2	• Strengthen and expand Perth's water sensitive cities capacity building program, New WAter Ways • Identify a range of champions to foster, endorse and communicate the vision, particularly to target industry, community and government members who are not yet engaged • Provide incentives and rewards for achieving water sensitive outcomes • Establish advocacy networks with representatives from government, industry and the community for ongoing collaboration and commitment • Establish a working group to develop a knowledge sharing strategy that drives an open and collaborative approach to share data and knowledge for coordinated decision-making

			• Identify and pursue tangible opportunities for collaboration and alignment to deliver water sensitive city outcomes

Strategies to embed solutions in policy and regulation

Strategy	Focus	#	Actions
Improve implementation of existing policies and programs	For protecting environmental health (in particular, water quality) in order to enable better coordination across governments, industry and the community, strong compliance levers and effective asset management systems to deliver ecosystem health protection	2.5	• Establish a working group including regulatory agencies and industry to review existing and recommend new standards for environmental health outcomes and programs of implementation, including how they influence other policies (e.g. open space, public health) • Seek opportunities to influence and uptake policies and regulation • Continually review and update policies and guidelines with contemporary science and evidence and outcomes from trials and demonstrations • Recognise and celebrate good trials and demonstrations
	For integrated water and urban planning and design in order to remove implementation barriers for strengthening the role of water in delivering quality and multi-functional urban spaces	3.7	• Review existing and recommend new policies and standards for water sensitive outcomes and programs of implementation, drawing on the latest knowledge and evidence
Improve policy and regulatory frameworks	To encourage and enable adaptive infrastructure and resource recovery solutions to be adopted so that barriers are removed and implementation of adaptive infrastructure and resource recovery solutions is improved	4.6	• Establish a working group to drive the consolidation of evidence for, and evaluation of, the business case and develop a strategy • Conduct systemic analyses of the economic value of water-related commercial opportunities

4. MONITORING TRANSITION PROGRESS

This forthcoming section will present Perth's monitoring framework developed in partnership with the WSTN in 2018. It will set out how Perth plans to track its progress in implementing the transition strategy in terms of achieving WSC outcomes (using the WSC Index) and improving the enabling environment (using the TDF).

5. ORGANISING FOR STRATEGY IMPLEMENTATION

This section is forthcoming and will present the agreed upon approach the WSTN to organise themselves in coordinating delivery of the strategy (e.g. terms of reference, leadership, working groups).

6. CONCLUSION

This section is forthcoming and will present key messages of the Implementation Plan

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APPENDIX A – RESEARCH METHODOLOGIES

B3.1 Cities as Water Supply Catchments: Green Cities and Microclimate

The heat vulnerability index was developed by project B3.1 in conjunction with the National Climate Change Adaptation Research Facility (NCCARF). A review of literature and existing data identified eleven variables to use in the index, which were themed into three main groups: environmental, health and demographic variables. The full list is outlined below:

Demographic variables	1. Age group
	2. Number of aged care facilities
	3. Socio-economic circumstance
	4. Population density
	5. Ethnicity
Environmental variables	6. Urban design (non-single dwellings)
	7. Urban design (single-person households)
	8. Presence of urban heat islands
	9. Land cover
Health variables	10. Persons with chronic disease
	11. Need for assistance (measure of disability)
	12. Accessibility to emergency service

The index was applied to each capital city (Melbourne, Brisbane, Perth, Darwin, Canberra, Hobart, and Sydney). A statistical analysis was then performed on the greater Metropolitan areas to determine the areas most vulnerable to future extreme heat events.

For further information on the heat vulnerability index, refer to the following report:

Loughnan, M.E., Tapper, N.J., Phan, T., Lynch, K., McInnes, J.A. (2013). *A spatial vulnerability analysis of urban populations during extreme heat events in Australian capital cities.* National Climate change Adaptation Research Facility, Gold Coast.

A2.3 Engaging Communities with Water Sensitive Cities

A national survey was conducted in February-March 2014 and involved 5,194 participants across all states and the ACT. The survey covered a broad range of demographic variables including cultural background, current residential status, current employment status, as well as water-related concepts. The survey included questions covering the following topics:

- Knowledge of catchments and the urban water cycle
- Knowledge of water treatment and management
- Knowledge of impacts of actions on waterway health
- Attitudes to alternative water sources and water management approaches
- Engagement in water-related activities
- Sources of information about water

Focus groups were also conducted to provide further detail and understanding of the survey results. Six focus groups were held in Brisbane, Townsville, Melbourne, Bendigo, Perth and Geraldton. Participants reflected a mix of ages, genders, and incomes. The focus groups included discussions about perceptions of water and stormwater, and knowledge about diverse management practices to mitigate stormwater pollution.

For further information on community knowledge about water, please refer to the following report:

Dean, A., Fielding, K., Newton, F., & Ross, H. (2015) *Community knowledge about water: Who has better water-related knowledge and is this important?* Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities.

For further information on water literacy in Australia, please refer to the following report:

Fielding, K., Karnadewi, F., Newton, F., & Mitchell, E. (2015) *A National Survey of Australians' Water Literacy and Water-related Attitudes.* Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities.

A3.2 Better Regulatory Frameworks for Water Sensitive Cities

An assessment of the regulatory framework in Western Australia was undertaken to determine the extent to which the framework facilitates or hinders the establishment of a water sensitive city. This assessment was undertaken by Maddocks University and focused on primary and selected secondary State legislation. A template was developed to capture the results of the stocktake and included:

1. Overview of the legislative instrument that may be relevant to the establishment of a water sensitive city
2. Relevant provision(s) of the legislative instrument that may be relevant to the establishment of a water sensitive city
3. Specific topic or issue raised by the provision that is relevant to the establishment of a water sensitive city
4. Assessment of the extent to which the provision can facilitate or hinder establishment of a water sensitive city

For further information, refer to the following report:
De Sousa, D. (2014). Results of a Legislative Stocktake for Western Australia. Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities. ISBN 978-1-921912-21-4

A4.2 Mapping Water Sensitive Scenarios – Greater Perth case study

The project methodology was based on the latest scientific insights on transition planning processes and frameworks for application to cities and towns wanting to shift practice towards water sensitivity. It drew on the basic principles of envisioning, backcasting and scenario planning that underpin the development of "transition scenarios", the latest generation of scenario approaches that has emerged in response to sustainability challenges. These approaches have integrated scholarship from socio-technical transitions (transition management in particular) and social-ecological system resilience.
In applying these methods, the project tailored them to suit the local context, with adaptations as the series progressed to accommodate workshop timeframes and evolving priorities of the participants. It involved a series of five half-day workshops held over the course of five months (July to November 2015) in Greater Perth, designed as a "pressure cooker" participatory process. These workshops guided participants through a series of analytical and creative steps:

1. Analysing the System
2. Horizon Scanning
3. Envisioning
4. Diagnosing the Challenges
5. Backcasting
6. Operationalising

Each workshop involved a combination of whole group discussions, small group discussions and facilitated activities designed to examine the workshop themes in detail. Between workshops, the research team synthesised and analysed results, which were then presented back to the participants at the following workshop for validation. This enabled an iterative process of reflection and refinement, ensuring that this final report is an accurate reflection of the workshop process and outputs.
For detailed process methodologies in each of the workshops, please see the following report:
Rogers, B.C., Hammer, K., Werbeloff, L., Chesterfield, C. (2015). Shaping Perth as a Water Sensitive city: Outcomes of a participatory process to develop a vision and strategic transition framework. Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities.

D6.2 Developing a water sensitive cities assessment tool

The Water Sensitive Cities Index is being developed by the CRCWSC, with support from two of its industry partners, e2designlab and LindseyB. The development has involved a review of existing water and urban indicators to inform a prototype of the tool, which was trialled with two municipal councils. The tool was subsequently refined and enhanced, and a beta version was pilot tested for metropolitan Perth and two local councils (City of Subiaco and City of Swan). Future development and testing will focus on further developing the WSC Index to identify and prioritise management responses.
For further information, please refer to the following paper:
Chesterfield, C., Rogers, B.C., Beck, L., Brown, R.R., Dunn, G., de Haan, F., Lloyd, S., Urich, C. & Wong, T. (2016). *A Water Sensitive Cities Index to support transitions to more liveable, sustainable, resilient and productive cities.* Singapore International Water Week, Singapore.

CRCWSC Tranche 2 Needs and Opportunities Workshops

The second tranche of CRCWSC research focuses on synthesising, utilising, and adopting the knowledge generated in Tranche 1 to align with local industry needs. In order to identify industry research needs, the CRCWSC hosted a "Needs and Opportunities" workshop in each of the regions. These workshops involved 40-70 key stakeholders that influence the water and planning sectors, and focused on identifying the barriers and knowledge needs to support their transition to being more

water sensitive. The following 17 needs were identified in these workshops, with the needs in bold being common across each of the regions:

1. Strengthened and aligned policy, legislation and regulation in support of WSCs

2. Shared vision and narrative for WSCs that connects with community values and drives decision-making

3. New economic and financial models and incentives that recognise the values and benefits of a WSC

4. Robust and inclusive decision-making frameworks

5. Governance framework to enable coordination and collaboration across agencies and sectors

6. Holistic evaluation frameworks to support WSC investments

7. Guidance on how to develop context-specific solutions

8. Achieving multiple benefits through integrated planning and design of water systems and the urban form

9. Develop next generation flood risk assessment framework and tools as part of a WSC approach

10. Monitoring and evaluation for improved system design and performance

11. Efficient and effective operations and maintenance systems to achieve WSC outcomes

12. Coherent understanding of groundwater systems and interactions with surface waters

13. Leadership and influence

14. A culture of learning and innovation

15. Translation and sharing of WSC knowledge

16. Building community connection and engagement

17. Building capacity to deliver a water sensitive city

APPENDIX B – FUTURE DRIVERS AND IMPACTS FOR PERTH

Major Driver	Impacts	Consequences	Why does it matter?
Climate change	**Lower Overall Rainfall** Since the mid-1970s a 15% decrease in rainfall has already been recorded in south-west WA[1] Modelling suggests a 20% reduction in rainfall by 2030 and then 40% by 2060, compared to the baseline year of 1990[2] An 80% increase in drought months is projected for south-west WA by 2070[1] **More Random and Extreme Weather Events** There is high confidence that the intensity of extreme rainfall events will increase in south-west WA[3] 156 weather records were broken over the 2013/2014 summer, highlighting the continuing trend of more extreme weather events[4] **Hotter Days and Longer Heatwaves** By 2030 a warmer (0.5 to 1.5°C) and drier (5 to 15%+ reduction) climate is predicted for Perth, even under the best emissions scenario. This means a future climate more like the current climate of Jurien (WA) or Geraldton (WA)**Error! Bookmark not defined.** The average number of days per year above 35°C could increase from 28 in 1995 to 67 by 2070[1] The average number of days per year above 40°C is projected to increase by 150% from 1995 to 2090[5] Since 1950 the number of heatwave days experienced in Perth has increased by 50%[6] **Rising Sea Level** The WA State Coastal Planning Policy requires an allowance for a vertical sea level rise of 0.9 m over 100 years, until 2110[7] At Fremantle average sea level has risen at a rate of 1.54mm a year between 1897 and 2007[8] Under sea level rise projections 40% of WA's coastline is susceptible to recession[9]	1 **Biodiversity Impacts:** South-west WA is a known global biodiversity 'hotspot', with extreme weather events impacting important species. In 2010 an extreme heatwave left over 200 endangered Carnaby's black cockatoos dead[10]. Cued by temperature change the arrival and departure times of migratory birds has also been significantly altered[11]. **Water Security:** From 1911 to 1974 the average streamflow into Perth Dams was 338GL. From 2000 to 2010 inflows had quartered to 75GL, with half the decline linked to human induced climate change[1]. This has resulted in the reliance on groundwater and desalination[12]. **Food Security:** Wheat production in WA could decline by 8.9% by 2030 and 13.4% by 2050 due to warming and reductions in rainfall[1]. **Bushfire Risk:** A harsher fire-weather climate in the future is anticipated with high confidence for south-west WA[5]. The Perth Hills bushfires in February 2011 saw a total of 71 homes destroyed, a further 39 structures damaged and 12 people injured[13]. **Health and Safety:** Heat-related deaths in Perth are anticipated to more than double, to over 40, by 2050 because of climate change[13] and the UHIE[14]. **Water Quality:** Drought and warmer temperatures are linked to increased algae blooms[15]. Interestingly, a toxic Microcystis aeruginosa bloom in the Swan Estuary prohibited recreational activities for two weeks due to an extreme summer rainfall event in 2000[16]. **Saltwater Stratification:** The Swan Canning River System is expected to experience an increase in saltwater stratification as a result of sea level rise and decreased streamflow[8]. This will exacerbate the low dissolved oxygen conditions experienced in the Swan Estuary over the last 20 years which has seen the construction of five oxygenation plants[16]. **Saltwater Intrusion:** Coastline aquifer vulnerability to seawater intrusion is likely to increase due to sea level rises and increased storm surges predicted under climate change[17]. Perth aquifers ranked as highly vulnerable to saltwater intrusion, include: The Tamala Limestone, Yarragadee, Superficial and Leederville Aquifers[18]. **Storm Surge and Coastal Flooding:** Impacts of sea level rise will be mainly seen through increased high tides and storm surges, with increased storm surge activity already observed since 1990[8]. In Fremantle, a vertical increase of 0.2m since the late 1800s has been accompanied by a 300% increase in recorded flooding from high sea level events[19]. **Inland Flooding:** Sea level rise may cause flooding some distance inland, such as along estuaries, rivers, lakes and lagoons. A 0.5m increase in sea level could see a 100 fold increase in extreme sea level events in Perth[20].	Reduced flora and fauna biodiversity Increased risk to water supplies Increased risk for coastal communities and infrastructure Reduced crop yields and therefore decreased revenues Increased heat related illness caused by increased average temperatures Reduced amenity of Perth's iconic waterways Less readily available potable water

Major Driver	Impacts	Consequences	Why does it matter?
Population Growth	**More Pollution and Waste in the Environment** Based on current wastewater management practices, annual nitrogen loadings to Perth's marine environment would increase to 10,000 tonnes by 2040, predominantly as a result of domestic wastewater[xxi]. Approximately 2,500kg of waste was generated per person in WA in 2006-2007. Only one third was recycled. The high reliance on landfills has negative impacts on the environment particularly in relation to methane emissions and long-term pollution of the environment through leaching of heavy metals and chemicals[xxii]. **Higher Demand for Water Supplies** Projections suggest a 33% growth for Perth in the coming decades, with an anticipated population of 2.2 million by 2031. In the Peel region to the south of Perth, 50% growth is expected[xxiii]. The provision of scheme water in the Perth-Peel region is expected to double in the next 40 years[xxiv]. To support Perth's projected population growth, a further 110 million kilolitres per year of water is required by 2021[xxi]. **Larger Volume of Water Flowing Through System** Despite goals to reduce water use by 15% per person by 2030[xxv], overall water supply and wastewater production will increase due to population growth.	**Water Quality:** In general, Perth's coastal waters are high quality. However, the marine environment is already under pressure from contamination from wastewater treatment outfalls, urban runoff, agricultural impacts and groundwater discharge[xxi]. Modelling of the Ellen Brook Catchment, a rural catchment within the Swan River System, suggests conversion to urban lands would result in phosphorus and nitrogen loads increasing by approximately 4% and 12%, respectively, during the 10 years following urbanisation[xxvi]. Studies of the Peel-Harvey estuarine system suggest recent cyanobacterial blooms and macroalgae proliferations are a result of increased nutrients in the system from human activities[xxvii]. **Water Security:** By 2030, even with recycling targets being met, 70 to 100 GL of extra water will need to be sourced and will most likely come from desalination and groundwater sources[xxviii]. However, over the last 25 years the water table and amount of recharge into the Gnangara Mound aquifer, the main water supply for Perth, has reduced by around 25%[xxix]. Wastewater recycling is already being investigated as the best opportunity to provide future water for the Kwinana Industrial Strip. Existing industry produces around $15.5 billion annually and the Government's aim is to increase this output to $28.3 billion. Current water use is estimated to be around 21Gl annually, which is sourced from a combination of scheme water, groundwater, stormwater recovery and recycled wastewater[xxiv]. **Affordability:** The move away from rainfall dependent water supplies sees an increase in water supply and treatment. The energy needed to treat 1kL water to drinking standards is 0.4 to 0.6kWh for surface and groundwater sources; 0.8 to 1.0kWh for recycled water; and 3 to 5kWh for reverse osmosis desalination of seawater[xxx]. For example, the desalination plant in Perth accounted for 82% of the energy consumption associated with treatment despite only supplying 12% of the water[xxxi]. While the Kwinana Desalination Plant is powered by renewable energy (wind turbines), it does consume a relatively large amount of energy[xxxii].	Increased pressure on urban waterways leads to reduced amenity and liveability Increased energy emissions and costs associated with water treatment Increased water treatment pushes up water prices Less low-cost water available for non-household or discretionary use Household affordability and equity considerations will become increasingly important

Major Driver	Impacts	Consequences	Why does it matter?
Urbanisation	**Loss of Agricultural Land and Natural Areas** Current development patterns could see an increase of 1,468km^2 of urban sprawl[xxxiii]. Urban development is still favoured over agricultural use[xxxiv], with more than a football oval of rural land being cleared per day around Perth[xxxv]. Population growth increases the demand for land and housing. In Perth at present, 880 hectares of land per year are taken up for urban development[xxxvi]. **Less Private Green Space** Studies have revealed the amount of private green space (lawns and gardens) in Perth has reduced between 1955 and 2005 due to the increasing trend of development within home lots[xxxvii]. **Trade-offs for Public Open Space (POS)** A study of 139 suburbs in Perth-Peel analysed the impact on POS from having multifunctional requirements (playgrounds, sports fields, bush forever sites, WSUD). While conservation areas within POS have increased from 21% to 28%, active open space has decreased from 15% to 6%. This equates to a predicted shortfall of 495ha by 2031[xxxviii]. **Depletion of Endemic Vegetation** On the Swan Coastal Plain 80% of original vegetation has been cleared, mostly for urban development and agriculture[xxxix]. In the WA Wheatbelt 93% of the original vegetation has been cleared[xxxix]. **Depletion of Natural Wetlands** It is estimated that up to 80% of all wetlands have been filled, drained or cleared in the Swan Coastal Plain. The wetlands which remain are highly vulnerable to urbanisation impacts[xl].	**Food Security:** With urban expansion Perth has seen movement of traditional growing areas. This displacement either results in ceasing production or moving further out of the city[xxxiv]. **People's Behaviours:** The accessibility to POS is positively associated with its use. Park aesthetics and size are also factors influencing physical activity[xli]. **Urban Heat Island Effect (UHI):** Some Perth suburbs are up to 6°C hotter than surrounding suburbs. There is a strong correlation between this heat and canopy cover. The most affected are newer developed suburbs that tend to have smaller blocks with big houses and not as many trees. Some of Perth's hot spots include Piara Waters, Clarkson and Butler[xlii]. **Change in Ecosystems and Habitats:** A Perth study found that native mammals are the most disadvantaged vertebrates in remnant vegetation areas, with few species surviving the effects of long-term fragmentation as a result of urbanisation[xliii]. This is also true of native bird species, however, the opposite is true of urban bird species[xliv]. **Loss of Species:** Due to urbanisation and clearing of land there has been a large number of species extinctions in the Wheatbelt and Swan Coastal Plain, with 43 and 26 species, respectively. In contrast, the forest ecosystems of the south-west have remained largely intact and have only one associated species loss[xlv]. **Water Security:** In general it is recognised that groundwater has been degraded in areas developed for urbanisation, industry and agriculture[xxxv]. The Gnangara groundwater system, which supplies over 60% of Perth's scheme water, supports $100 million worth of agriculture and has pivotal environmental value, has experienced a drop in water levels. This has been linked to reduced rainfall, abstraction and altered land use[xlvi]. **Water Quality**: Nutrient input rates from urban development have been shown to be greater than displaced rural lands[xlvii]. A study of 20 suburbs in the Swan Coastal Plain found medium density urban residential development was responsible for a 5% and 95% increase in nitrogen compared to beef grazing and cropping, respectively[xlvii]. Along with a 79% and 171% increase in phosphorus, respectively. This increase in nutrient rates is responsible for many Perth estuaries and wetlands being excessively eutrophic[xlviii]. Eutrophic wetlands in the metropolitan and Avon Catchment have been linked annually to toxic cyanobacteria detected in the Swan Canning River System. In 2003 a bloom of the dinofl agellate Karlodinium micrum killed thousands of fish in both the Swan and Canning Rivers[xlix].	Reduced availability of cheap, fresh locally grown food Reduced public open space for active and passive recreation Reduced physical and mental wellbeing of people Increased heat stress and related health impacts; more time spent indoors with air conditioning Loss of native species that shape Perth's identity Reduced amenity and diversity in the urban environment Increased frequency of algal blooms Reduced availability of waterways for active recreation

APPENDIX B – TRANSITION DYNAMICS FRAMEWORK MATRICES

1. Ensure good water sensitive governance

Transition phase	Champions	Platforms for connecting	Knowledge	Projects and applications	Tools and instruments
1. Issue Emergence	Issue activists	N/A	Issue highlighted	Issue examined	N/A
2. Issue Definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	N/A
3. Shared Understanding & Issue Agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance
4. Knowledge Dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and early policy
5. Policy & Practice Diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Early regulation and targets
6. Embedding New Practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

2. Increase community capital

Transition phase	Champions	Platforms for connecting	Knowledge	Projects and applications	Tools and instruments
1. Issue Emergence	Issue activists	N/A	Issue highlighted	Issue examined	N/A
2. Issue Definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	N/A
3. Shared Understanding & Issue Agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance
4. Knowledge Dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and early policy

5. Policy & Practice Diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Early regulation and targets
6. Embedding New Practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

2.5 Indigenous involvement in water planning

Transition phase	Champions	Platforms for connecting	Knowledge	Projects and applications	Tools and instruments
1. Issue Emergence	Issue activists	N/A	Issue highlighted	Issue examined	N/A
2. Issue Definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	N/A
3. Shared Understanding & Issue Agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance
4. Knowledge Dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and early policy
5. Policy & Practice Diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Early regulation and targets
6. Embedding New Practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

5. Ecological health

Transition phase	Champions	Platforms for connecting	Knowledge	Projects and applications	Tools and instruments
1. Issue Emergence	Issue activists	N/A	Issue highlighted	Issue examined	N/A
2. Issue Definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	N/A
3. Shared Understanding & Issue Agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance

4. Knowledge Dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and early policy
5. Policy & Practice Diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Early regulation and targets
6. Embedding New Practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

5.2 Surface water quality and flows

Transition phase	Champions	Platforms for connecting	Knowledge	Projects and applications	Tools and instruments
1. Issue Emergence	Issue activists	N/A	Issue highlighted	Issue examined	N/A
2. Issue Definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	N/A
3. Shared Understanding & Issue Agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance
4. Knowledge Dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and early policy
5. Policy & Practice Diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Early regulation and targets
6. Embedding New Practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

3.4 Equitable access to amenity values of water-related assets

Transition phase	Champions	Platforms for connecting	Knowledge	Projects and applications	Tools and instruments
1. Issue Emergence	Issue activists	N/A	Issue highlighted	Issue examined	N/A
2. Issue Definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	N/A
3. Shared Understanding & Issue Agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance

4. Knowledge Dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and early policy
5. Policy & Practice Diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Early regulation and targets
6. Embedding New Practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

6.1 and 6.3

Transition phase	Champions	Platforms for connecting	Knowledge	Projects and applications	Tools and instruments
1. Issue Emergence	Issue activists	N/A	Issue highlighted	Issue examined	N/A
2. Issue Definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	N/A
3. Shared Understanding & Issue Agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance
4. Knowledge Dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and early policy
5. Policy & Practice Diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Early regulation and targets
6. Embedding New Practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

6.2 Urban elements functioning as part of the urban water system

Transition phase	Champions	Platforms for connecting	Knowledge	Projects and applications	Tools and instruments
1. Issue Emergence	Issue activists	N/A	Issue highlighted	Issue examined	N/A
2. Issue Definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	N/A
3. Shared Understanding & Issue Agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance

4. Knowledge Dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and early policy
5. Policy & Practice Diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Early regulation and targets
6. Embedding New Practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

7. Promote adaptive infrastructure

Transition phase	Champions	Platforms for connecting	Knowledge	Projects and applications	Tools and instruments
1. Issue Emergence	Issue activists	N/A	Issue highlighted	Issue examined	N/A
2. Issue Definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	N/A
3. Shared Understanding & Issue Agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance
4. Knowledge Dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and early policy
5. Policy & Practice Diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Early regulation and targets
6. Embedding New Practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

4.2 Low GHG emissions and 4.5 Maximised resource recovery

Transition phase	Champions	Platforms for connecting	Knowledge	Projects and applications	Tools and instruments
1. Issue Emergence	Issue activists	N/A	Issue highlighted	Issue examined	N/A

2. Issue Definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	N/A
3. Shared Understanding & Issue Agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance
4. Knowledge Dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and early policy
5. Policy & Practice Diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Early regulation and targets
6. Embedding New Practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

4.1 Benefits across other sectors and 4.4 Water-related economic and commercial opportunities

Transition phase	Champions	Platforms for connecting	Knowledge	Projects and applications	Tools and instruments
1. Issue Emergence	Issue activists	N/A	Issue highlighted	Issue examined	N/A
2. Issue Definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	N/A
3. Shared Understanding & Issue Agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance
4. Knowledge Dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and early policy
5. Policy & Practice Diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Early regulation and targets
6. Embedding New Practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

4.3 Low end-user potable water demand

Transition phase	Champions	Platforms for connecting	Knowledge	Projects and applications	Tools and instruments

1. Issue Emergence	Issue activists	N/A	Issue highlighted	Issue examined	N/A
2. Issue Definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	N/A
3. Shared Understanding & Issue Agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance
4. Knowledge Dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and early policy
5. Policy & Practice Diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Early regulation and targets
6. Embedding New Practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

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6th February 2018

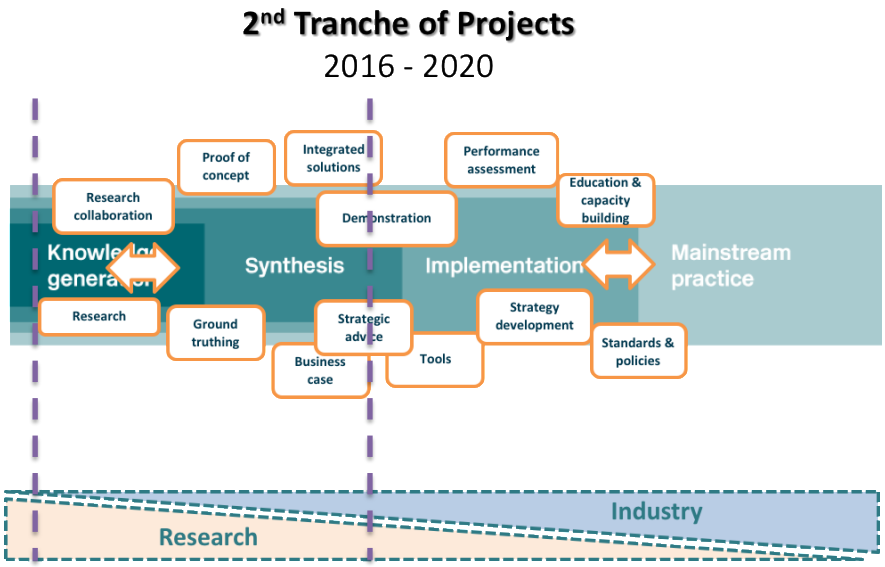
GHD: Nicholas Deeks (Perth), Miles Coker (Darwin)
JBA: Darcy Hodgkinson
KBR: Ajay Shah
Urbaqua: Shelley Shepherd
Water Technology: Richard Connell

By email.

Dear colleague

Introduction
We are pleased to request an expression of interest from your organization to assist the work of the Cooperative Research Centre for Water Sensitive Cities (CRCWSC). This follows our discussion at our meeting on 1st February.

Background
The CRCWSC has completed tranche of its activities and is embarked on tranche 2. This is illustrated below:



Of particular relevance is that a large part of the core research for the CRCWSC has been completed and we are now well advanced with the industry adoption / implementation stage.

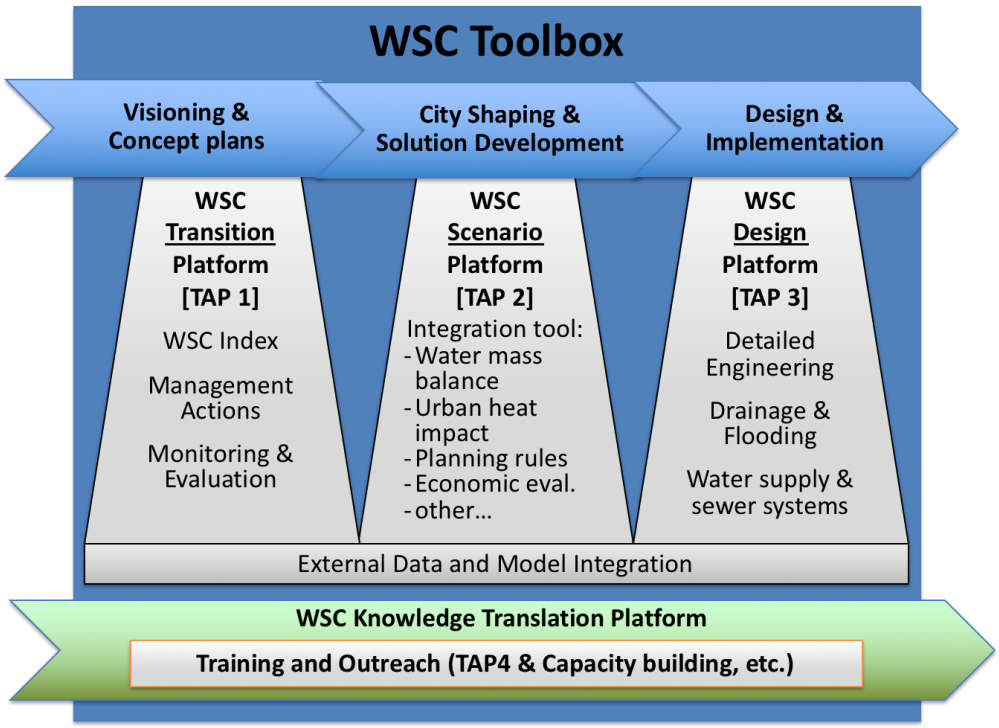
As discussed, the CRCWSC spans across a large range of disciplines: Economics, Landscape Architecture, Architecture, Urban Design, Planning, Law, Engineering, Ecology, Sociology, Information Technology, Communications and Engagement and Political Science. To varying degrees, we are working with our key stakeholders to integrate water sensitive approaches with consideration of all these disciplines.

We are consolidating research into 5 integrated projects:

- WSC Transitions
- A WSC Economics Framework
- Planning
- Infill Development
- Groundwater Impacted development

These projects aim to integrate core research into practical outcomes for industry.

We have also developed a 'Toolbox' illustrated below, setup to provide a suite of tools operating at the City Transitions, City Shaping / Land Use and Design levels.



Key to our outcomes is adoption of WSC approaches, so knowledge translation and capacity building are key aspects of our work over the next few years.

Partnership models

Multiple partnership models will apply including:

1. The Client will engage CRCWSC who will subcontract work to participant consultants (eg Flood Resilience work in Qld)
2. CRCWSC will provide accreditation for consultants engaged directly by the client to deliver CRCWSC tools (eg WSC Index workshops)
3. Consultants engaged directly by the client will deliver projects using CRCWSC IP and or tools independently of the CRCWSC (eg use of Tranche 1 or 2 research findings or tools (not requiring accreditation). It is expected that CRCWSC branding and referencing will use used in this case.

This EOI relates to the first model.

CRCWSC Needs

The CRCWSC team is keen to engage more closely with the SME's and consultant participants. The purpose of this is the following:

- Enable and enhance a greater understanding by you of the CRCWSC research, tools and products so that water sensitive practices can become more embedded into your work, therefore providing a platform for adoption within the broader industry;
- Have your assistance with project delivery for the CRCWSC, for example, we are engaged by the QRA to run a synthesis workshop for them on flood resilience;

Work Scope

There are three kinds of work we seek your involvement with:

1. *Projects,* providing key technical expertise and/or assisting with facilitation of Synthesis/ Ideas workshops;
2. *Tools and Products:* sandbox or beta testing of software prior to its release to the broader industry. Christian Urich, who is leading the Tools and Products team is in the process of drafting arrangements for this testing;
3. *Knowledge Translation:* assistance with capacity building, and guidelines or other education products or activities.

Submission

We would be pleased if you could provide us with a submission addressing the above. As was discussed at our meeting it will be at your discretion as to what parts, either by discipline or location, of your firms that you include, and we are happy to have consortia

proposed. Our focus will be to match the skills and capability you can offer to the CRCWSC needs. Therefore, your submission should:

- Provide a brief outline of your firm's general capability
- Provide bios and CV's for the key personnel that you wish to include in your offer, along with your commentary on the roles you envisage they may best fit in the work scope outlined above;
- Provide rates ex GST for those people including generic terms and conditions;

It's important to note that the CRCWSC is a collaboration of government, research institutions, and private industry with private industry providing substantial value to the research agenda and long-term adoption of the outputs. We will be seeking:

- Commitment to sharing / transferring lessons post activity with other CRCWSC partners to ensure continual improvement and capacity building (e.g. by participating in communities of practice etc.);
- Collaboration across CRCWSC partners is encouraged (ie. where skills / experience is lacking / limited look to other CRCWSC partners first before going outside to non-CRCWSC partners);
- Agree to follow agreed branding and IP licencing requirements that communicate the collaboration aspect – e.g. CRCWSC logo beside the relevant consultants;

The CRCWSC will actively support the teams in carrying out any activities (i.e. advice, technical support and helping with access to researchers etc).

Engagement processes

To initiate engagement on any of the above, it is our intent that, subject an assessment by us of the likely scale of the work, and the skills necessary we will go through a secondary process as follows:

- For *Projects*, we would review the information provided through the EOI process to match up the offered skills with the project needs, then seek one or two quotes for the input required. Typically, we will issue a short, simple brief and ask you to confirm your best skills match and availability. We envisage this to be a relatively quick, simple process;
- For *Tools and Products*, will primarily be managed by Christian Urich;
- For *Knowledge Translation,* a more comprehensive brief is likely to be required, but it would be assessed at the time;

For any of the above we will be keen to work with you in a highly collaborative way so that the work is done, your firm gains new skills, embedding new water sensitive practices and we trust this will be beneficial for your firm's profile.

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Water Sensitive Cities

Could you please submit your proposal by email to me no later than 23rd February COB. We look forward to the opportunity of working with you for the delivery of water sensitive cities.

Please call me should you wish to discuss any aspect of the above.

Yours sincerely,
CRC–WSC

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Australian Government
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CRC for
Water Sensitive Cities

Amaravati WSC principles and strategy

Consultancy brief
March 2018

Australian Government
Department of Industry, Innovation and Science
Business Cooperative Research Centres Programme

Project Brief – Amaravati Task 1: Master Plan review and Water sensitive city practice principles

Background

The CRCWSC has been engaged by the Government of Andhra Pradesh to assist in incorporating Australia's world leading water sensitivity practices into the planning of a new capital city (Amaravati) and an existing city (Vijayawada). Further details are available here: https://watersensitivecities.org.au/content/crcwsc-work-lifetime-project-design-new-indian-city/

This activity is initially considering the planning of the green field city of Amaravati and the need to develop a drainage strategy that is based on a water sensitive approach. This project brief relates to the first deliverable of this activity: Master Plan review and Water sensitive city practice principles.

CRCWSC Deliverable

The CRCWSC is required to deliver a water sensitive cities opportunities plan that:

- Interprets what a water sensitive approach means for Andhra Pradesh (generally) and Amaravati (specifically).
- Reviews the current Amaravati master plan and water services plans to identify opportunities for a water sensitive city approach in the Govt complex of that city.
- Proposes a water sensitive city vision for Amaravati, and for the Government precinct (ie the role that the government precinct plays in helping Amaravati become a water sensitive city).
- Proposes practice principles and/or a drainage strategy to implement this within the overall master plan.
- Informs task 2 by identifying the outcomes and concept designs required.

Consultancy Brief

Tasks

1. Desk top review of best practice. Summarise current water sensitive and IWM approaches in Aust along with the Singaporean ABC Water approach and any other relevant international approaches. This may use the WSC Index indicators and international case studies to illustrate aspects of a WSC approach.
2. High level review and summary of the Government precinct master plan, water services plan, drainage plan, sewerage plan, waterways plan. The purpose is to understand the current/BAU approach by documenting key features/approaches, challenges and opportunities for innovation.
3. Consider the local climate and context in Andhra Pradesh (such as high intensity rainfall) and identify aspects of Australian best practice to be modified for Amaravati.
4. Propose a draft vision for the Govt Precinct if the city of Amaravati is to be a water sensitive city. This can be documented as outcome statements or similar. It is intended that the draft vision will be presented to Andhra Pradesh stakeholders for consideration, although this is outside of the scope of this project.

5. Develop a drainage strategy for the Govt precinct that addresses the findings of tasks above. The drainage strategy should consider the emerging evidence from the CRCWSC and reflect the input of multiple disciplines. Using a rapid, expert workshop approach may be appropriate, in which case CRCWSC can assist in convening and running this workshop. A budget is also available to allow research and practice experts to attend and participate in a workshop.

6. Advise on water levels and development levels in the Government precinct from mastering planning and engineering plans provided by the Andhra Pradesh client.

7. Identify the types of concept designs that will be required to implement this strategy.

Deliverables

1. A report that may include the following sections:

    Brief background and context of the city and the government precinct

    Outline of what a water sensitive city approach is, with reference to international case studies including ABC Waters in Singapore and modifications to adapt to Andhra Pradesh.

    Review of current master plan and water cycle/service plans – to identify opportunities to integrate a water sensitive approach and benefits that could provide.

    Vision for the city and vision for the Government precinct.

    Practice principles and/or strategy to implement a water sensitive approach in the govt precinct.

    List of required concept designs to implement the ‘strategy’

2. Outcomes of the review of water levels and development levels.

Appointment process

CRCWSC will seek multiple proposals from its partners to deliver this task.

A preferred consultant will be selected considering price, availability and experience.

This task is part of a larger project in Andhra Pradesh. Successful appointment of a consultant to deliver this task is independent of appointment for future tasks – no assumption should be made about the likelihood of selection to deliver future tasks.

Timeframes

This project is ready for immediate start. A final report should be completed by April 18 2018.

Budget

A project budget of the order of $30,000 is available for this task.

It is expected that proposals will use rates consistent with those submitted via the CRCWSC’s recent call for expressions of interest to deliver CRCWSC products and services.

Cooperative Research Centre for Water Sensitive Cities


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www.watersensitivecities.org.au

CRC for Water Sensitive Cities

Water Sensitive Urban Design for new developments

Q: What is a water sensitive development?

Water sensitive urban design is where all aspects of the water cycle are managed sustainably. The water cycle includes all types of water ranging from tap water, groundwater, rainwater, and sewage to the water in creeks, wetlands and estuaries. At the precinct level, a water sensitive development could use treated wastewater to irrigate a park, or natural vegetated filters to remove pollution in storm water before entering a creek. Meanwhile a water sensitive household could use rainwater for washing or toilet flushing, or greywater for garden watering instead of drinking water. Being water sensitive is much more than just reducing the amount of water we use, it is also about making our communities more liveable, resilient and productive.

Q: Are home owners willing to pay for Water Sensitive Urban Design?

Research found that 38% of survey respondents would definitely or very likely consider water sensitive urban design principles when buying or building a house. Future home owners look for not only style and comfort, but also improved resale value. Our research shows:

- Large broad-leaved trees increase property value by up to $17,000 when located on the verge outside the property boundary[i]
- The median price of homes within 200m of a restored natural waterway were up to $26,000 (or 4.7%) higher compared to equivalent homes without accessible natural waterways[ii].
- Some households are willing to pay six times[iii] the actual price of tap water for treated grey water during periods of water shortage.
- Homes with rainwater tanks had resale prices that were higher by up to 9 times the cost of tank installation[iv].

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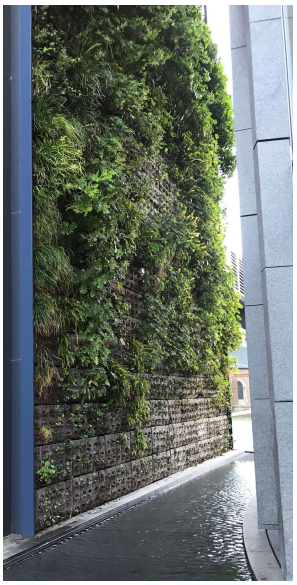
- The median price of homes within 50 m of a natural vegetated filter treating stormwater also known as a 'raingarden', were found to be approximately $50,000 higher than homes located further away in Sydney[v]

Q: Do trees make our communities more liveable?

Suburbs with trees and vegetation cover not only have higher house prices but better mental health outcomes and are cooler.

Streets with trees or irrigated vegetation reduce surrounding temperatures by providing shade and evapotranspiration. This results in a 4° C difference in areas where vegetated cover increases by 30%. For Central Business Districts with limited greenspace, the combined effects result in urban heat islands and peak temperatures up to 7°C hotter than outlying suburbs. The CRCWSC has a "Water Sensitive Cities Modelling Toolkit" which can be used to simulate on a computer, temperature differences due to changes in the amount of greenspace.



Q: How can I use trees to reduce temperature?

To maximise the benefit from trees the following should be targeted:

1. Maintain healthy existing trees
2. Focus on dense urban developments with both high heat exposure and vulnerable populations (eg bus transfer stations, hospital carparks)[vi]
3. Prioritise trees (over other forms of vegetation) because they provide cooling through both evapotranspiration and shade
4. Distribute trees throughout the landscape to maximise impact
5. Planning in smart ways that considers sea breezes, prevailing winds and other sources of shade from the built form.

More detailed information on optimal placement, grouping, height, and spacing of trees can be found in the CRCWSC guideline, "Trees for a cool city".

Q: How do I reduce risks?

Some developers and local governments have expressed concern that water sensitive urban design will introduce risks in addition to the significant social and financial benefits they deliver. Risks are reduced through an accurate assessment of these risks followed by mitigation through planning, design and maintenance.

The CRCWSC has reviewed the risks of non-potable reuse schemes where residential water supplies use recycled wastewater for non-drinking uses. This showed ways to mitigate risks through:

- Determining upfront what the customer is willing to pay for recycled water. A comprehensive literature review has been undertaken on willingness to pay for recycled water and associated improved reliability.
- Accurately estimating and making budget provisions for both operational and capital costs. The "Benefit-Cost Analysis Tool" helps in comparing the true benefits and costs, including non-market values. Operational costs will depend on required maintenance activities which are summarised in the New WAter Ways fact sheet "maintaining water sensitive urban design assets".
- Employing suitably trained and experienced contractors during installation so that systems are installed correctly. New WAter Ways provides training and other capacity building activities for the water industry.
- Accurate estimation of timelines for approvals and negotiating contractual arrangements (eg who will be the long-term owner or operator).

The CRCWSC also provides guides on how to reduce risks associated with raingardens. This includes checklists for pre-construction, construction, planting and establishment in addition to how to develop a maintenance plan once a raingarden is operational. Guidelines on species selection for south-west of Western Australia can also be used to ensure appropriate plants are used. It is important that maintenance crews have input into design, access to relevant information and necessary skills to undertake maintenance, particularly during establishment and dry periods.

More information on how to undertake water sensitive urban design can be obtained from the website https://watersensitivecities.org.au/ or by contacting the CRCWSC via email admin@crcwsc.org.au

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i An assessment of 5606 single family homes sold in 2009 in Perth showed that large verge trees increase property value (+$14,000). This decreases when the large tree is on own property or adjacent property near boundary (−$6,000)

ii The median home within 200m of a restoration site (Bannister Creek living stream) increased in value by $17,000 to $26,000 above the trend increase in house values in the area

iii Research conducted in Bendigo, Victoria, Australia found that households would be willing to pay six times the actual water price for treated grey water during a period of extreme water shortages

iv The benefits in terms of improved house sale (around $18,000) to a typical Perth house outweighed the cost of installation ($2000 - $2500) of rainwater tanks

v The amenity benefits of rain gardens in an area of Sydney can increase house prices by 2 to 4 per cent, not considering the additional public environmental benefits

vi These principles should be applied in areas with one or more of the following characteristics, ideally all three:

- High urban temperatures or hotspots with large impervious surfaces
- High population vulnerability with very old or very young people
- High behavioural exposure where people move and gather

CRCWSC T1 Project D1.4: Learning through integration and demonstration - Case studies

Recommendations were given to the CRCWSC by each State for case studies in 2016 & 2017. Twenty-two case studies have been drafted so far. See template provided as an example. Template is still being revised, and is likely to include a better project description and improved presentation of cost-benefit.

Project D1.4 will end in June 2018 however there is scope to prepare another 20 or so case studies. There are 13 recommended in the table below and we have an opportunity to recommend additional projects where sufficient information is available to enable the case study to be easily prepared. Key topic gaps are:

- Green roofs and walls
- Street and car park WSUD
- Infill WSUD development
- Residential WSUD precincts

Projects to be considered by the WRAP for recommendation to D1.4 are suggested as:

- City of Perth Library Green Wall
- Woodlupine Brook Living stream Project
- Water Corporation Kalgoorlie smart metering
- Point Fraser wetlands
- North Forrestdale – Vertu & Heron Park residential precincts
- Bletchley Park residential estate – WSUD in streets & parks
- Seascapes WSUD integration into POS
- City of Subiaco car park retrofits
- Others?

Case study drafted		Topic
Central Park	NSW	Recycling, Infill WSUD, Green walls
Orange direct-to-potable stormwater harvesting	NSW	Supplementary water supplies
Sydney water bank naturalisation	NSW	Waterway naturalisation
Gladstone east shore parkland (QLD)	QLD	WSUD in parks
Small Creek Naturalisation (QLD)	QLD	Waterway naturalisation
Southbank Parklands rain bank	QLD	Supplementary water supplies
Adelaide airport irrigation trial - temperature data	SA	Cooling
Randolph Avenue streetscape upgrade (SA)	SA	Street & car park WSUD
Salisbury Water alternative water scheme	SA	Supplementary water supplies
Waterproofing the west	SA	Supplementary water supplies
Dobsons Creek Catchment Disconnection Project	VIC	Waterway improvements
Enhancing Our Dandenong Creek program	VIC	Waterway naturalisation
Greening the Pipeline	VIC	WSUD in parks
Kalkallo Stormwater Harvesting & Reuse	VIC	Supplementary water supplies
Officer waterway corridors	VIC	Waterway naturalisation, residential precincts
Park Orchards Community Sewerage Program	VIC	WW management and recycling
Warrnambool rainwater harvesting project	VIC	Supplementary water supplies
West Werribee Aquifer Storage and Recovery	VIC	WW management and recycling, ASR
Bannister Creek	WA	Waterway naturalisation

Kalamunda Managed Aquifer Recharge Project	WA	Supplementary water supplies, ASR
Kings Square raingardens	WA	Street & car park WSUD
Kwinana wastewater recycling plant (for industrial uses)	WA	Supplementary water supplies, ASR
Proposed		
Tomorrow's Dulwich Hill	NSW	Community visioning
Currumbin Ecovillage	QLD	Supplementary water supplies, Lot scale WSUD & smart technologies
Elizabeth Street Catchment IWCM Plan (VIC)	VIC	Flood mitigation
Allotment stormwater treatment requirements / Expansion of Clause 56.011	VIC	WSC policy & programs
Kilmore waterways offsets project	VIC	WSC policy & programs
Water sensitive Elwood	VIC	Community visioning
Yarra Valley Water Citizen Jury	VIC	Community visioning
Aquarevo	VIC	Supplementary water supplies, Lot scale WSUD & smart technologies
Drainage Nutrient Intervention Program (DNIP)) incl Leige Street Wetland and Wharf Street Wetlands	WA	WSUD in parks, waterway improvement
State Planning Policy 2.9: Water Resources and Better Urban Water Management (WAPC, 2008)	WA	WSC policy & programs
Waterwise program	WA	WSC policy & programs
White Gum Valley	WA	Infill development & smart technologies
Josh's House	WA	Lot scale & smart technologies

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Warrnambool Roof Water Harvesting Project

Location:
Warrnambool, Victoria

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

Case Study

Prepared by Cooperative Research Centre for Water Sensitive Cities, January 2018.

WSC Infrastructure
Supplementary Potable Supplies

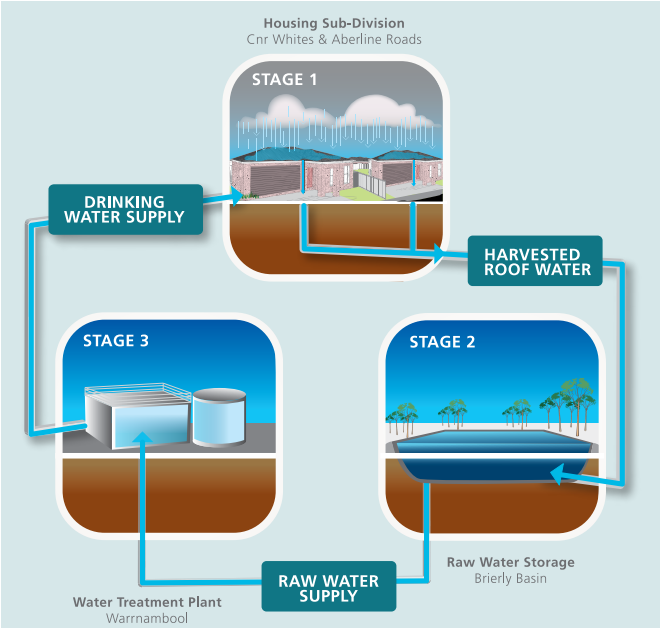
Insight

Regional roof water harvesting for potable uses

The drivers

Working demonstration of innovative water management approach to meet the increased water supply demands in urban growth areas

- Wannon Water's Water Supply Demand Strategy 2007–2055 identified the need for new water resources within the 50- year planning period to meet the projected increase in demand
- The growth areas in Warrnambool provided an opportunity to test innovative ways to save water and secure water supplies by constructing, monitoring and evaluating the rainwater harvesting scheme as a pilot to identify risks and barriers and build confidence for other water authorities and councils to establish similar projects in applicable developments.



The Concept —Wannon Water

Figure X: ....

Find out more at: http://www.wannonwater.com.au/whats-happening/innovation.aspx#roof-water-harvesting

The innovations

The first project of its kind in Australia, collecting and diverting roof runoff for potable uses in VIC.

- **Regional harvesting of roof runoff** – A separate collector pipe system has been installed for houses in new developments in the Warrnambool growth area. This pipe network (which includes trunk water mains and smaller collector pipes through the development) flows under gravity into the Brierly Basin where it is mixed and treated with other untreated water.

- **Treatment of rainwater** - Harvested roofwater is treated with other untreated water in the Brierly Basin at the existing Warrnambool water treatment plant to produce drinking water for the City of Warrnambool. As roof water is generally cleaner than other surface runoff, there was no requirement for additional treatment to be provided.

- **Hybrid model** – Typically there are discussions around the benefits of centralised vs decentralised water solutions. This project provides a hybrid model which collects water using a decentralised system but treats the water in an existing centralised system which eliminates many of the public health and safety risks associated with decentralised systems.

- **Progressive expansion** – The project commenced in 2011 in Warrnambool's northern growth areas with an initial 142 lot subdivision to expand to over 3000 homes and a new industrial estate. There is potential for the roof water harvesting scheme to continue to be extended as development in the growth corridor continues.

- **Toolkit** - A Toolkit has been developed by Wannon Water which allows the estimation of capital and operating costs of rainwater harvesting schemes. The toolkit can calculate a net present cost (NPC) per Megalitre which can be used to directly compare the financial viability of rainwater harvesting schemes with other potential water supply solutions across Australia.

Peter Wilson looking over the rooftops

↓

The lessons

- **Collaborative management** – Collaborative working relationships between project stakeholders were required to overcome management challenges, particularly the transfer of water from a local government authority to a water retailer.

- **Compliance** - The regulatory and cultural behaviours of the plumbing industry has been challenging as a number of domestic plumbers have installed house connections with a 'business as usual approach' and connected the roof downpipes into the regular stormwater system.

- **Reducing risk**- While no significant risks were identified with the project, Wannon Water will be monitoring the water quality, inspect connections to ensure there are no cross-connections, and will be responsible for the roof water harvesting network including screening of leaves and other materials.

The outcomes

Cities providing ecosystem services	Cities as water supply catchments	Cities comprising water sensitive communities
• **Reduced excess stormwater entering waterways** – reducing stormwater volumes entering the waterway reduces erosion risk and improves waterway health. • **Improved environmental flow**s – Harvesting rainwater reduces the volume of water being extracted from the Gellibrand River.	• **Augmentation of water supply system** – Each new dwelling is expected to generate 145KL/year. • **Harvested roof water can meet urban demands** – Preliminary forges suggested that the project will meet approximately 75% of the annual demand of the connected properties. In fact early monitoring of the system identified more water was generated than the estimated water demand which would result in excess water being used by other Warrnambool customers.	• **Informed residents** - Flyers are sent out regularly to remind landowners that water is being harvested from their roof and treated to form part of the drinking water supply for Warrnambool. This builds their community consciousness and reduces risk of contamination. • **Toolkit to assist other growth areas** - The toolkit has been developed to assist stakeholders in other growth areas to use similar rainwater harvesting schemes.

Business case

Costs	Benefits
• The total cost of the project was $3.8M with $2M contributed by Federal and State funding. In addition, it costs approximately $3000 per new property to augment the drainage system and connect into the water supply system.	• Stormwater management costs to the Council and the development industry were minimised as less extensive flood management and stormwater treatment systems are required to mitigate increased stormwater runoff from the new development areas.
• Assessments by Wannon Water identified that the roof water harvesting approach has a significantly lower cost per ML than individual rainwater tanks and the development of a new groundwater resource.	• Deferred the need to augment the existing water supply system for a very long time as the new developments are close to 'water neutral' as they generate enough water to meet the new demand. The rainwater harvesting scheme can also be implemented progressively as it is needed.
	• The local harvest and gravity transfer of rainwater reduces the energy costs and associated greenhouse gas emissions associated with the transport of water and any of the alternative augmentation solutions.

Transferability

There are opportunities to use this concept across most urban areas across Australia which have an annual rainfall of over 700mm. The tooklit was used to determine the potential yield from a similar regional roofwater harvesting scheme across each Australian capital city. The outcomes of this assessment is provided below.

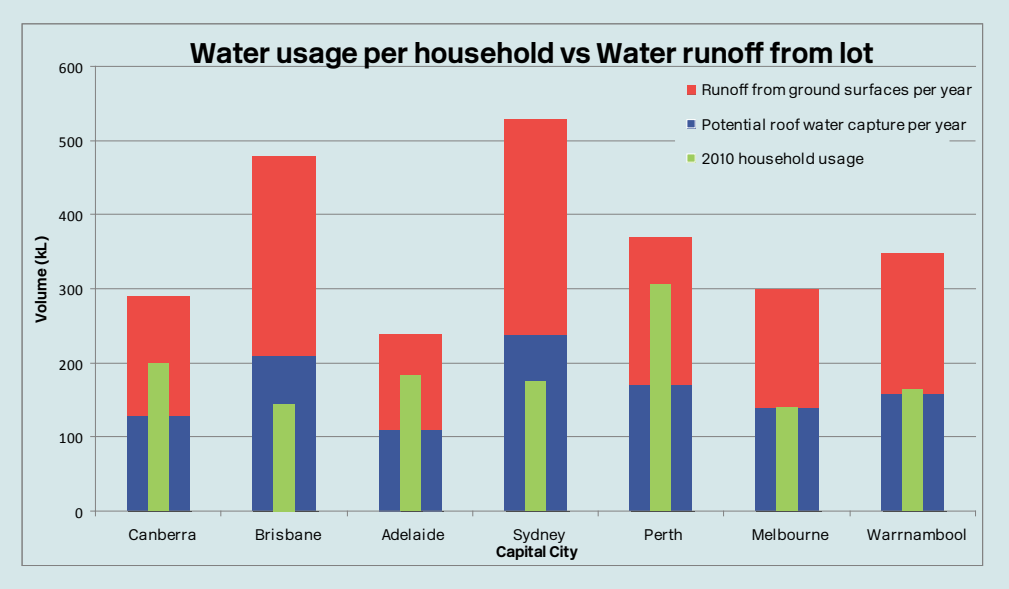


Figure X: Comparison of available roof water to residential demand.

Assumptions: Allotment size 750 square metres – 1/3rd roof area, 1/3rd paved, 1/3rd garden/lawn. Runoff coefficients: roof 0.85, paved 0.8 and garden/lawn 0.2. Water restrictions applied for some cities in 2010. Warrnambool water consumption from 2009/10. Using historical average rainfall and typical temporal patterns.

Project collaborators

- Wannon Water (Project Initiator)
- Australian Government – Water for the Future (Funding Partner)
- Victorian Government – Stormwater and Urban Recycling Fund (Funding Partner)
- Cove Land Developments Pty Ltd (Developer)
- Warrnambool City Council (Responsible Council)

Awards

- High Commendation at the AWA 2012 Victorian Water Award

Additional information

More information on the rainwater harvesting scheme can be found at:

- Wannon Water
  http://www.wannonwater.com.au/2015/june/roof-water-harvesting-project-expanded-in-warrnambool.aspx
- Clearwater:
  https://www.clearwater.asn.au/resource-library/case-studies/roof-water-harvesting-project.php
  https://www.clearwater.asn.au/user-data/resource-files/Wannon-Water-Toolkit-AWA-article.pdf

WRAP additional RM actions to June 2018

Background

Options for additional PM activities are considered to be:

1. Host a LG forum to share lessons learnt regarding the planning, design, construction and maintenance of WSUD assets and landscapes. Participant councils could share their experiences with CRCWSC products and research including the following:

- Index and Visioning (Canning and Mandurah)
- GW studies and position paper lead to engineering approvals (Armadale)
- Monitoring of WSUD (Mandurah)

2. Host a practical workshop for LG asset managers and parks staff to explain functions of WSUD assets and describe some of the key maintenance tasks.

3. Establish an expert panel to assist DWER and LG to review Water Management documents and support best practice and innovative approaches through the assessment process

4. Develop messages in their own language that conveys linkages between WSC principles and the objectives of each agency involved in the land use planning and development process. Aim to reframe WSC into a common language to demonstrate the synergies and de-mystify WSUD – convert the unconverted.

There is $5,000 available in the RAP budget to spend this financial year that can be used to fund one of these via a short term contract.

CRC for Water Sensitive Cities

ATTACHMENT : CRCWSC Western Region EVENT SCHEDULE 2018

	Event	Topic	Organisation(s) in charge
2018	2018	2018	2018
14 Dec 17 – 30 Jan 18	WA School Holidays		
18 January	IRP5	Project Steering Committee Meeting	Nick Deeks
25 January	Regional Advisory Panel		CRCWSC WR
1 February	Delivering products and services on behalf of the CRCWSC		Barry Ball
9 February	IRP1	Project Steering Committee meeting	Katie Hammer
12 – 15 February	10th International Water Sensitive Urban Design	WSUD 2018 & Hydropolis 2018 Crown Towers, Perth	Engineers Aust, AWA Stormwater WA
28 February	CRCWSC Board Meeting/ Annual EPRG Meeting	Board and Executive Committee Meeting	CRCWSC
28 Feb – 2 March	Developing WA	UDIA State Conference	UDIA WA
1 March	Brabham Mini Brainstorming Workshop		CRCWSC
8 March	Research Projects Update Session		CRWSC
21 – 23 March	IPWEA WA 2018 State Conference	"Changing Face of Public Works"	IPWEA WA
26 March	Water Sensitive Transition Network Meeting		CRCWSC
27 March	New WAter Ways 2018 training session 1	Session 1: Planning processes, introduction to stormwater management practices, the decision process and biofilters	New WAter Ways
28 March	Regional Advisory Panel		CRCWSC WR
6 April	AWA Conference 2018	WAter – A State of Extremes	AWA
11 April	UDIA Industry Breakfast	What is the future of alternative/lightweight housing construction in Perth?	UDIA WA
14 April – 29 April	WA School Holidays	T1 WA School Holidays	
8 May	New WAter Ways 2018 training session 2	Session 2: Groundwater management for urban development, local water management strategies, retrofitting for WSUD and maintenance of WSUD assets	New WAter Ways
30 May	Regional Advisory Panel		CRCWSC WR
6 June	CRCWSC Board Meeting	Board Meeting	CRCWSC
13 June	UDIA Event	The Future of Development – Minister Saffiotti; Landgate	UDIA WA
30 June – 15 July	WA School Holidays	T2 WA School Holidays	
25 July	Regional Advisory Panel		CRCWSC WR
29 August	CRCWSC Board Meeting	Board Meeting	CRCWSC

22 Sept – 7 Oct	WA School Holidays	T3 WA School Holidays	
26 September	Regional Advisory Panel		CRCWSC WR
12 October	2018 Stormwater Australia National Conference		Stormwater Australia
24 October	CRCWSC Extraordinary Board Meeting	Board Meeting	CRCWSC
28 November	Regional Advisory Panel		CRCWSC WR
27 November	CRCWSC Board Meeting	Board Meeting	CRCWSC
14 Dec – 3 Feb 2019	WA School Holidays	T4 WA School Holidays	

CRC Board, Executive or Committee Meeting	CRC Project Event	CRC Special Event
CRC Project Team Meeting	CRC Synthesis Event	National External Event
Regional Advisory Panel Meeting	Capacity Building – Public	WA External Event
	Capacity Building – Invite	WA School Holidays