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Ensuring Perth, Western Australia, transitions to a leading water sensitive city.

How key changes in culture, governance, planning and practice are working to transform urban development and water system management in Perth.

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ABSTRACT

The climate of Perth, Western Australia, is becoming hotter and drier, while urban development and the demand for water continue to grow. No single organisation on its own can tackle the complex challenge of a growing city in the face of climate change – a 'wicked problem'. Stakeholders in Perth recognised that collaboration across sectors and disciplines, and a shift from conventional water management approaches were required to maintain a highly liveable city.

Through a partnership with the Cooperative Research Centre for Water Sensitive Cities (CRCWSC), Perth stakeholders trialled novel tools to identify the transformative changes required to achieve the vision for the city's water future. Further description of these tools are provided in Transforming water systems for people and planet (Rogers et. al., 2022).

Insights and benefits of applying these tools are discussed in this article, along with the key changes occurring in culture, governance, planning and practice to transform urban development and water system management in Perth. The shifts in leadership – from individual activists through to senior executive networks – championing the change to water sensitive practice will be explored. Through increased collaboration and collective action across many stakeholders, Perth is well on its way towards our vision of being a leading water sensitive city.

HIGHLIGHTS

- Perth was the first city to trial the Water Sensitive Cities Index benchmarking tool in 2016 and the first to re-benchmark in 2021.
- Working with the CRCWSC has helped to establish a thriving community of practice, called the Water Sensitive Transition Network – a group of champions from across government, industry, community and research organisations working together with a clear ambition for Perth to be a water sensitive city in 2065.
- Coordinated action has led to multi-agency commitment demonstrated by publication of the Western Australian Government's Waterwise Perth Action Plan in 2019 (DWER, 2019).
- Perth has progressed substantially towards the achievement of our water sensitive city vision, with an overall improvement in urban water management performance of 26% over 5 years, as measured by the Water Sensitive Cities Index (total score across all seven goal areas in 2021 compared to the benchmark for Perth in 2016).

KEYWORDS

Water sensitive cities
Benchmarking
Transition dynamics framework
Perth
Water Sensitive Cities Index
Climate change

INTRODUCTION

Perth has seen climate change happen faster and earlier than almost anywhere else on the planet. Since 1970, Perth's rainfall has decreased by more than 20%, with climate models predicting a further 6% reduction over the state's south west by 2030 (Water Corporation, 2022a). This decrease in rainfall has resulted in an 80% decline in streamflow into Perth's dams over the last decade compared to the flow received pre-1975. At the same time, Greater Perth's population grew by 150% between 1975 and 2020. Urban sprawl has seen the city expand across a 150 kilometre stretch of the coast, increasing the cost and environmental impact of servicing households. Additionally, the climate - and city - is getting warmer, increasing the demand for water. The average annual number of days above 35°C in Perth is predicted to increase from 28 (1971–2000 average) to 36 by 2030.

To adapt to the impacts of climate change, the sources of Perth's drinking water have changed dramatically over the last 15 years. Perth is an international leader in developing climate-resilient water sources, like seawater desalination and groundwater replenishment, which now make up approximately half of Perth's drinking water. There has also been great success in working with the community to reduce water use in Perth, achieving more than a 30% reduction in water supplied per capita since 2001 (Water Corporation, 2022b). However, Perth has the highest greenhouse gas emissions per property associated with its water services in Australia, and remains one of the highest water using cities in Australia (and, indeed, the world) (BOM, 2021).

A key challenge for Perth is how to create and maintain highly liveable communities when natural fresh water sources continue to decline. Responding to this challenge, Perth stakeholders saw the opportunity for action created by the CRCWSC and have been active collaborators since 2012. The purpose of the CRCWSC was to help change the way we design, build and manage our cities and towns by valuing the contribution water makes to the economic development and growth, our quality of life, and the ecosystems of which cities are a part. With guidance from the CRCWSC, Perth's journey towards becoming a water sensitive city was accelerated over the last six years. Key milestones included:

- 2015 – A vision and suite of critical strategies to move towards a water sensitive city is developed through the CRCWSC's participatory research processes and documented in Shaping Perth as a Water Sensitive City (Rogers et. al., 2015). A Transition Reference Group is formed, later to be known as the Water Sensitive Transition Network (WSTN).
- 2016 – Perth is the first city to trial the Water Sensitive Cities Index benchmarking process.
- 2017 – The Transition Dynamics Framework (TDF) is trialled to identify priority strategies to assist in making the practice changes necessary to achieve a water sensitive city.
- 2018 – In response to the TDF findings, the way forward is re-drafted as a Vision and Transition Strategy for a Water Sensitive Greater Perth (Hammer et. al., 2018).
- 2019 – WSTN prepares the Implementation Plan 2019-2021 (WSTN, 2019) comprising 31 actions and indicators of success.
- 2021 – Perth is the first city to re-benchmark using the Water Sensitive Cities Index process. Insights from this reassessment are being used to update the Implementation Plan. .

PROCESS

The application of three novel tools, developed by the CRCWSC, and designed to identify the transformative changes required to achieve the vision for a city's water future have enabled and accelerated progress:

1. An Envisaging process (Rogers et. al., 2021) to develop a shared vision across the diverse stakeholders who shape a city and foster commitment to a strategic transition framework;
2. The Water Sensitive Cities Index (Rogers et. al., 2020) to benchmark Perth's urban water management performance; and,
3. The Transition Dynamics Framework (Rogers et. al., 2021) to diagnose the presence and maturity of

enabling factors required for a city's shift to water sensitive practices.

Learnings from the Perth pilot led to this process being improved for other cities by running the benchmarking process first, followed by the envisioning process and transition planning.

Creating a shared vision

Leading professionals from across water, planning, community, urban development and other related sectors took part in a series of five workshops to collaboratively develop a 2065 vision for Perth as a water sensitive city, guiding principles of practice, and ideas for strategies and actions for transitioning towards the vision.

The participatory process develops and applies innovative transition planning processes and frameworks in different case study contexts. Whilst the key artefact generated by the process was a high level orienting vision and supporting strategies, the process guidance included a range of specific ideas to inform the design and implementation of operational programs of action to accelerate the desired transitional change.

A key benefit of the process for Perth stakeholders was peer-to-peer learning across diverse disciplines, as well as sharing case studies and knowledge. The high level of collaboration also supported the creation and maintenance of trusted relationships which are critical to support trials of new processes and practices. The process also fostered a group of champions and empowered them to act as leaders in their organisations and promote a shared vision.

Benchmarking

The next step was developing a plan to achieve the shared vision for Perth. This began by understanding where the city was at in terms of its water sensitive performance. The water sensitivity of the Perth was benchmarked in February 2016 using the Water Sensitive Cities Index.

The Index enables a city to measure performance against seven urban water goal areas that characterise a water sensitive city (Figure 1). These goal areas cover both biophysical and socio-institutional elements, which are organised into 34 corresponding indicators. Each of the 34 indicators is scored on a 1 to 5 rating scale in a collaborative workshop process, based on detailed descriptions and (where available) quantitiatve crtieria in the benchmarking tool. A score of 5.0 represents the aspirational water sensitive performance for each indicator. The scores are plotted to visually display where a city's strengths and weaknesses lie across the seven goal areas – establishing a benchmark for the city at that point in time. The tool is applicable to cities of all scales, from a broad metropolis to a local government area.

Following benchmarking, the Index tool supports the city to set targets and identify strategic priorities and actions to improve water sensitive performance and ultimately reach the water sensitive cities vision. Progress towards the achievement of the vision can be measured through subsequent applications of the Index benchmarking tool.

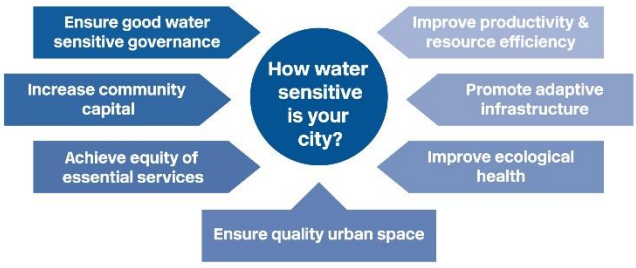

Figure 1: Seven goal areas that characterise a Water Sensitive City

Transition phase	Champions	Platforms for connecting	Knowledge	Projects	Tools and Guidance	
					Technical	Administrative
1. Issue emergence	Issue activists		Issue highlighted	Issue examined		
2. Issue definition	Individual champions	Sharing concerns and ideas	Causes and impacts examined	Solutions explored	Data and evidence collected	
3. Shared understanding & issue agreement	Connected champions	Developing a collective voice	Solutions developed	Solutions experimented with	Preliminary practical guidance	Administrative instruments explored
4. Knowledge dissemination	Influential champions	Building broad support	Solutions advanced	Solutions demonstrated at scale	Refined guidance and design tools	Early policy & performance standards
5. Policy and practice diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learning	Guidance for implementation & cross-sector	Refined policy & standards, early regulation
6. Embedding new practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive standardised guidance	Comprehensive policy and regulation

Figure 2: Transition Dynamics Framework: five types of enabling factors to drive progress through six phases of change (Wong et al., 2020)

Planning for new practices

Realising new practice on the ground is never easy and requires significant change across the structures, cultures and practices of urban and water system planning, design, management, engagement and decision making. CRCWSC research shows that water sensitive transition requires five types of enabling factors to drive progress through six phases of change (Figure 2).

The Transition Dynamics Framework (TDF) provides an analytical approach that helps stakeholders diagnose their current phase of change and associated strengths and weaknesses to inform the design of tailored and effective transition strategies.

By applying the TDF approach, Perth stakeholders were able to break down the complex social, institutional and technical context in which change was required. The approach highlighted the need for organisational change, leadership, cross-sector collaboration, technology demonstrations, research, and community engagement and education activities. The TDF helped stakeholders understand that the delivery of projects or demonstrations was not enough to affect the degree of transformational change required to achieve the vision and that changes in institutional and individual processes, practices and behaviours are also critical.

2021 re-benching and strategy development

The water sensitivity of Perth was re-benchmarked in February 2021 (Figure 3). This revealed that Perth has made substantial progress towards a water sensitive city, increasing from 5% in 2016 to 18% in 2021. A notable uplift against the preceding phase, a 'water cycle city', was also recorded – a 22% increase (from 44% in 2016 to 66% in 2021).

Similarly to 2016, the goal areas that scored the highest were 'ensure good water sensitive governance' and 'achieve equity of essential services'. These scores are reflective of the presence of a long term vision and cross-sector commitment to the CRCWSC and the safe and reliable water services provided across the metropolitan region.

Least progress has been made to 'improve ecological health'; 'ensure quality urban space'; and 'improve

productivity and resource efficiency', and accordingly, these goal areas were considered to be a focus for strategy development. TDF assessments were undertaken to bettter understand the practice change needs and the outcomes used to support preparation of the WSTN Implementation Plan for 2021-2024.

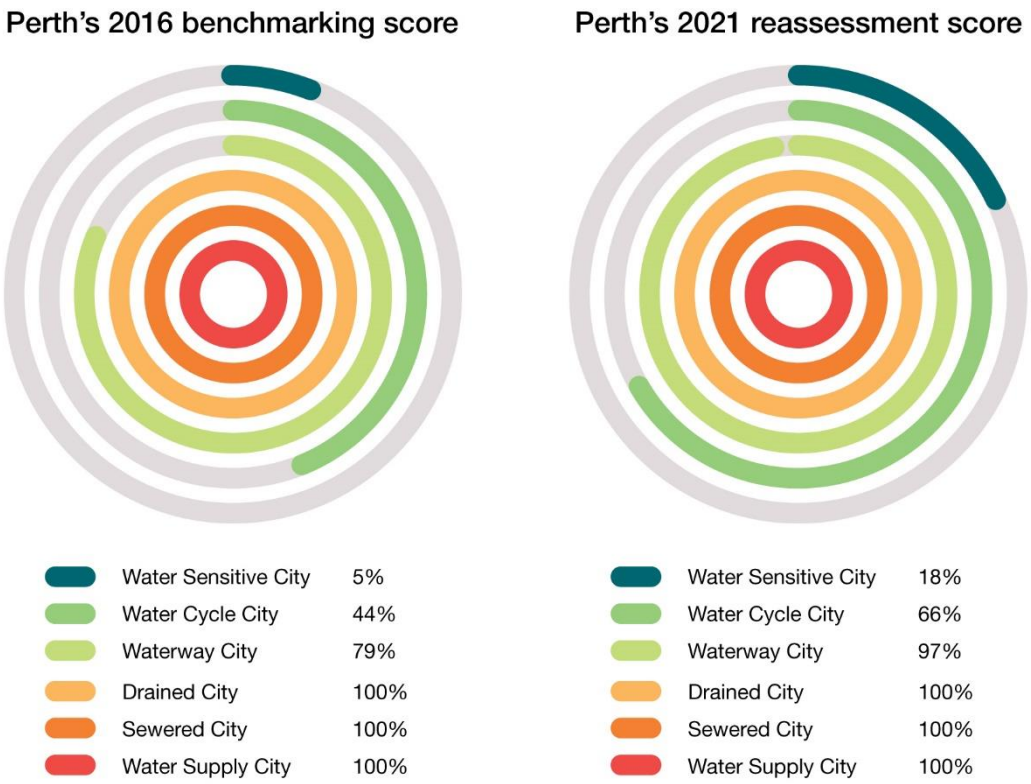

Figure 3: Perth's 2016 benchmarking score (left) compared to the 2021 reassessment (right). The scores are presented as a percentage attainment of each of the city-states of the Urban Water Transitions Framework. This framework identifies six developmental states a city can occupy while on its path to increased water sensitivity, from the essential services of water supply, wastewater management and flood protection to holistic and integrated water cycle management that meets the city's water needs while also delivering a range of associated liveability benefits (Brown et. al. 2016). The progression through the city-states is nonlinear and elements of each city-state contribute to the next.

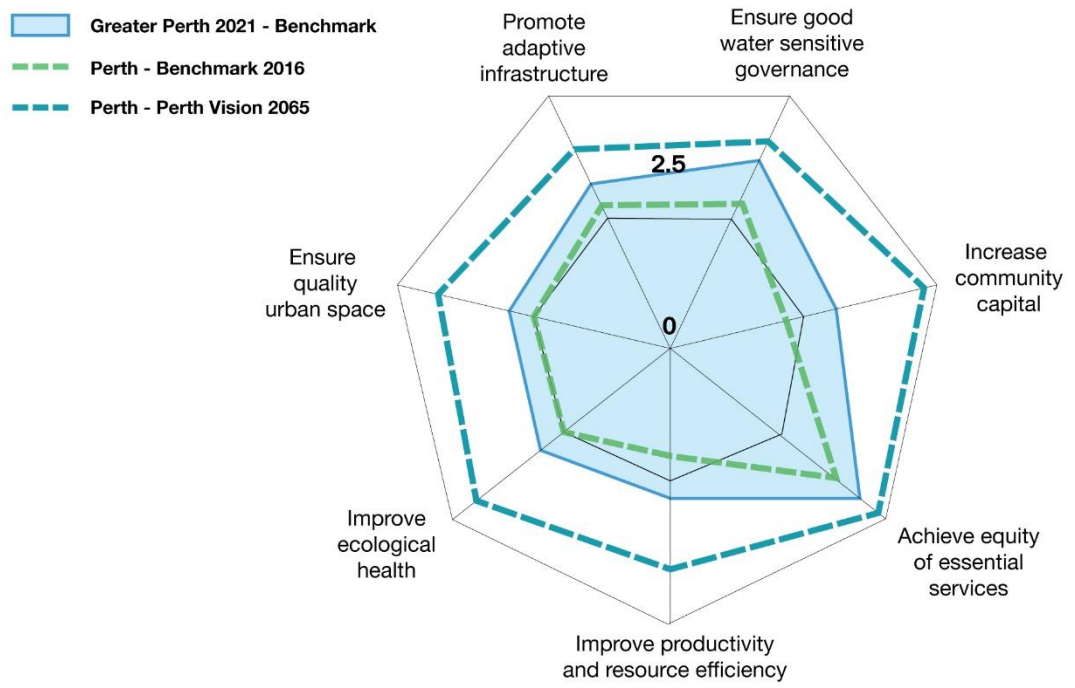

Figure 4: Results of Perth's reassessment using the WSC Index in 2021, compared to the 2016 benchmark and 2065 vision mapped to the seven goals of the Water Sensitive Cities Index.developmental states a city can occupy while on its path to increased water sensitivity, from the essential services of water supply, wastewater management and flood protection to holistic and integrated water cycle management that meets the city's water needs while also delivering a range of associated liveability benefits (Brown et. al. 2016). The progression through the city-states is nonlinear and elements of each city-state contribute to the next.

OUTCOMES

A significant contribution to Perth's improved score is the action undertaken by the 32 Perth and Peel local governments. A major milestone achieved in 2021 was all local governments being endorsed under the Waterwise Council Program (Water Corporation, 2022c), which is a joint initiative between the Water Corporation and the Department of Water and Environmental Regulation. The Program supports and encourages local governments to continuously improve their water management and adopt water sensitive principles as part of the Program's recognition scheme. Eligible local govenments are offered an Index workshop. Since 2016, 20 of the 32 local govenments have completed benchmarking workshops which has led them to developing comprehensive water management action plans.

Perth achieved notable progress in the following areas of the Index framework (Figure 4):

Goal 1 'Ensure good water sensitive governance', where the political, social, economic and administrative systems are in place to support water sensitive practice. Improvements in this goal area were driven by:

- strengthening cross-sector institutional arrangements including the Water Sensitive Transition Network and high level commitment to cross agency streering groups to deliver the long term vision through development of the WA Government's Waterwise Perth Action Plan;

- updates to the water planning framework by streamlining and consolidating six water-related State planning policies and the Government Sewerage Policy into one to deliver greater clarity and guidance around integrating the management of water resources into planning and development decision-making;
- improvements to public engagement and participation through initiatives such as Tap In, Water Corporation's largest and most comprehensive community engagement program and establishment of a reference panel of almost 10,000 customers who provide input and feedback to guide the Corporation's activities;
- establishement of the Groundwater Replenishment Visitor Centre in 2018 which saw more than 11,000 community members touring the site; surveys taken of people who visited the plant indicate support of over 90% once they have an understanding of the processes involved in wastewater treatment and groundwater replenishment;
- an increase in equitable representation of perspectives achieved through organisations' equity and inclusion policies, improvements in diversity of Board members; increase in Indigenous Australians employed in the water sector (4.8% Indigenous Australians employed at Water Corporation in 2021, compared to 3.0% in 2016 (Water Corporation, 2021 & 2016); and progress implementing Reconciliation Action Plans and Aboriginal Engagement Strategies.

Goal 2 'Increase community capital', where citizens have the knowledge and connection to water and are empowered to contribute to decision-making. The increase in this goal area was driven by:

- an increase in connection to water achieved by community engagement in the Drainage for Liveability Program (Water Corporation, 2022d), which transforms drains and basins to provide greater amenity for the community;
- an increase in community connection to local water assets and stories through Water Corporation's Splash of Colour Program (Water Corporation, 2022e), which has resulted in over 50 assets transformed into artworks reflecting the importance of water to local communities and ecosystems since the program commenced in 2017;
- success of waterwise messaging and incentives, reflected in the high uptake of water saving measures by customers (e.g. Shower Head Swap Program) and market research finding customers have good knowledge of water saving practices around the house and garden and 90% of survey respondents indicating their household actively tries to save water; and
- COVID-19 restrictions changing people's behaviour and resulting in increased appreciation of river systems, greenspace and gardening.

Goal 4 'Improve productivity and resource efficiency', including low greenhouse gas emissions, low potable water demand, maximised resource recovery and new business opportunities and benefits across other sectors generated through innovation in the water sector. Improvements in this goal area were driven by:

- improvement in managing greenhouse gas emissions associated with the water sector through release of the Western Australian Climate Policy (DWER, 2020) setting targets to transition to a zero net carbon future, investment in clean energy (such as the Water Corporation's $30 million solar program), increased investment in offsetts, transitioning vehicle fleets to electric, and local government investment in improving energy efficiency, solar and geothermal energy;
- the success of waterwise programs and targeted initiatives to reduce potable water demand, for example over nine billion litres of scheme water was saved by businesses participating in the Waterwise Business Program in 2019-20, and 100% of local governments in the Perth region achieving endorsement as Waterwise Councils through their commitment to improving water efficiency and creating waterwise communities (Water Corporation, 2021); and
- greater investment in recovering resources from waste streams, including over 20 billion litres of water being recycled as well as reuse of 100% of biosolids produced in Perth in 2019-20, biogas generators at two wastewater treatment plants to

produce renewable energy, and exploration of new opportunities such as Water Corporation's partnership with Hazer Group to deliver an Australian-first project to produce low-emission hydrogen and graphite from sewage at a wastewater treatment plant.

Application of the TDF tool also highlighted the changes required to improve lower-performaing goal areas.

- To improve ecological health, the practice change required should focus on developing a community of practice that provides support for better environmental outcomes;
- To ensure quality urban space, support for water sensitive urban design solutions particularly in infill development areas, and retroftting of exisiting infrastructure was identified by stakeholders;
- To improve productivity and resource efficiency, economic valuation methods that support business cases for increased resource recovery, and increasing knowledge and experience through implementing trials and demonstrations of innovative adaptive, multi-functional and resource efficiency solutions beyond wastewater recycling are required; and,
- To increase community capital, there is a need to obtain information on why community knowledge and interest in the water system is low. Once there is more clarity in this area, programs to connect stakeholders and the community will be required to share the knowledge and trial projects to build community water literacy.

More broadly, application of the TDF tool suggests there is a need to expand the Water Sensitive Transition Network so there is a collective voice that speaks about all elements of a water sensitive city.

CONCLUSION

Working with the CRCWSC tools enabled the formation and adoption of a vision of Perth as a leading water sensitive city, consisting of four themes:

1. Fostering stewardship of the system;
2. Protecting and enhancing the wellbeing of people and the environment;
3. Integrating and engaging with the built and natural landscape; and
4. Sustaining the long-term use of Perth's resources.

Application of the three novel tools between 2015 to 2021 achieved:

- Establishment and growth of a community of practice, called the Water Sensitive Transition Network – a group of champions from across government, industry, community and research organisations working together to transition Perth to a water sensitive city.
- Coinvestment by stakeholders to deliver key projects designed to address priorities identified under the Vision and Transition Strategy for a Water Sensitive Greater Perth (2018), including projects to increase understanding of Aboriginal knowledge to inform land and water planning; effective community messaging to influence water knowledge and behaviours; and maintenance and life cycle costs of water sensitive systems.
- Increased collaboration and coordinated action across Government, leading to the development of the Western Australian Government's Waterwise Perth Action Plan (2019) - this plan is the first time key government agencies across water, planning, community and development portfolios came together to work towards achieving our shared vision of Perth as a leading water sensitive city (referred to as a waterwise city in Western Australia).
- A 26% improvement in Perth's overall performance assessed using the Water Sensitive Cities Index tool, compared to when the city was benchmarked five years previously.

These key changes in culture, governance, planning and practice are working to transform urban development and water system management in Perth. Shifts in leadership – from individual activists through to senior executive networks – championing the change to water sensitive practice have occurred over the last 30 years, but most notably in the last six years, culminating in the state government establishing

an authorising environment. Through increased collaboration and collective action across many stakeholders, Perth is well on its way towards its vision of being a leader.

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AUTHOR BIOGRAPHIES

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