CRC for
Water Sensitive Cities

Vision and Transition Strategy

for a Water Sensitive Bendigo

CRCWSC Integrated Research Project 1:
Water Sensitive City Visions and Transition Strategies

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

Vision and Transition Strategy for a Water Sensitive Bendigo
Water sensitive city visions and transition strategies (IRP1)
IRP1–2–2018

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Disclaimer

Executive summary

This Vision and Transition Strategy defines a vision of a water sensitive future for Bendigo, Victoria, and outlines the broad steps Bendigo should take to enable a transition towards this future. It is the outcome of nine months of research, analysis and engagement with 31 community champions and 47 leading thinkers from across water, planning, development and the environment in Bendigo.

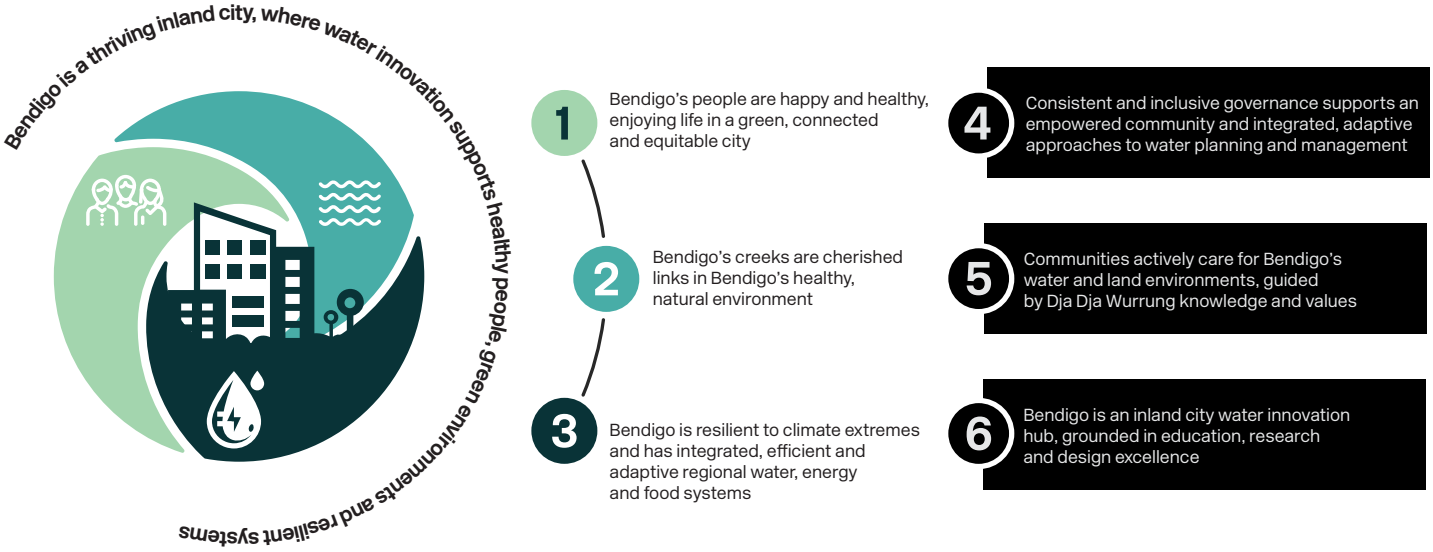
The project developed and applied methods and tools of the Cooperative Research Centre for Water Sensitive Cities (CRCWSC) designed to consider a city's long-term water aspirations, benchmark current water sensitive performance and explore strategic priorities for the short- to medium-term that will be important in pursuing its water sensitive city vision. These approaches have helped situate Bendigo on its water sensitive city transition journey and identified the critical interventions to enable progress.

Bendigo's water story

Bendigo has a unique heritage in hosting, for a time, the most lucrative gold deposit in Australia. This has created an important cultural legacy but also a highly disturbed landscape with fragile natural resources. This is arguably best represented by Bendigo Creek, which fulfils the multiple roles of Bendigo's first encounter with gold, its primary urban stormwater drainage channel, the site of several groundwater management issues, and the city's most prominent linear recreational trail. In addition to its current challenges, to retain its prized liveability, Bendigo will have to plan wisely to adequately service a growing population in a warming and drying climate.

Bendigo's water sensitive vision

The 50 year vision is for Bendigo to be a ***thriving inland city, where water innovation supports healthy people, green environments and resilient systems***. The vision encompasses a set of three central outcomes that define the benefits for communities living in Bendigo, reinforced by the three surrounding outcomes that describe important enabling conditions for achieving the vision.



Bendigo's water sensitive city vision

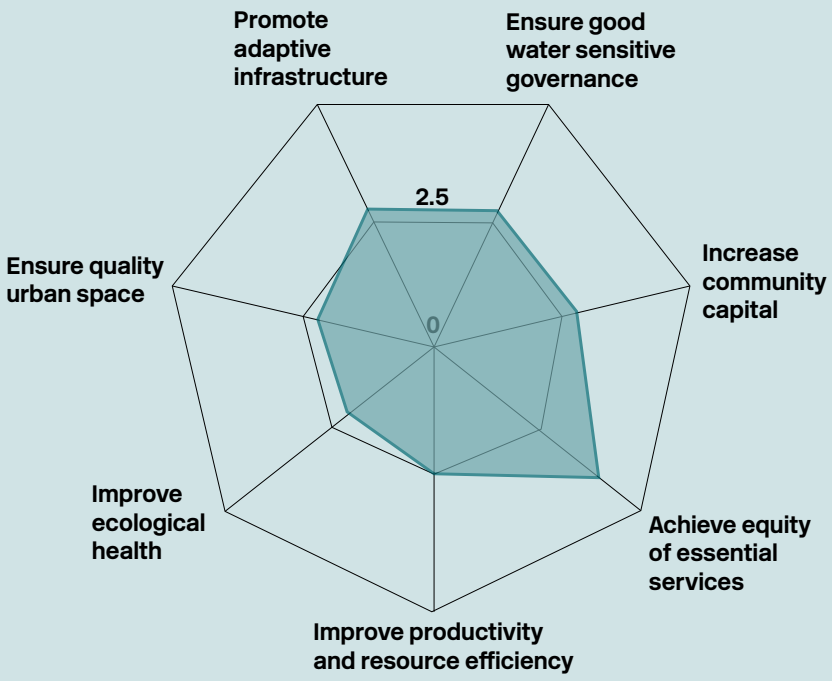
Current water sensitive performance

Bendigo's current water sensitive performance was benchmarked using the CRCWSC's Water Sensitive Cities Index (WSC Index). Bendigo's performance in the Index suggests it is strongest in the goal of *equity of essential services*. Its relative weaknesses are in the goals of *ecological health*, *quality urban space*, and *productivity and resource efficiency*.

Interpreting these results against the six city-states of the Urban Water Transitions Framework highlights Bendigo's high performance in the provision of basic services of water supply, sewerage and drainage. Beyond these, Bendigo has shown good progress in waterway (82%) and water cycle (31%) management, with room for further innovation to increase these ratings as it becomes more water sensitive.

Transition assessment and strategic recommendations

Bendigo has a strong tradition of strategic collaboration for managing its challenges, and in the water sector there is a drive for new approaches and innovation. This is evident in the interest in recycled water use, sustainable groundwater management and sustainable building design. Bendigo also has a community that is highly invested in the future of Bendigo, with a strong overall commitment to sustainability and the natural environment. Nevertheless, for Bendigo to achieve its 50-year water vision, greater emphasis will be needed to establish institutions that reinforce the delivery of water sensitive outcomes and support technological and process innovation for Bendigo's unique context, and ensure there is adequate integration across the whole regulatory system as well as business and community practices. Platforms for collaboration and learning relating



WSC Index results for Bendigo goals

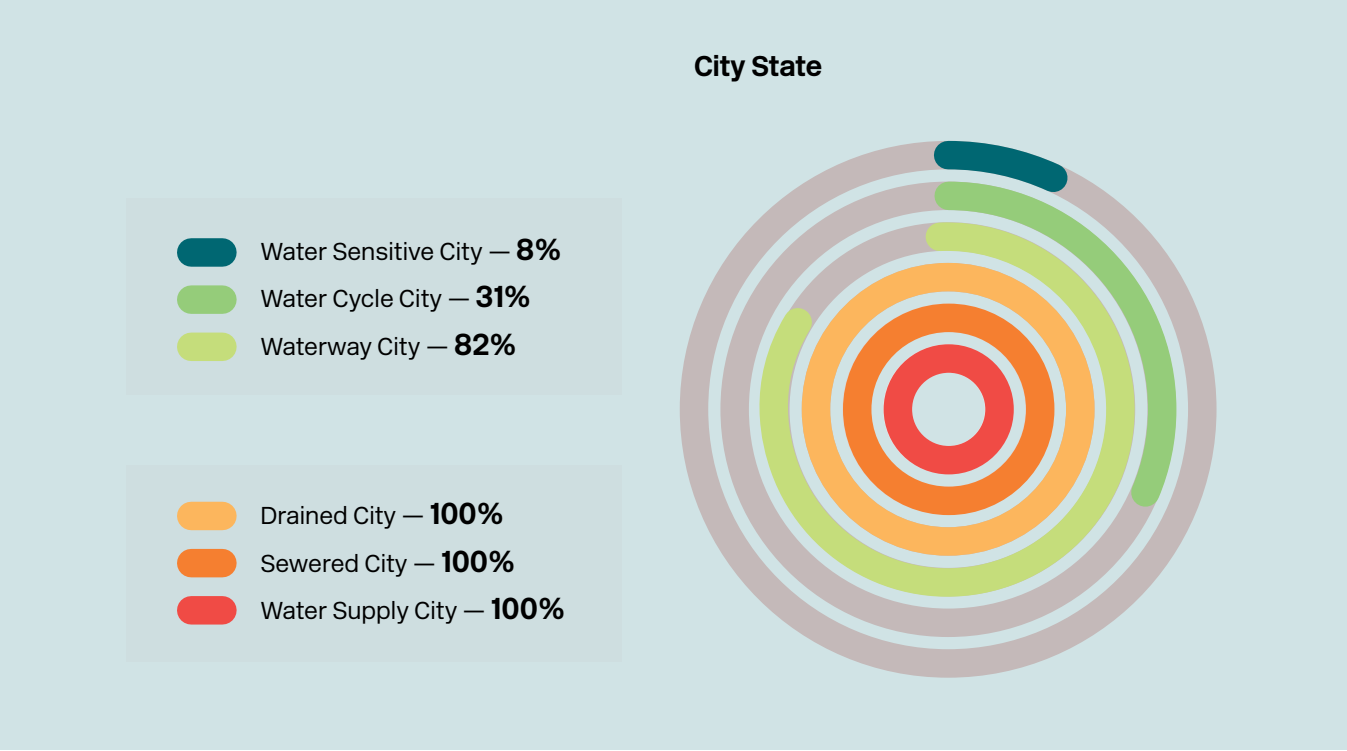
to water sensitive practices will need to permeate all levels of decision-making, scales of implementation and elements of the urban water cycle. To achieve this transformation, 28 strategies across the six vision outcomes are recommended. The short-to-medium term transition needs of Bendigo can be summarised by the following four overarching strategies:

I. Seek broad support from Bendigo's political, organisational, sectoral and community leaders and the general public for the city's water sensitive vision

II. Embed Bendigo's water sensitive aspirations in a broad city vision, organisational frameworks and a cross-agency strategy that promotes integrated water sensitive outcomes

III. Establish a network for endorsing and driving coherent water sensitive action across stakeholders

IV. Learn from and scale innovative solutions to provide on-ground demonstrations and practical guidance for a full suite of water sensitive approaches that suit Bendigo's inland city context



WSC Index results for Bendigo filtered by city-state

Bendigo's strong community connections, history of innovation and compact size, means it is has valuable foundations for rapidly advancing its water sensitive city vision. The network of industry and community champions established through this project is committed to transition action and have developed hundreds of ideas for how to drive the water sensitive city agenda forward. These are documented in the companion full case report (*Benchmarking, Envisioning and Transition Planning for a Water Sensitive Bendigo: Final Case Report*) and further planning will need to be undertaken to define roles, responsibilities, targets and timeframes for implementation. Mobilising resources for further planning through formal governance support will help accomplish effective implementation. Victoria's current water policy framework supports the directions set out in Bendigo's water sensitive city vision, and local stakeholders are confident that Bendigo can capitalise on its existing collaborations to implement the transition strategy presented here.

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Glossary / List of Abbreviations

Council	City of Greater Bendigo
CRCWSC	Cooperative Research Centre for Water Sensitive Cities
DELWP	Department of Environment, Land, Water and Planning
Dja Dja Wurrung	Used as an entity, referring to the Dja Dja Wurrung Clans Aboriginal Corporation, which is recognised as the Traditional Owner Group for the area comprising Bendigo
Djandak	Dja Dja Wurrung Enterprises Pty Ltd, trading as Djandak, is the commercial arm of Dja Dja Wurrung Clans Aboriginal Corporation (DDWCAC), which represents the Traditional Owners of the region, covering North-Central Victoria.
IRP1	CRCWSC Integrated Research Project 1 *Water Sensitive City Visions and Transition Strategies* (https://watersensitivecities.org.au/content/project-irp1/)
IWM	Integrated Water Management
NCCMA	North Central Catchment Management Authority
Transition	A fundamental shift in cultures, structures and practices as society changes from one pattern of socio-technological development to another usually more sustainable pattern
Transition Dynamics Framework	A framework that conceptualises how system-wide changes in practice (e.g. the transition to water sensitive practices) unfold over time, based on the establishment of key enabling factors: individual and organisational champions, platforms for connecting, science and knowledge, projects and applications, and tools and instruments
WSC	Water Sensitive City; a WSC provides water system services in a way that reflects an integrated approach to infrastructure, the built form, the environment, governance and community, in order to deliver outcomes that support the enduring sustainability, liveability, resilience and productivity for a place's community and ecosystems
WSUD	Water Sensitive Urban Design; an approach to the planning, design and maintenance of urban landscapes that will deliver WSCs through protecting and enhancing natural water systems and integrating the management of the total water cycle
WSC Index	A tool to benchmark and diagnose the water sensitive performance of a place (from the municipal to metropolitan scale), based on 34 indicators; good water sensitive governance, community capital, and equity of essential services, productivity and resource efficiency, ecosystem health, quality urban space, and adaptive infrastructure

1. Introduction

1.1 About this report

The Cooperative Research Centre for Water Sensitive Cities (CRCWSC) was invited to develop a water sensitive city vision and transition strategy for Bendigo. This forms part of the Water Sensitive City Visions and Transition Strategies integrated research project (IRP1), which aims to deliver a suite of participatory methods and associated tools for guiding cities and towns in accelerating their water sensitive transitions.

The CRCWSC is part of the Commonwealth Government's Cooperative Research Centre Program. It partners with research, government and industry organisations around Australia in delivering its mission to help change the way urban areas are designed, built and managed with water sustainability and productivity as a central driver. The CRCWSC envisions future cities and towns, and their regions, to be sustainable, resilient, productive and liveable.

Bendigo is one of six case studies conducted as part of IRP1, the others being Perth, Adelaide, Townsville, Sydney and the Gold Coast. The Bendigo case involved facilitation of stakeholder discussions across a series of industry and community workshops, stakeholder interviews, focus groups, literature review and the application of benchmarking and diagnostic tools to inform detailed analysis. 47 of Bendigo's leaders and strategic thinkers from across water, planning, environment, community and other related sectors, and 31 members of the local community, participated in the core workshop series between October 2017 and May 2018. In addition, 30 community members that reflected demographics that were under-represented in the core workshop series were recruited to participate in focus groups that explored, tested and enriched the water sensitive city vision and ideas.

This report presents the key outputs of the project. Its purpose is to provide a framework for orienting and coordinating strategic action across the many different stakeholders who will need to collaborate for Bendigo's envisioned water future to be achieved. It is anticipated that this summary report can be used as a resource to inform the design and implementation of strategic and operational programs of action within key agencies and other organisations and community groups.

This report is complemented by a companion document, *Benchmarking, Envisioning and Transition Planning for a Water Sensitive Bendigo: Final Case Report*, which provides a full description of the case study methodology as well as the detailed analyses that underpin the results presented herein and a database of short-to-medium term actions that includes a vast array of ideas for action implementation.

Alongside the production of practical guidance for Bendigo's water sensitive transition contained in this report and its companion document, the engagement process overall has been valuable for strengthening relationships amongst stakeholders and building momentum and commitment for driving Bendigo's transition towards its envisioned water sensitive future.

1.2 What are water sensitive transitions?

As cities and towns globally are grappling with the challenges of climate change and rapid urbanisation, practitioners, decision-makers and academics are recognising the importance of water in supporting urban liveability, sustainability and resilience for a city's long-term prosperity.

In Australia, the concept of the water sensitive city (WSC) is now widely used to represent an aspirational state in which efficient, sustainable and productive water use and management is integrated throughout the urban system. In a water sensitive city, people can enjoy reliable water supplies, resource-efficient sanitation, protection from environmental threats, healthy ecosystems, beautiful landscapes, new business opportunities, and cultural and recreational pursuits that help build community resilience.

A WSC incorporates innovative infrastructure, design and governance solutions. For example, water recycling at different scales through wastewater recovery and stormwater harvesting provides a diversity of water sources and improves the health of downstream rivers and creeks by reducing pollution and flow impacts. Water sensitive urban designs integrate nature-based infrastructure into the landscape to provide hydraulic and water treatment functions, as well as amenity benefits such as an aesthetic environment and mitigation of urban heat island effects. Integrated and collaborative land use and water planning results in catchment-scale approaches to enhancing flood resilience and connecting areas of green and blue to create ecosystem and recreation corridors throughout the city footprint. Citizens are active in caring for water and the environment, and there is cohesion amongst the community as their sense of place and collective identity is nurtured through their connection with water.

Many places are starting to articulate aspirations represented by the WSC concept. Becoming a WSC involves breaking from deeply embedded conventions for water service provision. In Australia this is characterised by centralised infrastructure that typically manages water as separate streams for supply, wastewater and stormwater, and an approach that generally separates water service planning from building design and support for ecosystem services. Traditional water systems have given us critical benefits such as clean water, safe sanitation and effective drainage, and this mode of servicing is still an important part of a WSC. However, we now recognise that adaptations are needed to address key social and environmental vulnerabilities such as degraded waterways, uncertain and extreme rainfall patterns and growing community expectations for improved liveability.

The Urban Water Transitions Framework depicted in Figure 1 is a heuristic tool developed to help cities understand their present water management orientation and define their short and long-term sustainability goals.

The framework identifies six distinct developmental states that cities may move through on their path toward increased water sensitivity. Most cities in the world would appear somewhere on this continuum, however, a city's journey from a water supply city through to the aspirational WSC is not linear. Australian cities are typically somewhere between a drained city and a water cycle city, with observable features across all six of the city-states.

Becoming a WSC requires significant changes in policy and practice as the water servicing system moves through different city-states. A successful transition will therefore rely on commitment and alignment amongst many different people and organisations.

Developing a shared perspective of water today, a compelling vision for the future and a framework to guide coherent strategic action is critical for establishing the understanding, motivation and capacity amongst stakeholders to drive their WSC transition.

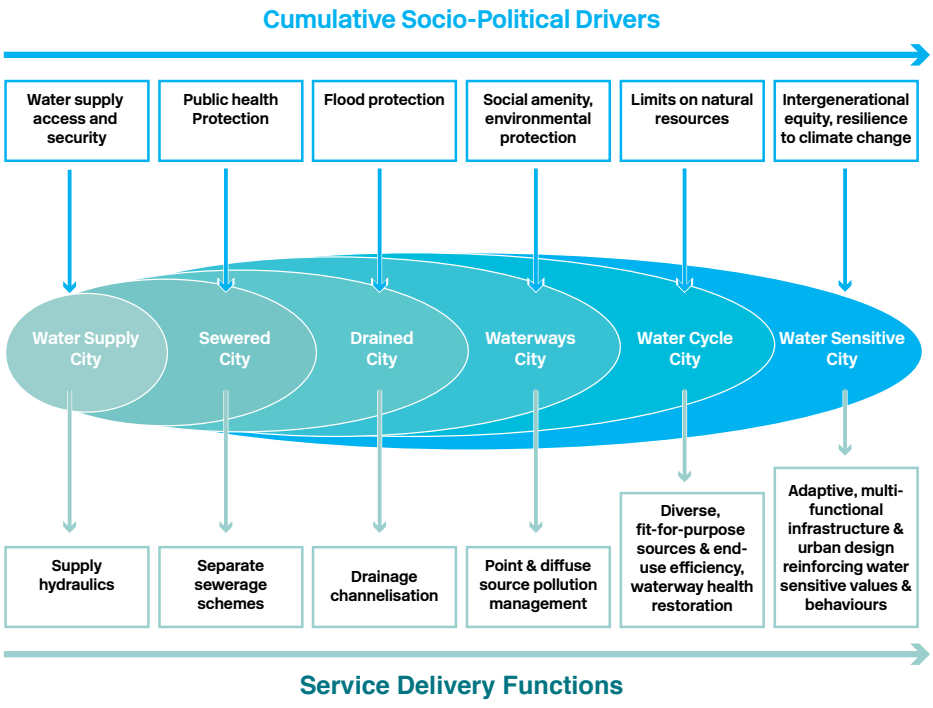


Figure 1. Urban Water Transitions Framework [1]

[1] Brown, R., Keath, N., & Wong, T. (2009). Urban water management in cities: historical, current and future regimes. *Water Science and Technology:* 59 (5), 849-855.

2. Bendigo's water story

2.1. Looking to the past

Bendigo is located in central Victoria, approximately 150 km north-west of Melbourne and 90 km from the Murray River. Its population is approximately 96,000. The Bendigo region flourished in the colonial era due to the discovery of gold, and for a time Bendigo was the most lucrative gold deposit in Australia.

Much of the urban area lies in a shallow basin within protected forests, and the area forms the catchment of Bendigo Creek, which runs through the city centre. Bendigo Creek is now highly modified and has been channelised for part of its course. Bendigo Creek leaves the urban area to the north east of the city centre at Huntly, before its waters eventually flow into Kow Swamp.

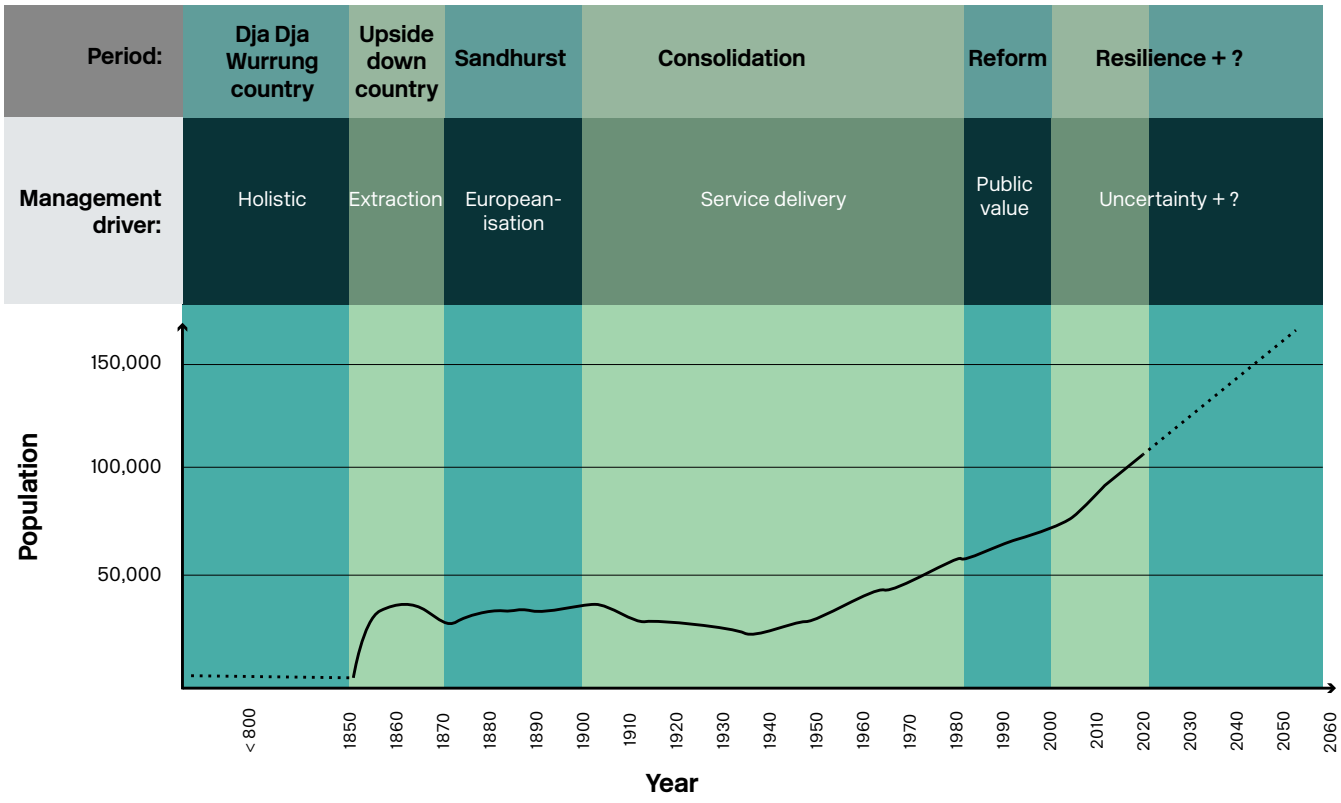


Figure 2. Bendigo's water story

Pre-1850: Dja Dja Wurrung country

Bendigo's land and water resources were under the stewardship of Dja Dja Wurrung people for thousands of years before European colonisation. They used a system of cultural governance in which water and land was managed holistically for the benefits of the people.

In this time it is believed that Bendigo had relatively reliable water. Reports of early pastoralists suggested the waterway to soon be named Bendigo Creek formed a chain of ponds, with early sights of platypus. Nevertheless, the landscape tended to be dry, and the Dja Dja Wurrung relied on wells to provide safe travel during drought.

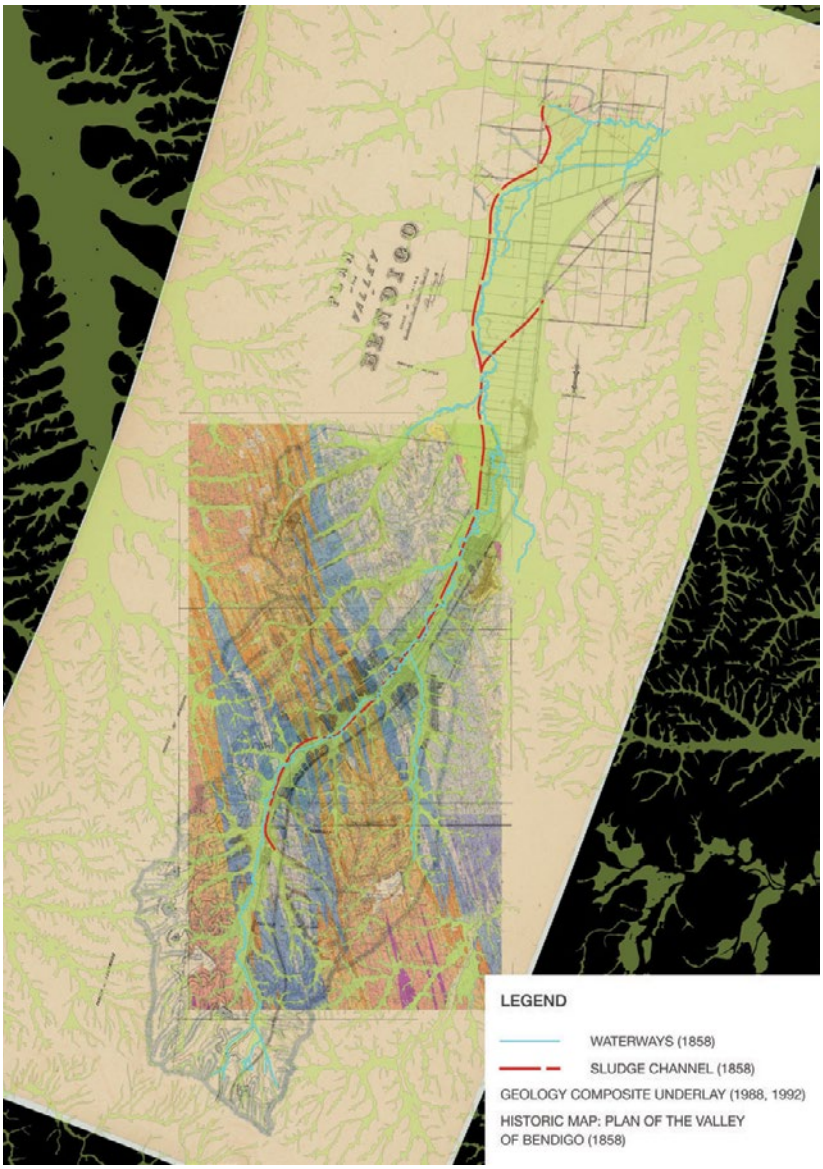


Figure 3. **Historic; 1:100,000**
Historic alignment of the Bendigo Creek (cyan) and proposed 'sludge channel' (dotted red) drawn from Plan of the Valley of Bendigo 1858 map underlay (shown), with both current and historic (1858) waterbodies and reservoirs, and colluvial geological underlay (light green).
Existing geological maps (1988, 1992) are also overlaid atop the historic map, and reveal how deeper geological moments influence waterways, infrastructural systems and developments at the surface. This spatial representation of Bendigo provided by MADA.

1850 – 1870: Upside-down country

From the time gold was discovered in 1851, Bendigo's natural landscape appears to have been disturbed. Bendigo Creek was relocated to facilitate gold extraction and began to accumulate sludge from mining and human waste. Other waterways experienced similar disruption. Bendigo lost the vast proportion of its original woodlands to support mining activity. The extent of change caused the Dja Dja Wurrung to rename the land 'upside-down country'.

> ***"In 1851, there was just a fracturing of whatever existed before. It was just totally overwhelmed... It wasn't even on anyone's radar, [the natural environment] was just cast aside. To rebuild it was such a long slow process because it was just tossed aside as if it didn't exist!"***

The supply of water to the Bendigo goldfields was a significant concern of the colonial government. Drought years interrupted gold production and made life in Bendigo difficult. Just over 20 years after the discovery of gold, a scheme was constructed to divert water from the Coliban River in the south to be conveyed to Bendigo along 70 km of channels. This provided more security for miners and residents alike, though it did not come cheaply.

1870 – 1900: Sandhurst (Bendigo's Europeanisation)

> ***"There was obviously a period where people said we actually need water in this place, in terms of a physical part of the urban form."***

In this period Bendigo was renamed Sandhurst after a village and military academy in England. The Bendigo Goldfields were key to Victoria's prosperity, more important than Melbourne at the time. The settlement grew and established itself around the mining industry, and city leaders were quick to begin a program of urban improvement. This involved planting European trees throughout the township, establishing a botanic gardens in White Hills near Bendigo Creek and conceiving Lake Weeroona to rehabilitate a barren mining site and to bring water into the urban form. Bendigo Creek was lined with stone in the late 1800s to improve drainage. The city reverted to the name Bendigo in 1891.

1900 – 1980: Consolidation

Growth slowed by the 1880s as the profitability of alluvial mining subsided and investment in deeper mines wavered. Bendigo entered a lengthy period of fluctuating fortunes and little population change, but services gradually improved and water security was reinforced by dam upgrades and new reservoirs.

> ***"The vast majority of the wealth was exported to the UK."***

The Victorian Water Supply Department, then the State Rivers and Water Supply Commission (SRWSC), managed Bendigo's water supplies through this period. It was the SRWSC that oversaw the construction of the channel system – still in operation today – to support soldier settlement post-World War I. Other institutions evolved in Bendigo. The Bendigo Sewerage Authority was established in 1916, the first sewerage authority established after the passing of the Sewerage District Act 1915. The Authority built Bendigo's sewerage system, completed in 1931. Pollution into local waterways from mining activity was an issue that resulted in the establishment of a Sludge Abatement Trust for Bendigo.

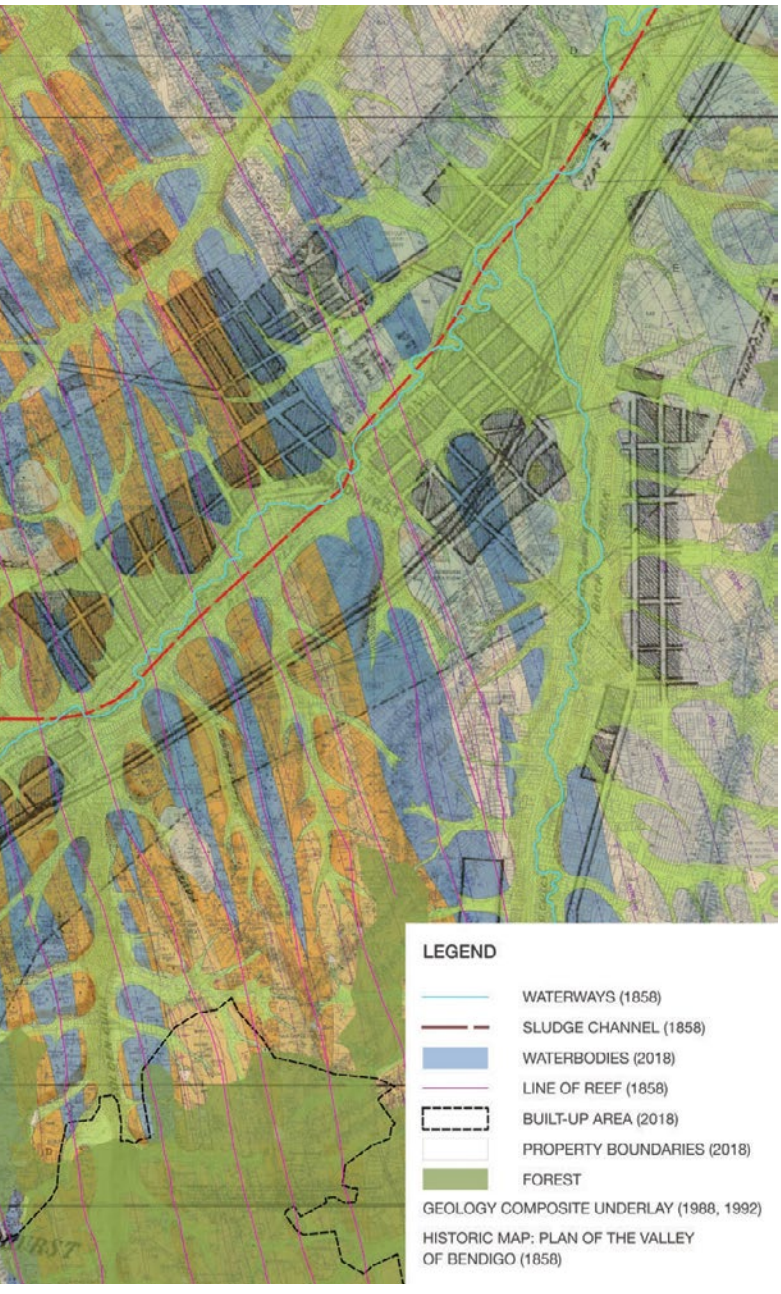
Bendigo entered a period of sustained population growth following World War II. This period was capped by the construction of Lake Eppalock in the early 1960s to supply irrigators and Bendigo residents.

Environmental health began to receive greater attention across Victoria and Australia more broadly in the 1970s. In the mid-1970s, biological nutrient removal was introduced into the wastewater treatment process by the Bendigo Sewerage Authority. Water quality for residents also improved with the commissioning of Sandhurst Reservoir and new chlorination processes in 1985. However, the proliferation of stock and domestic dams in the Coliban and Campaspe catchments impacted on the volume of water available in storages.

1980 – 2000: Government reform

The late 20th century saw a major push for more efficient governance. Responsibilities for headworks and bulk water distribution were given to regional water authorities, with Bendigo falling within the Goulburn-Murray region. Locally, the Bendigo Water Board replaced the Bendigo Sewerage Authority in 1984. However, throughout the 1980s, the highly fragmented regional urban water supply and sewerage industry was being amalgamated to improve management capability and accountability. For urban water services such as potable water supply and sewerage, the Coliban Region Water Authority was established in 1992.

"These were exciting times! People all around the state were displaced and put into other roles. But things started to get over the inertia to make change."



To improve the sustainable management of land and water resources and drive more coherent planning at the catchment level, the Victorian Government established Catchment Management Authority (CMA) boards in 1997, with the NCCMA responsible for Bendigo's region.

In the early 1990s, there were five municipalities in and around Bendigo. In 1994 these were amalgamated to form the City of Greater Bendigo.

Nationally, there were national productivity reforms and Landcare became an influential force for conservation.

Figure 4. **Historic: valley through a forest; 1:50,000**
Historic alignment of the Bendigo Creek and proposed 'sludge channel' drawn from Plan of the Valley of Bendigo (1858) map underlay (shown), emphasising the relationship between the colluvial geological underlay (light green) with the historic creek alignment and surrounding forests. Existing geological maps (1988, 1992) are overlaid atop the historic map, revealing the anticlines and seams that provided access to the hidden folds of precious metals below. This spatial representation of Bendigo provided by MADA.

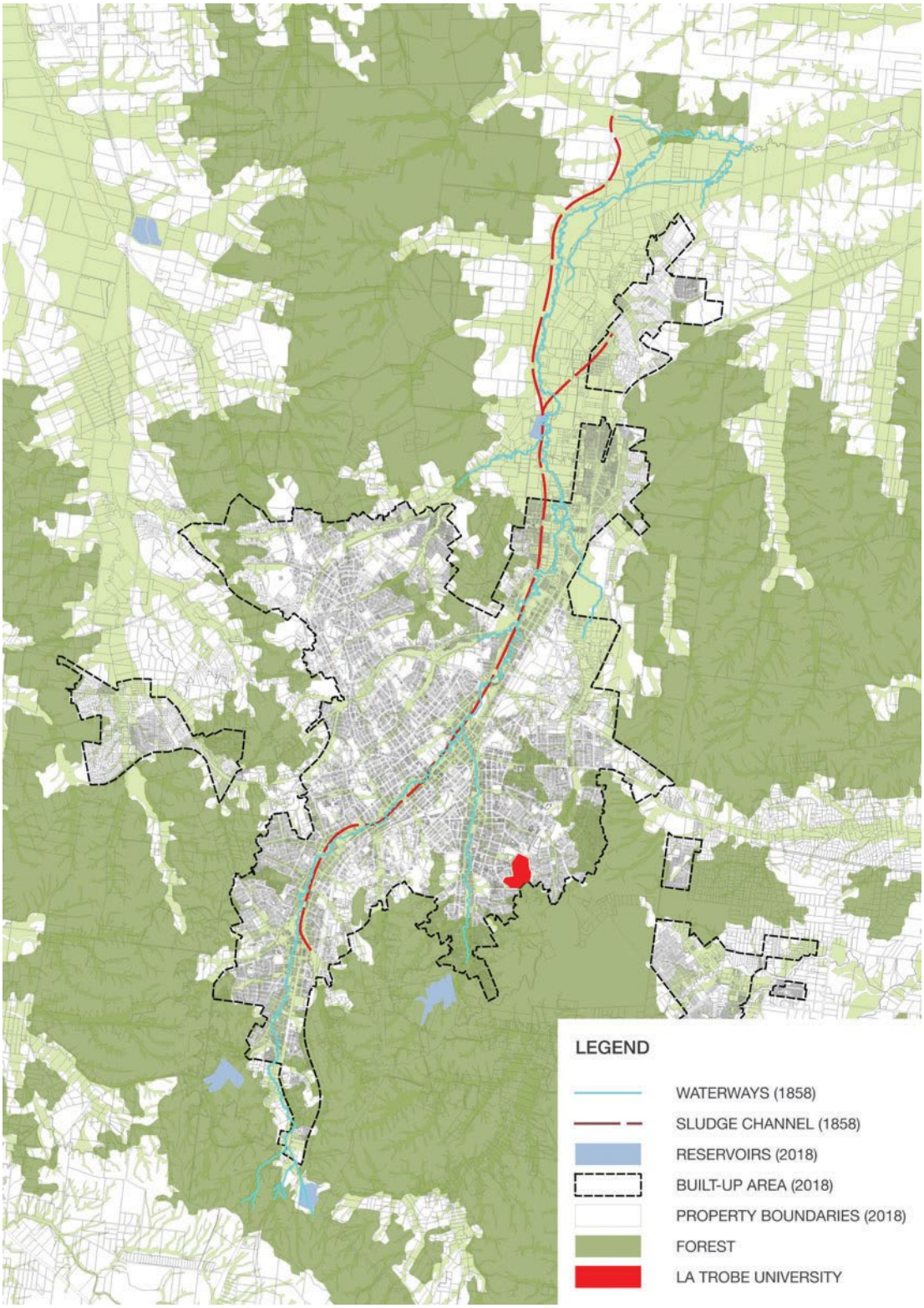


Figure 5. **Town in forest; 1:100,000.**
Historic alignment of the Bendigo Creek (cyan) and proposed 'sludge channel' from 1858 (dotted red), with current property boundaries and urban extents of Bendigo, La Trobe University (red), surrounding forested areas, current and historic (1858) waterbodies and reservoirs, and colluvial geological underlay (light green). This spatial representation of Bendigo provided by MADA.

2000+: Resilience

The Millennium Drought (1997-2009) produced a dramatic shift in Bendigo's relationship to water. Lake Eppalock fell to less than 10% of its capacity and Bendigo nearly ran out of water. As the scale of the drought worsened and water restrictions ramped up to reduce demand, the community's anxiety appeared to mount.

"Water was the conversation. Everyone was an expert."

"People recognised this as a different type of drought."

Fortunately, the institutional response to drought was effective. There was a united approach across local government and key water agencies. The community also rose to the challenge, with many households moving to drought-tolerant garden designs and an embrace of new technologies like grey water systems. Bendigo's first residential development with a third pipe system to supply recycled water for garden irrigation was planned for Jackass Flat during the drought.

New water security infrastructure for Bendigo included the Aqua 2000 water treatment plant (2002), the 'Goldfields Superpipe', and Recycled Water Factory and distribution network (both 2007).

Governance and planning changes during this period included the introduction of WSUD requirements in the Victoria Planning Provisions in 2006, and the release of the Northern Region Sustainable Water Strategy in 2009, which attempted to set a long-term plan for securing the region's water security and healthy ecosystems. In 2013, the State Government entered into the Recognition and Settlement Agreement with the Dja Dja Wurrung in accordance with the Traditional Owner Settlement Act 2010 (Vic). Other recent developments include the release of a new long-term statewide water plan 'Water for Victoria', the IWM Framework, and proposed amendments to the Water Act 1989 (Vic) to reflect Traditional Owner cultural values of water. 'Water for Victoria' was accompanied by a $30.8 million Government investment in Bendigo's groundwater management to address groundwater infiltration of historical mine shafts in parts of Bendigo. Nationally, the Murray Darling Basin Plan was signed into law in 2012.

The breaking of the Millennium Drought in 2010 was accompanied by flooding in Bendigo and across the region. There were two flash floods in Bendigo within 5 months in 2010-11. Lake Eppalock went from 17% of its total storage capacity to 100% in 24 hours. Water supplies were replenished, but the extreme level of inflows degraded the system's water quality. In 2011, the NCCMA commenced a flood study of Bendigo. This study, which has now been adopted by the Council, improved the understanding of the extent of land subject to flooding.

2.2 Looking ahead to Bendigo's water future

Bendigo has experienced rapid population growth in the past two decades, with its current population of 93,000 expected to increase to over 170,000 by 2051.[2] Net migration is expected to be the most significant driver of Bendigo's growth, with people drawn to the area mainly from other regions of Victoria and southern New South Wales.

The area is also becoming hotter and drier, leading to a decrease in streamflow in the Campaspe and Loddon Rivers. Hotter days will also result in increased bushfire risk, more heat-related illnesses and deaths, and higher energy consumption from air conditioning. Prolonged dry periods will make it difficult to maintain green parks and gardens. Although Bendigo is likely to be drier on average, the incidents of extreme rainfall events is expected to increase, putting low lying areas at risk of flooding.[3] Bendigo's water supply will be under pressure to meet a growing water demand, and consideration will need to be given for how water can be used more efficiently. Measures will be needed to protect the surrounding environments from increased pollutant loads from a larger urban footprint. Urban planning and design will need to be strategically integrated with water planning as part of an ongoing effort to maintain a green and liveable Bendigo.

"Our towns, being north of the divide, we have even more extreme weather conditions"

While these drivers are a challenge for existing water system services and processes, they also present an opportunity to change the 'business-as-usual' approach. Bendigo's residents are passionate about the future of their city and are committed to shaping it through the existence of volunteer contributions to community building initiatives and participation in local strategic planning.

The people of Bendigo love the community's spirit, and value the city's size for providing the small town benefits of a cohesive community while also providing larger-scale services and cultural facilities. Bendigo's unique identity, history and culture, demonstrated by the grandeur of some of its architecture and the presence of indigenous and Chinese heritage, give people a sense of pride in their city. Bendigo's diverse economy, with a mix of service industries, light manufacturing, agricultural services and education, is appreciated for providing employment diversity, sustaining a youthful population and creating a history of innovation. Residents also love their lifestyle in Bendigo; good food and wine, coupled with a vibrant arts and music scene, surrounding natural woodlands and Bendigo Creek make it an attractive place to live.

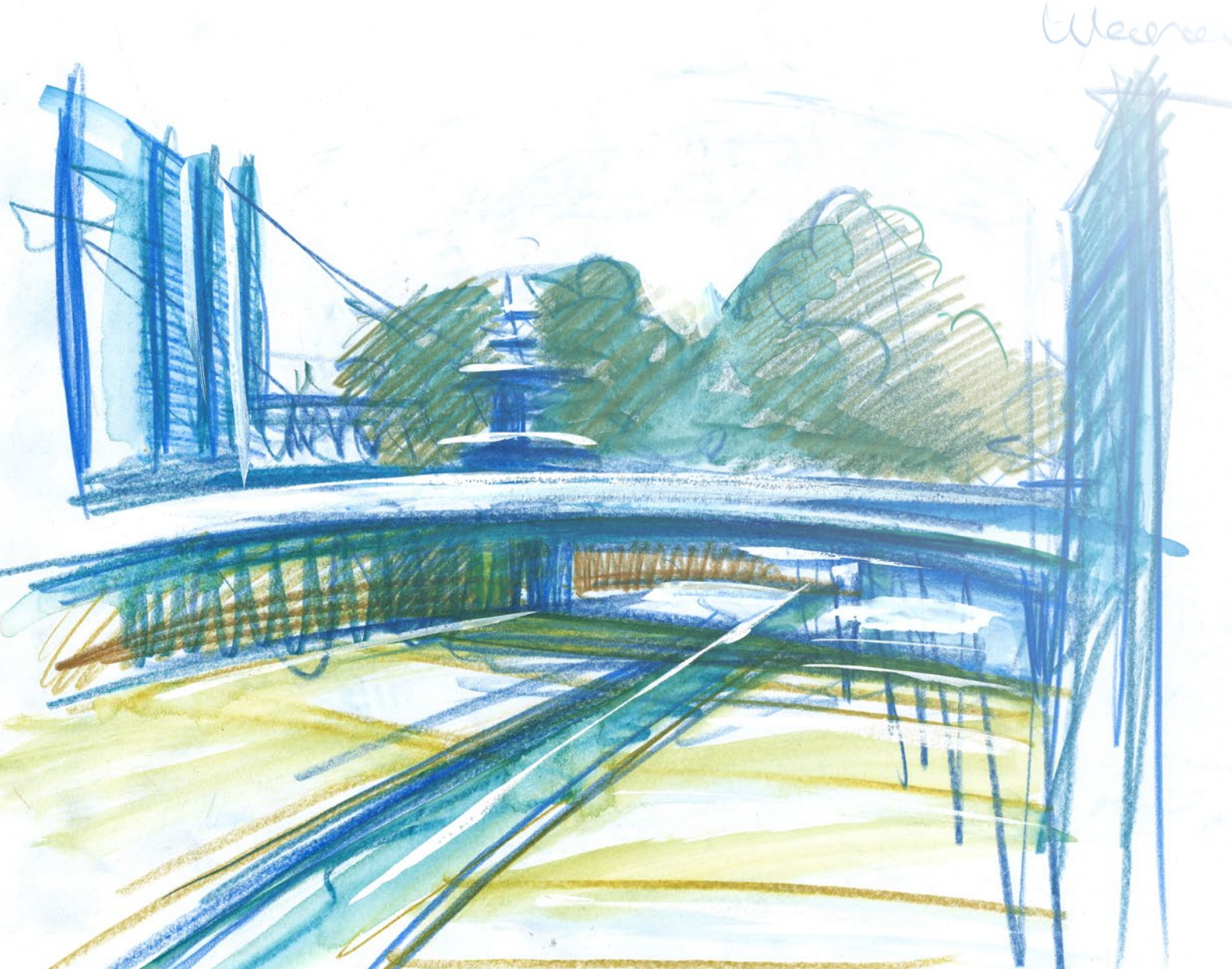
"[Bendigo] can be what I want it to be"

[2]Department of Environment, Land, Water and Planning (2016). Victoria in Future 2016: Population and household projections to 2051, State of Victoria: Melbourne.

[3] CSIRO and Bureau of Meteorology (2015). Climate Change in Australia Information for Australia's Natural Resource Management Regions: Technical Report, CSIRO and Bureau of Meteorology, Australia.

Business-as-usual water management may not be sufficient to ensure protection of these values, especially in the face of a changing climate and growing population. Without a proactive and strategic approach to adapting the way water is managed, Bendigo is at risk of a decline in investment and reduced affordability, removal of natural green areas and poor urban amenity, and unmotivated, disconnected and disillusioned residents. A more water sensitive approach would help ensure the health, safety and happiness of future populations, while also protecting the surrounding natural systems and contributing to the city's liveability. The following sections of the report describe what participants consider it means to be a water sensitive Bendigo and present recommended strategies for achieving the necessary changes in practice.

"Bendigo Creek – it's not yet pretty, but it's a creek of opportunities"



3. Vision for a water sensitive Bendigo

The 50-year water sensitive vision for Bendigo aims to orient and align the actions of stakeholders over the long-term. The aspirations of project participants for their city's water future are expressed as a suite of outcome statements with accompanying rich descriptions. The three central outcomes define the benefits for communities living in Bendigo, while the surrounding outcomes describe the enabling conditions that will be important for achieving and reinforcing the vision (Figure 6). The 50-year timeframe enables people to stretch their ambitions beyond today's systems and constraints to reflect on the transformative change that is possible over such a period.

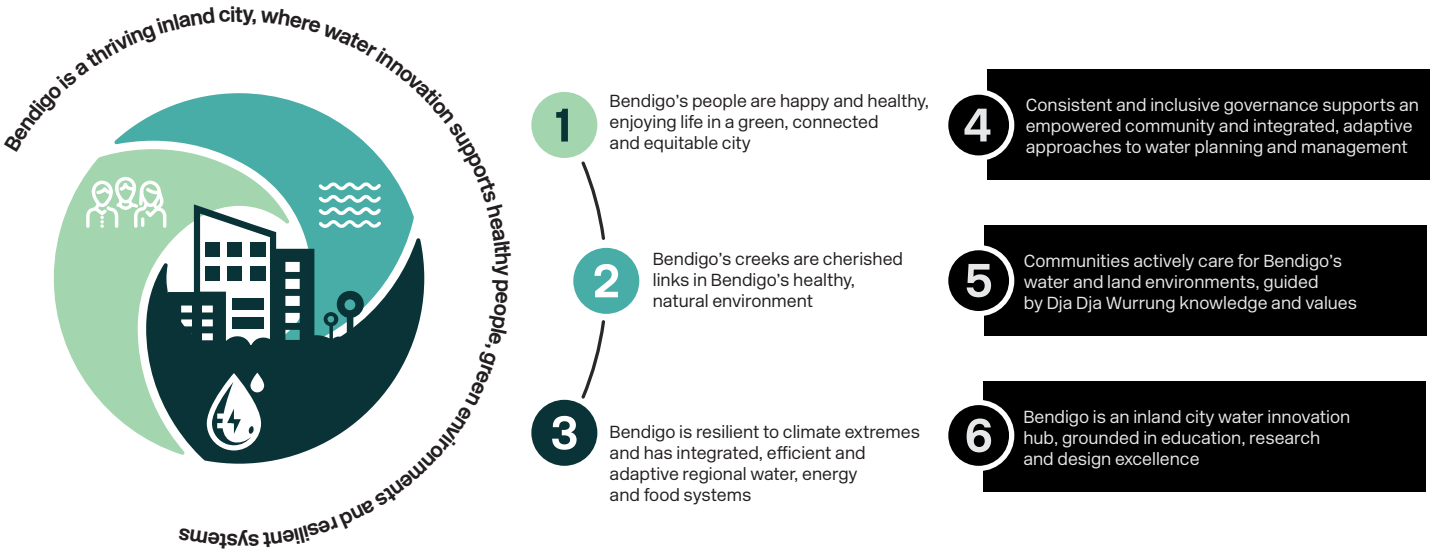


Figure 6. Bendigo's water sensitive city vision

1. **Bendigo's people are happy and healthy, enjoying life in a green, connected and equitable city**

Wise use of available water resources ensures Bendigo is a green, liveable community. People's health benefits from the green active spaces and corridors along creeks used to connect the community. Bendigo's extensive tree canopy – the shadiest city north of the divide – provides relief during the heat of summer. Bendigo's walkability means there is low reliance on cars and more space for shade trees on every street. Most neighbourhoods have wetlands or waterways, and stormwater is retained in the landscape. Despite the generally drier climate, the community has created a rich mix of adaptive indigenous and non-native vegetation to provide amenity. They have also created new space for greening Bendigo, as vertical and rooftop gardens are common.

Water is acknowledged for its fundamental links to people's mental and physical wellbeing through sustaining a healthy natural environment and supporting recreation. These recreation options include fishing, kayaking and rowing in local water bodies. Urban food gardens support healthy and active lifestyles. It is also important that Bendigo's fun and active lifestyle can be enjoyed by everyone. Fences, even backyard fences, are rare in this well-connected community. Fit-for-purpose water is affordable enough for residents to embrace.

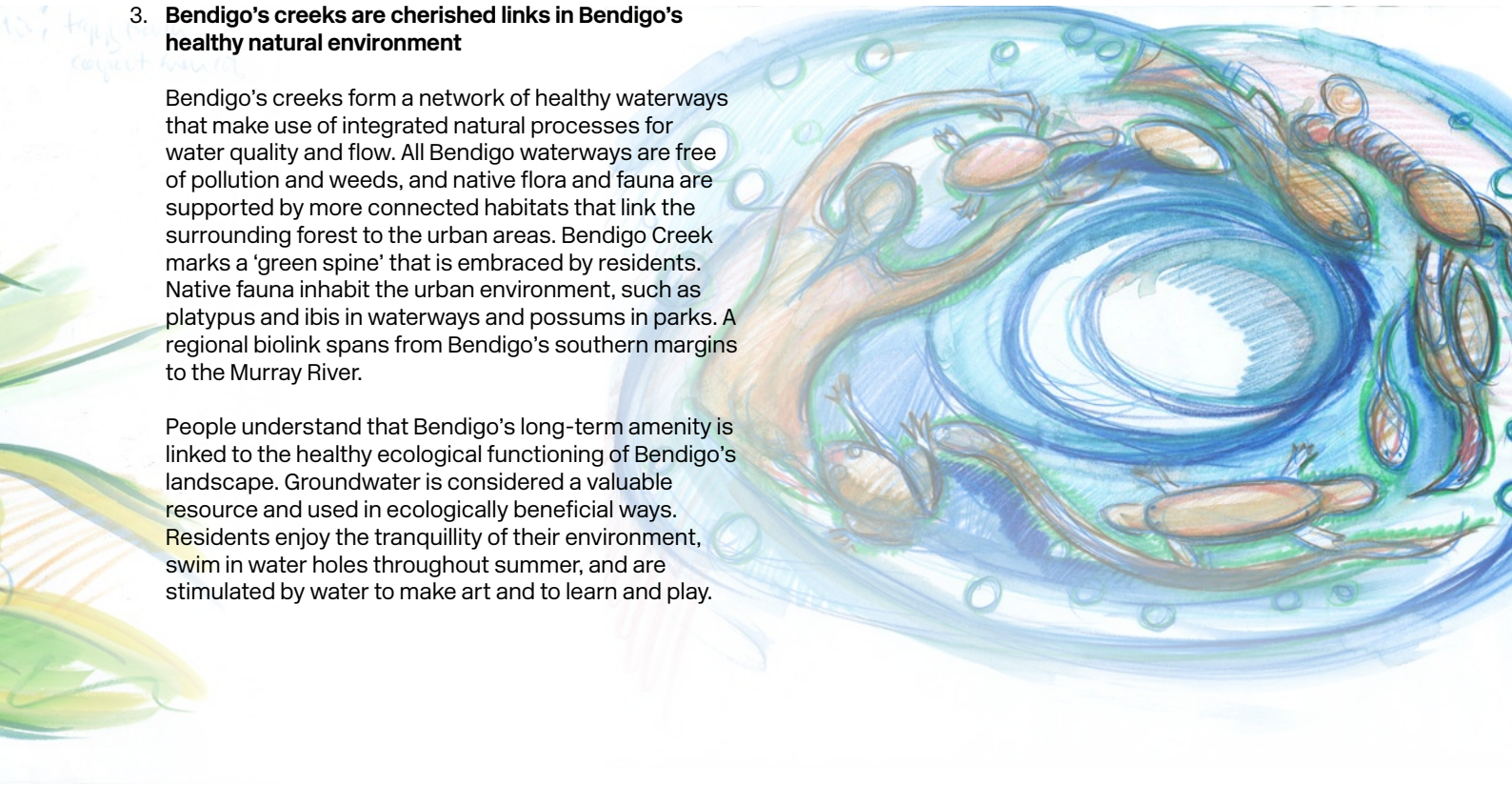
2. **Bendigo is resilient to climate extremes and has integrated, efficient and adaptive regional water, energy and food systems**

Bendigo has achieved sustainability in regional water, energy and food systems by maximising use of diverse water resources. The water supply is secure and safe, with integrated water management that directs the most appropriate water supply to the end use. Bendigo has achieved full reuse of water. Recycled wastewater also supplements water used for drinking purposes.

The community has flexibility and choice in sourcing water at the required quality to suit the end use, and households, businesses and neighbourhoods are also an important source of water. Rainwater is retained and used wherever possible. Groundwater is integrated into the portfolio of water supply options. All water resources and products are backed by legal property rights providing security of supply and access. Water and energy solutions are linked at the planning stage.

Leakage and waste from the water system is minimised, irrigation efficiency has been optimised, and high efficiency building standards have become the norm. There is a clear framework for using resources for productive and efficient outcomes, but the water system also enhances environmental values and provides new opportunities for water use. For example, the affordability of water enables residents to embrace urban agriculture.

3. **Bendigo's creeks are cherished links in Bendigo's healthy natural environment**



Bendigo's creeks form a network of healthy waterways that make use of integrated natural processes for water quality and flow. All Bendigo waterways are free of pollution and weeds, and native flora and fauna are supported by more connected habitats that link the surrounding forest to the urban areas. Bendigo Creek marks a 'green spine' that is embraced by residents. Native fauna inhabit the urban environment, such as platypus and ibis in waterways and possums in parks. A regional biolink spans from Bendigo's southern margins to the Murray River.

People understand that Bendigo's long-term amenity is linked to the healthy ecological functioning of Bendigo's landscape. Groundwater is considered a valuable resource and used in ecologically beneficial ways. Residents enjoy the tranquillity of their environment, swim in water holes throughout summer, and are stimulated by water to make art and to learn and play.

4. **Communities actively care for Bendigo's water and land environments, guided by Dja Dja Wurrung knowledge and values**

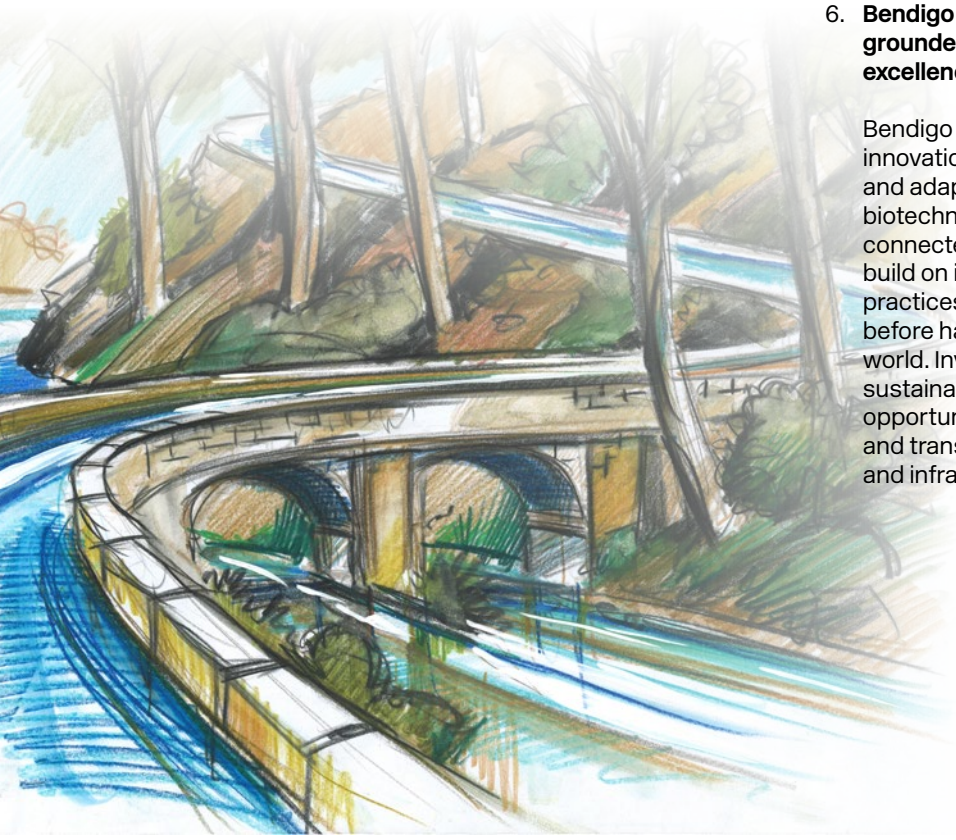
Community are active in caring for the broader ecological health of Bendigo's landscapes. This behaviour is driven by a sense of pride in the land irrespective of its ownership – residents care for public land as well as their own. The community's participation in Caring for Country reimagines traditional Dja Dja Wurrung culture to meet the needs of the future.

Bendigo Creek and other special locations are considered places for ceremony, where songs tell their story in traditional and contemporary terms, as well as places for informal meeting and reflection. Enjoyment of Bendigo's natural environment encompasses the sustainable harvesting of plants for traditional uses – plants may be harvested for ceremony, picnics or basket-weaving workshops. There is pride in the indigenous Jaara language, which is reflected in the names of places, buildings and organisations.

5. **Consistent and inclusive governance supports an empowered community and integrated, adaptive approaches to water planning and management**

   The community and government are united in sharing responsibility for Bendigo's water resources and environmental health. Many people in Bendigo have good knowledge of the urban water cycle and how water is managed, and natural resource education is a core part of the curriculum. Community is empowered to participate in government processes to set priorities that accommodate diverse interests in sometimes complex local issues. Overall, the broader community and traditional owners are equally responsible partners for water, and traditional owner rights to water are accepted and accommodated.

   Decisions about development and the management of Bendigo's resources are consistent, strategic and integrated, and all disciplines are 'at the table' from the start. Decisions are underpinned by sound knowledge of water resources, the capabilities of system infrastructure, and contingency planning. There is shared understanding across all levels of government of social, economic, environmental and cultural benefits of good water stewardship.



6. **Bendigo is an inland city water innovation hub, grounded in education, research and design excellence**

   Bendigo is a learning city, a hub of research and innovation in ecology and landscape restoration and adaptation, water sensitive technology and biotechnology. People in Bendigo are knowledgeable, connected to Australia and the world, and able to build on its history of innovation. It is where new water practices, technologies and initiatives can be explored before having influence throughout Australia and the world. Investment is attracted to Bendigo as a liveable, sustainable and resilient city. This has led to ample job opportunities in the knowledge, culture, building, solar, and transport sectors. Bendigo supports the services and infrastructure of an international city.

4. Assessing Bendigo's current water sensitive performance

Planning Bendigo's transition to its water sensitive city vision requires a detailed understanding of its current performance in relation to its aspirations. The CRCWSC's Water Sensitive Cities (WSC) Index[4] is a benchmarking tool designed for this purpose. It articulates seven WSC goals, which organise 34 indicators representing the major attributes of a WSC. These indicators are also mapped to the idealised city-states represented in the Urban Water Transitions Framework (Figure 1) to provide a benchmarked city-state.

While a city's local WSC vision may not emphasise all indicators of the WSC Index to the same degree, the tool enables diagnosis of key areas of strength and aspects for improvement. These insights can then inform the prioritisation of actions and provide a framework for ongoing monitoring and evaluation of a city's water sensitive performance.

4.1 Bendigo's WSC indicator scores

The WSC Index was applied to Bendigo to benchmark current water sensitive performance. Figure 7 below shows the WSC Index goal results for Bendigo (shown by the shaded blue area). Table 1 below provides the individual indicator scores for each goal.

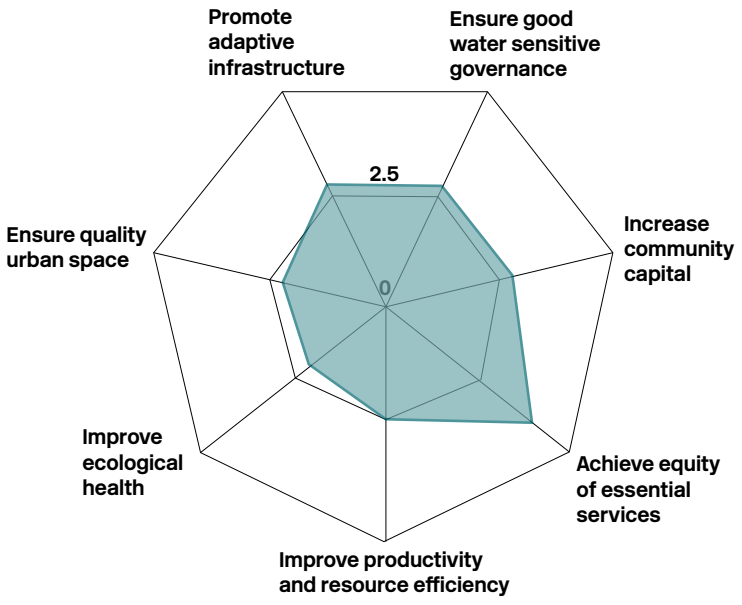


Figure 7. Bendigo's performance (shaded blue area) for the WSC Index goals

[4] CRCWSC. (2018). *Water Sensitive Cities Index*. Retrieved from https://watersensitivecities.org.au/solutions/wsc-index/.

Table 1. WSC Index scores (goals and indicators) for Bendigo

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

4.2 Bendigo's benchmarked city-state

Figure 8 summarises the city-state benchmarking results for Bendigo, which interprets the scores in Table 1 against the modelled requirements for the six phases of the Urban Water Transitions Framework (Figure 1). Percentage attainment for each city-state ranged from 100% as a Water Supply City and Sewered City through to 8% as a Water Sensitive City. This section summarises the key elements that contribute to the overall percentage attainment of each city-state.

100% Water Supply City and Sewered City

There is confidence in Bendigo's water security due to its link to the Goulburn irrigation system via the 'Goldfields Superpipe', which contributed to Bendigo rating 100% as a Water Supply City. Water supply is managed centrally, provided at an affordable cost to end users and with reliable public health outcomes.

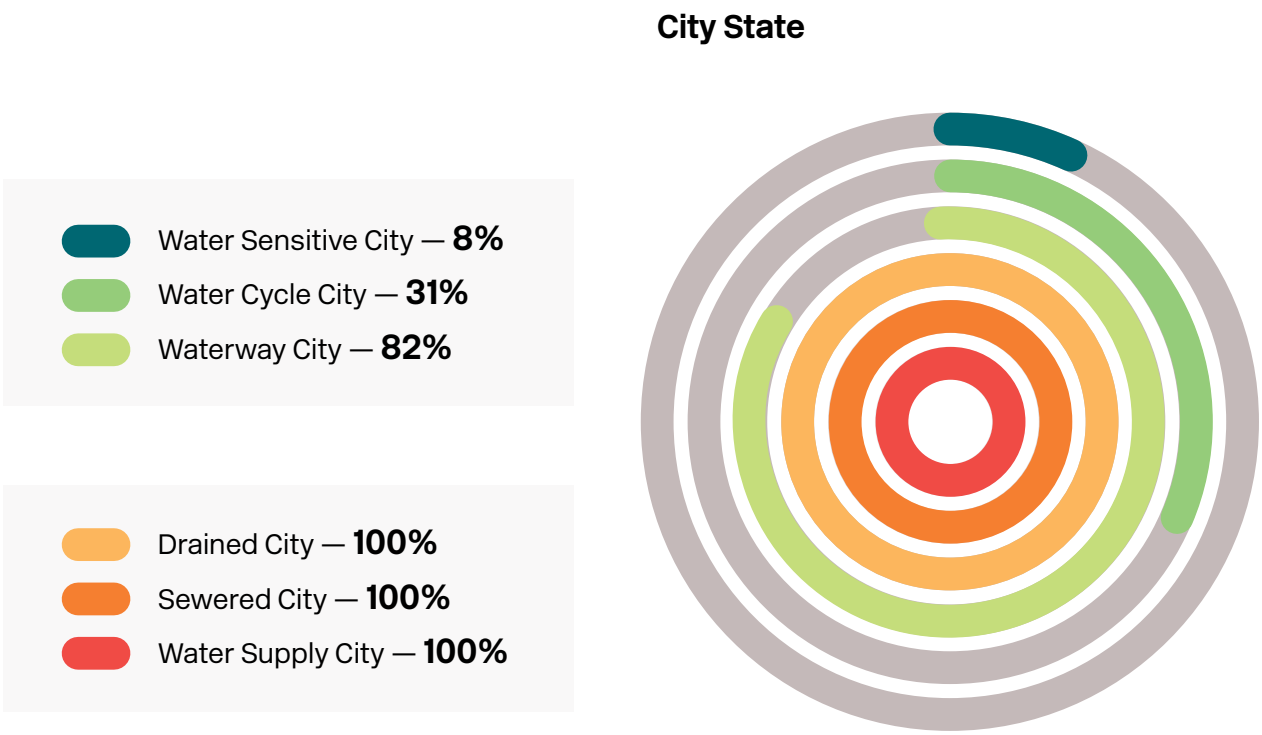


Figure 8. Summary of Bendigo's performance against the ideal measures for each city state

"The public perception is that Bendigo doesn't have a secure water supply, but public perception hasn't caught up to reality."

Coliban Water provides wastewater services to nearly 41,000 residential properties and over 3,000 non-residential properties in Bendigo, ensuring safe and reliable sanitation and 100% attainment of a Sewered City.

100% Drained City

Drainage services, primarily the responsibility of the City of Greater Bendigo, are managed to a standard befitting the city's dry climate. The system operates effectively on a day-to-day basis. Small-scale flash flooding events have the potential to occur from extreme local rainfall events in some areas.

"We've got access to much, much better modelling tools to help understand how Bendigo floods."

The Planning Scheme has recently been amended to update flood controls to reflect the more accurate modelling of flood risk undertaken in recent years. Options to reinforce flood protections on Bendigo Creek are being investigated.

82% Waterway City

Bendigo has high amenity and liveability values, with good accessibility to water-related and green infrastructure assets. Residents generally value waterways for amenity and recreational purposes.

The delivery of broader societal value is a key driver of water infrastructure projects. Point-source pollution is well-managed and there is growing recognition of the importance of addressing diffuse-source pollution. New developments are being constructed with water sensitive features that aim to manage stormwater quality as well as flow, but it is lagging in established suburbs. Nevertheless, there are strong industry guidelines and programmes in place to promote take-up and build professional capacity for water sensitive stormwater solutions. In the outer areas, most retarding basins provide public space. Many areas prone to flooding are protected as open space and include walking and cycling paths. The channel system also includes bike paths.

"I'd really like to see the [Bendigo] Creek addressed as the elephant in the room. It's so undervalued. We have the capacity to think about it differently."

Although Bendigo's waterways have been assessed as being in poor condition, there has been action recently to improve the quality of Bendigo Creek and Ironbark Gully through revegetation and weed control. There has been extensive community participation in this activity. There have been several projects which merge water sensitive outcomes with recreation planning along Bendigo's waterways, including at Crusoe Reservoir, Spring Gully, and Long Gully, with detailed planning for Ironbark Gully underway.

31% Water Cycle City

Bendigo's water supply has a fair degree of diversity, with potable water being sourced from the Coliban and Goulburn systems and non-potable water sources such as rainwater tanks, bores and wastewater recycling and reuse.

Permanent water saving measures are in place. Following the Millennium Drought, a number of education and incentive programs supported a reduction in demand. Since the end of the Millennium Drought, however, there has been a gradual increase in potable water demand in Bendigo.

"There's a need to recognise that the black boundaries between stewardship [of different elements of the water cycle] can actually be blurred a bit."

A principle of the Water Cycle City is co-management of the water system by government, business and the community in order to facilitate access to water sources at local scales as part of an integrated system. There are several policies affecting Bendigo to broaden participation in water management beyond traditional groups and disciplines. Such polices emanate from State Government, Council, NCCMA and Coliban Water. Indigenous knowledge is considered important to water system planning and management in Bendigo, and there is active involvement of the Dja Dja Wurrung traditional owner group in management.

8% Water Sensitive City

Bendigo achieved an 8% rating as a Water Sensitive City largely due to water supply and sanitation services being accessible to all residents: they are safe, secure and affordable.

The Council has just begun to design urban space to function as a part of the water system. There are few examples of water sensitive infrastructure such as raingardens or stormwater harvesting. Although there is irrigation of many green spaces, most residents would not yet draw benefit from green infrastructure's potential to mitigate the urban heat island effect. Tree canopy cover for Bendigo as a whole is thought to have reduced.

Urban habitats in Bendigo are thought to be patchy and with low biodiversity. Nevertheless, there are areas of protected forests on the periphery of Bendigo in good condition. There are some threatened species found in urban areas, which suggests that in general, the ecological functioning is fair given the development context.

While Bendigo has begun to make strides towards a Water Sensitive City, significant action is still needed to transition current water management practices to water sensitive practices across many of the objectives expressed in the Water Sensitive Cities Index.

A review of Bendigo's benchmarking results indicate that for Bendigo to become a Water Sensitive City, Bendigo 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.

"The transformation that we need is in the perception of the broader public that water sensitive cities should be a core part of infrastructure and a core part of business."

5. Advancing Bendigo's water sensitive city transition

Bendigo's transition towards its water sensitive city vision will require significant changes across the structures, cultures and practices of urban and water system planning, design, management, engagement and decision-making.

These changes are likely to happen over a long timeframe as new water sensitive practices supplant old unsustainable practices. CRCWSC research has identified water sensitive transitions unfold over six phases: (1) an issue with old practice emerges; (2) the issue becomes more defined; (3) people develop shared understanding and agreement about the issue; (4) knowledge about solutions is disseminated; (5) new solutions are diffused through policy and practice; and (6) solutions are embedded as new mainstream practice.

The CRCWSC's Transition Dynamics Framework (see Appendix A for more detail) sets out five types of enabling factors that help to drive progress through these phases of change: **champions, platforms for connecting, science and knowledge, projects and applications, and practical and administrative tools.** Together, these five factors create an enabling environment for accelerating a water sensitive transition.

Building the momentum for transition will require a diverse range of strategies and actions that progressively establish these enabling conditions. Strategies and actions with the most impact during the early phases of transition will be different from those during the later phases. It is critical to identify a city's current transition progress to ensure that actions are prioritised according to the effectiveness they will have in accelerating the WSC transition.

This section presents recommended strategies for advancing Bendigo's water sensitive transition based on analysis of the city's transition progress to date. Strategies are identified to advance the overall water sensitive Bendigo vision, as well as its individual thematic elements.

5.1 Assessing Bendigo's WSC transition progress

The CRCWSC's Transition Dynamics Framework was used as a diagnostic tool to assess the presence or absence of enabling factors as an indicator of progress towards Bendigo's aspired change in practice as it advances towards its water sensitive city vision (Table 2). It provides a checklist of the factors that should be deliberately and sequentially built up to inform the prioritisation of strategies and actions.

The overall transition progress assessment for Bendigo suggests that significant advancements have been made towards its water sensitive vision. However, it is at risk of stagnation if critical enabling conditions are not established to shore up Phase 2 (issue definition) and Phase 3 (shared understanding and issue agreement) and start pushing more into Phase 4 (knowledge dissemination) and Phase 5 (policy diffusion). A brief explanation and justification of the transition assessment follows.

Table 2. Assessment of Bendigo's overall transition progress

	Enabling factors				
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	Aligned and influential champions	Building broad support	Solutions advanced	Significant solution demonstrations	Refined guidance and early policy
5. Policy & Practice Diffusion	Government agency 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

Notes: Green boxes indicate the enabling factor is fully present and regression into the previous phase is unlikely. Yellow boxes indicate some presence, however they are vulnerable to regressing to the previous phase. Red boxes indicate a complete absence of the enabling factor, and that progression is unlikely.

The overall assessment for Bendigo suggests fairly consistent progression through transition phases across each of the enabling champions, platforms, knowledge, projects, and tools that support change in practice.

Champions recognise the need for a water sensitive transition but are not yet firmly connected, aligned and influential to secure greater support at the operational and broader societal level for implementation and collective action. Bendigo currently benefits from informal networks that have provided agility in times of crisis. However, further transition may be vulnerable without institutionalised coherence and alignment across stakeholders. Platforms for connecting stakeholders that create more consistent and coordinated alignment are needed to enable delivery of a cohesive water sensitive agenda that operates at all scales of implementation.

With Bendigo's long history of technological and business innovation across sectors, there is a strong drive for new water approaches. A number of projects have developed and experimented with innovative solutions, particularly in response to challenging environmental circumstances such as during the Millennium Drought. However, this drive to innovate and experiment has not yet permeated all levels of decision-making, scales of implementation or dimensions of water sensitivity. There is also a need to formalise learning from projects to build on past successes and achieve progress towards the vision.

Many organisational policies and issue-specific strategies across Bendigo's key water agencies (Coliban Water, City of Greater Bendigo, NCCMA) reinforce the direction that needs to be pursued to achieve Bendigo's aspirational water future. However, specific strategies and plans are not yet closely tied to the shared water sensitive city vision to provide operational guidance and a cross-organisational framework for collective action.

5.2 Strategies for advancing Bendigo's transition

Based on the assessment of Bendigo's transition progress, which is only summarised in this report, four overarching strategies are recommended to advance Bendigo's water sensitive transition:

I. Seek broad support from Bendigo's political, organisational, sectoral and community leaders and the general public for the city's water sensitive vision

II. Embed Bendigo's water sensitive aspirations in a broad city vision, organisational frameworks and a cross-agency strategy that promotes integrated water sensitive outcomes

III. Establish a network for endorsing and driving coherent water sensitive action across stakeholders

IV. Learn from and scale innovative solutions to provide on-ground demonstrations and practical guidance for a full suite of water sensitive approaches that suit Bendigo's inland city context

I. Seek broad support from Bendigo's political, organisational, sectoral and community leaders and the general public for the city's water sensitive vision

Bendigo's water sensitive city vision has been co-created by a diverse range of people, representing the water industry, government agencies, local council, Dja Dja Wurrung Corporation, private sector organisations such as consultants and developers, and the community. Such diverse participation in the envisioning process ensures that the vision resonates broadly and will serve to inspire, orient and guide action for achieving it. Dedicated attention is now needed to seek support from this broader community, starting with leaders from across the professional and general community that will provide an authorising environment for Bendigo's transition.

Engagement with the organisational and elected leaders of key agencies is an important step to establish this support, with a clear articulation of the value of the water sensitive vision for the city's broader aspirations. Increased support from the broader business community and the tertiary education sector could also help utilise untapped innovation capacity to apply to water sensitive solutions, gaining new insights through increased cross-sector collaboration. Key industries that should be targeted to raise support for the city's water sensitive vision include the building, community services and health sectors.

Promoting Bendigo's water sensitive vision in numerous forums will be critical to help gain its broad acceptance. Existing education programs in the primary and secondary school curriculums can be augmented, although new campaigns targeting particular parts of the community will also be necessary.

In the long-term, it is important that communities and businesses endorse and advocate for water system solutions aligned to Bendigo's water sensitive vision. Community ownership of the water sensitive vision will encourage active engagement in water-related dialogue, governance processes and local adaptations. It will also provide endorsement for land use planning policies and strategies that drive adoption of water sensitive design. With support for the vision and increased awareness of urban water challenges, citizens will be more resilient to environmental risk, supporting a wide array of resilience solutions.

II. Embed Bendigo's water sensitive aspirations in a broad city vision, organisational frameworks and a cross-agency strategy that promotes integrated water sensitive outcomes

It is critical to link the narrative of the benefits of the envisioned water sensitive city with the aspirations for Bendigo more broadly, including the city's future prosperity, the health and wellbeing of its people, and the preservation and enhancement of its natural environments. The water sensitive city vision for Bendigo needs to become embedded within the policies, plans and strategies of organisations. This will enable and encourage an integrated, holistic and aligned approach to water management across organisations and support organisational alignment rather than a siloed approach to policy implementation. Through embedding in relevant policies and strategies, regulatory compliance is likely to be reinforced and provide the community with more consistent and effective outcomes in land use and infrastructure planning processes. This will also help take advantage of opportunities when they arise to support multi-functional, healthier and more attractive outcomes across the public and private realms.

In infrastructure provision, Bendigo's water sensitive city vision will be achieved through the design and implementation of urban systems that are multi-functional and provide a range of benefits that deliver Bendigo's ecological, liveability and resource efficiency aspirations. This will need to involve understanding the synergies between natural and engineered water systems, taking advantage of the opportunities across all streams of water (e.g. supplied water, wastewater, stormwater) and working within the interfaces between the water system, the built form and natural landscapes. To achieve this, Bendigo will need to adopt an integrated and strategic approach to managing urban water and landscapes. To this end, developing a cross-organisational water sensitive city strategy that promotes and guides proactivity, opportunism and flexibility to achieve envisioned outcomes would be a valuable endeavour.

III. Establish a network for endorsing and driving coherent water sensitive action across stakeholders

The networks and relationships that must underpin the collective pursuit of Bendigo's water sensitive vision will need to be expanded and supported to drive further transition progress. Champions have advocated for water sensitive solutions in the past, and there are several examples of critical strategic partnerships between agencies. However, collaboration platforms in Bendigo have focused on specific issues such as water security during the Millennium Drought and natural resource management capacity through waterway revegetation, or encompassed broader regional concerns. They provide limited opportunity for exploration of the broad range of outcomes associated with Bendigo's ambition to become a water sensitive city.

Champions would be strengthened through the establishment of an ongoing informal network that focuses on knowledge sharing, collective capacity building and a culture of collaboration. Through such a network, stakeholders would have the freedom to explore issues and opportunities that may sit outside current policy and programs, while maintaining the support and endorsement of the authorising environment whose commitment is ultimately needed.

Bendigo's scale presents both challenges and opportunities for networking: an informal water sensitive city network may be relatively easy to establish because of the existing strong links between organisations, but without strong support from organisations, champions may feel isolated and untethered from existing power structures. Such a network would need clear organisational endorsement, and champions should be supported with relevant training and resourcing to help drive action on the ground and advocate to decision-makers for reforms and investments that will enable changes in practice. This could be complemented by formalised partnerships between key agencies to drive strategic programs and initiatives.

IV. Learn from and scale innovative solutions to provide on-ground demonstrations and practical guidance for a full suite of water sensitive approaches that suit Bendigo's inland city context

Becoming a water sensitive city will require a range of innovative solutions across social, technical and design domains to be developed and mainstreamed. Bendigo has a long history of innovation in in the city, reinforced by the presence of a number of universities and a range of cultural and creative festivals. This citywide culture of, and commitment to, innovation provides a strong foundation for achieving Bendigo's aspiration to be an inland city water innovation hub.

There are many examples of innovation in water sensitive technology and design across Bendigo, from early water treatment plants in the colonial era to more recent applications of treatment technologies and water efficiency. It has been difficult, however, to enable scaling and mainstream uptake of water sensitive innovations. To promote focus on Bendigo's innovation aspirations and gain explicit support from a broad range of stakeholders to drive associated actions, significant upscaling of innovation is needed to advance new solutions and practices beyond trials into widespread roll-out. In addition, some aspects of Bendigo's water sensitive city vision will require new solutions that have not yet been developed or trialled for Bendigo's inland context, which will need explicit investment.

This will require large-scale commitment and systematisation of learning and improvement over the long-term, supported by a culture that is willing to take appropriately-managed risks and embrace the opportunity to learn from failure.

5.3 Strategies for advancing individual vision elements

A more detailed assessment of Bendigo's transition progress was also conducted, using the CRCWSC's Transition Dynamics Framework (Appendix A) to consider each of the individual themes of the city's water sensitive vision.

Figure 9 below summarises the current transition progress for each individual vision theme. Vision themes early in their transition will require different types of strategies to progress further change than those later in their transition. As most of the vision themes have been assessed as being in the *Shared understanding and issue agreement* phase some parallels in the strategic recommendations across themes is to be expected.

The remainder of this section discusses the transition assessment for each theme and the strategies recommended to enable transition within the theme.

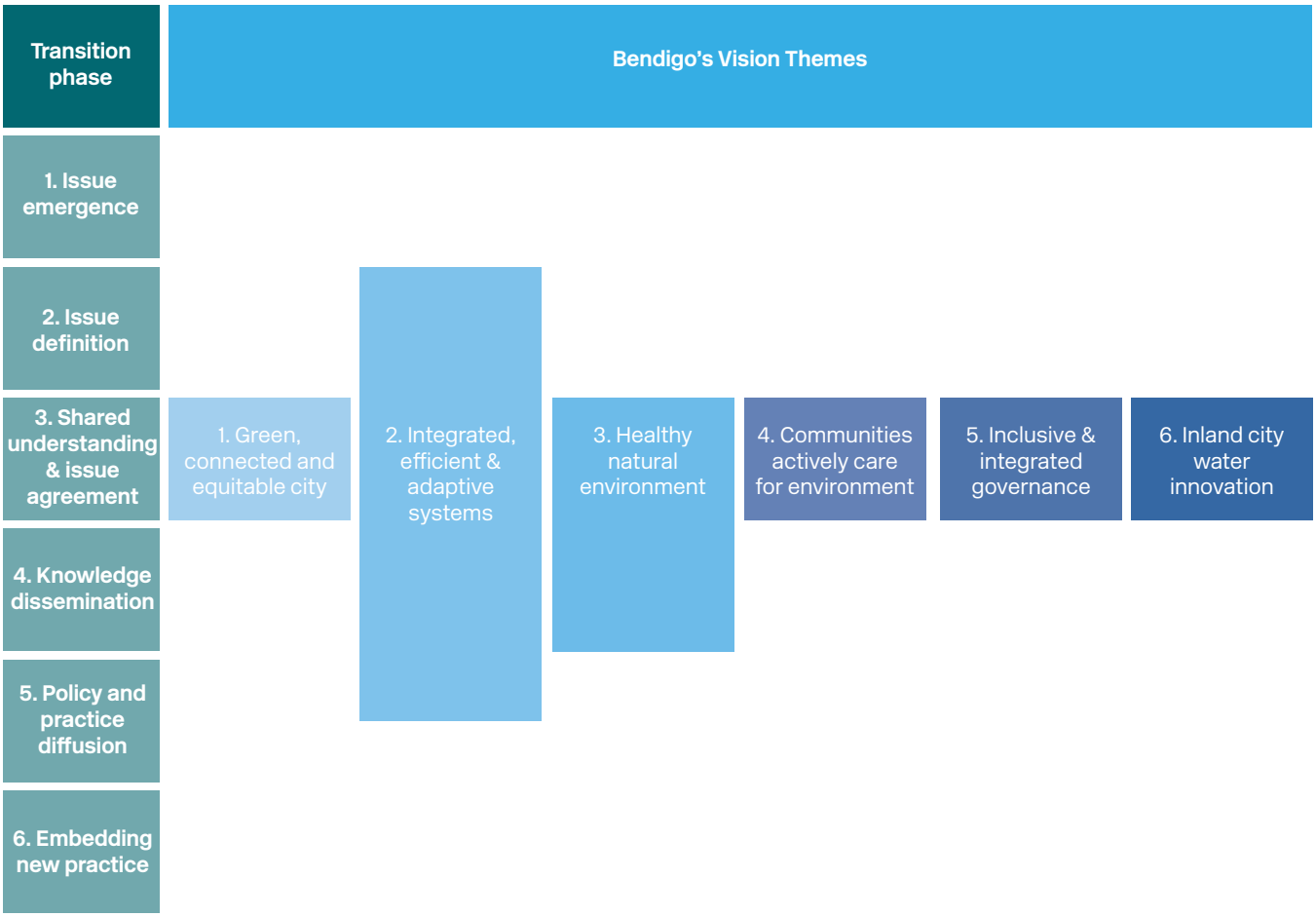


Figure 9. Summary of transition phases for each of the vision outcomes

Vision Outcome 1: Bendigo's people are happy and healthy, enjoying life in a green, connected and equitable city

There are numerous champions in Bendigo's water, planning, environment and community sectors advocating for integrated planning and design of the water system and urban form to support people's health and wellbeing. Key agencies have a range of strategies and processes, such as the City of Greater Bendigo's draft Plan Greater Bendigo and Public Space Plan, that indicate a sound direction for water sensitive urban space and healthy people. Local community groups have been critical to advancing improvements in their waterways and Bendigo's health sector has started to promote better-connected urban space. Many participants observed that because of the scale of the city, most people championing improved human and environmental health know each other through professional or personal connections, however more attention is needed to align their actions to ensure they are effective in delivering water system outcomes that better support urban amenity. There are a number of existing partnerships and collaborative projects – including GREATER, Wanyarram Dhelk, Plan Greater Bendigo, and the Ironbark Gully trail – that may be valuable foundations to build upon in formalising and strengthening this collective voice.

"People need to be committed to designing projects together and then following through on project management."

Beyond vision, strategies and plans, on-ground implementation of water sensitive urban form varies across Bendigo. Public spaces, including walking and cycling paths, are generally provided in areas prone to flooding and near retarding basis in outer areas, and in recent years a number of projects with a water sensitive focus have been implemented (e.g. at Crusoe Reservoir, Spring Gully, and Long Gully). However, there are relatively few examples of small-scale water sensitive solutions such as raingardens or stormwater harvesting. Participants noted there was not particularly strong advocacy for them and that more evidence of their social and environmental benefits for Bendigo was needed. While there are a number of promising trials of water sensitive urban forms that have been implemented in Bendigo and elsewhere, there is limited monitoring and evaluation and few larger-scale demonstrations, which hampers the opportunity to develop and refine solutions for Bendigo's particular context.

Table 3. Recommended strategies to advance green, connected and equitable city

No.	Strategies	Outcome
1.1	Develop and communicate a compelling narrative of the liveability and health benefits of multi-functional and connected water sensitive urban form in Bendigo	Broad support exists from across private developers, organisational leadership and the general public
1.2	Develop a platform for connecting and aligning stakeholders and promoting a collective strategic voice advocating the health and wellbeing benefits of water sensitive solutions	A broad range of stakeholders understand and are able to communicate the benefits of water sensitive urban design solutions
1.3	Embed the water sensitive vision of a healthy, liveable Bendigo based on a compact, connected and green urban form in all organisational policies and strategies under development	There is commitment, action and leadership from agencies and other organisations in driving the implementation of water sensitive urban form solutions
1.4	Evaluate the available evidence to quantify the social, environmental and economic benefits of water sensitive urban form to build a business case and inform a compelling narrative	The costs, benefits and risks of quality urban space solutions are understood and communicated to a broad range of stakeholders
1.5	Develop a broader suite of solutions for water sensitive urban forms, with particular attention to governance processes and structures	A comprehensive suite of solutions are developed ready for testing, refinement and widespread implementation
1.6	Implement trials and significant demonstrations of water sensitive urban form solutions, incorporating an explicit learning agenda	Water sensitive urban form solutions are demonstrated to provide evidence of their costs, benefits, and risks, and to learn about the capabilities needed for their effective implementation to inform the development of practical guidance

Vision Outcome 2: Bendigo is resilient to climate extremes and has integrated, efficient and adaptive regional water, energy and food systems

While a safe and secure potable water supply is provided to Bendigo's residents, this is through the traditional centralised system with limited flexibility for service delivery. While there are benefits to this approach in terms of universal quality management, it is reliant on large-scale infrastructure that is costly to upgrade and can cause service disruptions. In addition, residents in Bendigo are either provided with connection to the centralised sewerage system or are dependent on onsite treatment that is recognised as a threat to the environment. Coliban Water and the City of Greater Bendigo are actively considering alternative potable water sources and sanitation options as part of a more sustainable water system for Bendigo but there is uncertainty over their long-term financial viability and the environmental and social benefits.

Beyond the built capacity for recycled water production and distribution, many innovative adaptive infrastructure solutions are in their infancy in the local Bendigo context. For example, biosolids are recovered from Coliban Water's wastewater treatment process but there has not been detailed investigation into biogas or heat recovery, and the market for recycled water does not appear sufficient to enable the upgrade of infrastructure for recycling to occur at scale. Coliban Water has begun to develop an Energy Management Strategy, and is engaged in industry-wide energy networks to create opportunities for collaborative projects that reduce GHG emissions. Beyond Coliban Water, Bendigo Health has implemented a range of water sensitive measures in the hospital redevelopment. Some significant projects on system integration and efficiency have yielded valuable lessons, but several participants reported that smaller-scale projects are rarely reviewed to build on successes or failures. Further uptake of integrated, adaptive solutions will be limited without cross-organisational collaboration and coordination.

> ***"[In Bendigo] you can't have the green stuff without stormwater and recycled water."***

Flood risk in Bendigo is generally well understood, informed by the NCCMA's extensive flood risk modelling, and there are established platforms for developing a collective approach to flood management and emergency preparedness, such as planning amendment processes, Flood Eye, a flood mitigation advisory committee, and annual disaster awareness and preparedness events. However, the vulnerability of existing dwellings and business premises to unpredictable flash flooding remains an issue, as well as Bendigo residents who have no previous experience of flooding.

Table 4. Key strategies for enhancing climate resilience and advancing integrated, adaptive and efficient systems

No.	Strategies	Outcome
2.1	Examine and evaluate the evidence about the need for flexibility and choice in delivering water supply and sanitation services	The costs, benefits and risks (including avoided costs and risks) are understood for service providers and customers in providing flexibility and choice for customers in their water system services
2.2	Examine and evaluate evidence about the need for a holistic approach to nutrient and energy recovery	An understanding of the costs, benefits, risks and potential of nutrient and energy recovery solutions
2.3	Strengthen organisational culture, systems and processes to promote integrated, efficient and adaptive water system solutions	Integrated, efficient and adaptive water system solutions are consistently reflected in policy and practice
2.4	Develop an integrated water strategy that spans organisations, sectors and scales to assess and facilitate opportunities for adaptive and efficient solution implementation throughout Bendigo	Direction, support and guidance exists for cross-sectoral organisations to approach water system servicing in integrated ways
2.5	Embed an integrated water strategy in organisational policy and establish targets to drive its implementation	An integrated framework exists to support organisational alignment, widespread implementation of solutions and transparent monitoring and evaluation of progress
2.6	Consolidate existing knowledge and data from trials and demonstrations of water system innovations in Bendigo, as well as from projects and insights elsewhere	Solutions are refined and inform the development of practical guidance for the local Bendigo context
2.7	Implement significant demonstrations of adaptive infrastructure, resource efficiency and flood resilience solutions, incorporating an explicit learning agenda	All parts of Bendigo benefit from flood resilience measures, an understanding of how these solutions can be delivered, evidence of their costs, benefits and risks, and an understanding of the capabilities needed for their effective implementation
2.8	Develop a Bendigo-wide community resilience strategy that drives coherent and proactive community responses to water-related climate risks such as flooding and extreme heat	There is implementation support and guidance for communities to be empowered in supporting system resilience

Vision Outcome 3: Bendigo's creeks are cherished links in Bendigo's healthy natural environment.

There is diverse, broad and influential advocacy for ecosystem health in Bendigo. Council has developed several strategic and long-term vision initiatives in recent years, including promoting the "City in the Forest, Forest in the City" concept, Bendigo Creek's restoration and the revitalisation of the botanic gardens. The NCCMA has recently increased attention to urban waterways and catchments. Active community groups with an environmental focus include Northern Bendigo Landcare, Bendigo & District Environment Council and the Bendigo Field Naturalists Club.

Many groups have established informal alliances and formal collaborations. Wanyarram Dhelk – a leading example of a joint project of Djandak and NCCMA – is supported by Council, DELWP and Coliban Water, and has also leveraged community action. Other examples include the Spring Gully and Ironbark Gully Creek projects, which have aimed to enhance the ecological and recreational values of creek sections.

There is good knowledge of habitat quality and extent, and stream condition, in and around Bendigo. Council plans to undertake a comprehensive review of water quality monitoring to inform future infrastructure planning. However, the solutions for preventing decline in ecosystem health that results from urban development are unclear and there have been insufficient trials or demonstrations to test the viability of alternative forms of low impact development or management approaches.

There is policy at the state and local level to protect areas of habitat and listed flora and fauna. The planning scheme includes local policy to minimise nutrient discharges into waterways. However, participants indicated concern that planning permit requirements were not adequately enforced.

Groundwater in Bendigo requires additional consideration as practices currently reflect an emerging understanding of management issues. The return of groundwater to its natural levels within the historical mine shafts and tunnels in central Bendigo has prompted the State Government to fund a short-term response to the water quality problems this creates. Waste streams (brine and heavy metal-rich sludge) that are a by-product of most treatment options pose a long-term management issue that needs further investigation.

"From an aesthetic point of view, Bendigo has no river. But almost the entire urban area, 85% of the population, is contained in the catchment of Bendigo Creek. This can be a huge experiment [in water sensitive living]."

Table 5. Key strategies for enhancing Bendigo's creeks as part of a healthy natural environment

No.	Strategies	Outcome
3.1	Examine and evaluate the evidence for potential groundwater management solution options	An understanding of the potential costs, benefits and risks (including the avoided costs and risks) of groundwater management solutions
3.2	Develop an integrated implementation strategy for Bendigo's creeks as linking corridors to support healthy ecosystems and biodiversity	An integrated catchment-wide approach to the management of Bendigo's creek network and surrounding ecosystems
3.3	Collect and communicate lessons from existing community and government projects that identify opportunities to advance Bendigo's vision for environmental health	Existing knowledge to advance ecosystem management knowledge is consolidated and shared
3.4	Implement significant demonstrations of innovative water system solutions for improving habitat and biodiversity and increasing waterway corridor connections, incorporating an explicit learning agenda	An understanding of how ecosystem management solutions can be delivered, evidence of their costs, benefits and risks, and an understanding of the capabilities needed for their effective implementation

Vision Outcome 4: Communities actively care for Bendigo water and land environments, guided by Dja Dja Wurrung knowledge and values

Bendigo is relatively well-advanced with respect to indigenous involvement in water planning. This is helped by the involvement of Djandak in management activities and the requirements of the Settlement Agreement between the Dja Dja Wurrung and the State Government. There are champions for indigenous involvement throughout local government, water authorities and DELWP, though there is still a need for stronger connections between them. A range of national and state engagement frameworks have established platforms for developing alignment, including the COAG National Indigenous Reform Agreement, the Victorian Aboriginal Affairs Framework, the Inclusion Framework and the Economic Strategy. Wanyarram Dhelk is a practical example of collaboration, as it has involved the NCCMA and Djandak working closely together and also attracted funding from Council and Coliban Water. However, these opportunities tend to be framed by State Government directives and there still needs to be a broader embrace of indigenous cultural and economic associations with water planning in the local context.

There is a strong foundation to strengthen community stewardship of Bendigo's environments, although solutions or approaches are not yet well understood or explored. Many organisations champion a community connection with water in the landscape when it coincides with natural environment values (e.g. Bendigo Field Naturalists, Bendigo Sustainability Group, City of Greater Bendigo, Friends of Ironbark Gully, and NCCMA). More generally, Coliban Water promotes water literacy through school tours, awareness campaigns and publications, primarily with a focus on water conservation. Dja Dja Wurrung Enterprises include in their mission raising broader community awareness for healing country and waterway health. There is also teaching of indigenous cultural values in schools. In practice, however, many parts of the community are not effectively reached through water engagement (e.g. education campaigns typically find an audience with reasonably high water literacy).

"Staff need to be given a licence to explore new collaborative approaches... systems are geared towards the default approach."

Table 6. Key strategies for advancing communities actively caring for Bendigo's environments

No.	Strategies	Outcome
4.1	Develop and communicate a compelling narrative of the benefits of involving Dja Dja Wurrung in water planning and decision-making and of community participation in water sensitive management more broadly	There is broad support for indigenous involvement in water governance and broader community participation in water stewardship initiatives
4.2	Explore and pilot solutions for indigenous involvement in water planning and community water stewardship, incorporating a clear learning agenda	A suite of engagement solutions are developed and demonstrated to provide evidence of their costs, benefits, and risks, and to learn about the capabilities needed for their effective implementation
4.3	Establish a platform that brings focus to community messaging and engagement in relation to the water system and Bendigo's water sensitive city vision	Key agencies communicate a coherent suite of messages and commit to a shared agenda for community engagement in water stewardship
4.4	Consolidate lessons from existing projects with good community stewardship principles and solutions in Bendigo and elsewhere	Local water stewardship solutions are developed and practical guidance is created to support a more strategic and consistent approach to community engagement

Participant insights on how to engage effectively with the community

Community participants in workshops and focus groups gave in-depth insights about their vision for Bendigo's water sensitive city transition and how they can be effectively engaged in transition actions. Overall, community members can bring fresh approaches and energy to solving problems as they are unconstrained by existing institutional arrangements.

The diversity of perspectives represented in Bendigo's community could be harnessed as an important asset in considering how to achieve Bendigo's water sensitive vision. Listening to these perspectives gives insight into how community members can be engaged in the pursuit of ecological health and wellbeing.

Engaging with the broader community is clearly critical for Bendigo's water sensitive city vision to be widely embraced. It is important to recognise that the community is not homogeneous, comprising a diverse mix of value-sets and interests and preferences for engagement in sustainability and water management. Community participants from both the workshops and the focus groups suggested strategies for connecting to the vision of a water sensitive Bendigo;

- Identify and articulate why a water sensitive Bendigo is important for the community and how it can benefit from water sensitive solutions
- Employ a targeted approach for effectively engaging with specific community sectors, by identifying a particular 'hook' for each segment and developing associated messaging. For example;
    - Provide CV building and networking opportunities for **young people**
    - Consider opportunities for sustained social connection and free activities for **low income** groups
    - Consider a water mascot, educational paths, tours and trails suitable for **families** with children
- Understand the barriers (e.g. time, money, family commitments, language, level of knowledge) and needs (e.g. social interaction, financial incentive, opportunity to contribute) for different community segments in relation to engagement and develop tailored engagement approaches (e.g. surveys, workshops, planning meetings, working bees, and testing or trialling products)
- Be focused, authentic and transparent about the purpose of an engagement and the desired end result (e.g. goals might include public pressure, votes, support, raising awareness through word-of-mouth or fund-raising), and show how people's contributions have been considered.

Vision Outcome 5: Consistent and inclusive governance supports an empowered community and integrated, adaptive approaches to water planning and management

Aspirations of leadership, vision and public engagement in water governance are common to many organisations in Bendigo and there has been a strong history of high-level collaboration for Bendigo and the broader region, particularly in response to the drought, floods and major projects of the past 15 years. Council have adopted a range of high-level strategies that align with the water sensitive vision and has a strong focus on cross-institutional processes to achieve more integrated and efficient planning processes (e.g. Plan Greater Bendigo featured extensive stakeholder consultation and may support strategic alignment across organisations). Coliban Water has developed an integrated water management planning process in collaboration with NCCMA and Council, and has recently invested in new community engagement processes. Coliban Water has also initiated an open forum with Bendigo land developers in collaboration with the Urban Development Institute of Australia. At a State Government level, DELWP champions cross-sector institutional processes and the incorporation of community values in its Integrated Water Management Framework. The Loddon Campaspe Regional Partnership also provides a model for broader regional cooperation and long-term planning.

"We're all coming from different disciplines and we've got slightly different outcomes and needs. It is difficult but I think if you want to make [collaboration] work, you've got to think long-term and you've got to be making decisions that consider all aspects"

This positive recent progress needs to be embedded institutionally, as many organisations are now facing the challenge of how to adequately resource cross-sector collaboration and integration processes for water governance. This is in part due to water being less prominent on the agenda of many organisations since drought conditions ended more than five years ago. High-level strategies are in place but in practice, cross-institutional coordination is less likely to occur in smaller projects or at an operational level.

Table 7. Key strategies for advancing consistent and inclusive governance

No.	Strategies	Outcome
5.1	Develop and communicate a compelling narrative of the need for and benefits of an integrated and aligned approach across stakeholders in water planning and decision-making	There is support from the leadership of key agencies and broader public to drive innovation and long-term transformation in water governance to achieve water sensitive outcomes
5.2	Embed Bendigo's water sensitive vision in organisational policies, plans and strategies	There is a framework to support organisational alignment and widespread implementation of water sensitive solutions
5.3	Establish a platform that brings focus to collaborative approaches to achieving water sensitive planning objectives and operations	There is a collective voice and strategic approach guiding effective operational collaboration and knowledge sharing across stakeholders
5.4	Consolidate the lessons from Bendigo of successful collaborative (water) governance initiatives that have emerged in response to specific issues	Previous experiences of collaborative water governance inform the development and refinement of solutions for long-term and consistent partnerships

Vision Outcome 6: Bendigo is an inland city water innovation hub, grounded in education, research and design excellence

Bendigo has a history of innovation in the water sector and in the city more generally. Early water examples include the Coliban Scheme of the 1860s to transport water to Bendigo, and filtration-based treatment built into Crusoe Reservoir in the 1870s. The investment in the Aqua2000 treatment plant and efficient irrigation technology for sports and recreation assets in the early 2000s indicates water innovation is present in the modern era as well. Key agencies readily partner with universities to explore new solutions and have implemented a range of pilot projects to trial innovative water technologies and approaches, such as Coliban Water's biosolids recovery program and exploration of digital metering, the NCCMA's Flood Eye flooding visualisation tool, and NCCMA and Djandak's joint Wanyarram Dhelk project.

"There are lots of new approaches [to water management] in Bendigo that are more advanced than the traditional approach."

Beyond water, innovation is seen in entrepreneurial business ventures such as Bendigo Bank, the activities of a number of universities and a range of cultural and creative festivals. Initiatives have typically been driven by key champions and a strong business imperative. This citywide culture of, and commitment to, innovation provides a strong foundation for achieving Bendigo's aspiration to be an inland city water innovation hub.

Table 8. Key strategies for advancing water innovation in Bendigo

No.	Strategies	Outcome
6.1	Develop and communicate a narrative of the economic benefits of water sector innovation for other public sectors and the private sector	The importance of water sector innovation for achieving Bendigo's broad city aspirations for long-term prosperity is communicated to a broad range of stakeholders to begin building their support
6.2	Enable and encourage innovation uptake through organisational culture, systems and processes	Innovative ideas are trialled, demonstrated and then integrated as mainstream parts of the water system

5.4 Towards strategy implementation

Bendigo's water sensitive city vision is ambitious and long-term. Transitioning towards such an aspirational water future will involve multiple institutions and individuals acting with common purpose. The scale of the transition may be considerable, but the commitment expressed by industry and community participants in this project's workshop series indicates Bendigo is ready to advance an action agenda.

For Bendigo stakeholders to progress implementation of the transition strategies and actions, further work that goes beyond the scope of this current CRCWSC project will be required. However, the workshop discussions explored a range of implementation dimensions, including action development and prioritisation, and consideration of a governance model to support the city's water sensitive transition. A synthesis of these workshop discussions are documented in the project's companion report, *Benchmarking, Envisioning and Transition Planning for a Water Sensitive Bendigo: Final Case Report*.

In particular, the companion report presents a database of hundreds of transition actions identified by participants, along with ideas for their implementation, including local opportunities that may be leveraged in the short- to medium-term. The database is intended to help guide further action development through activities beyond this project and do not reflect any organisational commitment. Further planning is needed to develop actions into an operational plan that defines roles, responsibilities, targets and timeframes.

Further specific considerations to progress Bendigo's transition strategy's implementation may include:

1. *Prioritisation of outcomes to address in the short- to medium-term, potentially drawing on the WSC Index results to inform reflection on priorities.* This can build upon the preliminary prioritisation discussions undertaken during the workshops.
2. *Prioritisation of actions based on factors such as target outcome, feasibility, benefit, and potential leverage of current or upcoming projects, initiatives or available resources.* As above, this can build upon the preliminary prioritisation discussions undertaken during the workshops.
3. *Action planning for prioritised actions to form the basis of an implementation plan with targets, timeframes, budgets, roles and responsibilities.* This can build upon the action database documented in the companion report.
4. *Business case development to progress particular actions or initiatives.*
5. *Structure and process to maintain collective momentum across stakeholders committed to implementing the strategy.* Participants were interested in the potential of a Bendigo Water Sensitive Transition Network model. They felt this project provided valuable momentum and stakeholder interest that could support immediate establishment of a Transition Network, with initial membership comprising interested industry and community members involved in the workshop series. The companion report sets out the participants' initial considerations for such a Transition Network's form and important supporting mechanisms.
6. *Strategic communications and influence approaches to secure organisational support and endorsement of the strategy implementation.* Workshop discussions reflected on the need to legitimise Bendigo's water sensitive city transition agenda with formal authority and governance support in order to mobilise resources for planning and implementation of transition actions. Approaches to build this organisational leadership and strategic support are canvassed in the companion report.
7. *Framework for ongoing monitoring and evaluation of action implementation and Bendigo's transition progress.*

Ultimately, it is intended for this Vision and Transition Strategy, and the companion report, to provide a resource for Bendigo stakeholders as they continue to collaborate through their next strategy implementation stages.

The CRCWSC has been working with other cities to support their implementation planning and can offer guidance to Bendigo through the provision of tools, strategic advice, facilitation of further processes, and sharing of lessons from other places.

6. Conclusion

Bendigo's communities are acutely aware of the severe threats that climate change and poorly managed growth are likely to bring to their city: cherished values such as outdoor recreation, green streetscapes, biodiversity, healthy creeks and secure water supplies are at risk. At the same time, Bendigo aspires to be a resourceful, innovative and sustainable city. Ensuring these outcomes over the long-term requires action to be taken now to avoid negative trajectories and steer Bendigo's development towards its future water sensitive city vision.

This report marks the culmination of a process that brought 31 community champions together with 47 leaders and strategic thinkers from across Bendigo's water, planning, development and environment sectors to explore these issues and opportunities. Workshop discussions and associated analysis aimed to understand the city's unique water story, envision a future water sensitive Bendigo and identify the transition pathways that will need to be pursued to achieve their vision.

Participants in the project agreed on shared aspirations for Bendigo's water future, with the vision themes of urban liveability, adaptive systems, healthy ecosystems, community stewardship, inclusive and integrated governance, and water innovation receiving unanimous support across both the community and industry participants. Workshop discussions highlighted the pride that Bendigo residents feel for their unique inland environment and the particular challenges and opportunities its context presents in embracing these elements as part of their future aspirations.

Using tools and methods of the CRCWSC, the project generated insights into Bendigo's transition progress to date, and the shifts in policy direction, organisational frameworks and on-ground practice that will be required. The results form a transition strategy as a framework for prioritising and designing action for implementation across the range of people and organisations that will need to work collaboratively to facilitate Bendigo's water sensitive city transition.

Bendigo already has many important conditions in place to enable its water sensitive transition. These include a wealth of individual champions who understand the need for change and are well-placed to build further momentum for collective action. The city's regional scale and cohesive community fosters informal relationships and networks, which have provided agility in times of crisis. State Government and Council are establishing a supportive policy and regulatory foundation for making progress towards a range of water sensitive objectives. Many organisational policies and issue-specific strategies across Bendigo's key water-related agencies reinforce the direction that needs to be pursued to achieve Bendigo's aspirational water future.

On the ground, there is a strong drive for new approaches to water management among many stakeholders, which has led to the implementation of recycled water distribution, creek revegetation, sustainable gardens and efficient recreation management. Bendigo has a community that is highly invested in its future, with a strong overall commitment to sustainability and the natural environment that has supported the implementation of several innovative projects. The Dja Dja Wurrung Corporation has a clear role in local planning, providing a foundation for engaging Aboriginal communities in water planning and decision-making and guiding community water stewardship.

To capitalise on these promising conditions, a broad embrace of Bendigo's water sensitive vision amongst the wider community is needed. Achieving Bendigo's water aspirations will require distributed leadership across organisations and sectors, as well as grassroots community leadership that can drive local adaptations tailored to Bendigo's needs and enable a more resilient citizenry.

Establishing a Transition Network for endorsing and driving coherent water sensitive action across stakeholders, and embedding Bendigo's water aspirations in a broad city vision, organisational frameworks and a cross-agency water sensitive city strategy, will help bring focus to the structures and processes needed to reinforce collaboration for integrated water sensitive outcomes. These governance arrangements should permeate all levels of decision-making, scales of implementation and elements of the urban water cycle.

As the pathway to Bendigo's vision requires widespread adoption of innovative solutions and practices, a whole-of-system approach to learning is needed to ensure past local experiences, as well as lessons from elsewhere, can be built upon to achieve progress towards its water aspirations. Bendigo therefore needs to maintain focus on a policy, organisational and cultural environment that supports innovation and experimentation.

The project participants from both industry and the community demonstrated openness, motivation and commitment for water sensitive outcomes and collective action. Building on this momentum and broadening industry and public support will put Bendigo in a strong position to accelerate its ongoing transition to achieve its water sensitive vision and support the city's future liveability, sustainability, productivity and resilience.

Appendix A: Transition Dynamics Framework

This Appendix presents the framework and methodology applied to analyse Bendigo's transition progress in Section 5.

Transitions theory is a body of interdisciplinary research that studies how transitional changes are driven and enabled over time. CRCWSC research has drawn on this knowledge base to develop the Transition Dynamics Framework (Brown et al., 2016; Brown et al., 2017). This Framework identifies six distinct phases of change during a city's water sensitive transition (Figure 1).

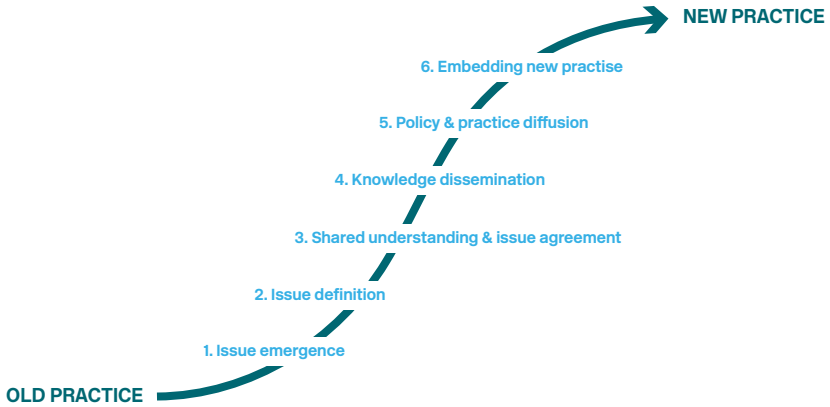


Figure 1. Six phases of change during the transition to a new practice

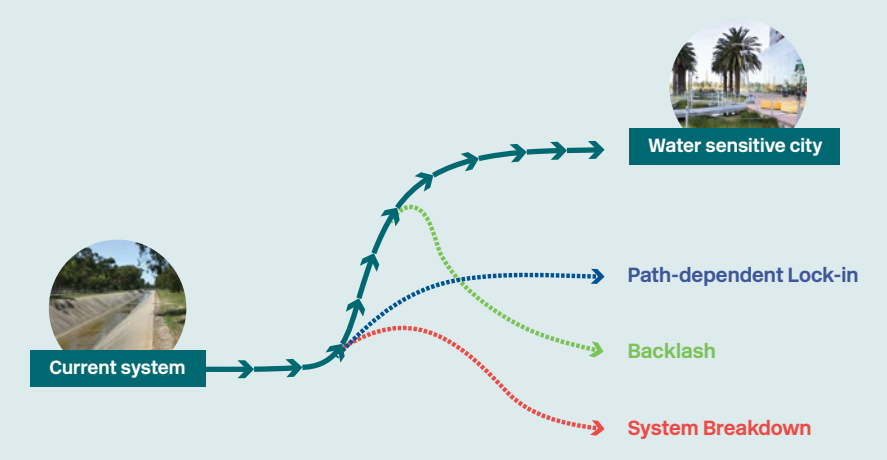


Figure 2. Transition pathways: Successful transition, lock-in, backlash and system breakdown

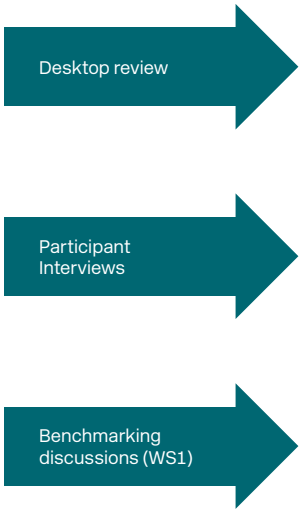
As a city moves through each phase sequentially, enabling conditions are established to support its trajectory towards its WSC vision and avoid the risk of change pathways that reflect lock-in, backlash or system failure patterns (Figure 2).

Actions to orient and drive change towards a city's envisioned water sensitive future need to progressively establish these enabling conditions. Actions with the most impact during the early phases of transition will be different from those during the later phases. It is critical to identify a city's current phase of change to ensure that actions are prioritised according to the effectiveness they will have in accelerating the WSC transition.

The CRCWSC's 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 factors create an enabling environment for a WSC transition and, mapped against the six transition phases, they create a matrix (Figure 3) for a deeper understanding of the current transition phase for each vision outcome.

The Transition Dynamics Framework was used as a diagnostic tool to assess the presence or absence of enabling factors as an indicator of progress towards Bendigo's aspired change in practice as it advances towards its water sensitive city vision. A range of desktop and engagement activities provided data on Bendigo's enabling environment to apply the Framework.

The Framework provides a checklist of the factors that should be deliberately and sequentially built up to inform the prioritisation of strategies and actions.



Transition Phase	Champions	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 and ideas	Causes and impacts examined	Solutions explored	
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 and practice diffusion	Organisational champions	Expanding the community of practice	Capacity building	Widespread implementation and learing	Early regulation and targets
6. Embedding new practice	Multi-stakeholder networks	Guiding consistent application	Monitoring and evaluation	Standardisation and refinement	Comprehensive policy and regulation

Figure 3. Transition Dynamics Framework (adapted from Brown et al., 2016; Brown et al., 2017)

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