



Climate Change Adaptation Plan – sustaining resilience

2023–2028

Public version 2.0 - December 2023

Let's connect



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Icon-Water



We acknowledge the traditional custodians of the Canberra region, the Ngunnawal people and also recognise other people or families with connection to the ACT and region. We pay our respects to their Elders – past, present and emerging.

We recognise and value their continuing culture and the contribution they make to the life of the city and the region.

We also acknowledge the First Peoples of the broader region in which we live and work.

As a custodian of our local water cycle, we are committed to respect and care for country and recognise our dependence on nature in providing essential services for the community.

Foreword

A message from our Managing Director

As the ACT region's water and sewerage utility, our operations can be greatly impacted by climate change. We acknowledge that climate change is occurring harder and faster than many anticipated and this has serious implications for our region and our business.

We know that climate change events do not happen in isolation; there are various changes from warming temperature, to extreme events, often happening consecutively. We experienced an extreme 'flash' drought from 2017 to 2020, alongside the Black Summer bushfires of 2019–2020, storms and flooding. In addition, cascading impacts from external forces also amplify the impacts of climate change on our business, adding complexity to our adaptation planning.

This *Climate Change Adaptation Plan 2023 – sustaining resilience* assesses our vulnerabilities to projected climate change impacts and identifies actions to position us for maintaining essential services. It builds on the actions delivered under Version 1.0 from 2020 to 2023. Our core purpose is to sustain and enhance quality of life – we intend to adapt alongside the changing climate to continue to fulfil our core purpose.



Ray Hezkial, Managing Director, Icon Water



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Executive Summary



Introduction

Icon Water is highly vulnerable to the impacts of climate change. Rising temperatures, droughts, bushfires, heatwaves, storms and floods can all have severe implications on our ability to provide our community with high quality water and sewerage services and safeguard Canberra's water supply and sewerage network.

We already have a wide range of programs in place to protect against a changing climate, however the dynamics of more variable, extreme and uncertain climate conditions now place unprecedented pressure on our business activities.

We need further practical action that supports resilience of our business and community. This Climate Change Adaptation Plan outlines this action. It builds on existing work, business capability and processes and identifies where we must focus.

It is the culmination of research, internal consultation, external engagement and sound climate change adaptation methodology based on climate modelling, contemporary scientific evidence and industry standards. It provides a key component to understanding

our exposure to climate change and developing sound climate risk management.

In designing this plan, we acknowledge that temperatures in the ACT have already increased by 1.4 degrees since national records began in 1910 and have used the NSW and Australian Regional Climate Modelling (NARClIM) 1.5 climate change projections to inform our scenario planning, impact assessments and action plan.



Approach

Methodology

This Plan follows a four-step methodology (Figure 1) adapted from the Water Services Association of Australia (WSAA) Climate Change Adaptation Guidelines.

It replaces our first version of the plan in 2020. We have reflected and drawn on lessons learned from that plan, refined our approach and extended the timeframe to a five-year horizon (2023–2028) to better align with our regulatory pricing submission.

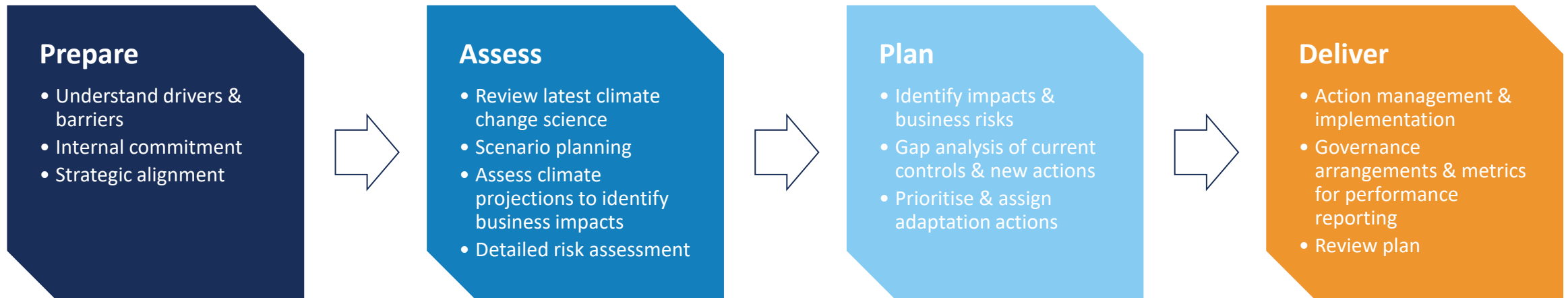


Figure 1: Climate Change Adaptation Plan Methodology

Approach

Objective and principles

The approach we have adopted helps us to realise our objective and is based on a foundation of principles listed below:

Objective

Building our organisational and regional resilience to climate change by delivering an integrated approach that maintains a steady or reduced risk profile to climate change pressures.

Principles

Accounting for uncertainty and cascading impacts



Allowing for consecutive and compounding hazard events, cascading impacts and uncertainties from amplified climate change.

Informing our response to natural hazards



Informing our strategic planning, asset management and existing business procedures.

Risk-based approach



Strategically investing and adapting based on prudent, efficient and timely spending.

Active collaboration with stakeholders and partners



Involving stakeholders and partnering with government, academia and industry to share effort, risk, cost, trials and outcomes.

Whole of business accountability



Individual initiative and action to proactively contribute to business resilience.

Meeting expectations



Through action consistent with customer feedback, government frameworks and shareholder and insurer expectations.

Approach

Review and analysis

To understand the full extent of our vulnerability to a changing climate, we reviewed our performance under Version 1.0 of the plan, held a series of internal impact workshops and conducted an external survey. Individual impacts were then consolidated into risks for the next five-year risk outlook in accordance with our risk management framework. This process, summarised in Figure 2 below, has provided us with a comprehensive understanding of our ability to respond to or recover from the impacts.

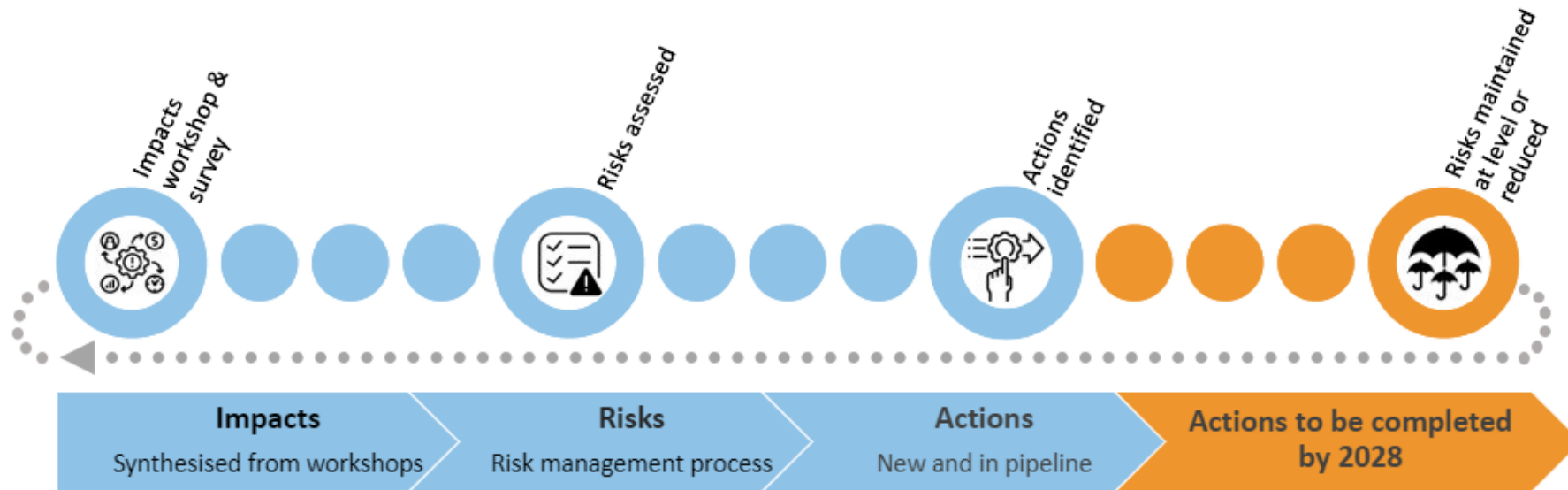


Figure 2: Impacts and risk assessment process

Approach

Key risks

From our risk assessment, our most significant climate risks relate to reduced streamflow, bushfire impacts, rising costs from cumulative hazards and increasing network issues caused by changes in water use patterns. We have identified a range of actions over the next five years that will help to mitigate relevant risks. Climate risks are dynamic and evolve over time; as such, we are committed to ***maintain a steady or reduced risk profile to climate change pressures*** for the next five years. This means close engagement with stakeholders is critical to our methodology, as we manage and monitor the progression of new and existing adaptation actions.

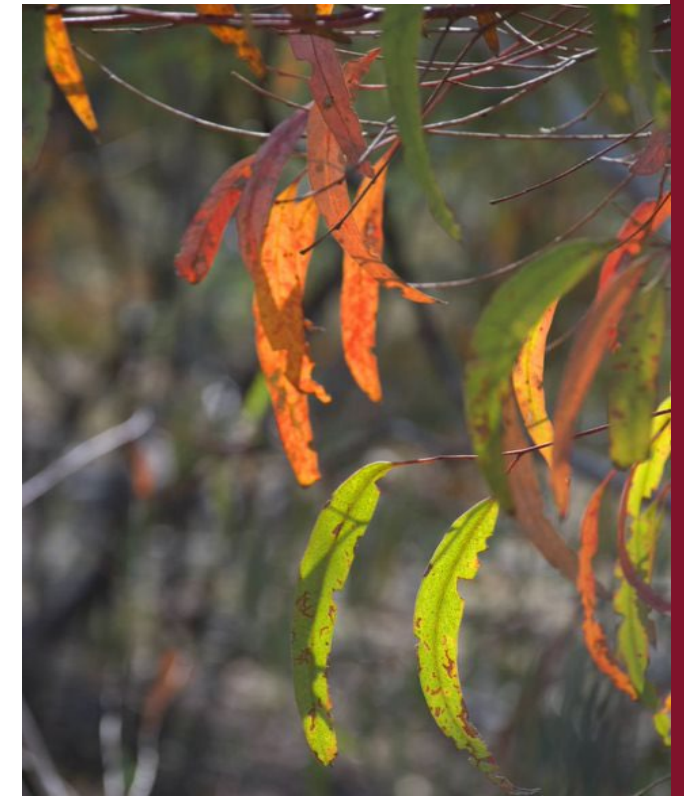
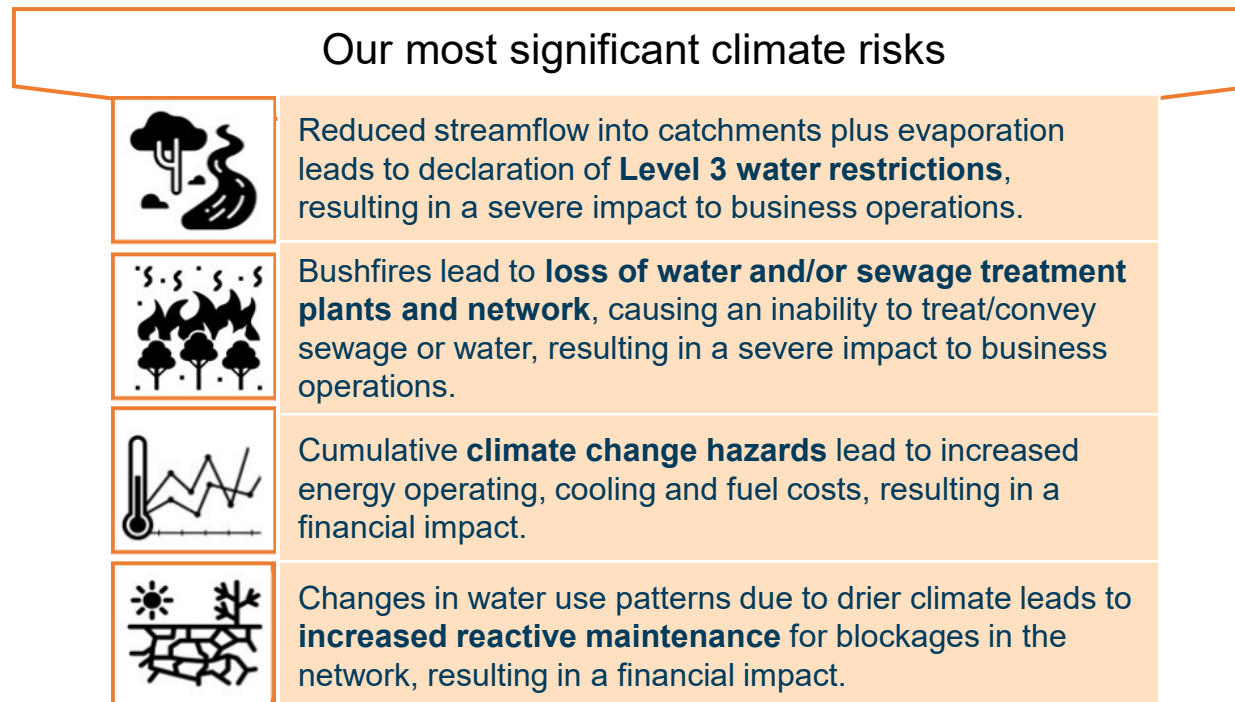


Figure 3: Significant climate risks

Existing resilience

Mitigation and adaptation

Our operations rely on weather and the water cycle, so climate change has been a factor in our planning for many years. As a result, we have a wide range of business programs and controls already in place which improve our resilience to climate change.

Our mitigation activities date back to our 2008 Greenhouse Gas Abatement Strategy and continue now through our eMission Possible Plan which sets out our pathway to meet our net zero target and interim targets which align with the ACT Climate Change Strategy.

Equally, our adaptation to the impacts of climate change has been a priority for just as long – from our spearhead water security infrastructure projects in 2008 through to bushfire management, emergency management, staff health and safety programs, climate resilient building design and the actions from our first Climate Change Adaptation Plan. We have also had an emphasis on resource recovery and circular economy since 2017.

Climate change adaptation and mitigation are synergistic. While this plan focusses on our adaptation responses, it's important the actions of this plan also reduce emissions, wherever possible.

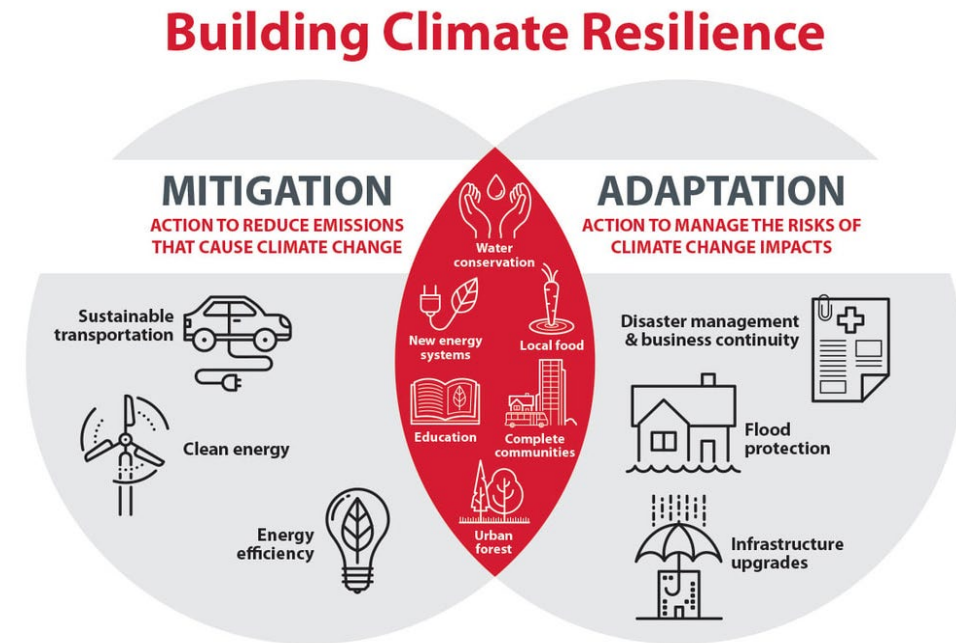


Figure 4: Mitigation and adaptation
Source: Calgary Climate Resilience Strategy (2018)

1. Prepare



Drivers

Strategic alignment

This plan aligns with broader strategic policies and governance frameworks.

The ACT Government released the ACT Climate Change Adaptation Plan in 2016, declared a climate emergency in 2019, and released the ACT Climate Change Strategy 2019–2025.

Additionally, as a Territory-owned corporation we have four obligations defined under the *Territory-owned Corporations Act 1990*:

- To operate at least as efficiently as any comparable business.
- To maximise the sustainable return to the Territory
- To show a sense of social responsibility
- To integrate environmental and economic considerations in decision-making processes.

These obligations are met in our Business Strategy with a focus on sustainable value to:

- ensure long-term water security to support our growing population and to meet the challenges of a changing climate.
- continue to implement our eMission Possible Plan which defines our pathway and actions to reach net zero greenhouse gas emissions by 2045.
- implement actions within our Climate Change Adaptation Plan to build our resilience to the changing environment.

Our commitment to tackling climate change can be found through our public Sustainability and Environment policy.

We commit to taking action, large and small, “to build our resilience to address the climate emergency we face”.

As a result of our first adaptation plan, climate change resilience is integrated into Icon Water’s current strategies, plans, processes and operations.



Risk

Enterprise risks

Integrating this plan across our business helps to mitigate our top-level enterprise-wide climate change risk – that climate change could disrupt our ability to provide consistent levels of water and wastewater services to our community.

This plan helps us address the causes associated with this enterprise risk as well as anticipate the adverse effects of climate change across the whole business. It positions us to understand the risks and opportunities and take appropriate actions to mitigate future damage.

Enterprise risk



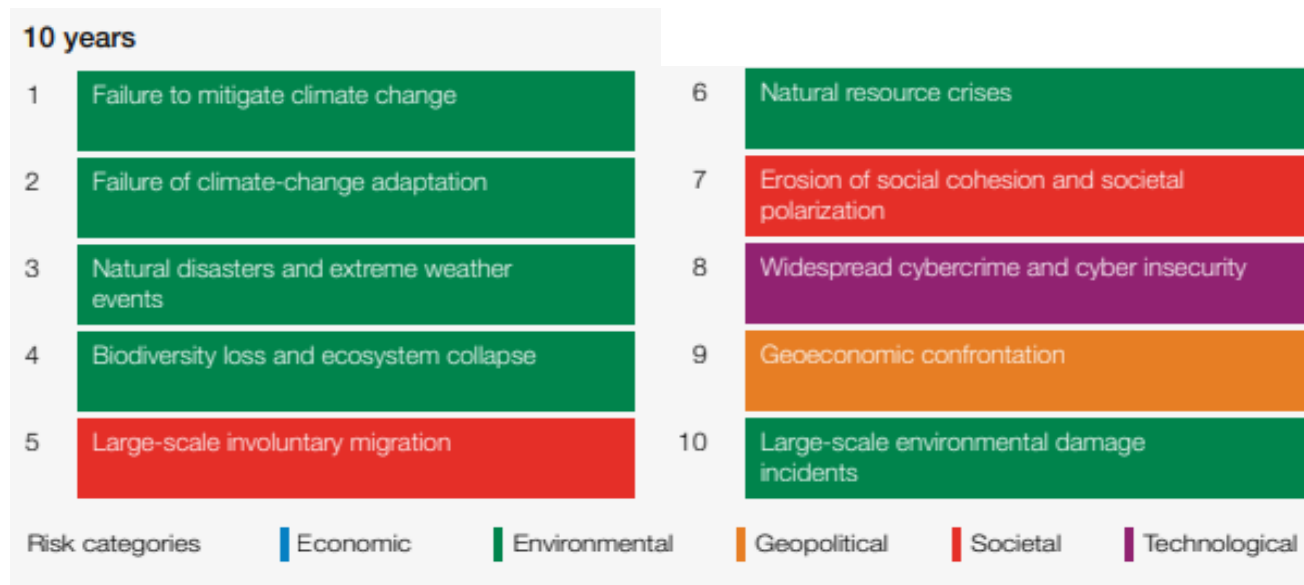
Climate change impacts the ability for Icon Water to provide consistent levels of water and wastewater services



Risk

Economic view

Climate risk is seen as a significant risk globally. Economists* world-wide have ranked climate change action failure as the top two most critical threats to the world over the long term (10 years), with the highest potential to severely damage societies, economies and the planet (World Economic Forum Global Risk Report 2023).



**This draws on the views from nearly 1,000 global experts and leaders plus over 12,000 country level leaders in 124 countries.*

Figure 5: Global risks ranked by severity over long term, World Economic Forum Global Risks Perception Survey 2022-23. World Economic Forum Global Risk Report 2023

2. Assess



Global climate change

Informed by science

Science overwhelmingly shows that the world is warming and that changes are happening at an increased pace.

Our decisions are informed by publications by the Intergovernmental Panel on Climate Change (IPCC), the observed and future predictions from the Bureau of Meteorology and CSIRO, and the NARClIM project.

The IPCC Sixth Assessment Report shows many climate-related risks are greater than previously reported. With each additional half-degree temperature rise, the risk of deadly heat waves and flooding will increase substantially. We are already seeing the effects today.



Earth's surface temperature has increased by an average of 0.78°C from 2003 to 2012.

The average global sea level rise has increased from 1.9mm per year (1971–2006) to 3.7mm per year (2006–2018).

Greenhouse gas emissions have increased by an average of 1 gigatonne of carbon dioxide (GtCO₂) per year (2000–2010) compared to 0.4 GtCO₂ per year (1970–2000).

Australian climate change

Changing pressure systems

Australia's weather systems are changing. Sea level pressure is increasing, which in turn is increasing the number of high-pressure systems.

Australia is also strongly influenced by various broad-scale climate-driven events such as El Niño and La Niña, which are both becoming increasingly warmer.

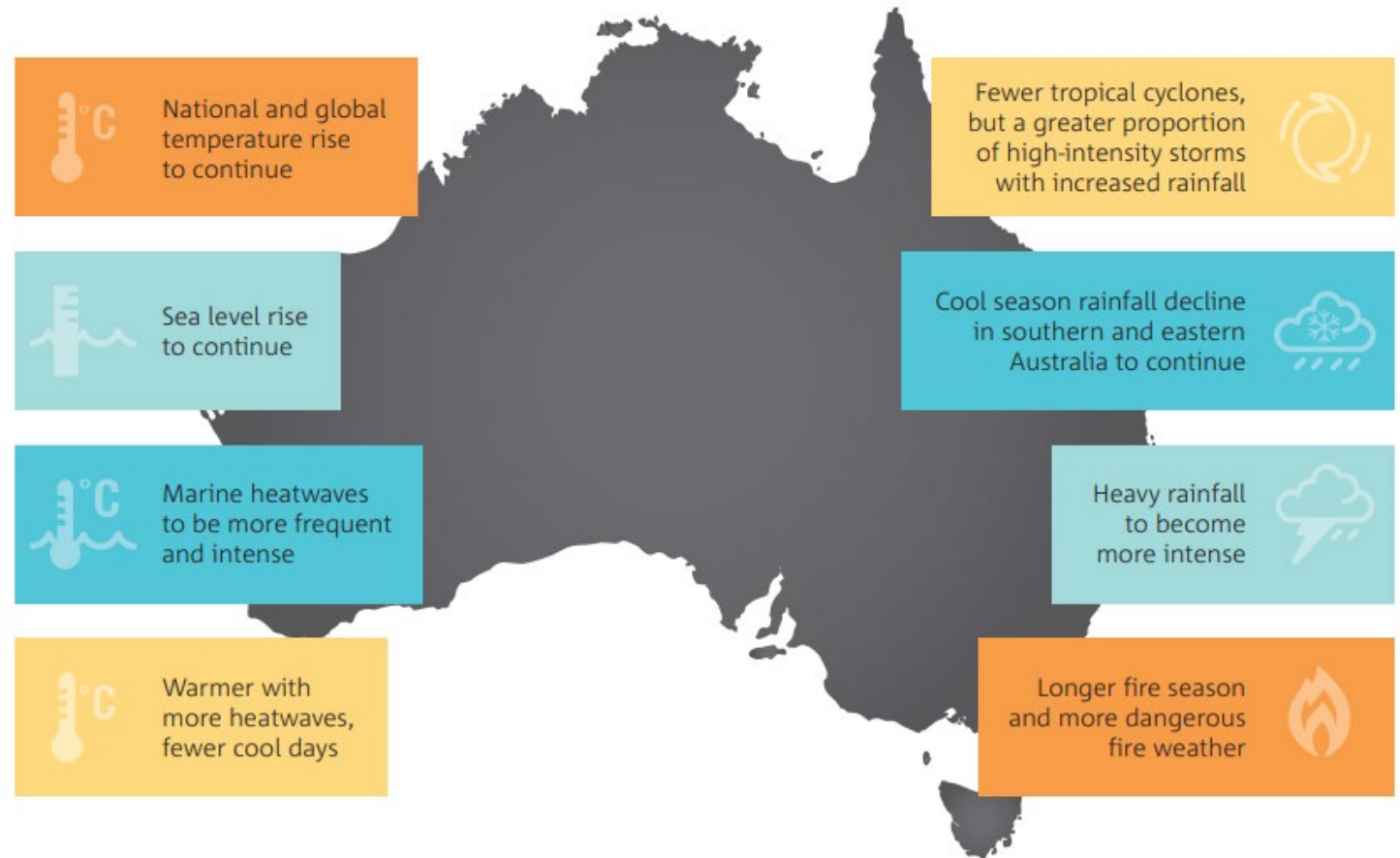


Figure 6: Source: The Bureau of Meteorology and CSIRO, State of the Climate 2022

ACT climate change

Climate change is evident in the ACT through the occurrence of widespread bushfires, such as the Orroral Valley fire, which burned approximately 86,562 hectares between 2019 and 2020.

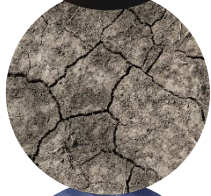
Four main climate impacts have been identified for the ACT (adapted from the ACT Climate Change Strategy).



Bushfires becoming more frequent and severe as rainfall is reduced and temperatures increase.



Heatwaves becoming hotter, longer and more frequent during the day and night.



Droughts becoming more frequent and prolonged as rainfall is seasonally more variable.



Storms becoming more frequent and severe over a longer summers.

We have already seen more frequent extreme heat and storm events, a change in rainfall patterns, an increase in extreme fire weather and an extension of the fire season (*State of the Climate 2022*, CSIRO and Bureau of Meteorology).



Scenario planning

Based on emission pathways

Scenario planning helps us understand how resilient and robust we can be in various future scenarios.

We have undertaken scenario analysis on a range of future possibilities based on the emission scenarios (called Representative Concentration Pathways or RCPs) adopted by the IPCC. This plan uses two IPCC scenarios – RCP 8.5 and RCP 4.5 – selected as they are considered most likely to occur and most suitable for our planning:

RCP 8.5	RCP 4.5
<p>Business as usual trajectory featuring the current suite of climate-related policies with global greenhouse gas emissions continuing to rise at current rates (the current global path).</p>	<p>A transition to a low carbon economy is delayed until 2030 but a rapid transition towards net zero from 2030 to 2050 sees emissions stabilise at half today's levels by 2080. This scenario has a high reliance on energy efficiency, grid decarbonisation and negative emissions technologies.</p>

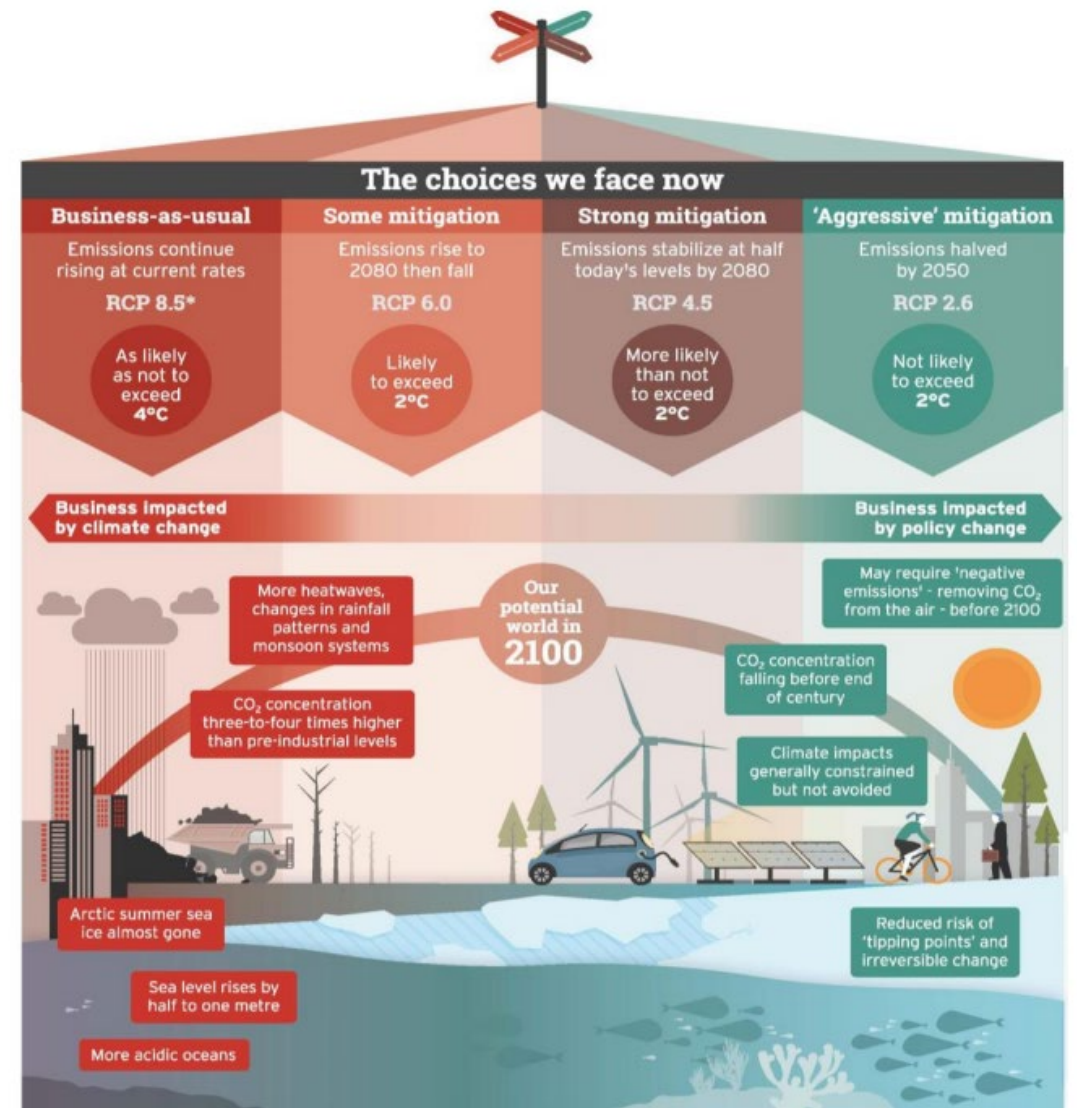


Figure 7: Source: Intergovernmental Panel on Climate Change, Fifth Assessment Report (AR5), Climate Change: Action, Trends, and Implications for Business

Projections

Downscaled modelling

To generate local projections, we used the NARClIM 1.5 dataset from AdaptNSW. NARClIM is applied by the ACT Government and Icon Water in its strategy and action planning. This climate model produces the latest climate data available for our region at the most detailed resolution. It generates data at a ten-kilometre scale for over 100 weather and climate variables.

We have used this data to identify 12 projections (see Table 1) covering temperature increase, change in rainfall, and percentage of evapotranspiration (evaporation and transpiration), across both of the prioritised climate scenarios (RCP 4.5 and 8.5).



NARClIM 1.5 is based on the IPCC emission scenarios and built from three global climate models and two regional climate models for **near** and **far future** projections.






Projections

ACT projections snapshot

The following NARClIM 1.5 climate change projections provide the basis for our adaptation planning. They are comparable with IPCC and CSIRO projections over these time periods, noting that observations show that Australian temperatures have already increased by 1.4 degrees since national records began in 1910.

Table 1: NARClIM 1.5 projections
based on Canberra Airport

Climate variable	Near Future 2020-2039		Far Future 2080-2099		Projections assumed for this adaptation plan	
	RCP4.5	RCP8.5	RCP4.5	RCP8.5	Near Future 2020-2039	Far Future 2080-2099
Temperature increase (°C) 	0.5–1.5	0.6–1.7	1.8–2.5	4.1–5.1	1.5	4.7
Changes in rainfall (%) 	+12 to -9	+10 to -11	+1 to -14	-1 to -27	-7	-23
Increase in evapotranspiration (%) 	1.6–3.1	1.6–4.2	4.3–6.8	9.6–13.1	3.7	12.5

These projections show our climate is likely to become hotter and drier, particularly given the cascading impacts of some of these changes may be exponential rather than linear.



High fire danger days increasing



Hot days over 35°C increasing



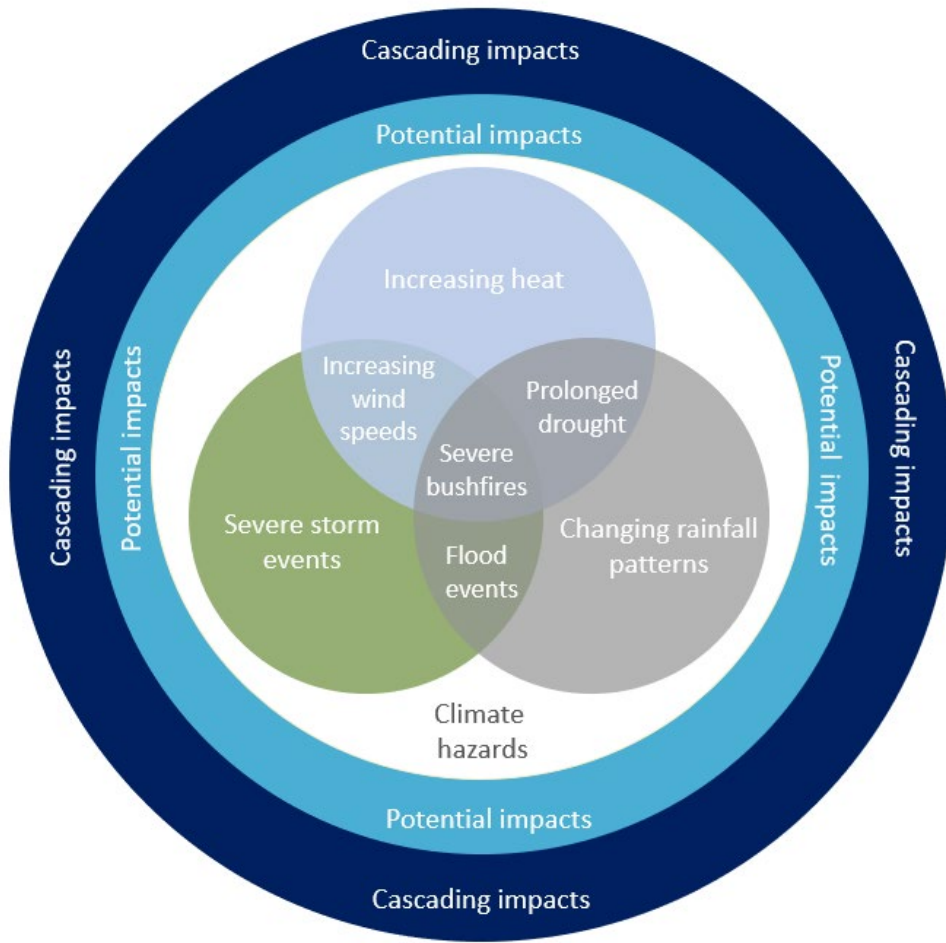
Cold nights under 2°C decreasing

3. Plan



Vulnerabilities to climate change

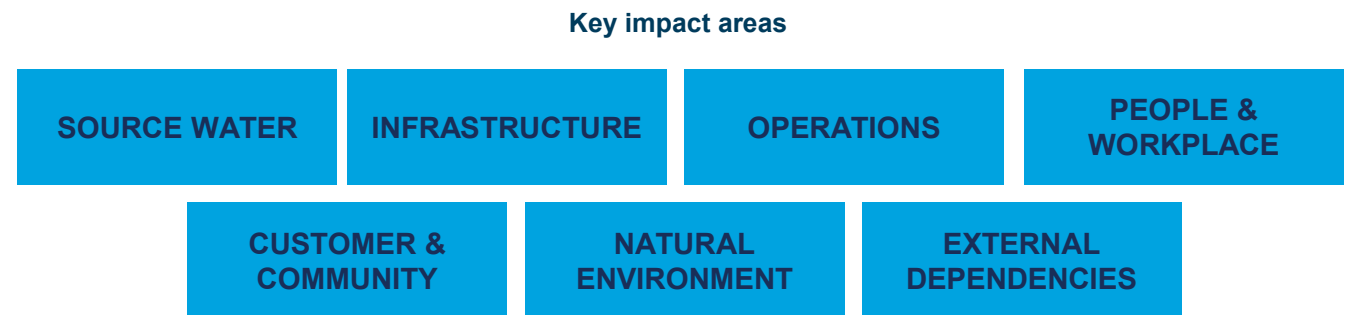
Impact assessment



Using the scenario planning and projections data described in Chapter 2, we then analysed how this would impact our ability to provide services to the community.

We conducted 10 internal workshops with subject matter experts to brainstorm and assess our vulnerability. The impacts, based on the **key climate hazards** relevant to the ACT region, are summarised in Figure 8. These impacts could occur as individual events, in unison, or in sequence. We also considered other possible cascading impacts that could overlap on our business.

Over 400 individual impacts were raised through these workshops across the seven impact areas adapted from the WSAA Climate Change Adaptation Guidelines:



The individual impacts were synthesised into 78 key potential impacts (summarised in Table 3 on page 26 and listed in full in Appendix B). Cascading impacts, stretching across the entire Icon Water business are shown in Figure 9 on page 27.

Figure 8: Key climate hazards and relationship with compounding and cascading impacts. This is conceptual only.

Vulnerabilities to climate change

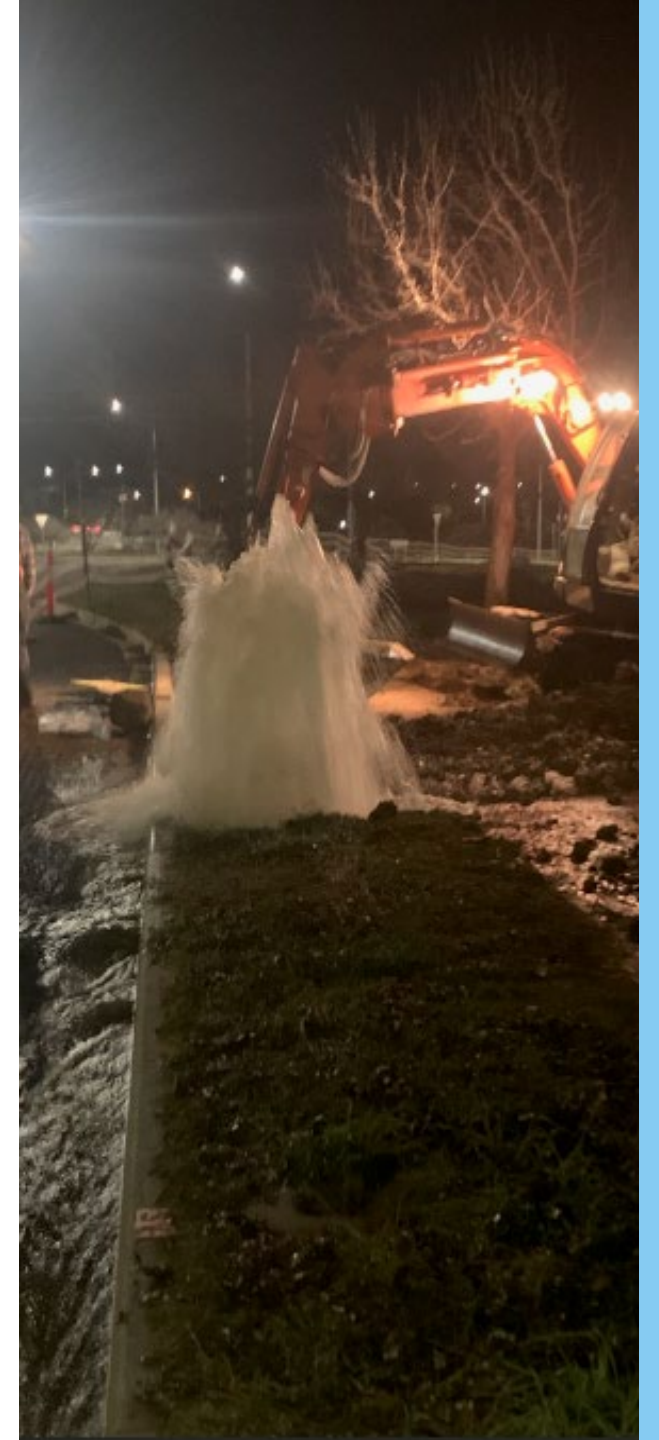
Stakeholder survey feedback

We also sought external feedback via a survey that asked stakeholders to prioritise elements for us to consider in our adaptation planning. Respondents included representatives from WSAA, the ACT Chief Minister, Treasury and Economic Development Directorate (CMTEDD), ACT Environment, Planning and Sustainable Development Directorate (EPSDD), and the ACT Commissioner for Sustainability and the Environment.

The top five ranked elements are identified in Table 2 and have been included as potential impacts for our planning purposes.

Table 2: Top five ranked elements from survey

Top five survey results	
1	Catchment condition and runoff reduced (bushfire, blue-green algae, new weeds etc.)
2	Unexpected climatic changes making planning more difficult
3	Demand for alternative water sourcing options (including purified recycled water)
4	Disruptions to sourcing critical supplies
5	Community expectation to accelerate climate change mitigation and adaptation








Impacts

Snapshot of potential impacts

Impacts are listed in full in Appendix B

Table 3: Snapshot of potential impacts

Table 3: Impact area	 Increasing temperature	 Severe storms	 Changing rainfall	 Prolonged drought	 Increasing bushfire severity
SOURCE WATER	<ul style="list-style-type: none"> • More algal blooms • Changing ecology in source water affects quality 	<ul style="list-style-type: none"> • Flash flooding causes turbidity and erosion in source water 	<ul style="list-style-type: none"> • Less water flowing into our dams 	<ul style="list-style-type: none"> • More demand for catchment recreation • Calls to assist neighbouring communities 	<ul style="list-style-type: none"> • Ash, debris and firefighting materials impact water quality in dams
INFRASTRUCTURE	<ul style="list-style-type: none"> • More pipe leaks and bursts from thermal expansion • Heat stress on electrical equipment 	<ul style="list-style-type: none"> • Storm damage causes damage to trees, vegetation and infrastructure 	<ul style="list-style-type: none"> • Unexpected changes in climate make future planning difficult 	<ul style="list-style-type: none"> • Subsidence (shrinking of clay-based soil) causes infrastructure damage 	<ul style="list-style-type: none"> • Infrastructure damage causes outages, disrupting operations and customers
OPERATIONS	<ul style="list-style-type: none"> • Increases in volatile organic compounds impact sewage heat treatment performance • More sewer odours 	<ul style="list-style-type: none"> • More reactive maintenance from overflows • More frequent energy disruptions 	<ul style="list-style-type: none"> • Less demand for biosolids-derived materials (Agri-ash) 	<ul style="list-style-type: none"> • More sewer blockages from tree root intrusions • Reduced flushing/low flows cause operational issues 	<ul style="list-style-type: none"> • Pressure on water treatment processes
PEOPLE & WORKPLACE	<ul style="list-style-type: none"> • Staff exposed to health risks (e.g. heat stress, smoke inhalation) 	<ul style="list-style-type: none"> • Transport disruptions impact staff availability 	<ul style="list-style-type: none"> • Disruptions to project timeframes and costs 	<ul style="list-style-type: none"> • More regular switching between water sources to address contamination 	<ul style="list-style-type: none"> • Staff can't access sites due to bushfires
CUSTOMER & COMMUNITY	<ul style="list-style-type: none"> • Large and essential supply customers need help to build resilience 	<ul style="list-style-type: none"> • Difficulty providing standard service levels during emergencies 	<ul style="list-style-type: none"> • Customer dissatisfaction if service levels reduce 	<ul style="list-style-type: none"> • Water restrictions across the community 	<ul style="list-style-type: none"> • Higher demand for water for urban firefighting
NATURAL ENVIRONMENT	<ul style="list-style-type: none"> • Changes to biodiversity (decline, invasive species) 	<ul style="list-style-type: none"> • Sewer overflows cause environmental damage 	<ul style="list-style-type: none"> • Increase in environmental water needs 	<ul style="list-style-type: none"> • Stress on catchment health 	<ul style="list-style-type: none"> • Catchment biodiversity loss
EXTERNAL DEPENDENCIES	<ul style="list-style-type: none"> • Stricter and accelerated targets for emission reduction 	<ul style="list-style-type: none"> • Supply chain disruptions for critical supplies 	<ul style="list-style-type: none"> • Increased water demand for food production in local area 	<ul style="list-style-type: none"> • Financial cost associated with increasing water security 	<ul style="list-style-type: none"> • Energy and communications disruptions during emergencies

Cascading impacts

Cascading events occur when one event or change triggers, magnifies or contributes to others. We have identified 15 cascading impacts as part of this plan – they are important because they magnify the core impacts of climate change on our business.

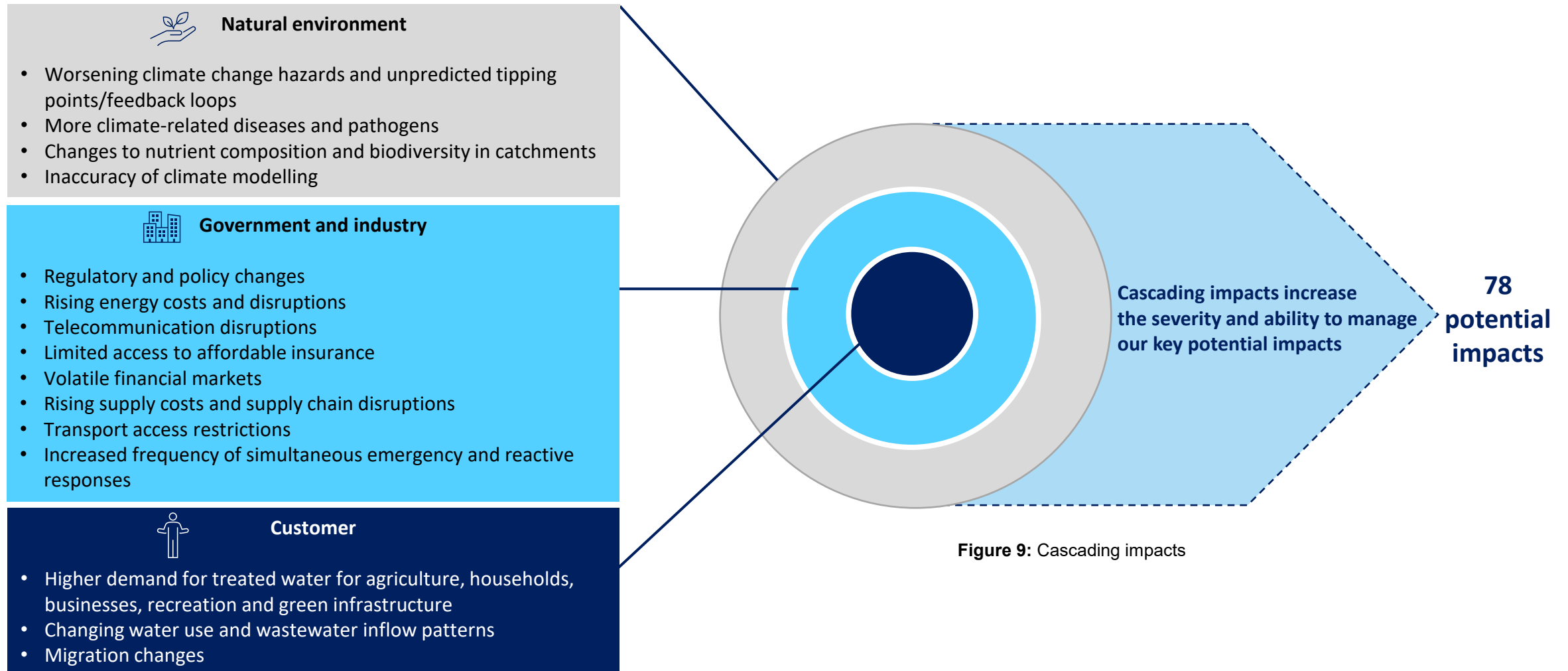


Figure 9: Cascading impacts

Existing resilience programs

We have a wide range of business resilience programs already in place that improve our ability to manage climate change impacts. These programs need to be sustained.



- We learned from two major bushfires (2003 and 2019–2020).
- We reduce fuel load in vegetation around assets as per our annual Bushfire Operational Plan (BOP).
- We promote Total Fire Ban (TOBAN) and bushfire alerts to staff with clear guidelines around work restrictions.
- We can treat elevated levels of ash and sediment in our source water at Googong Water Treatment Plant (GWTP) using powdered activated carbon processes.



- We have infrastructure redundancies and processes for business continuity during severe events e.g. two water treatment plants; backup power generators at critical infrastructure.
- We upgraded the high voltage power infrastructure at our largest wastewater treatment plant.
- We incorporate climate change challenges into our asset management plans, circular economy plan, investment planning and delivery process, and asset replacement programs.
- We use adaptive planning when developing asset management strategies.



- We have incorporated climate projections in our design and construction standards.
- We ensure sufficient fire protection, backup energy and critical supplies at site.
- We use Sustainable Design Guidelines in all infrastructure projects.
- We undertake sustainability assessments for all capex projects over threshold values.
- We use sustainable and climate-resilient materials and ensure our assets have the capacity to address and withstand climate changes now and into the future.

Existing resilience programs



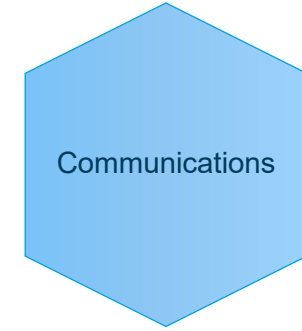
- Icon Water is a critical stakeholder within ACT and region emergency management arrangements.
- Our emergency planning is integrated with internal processes and with various ACT, NSW and Commonwealth agencies and their emergency plans.
- We are a valued member of emergency committees and provide support to other agencies to mitigate the impacts of climate change-related hazards.



- Our health, wellbeing and safety campaigns increase staff resilience against health risks as climate change progresses e.g. heat and smoke inhalation, climate anxiety.
- Our crews are provided with personal protective clothing that has heat and sun protection to address warming temperatures.



- We developed our Climate Change Adaptation Plan and eMission Possible Plan in consultation with subject matter experts.
- We engage with our internal stakeholders to ensure controls are current and updated across the business.
- We contribute to regional committees on catchment management issues and emergency responses.





- We provide a range of public communications focused on climate change from community tours, education about drought tolerant plants, and campaigns to promote wise water use to Canberra and the surrounding region.

Risk assessment

We performed a detailed risk assessment, relevant to the five-year outlook, to understand our ability to respond or recover from the impacts revealed through our workshops. The risks were rated in terms of likelihood and consequence, in line with our corporate risk management framework and ranged from high to low risks.

Climate risk is dynamic and increasing over time, and as such, **our risk target is to maintain a steady or reduced risk profile to climate change pressures.**

Our most significant climate risks	
	Reduced streamflow into catchments plus evaporation leads to declaration of Level 3 water restrictions , resulting in a severe impact to business operations.
	Bushfires lead to loss of water and/or sewage treatment plants and network , causing an inability to treat/convey sewage or water, resulting in a severe impact to business operations.
	Cumulative climate change hazards lead to increased energy operating, cooling and fuel costs, resulting in a financial impact.
	Changes in water use patterns due to drier climate leads to increased reactive maintenance for blockages in the network, resulting in a financial impact.



4. Deliver



Implementation

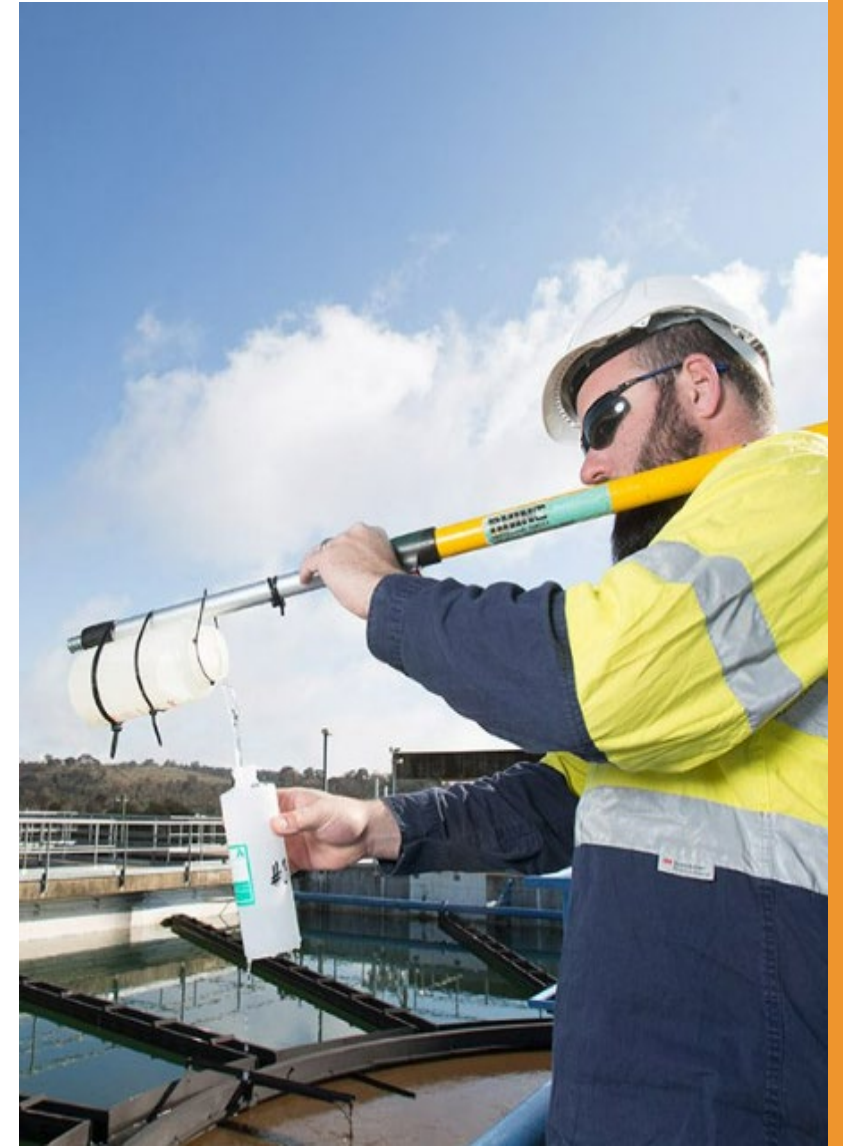
Adaptation actions

To manage and mitigate the risks from Chapter 3, this plan has identified a broad range of internal adaptation actions for completion by 2028. These actions are fluid and others may be added in due course. Key themes for these actions have been described over the following pages. Approximately a third of the actions identified are new to this plan and two thirds are the continuation of actions already underway or in the pipeline for business resilience reasons.

We will progress and invest in the actions in accordance with pricing regulator endorsement and our business planning, development, delivery and review frameworks. Actions are designed to be adapted if required based on their effectiveness as well as emerging climate conditions.

Actions with longer completion timeframes will be incorporated into future versions of this plan.

The actions fall into five key focus areas (enhanced focus areas) which require increased effort, and which are described in more detail on the following pages.

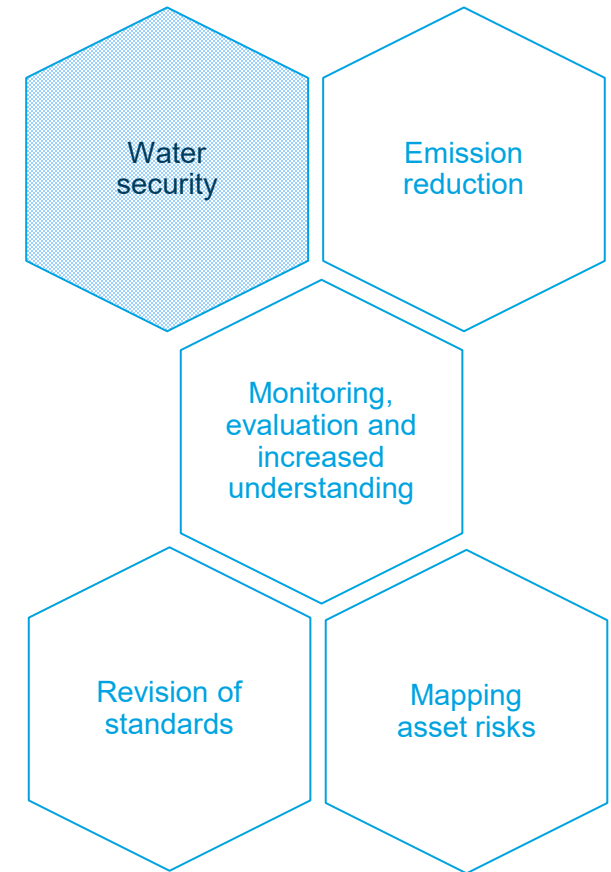


Enhanced focus areas

1. Water security

Our focus is always on ensuring long-term water security to support our growing population and to meet the challenges of a changing climate. We expect more rainfall variability, with severe droughts predicted to occur more often in the future. To prepare for this, we will:

- Prepare a water security plan, that integrates our short and long-term water security planning. This will draw upon the lessons from the recent (2017–2020) drought and consider operational changes, demand management and infrastructure solutions.
- Develop and implement an Integrated Water Management Program, to ensure our systems are integrated and coordinated, and future investment decisions consider the whole water cycle.
- Explore and prioritise new source water augmentation options, including alternative climate independent water supplies that increase resilience to drought.
- Look to expand our water conservation program so we can continue to maintain our high standards of service to the Canberra community, extend our collaboration with partners and our community, support our regional neighbours and value and respect our local catchments.



Enhanced focus areas

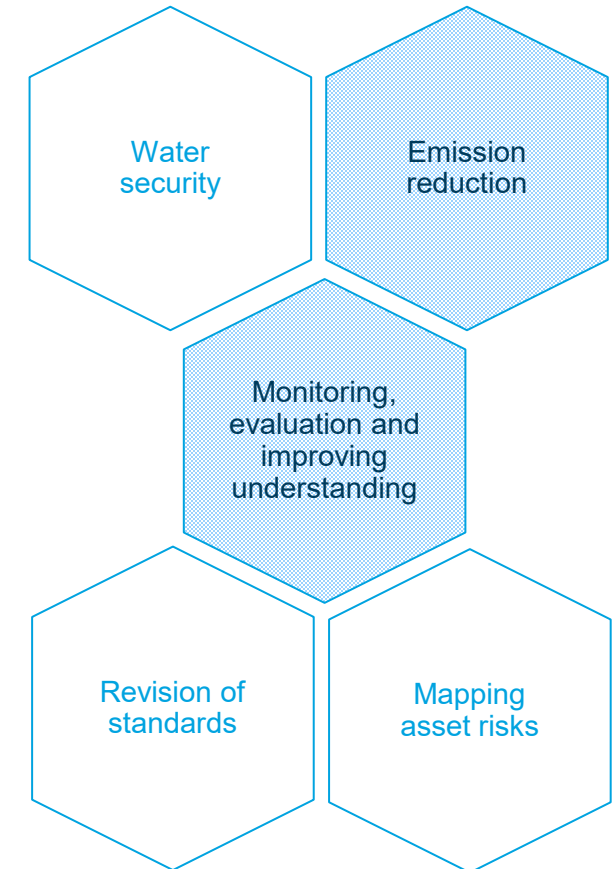
2. Emission reduction

Eliminating greenhouse gas emissions is a critical part of adaptation – it helps limit the severity of climate change and, therefore, its impacts. We have set a target and pathway to achieve net zero in our eMission Possible Plan, consistent with the ACT Government's commitment. We will continue to decarbonise our business and work with government and regulators towards limiting the climate threshold to 2°C.

3. Monitoring, evaluation and improving our understanding

We can no longer make assumptions about the stability of the climate. The effects are changing the distribution of seasonal temperatures and rainfall. These shifts are resulting in novel climates. Climate change is a fast-moving field of research, and the science continues to evolve.

We will continue to improve our knowledge and use the tools available to the water industry, to ensure we feel confident in taking short and medium-term decisions that build our resilience, despite the uncertainty of these new novel climates. We will collaborate and share experience with industry bodies and climate change researchers to aid our adaptation efforts.



Enhanced focus areas

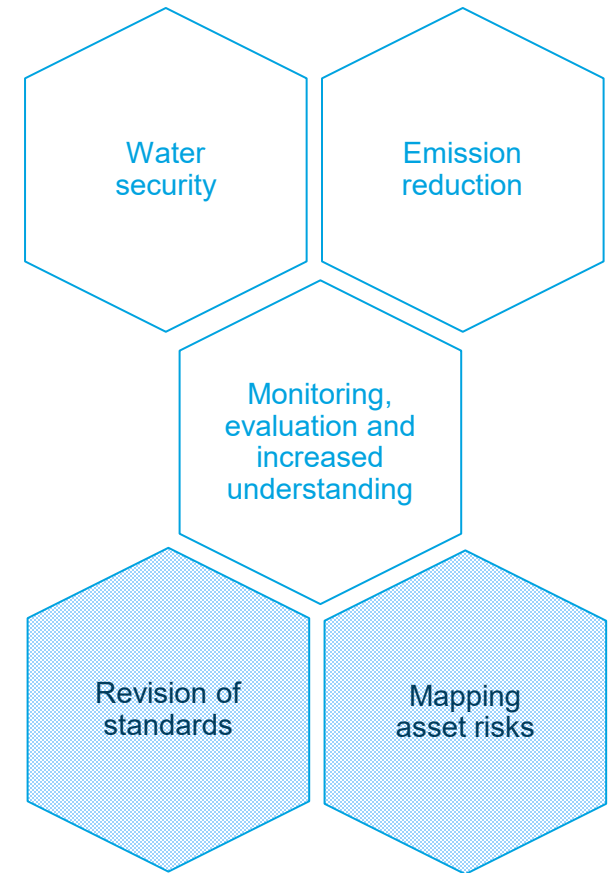
4. Revision of standards

Increasing temperatures and extreme events may impact our infrastructure and operations. In response, we will continue to update our design and construction standards and our Sustainable Design Guidelines to align with NARClIM, where relevant.

We will review our Water Supply and Sewerage Standards to ensure they adapt to changing climates. We will keep abreast of firefighting standards in catchments and urban areas so we can make sure there is water available to the community and that our assets and source water catchments remain safe.

5. Mapping asset risks

Our asset management plans currently consider climate change risks and projections. However, it would be beneficial to map climate hazards against each asset. Therefore, collaborating with the ACT Government to see what is possible around adding future climate projection layers to existing mapping tools could increase our understanding of asset risk.



Governance

Performance reporting

Icon Water's Board and Executive have primary oversight for managing and overseeing climate-related risks and opportunities. Climate change is a standing item at every Board meeting as a strategic priority on delivering towards the sustainable value objective for the business. Progress is provided through Board business performance reports around our transition to net zero and adaptation. This information is then communicated to our shareholders.

Climate risks are discussed with the Board and executive management through annual climate change risk reviews using the bowtie methodology, initiated through our Enterprise Risk Management Framework. Performance against the metrics in this plan will be provided to the Board annually as part of in-depth reviews on climate-related matters.

We will also communicate performance publicly via our Annual Report and internally via our Environmental Management System (EMS) management review process.

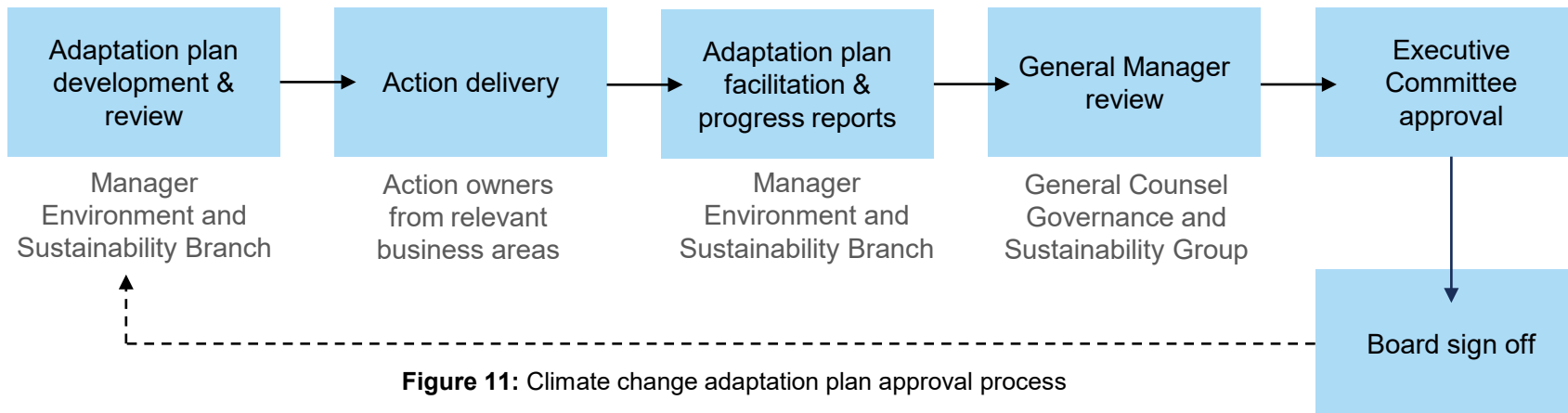


Figure 11: Climate change adaptation plan approval process



Metrics

1. To maintain a steady or reduced risk profile to climate change pressures

- Metric 1.1 – Assess current climate change adaptation impact risk profile annually and report to Executive Sponsor
- Metric 1.2 – Review portfolio of actions and consider change or acceleration if risk profile increases

2. To deliver actions towards the target risk profile

- Metric 2.1 – Assess climate change adaptation action status biannually and report to Executive Sponsor
- Metric 2.2 – Engage with action owner for any delayed actions and update



Review

Trigger points

We will remain vigilant to the impacts of climate change, and revise and improve this plan as required. This includes monitoring our exposures to climate change, tracking our adaptation actions, staying up to date with scientific developments and best practice, and operating in line with the priorities of our stakeholders and business.

We will undertake a major review of this plan after five years. Additional reviews may occur in response to any of the following trigger points:

Table 4: Trigger points for review

Trigger points
Projections from NARClIM2.0 when available
Major carbon and climate policy changes
Significant advances in climate science, technology or innovation
Extreme climate-related events
Substantial changes in global economic outlook
Considerable change in community and/or shareholder expectations



Collaboration

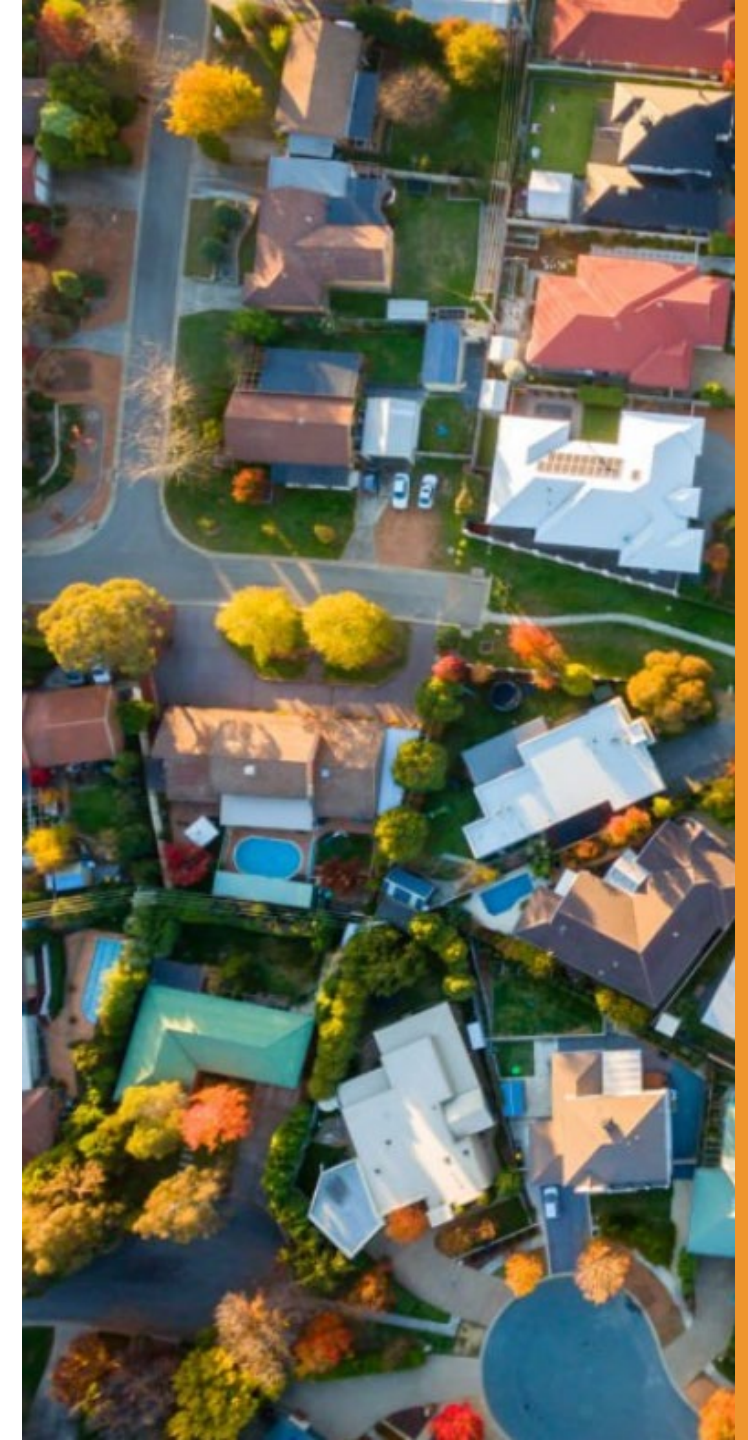
Collaboration is key

The success of this plan relies on resourcing and delivering the adaptation actions through the relevant internal business areas. **Internal collaboration** is essential to ensure cross fertilisation of opportunities and to monitor the progress of these actions.

External collaboration is also critical, to gain support for these initiatives from industry, community and government and to share effort, resources and knowledge, so we can support community resilience and be a valued partner in the community.

We actively participate on industry collaboration networks, such as the WSAA Climate Change, Energy and Environment Network.

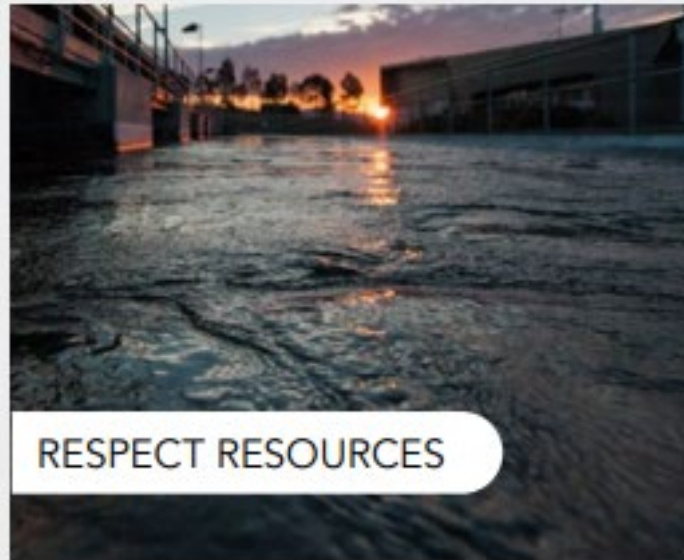
We also contribute to presentations and publications such as the WSAA Climate Change Adaptation Guidelines 2016 and Towards resilience – Climate change and the urban water industry in Australia and New Zealand, WSAA, 2021.



Ongoing commitment

This plan provides the framework for building our resilience to the impacts from climate change and supports our three sustainability principles.

Our Sustainability Principles



Appendices

Appendix A: ACT projection maps

Appendix B: Potential impacts of climate change



Appendix A: ACT projection maps

Change in days over 35°C in ACT

The Adapt NSW website, produced by the NSW Government, provides NARClIM data for NSW and the ACT. It reports predictions of climate scenarios such as hot days over 35°C, changes in temperature and high fire danger days. Figures below illustrate the single risk-based maps of the predicted climate scenarios for the years 2023–2039 (near future) and 2060–2079 (far future).

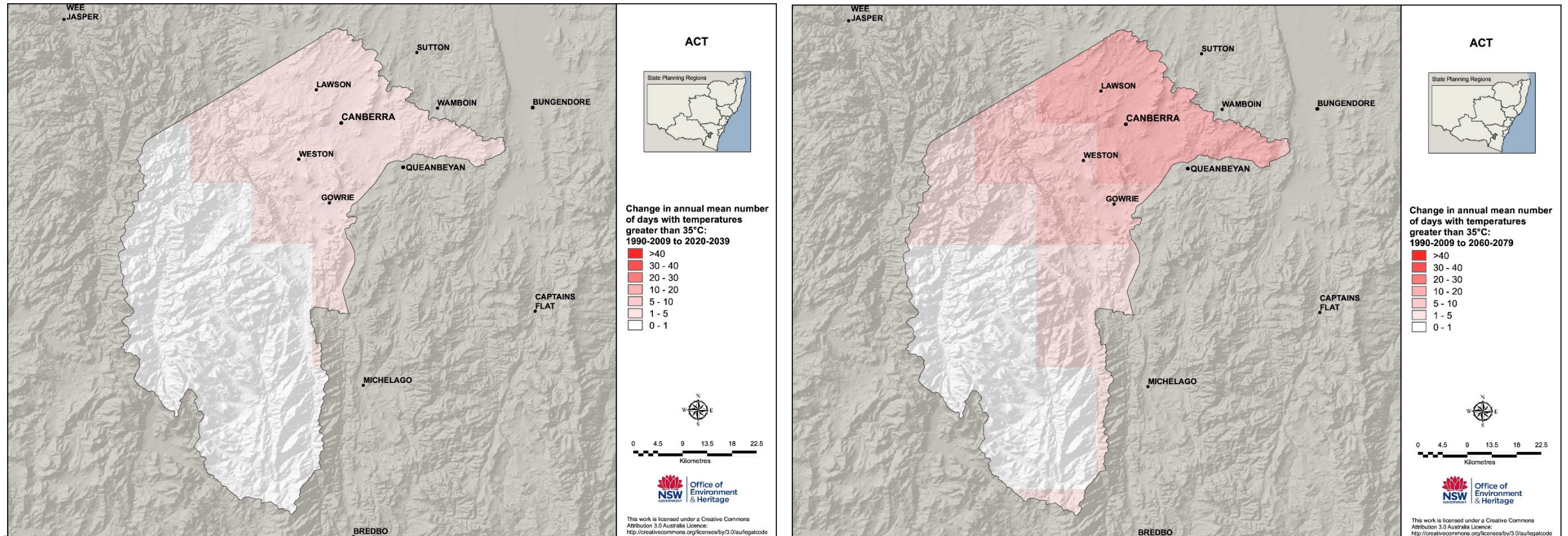


Figure A1: Change in days over 35°C in ACT

Appendix A

Change in annual mean daily maximum temperature for near and far future scenarios

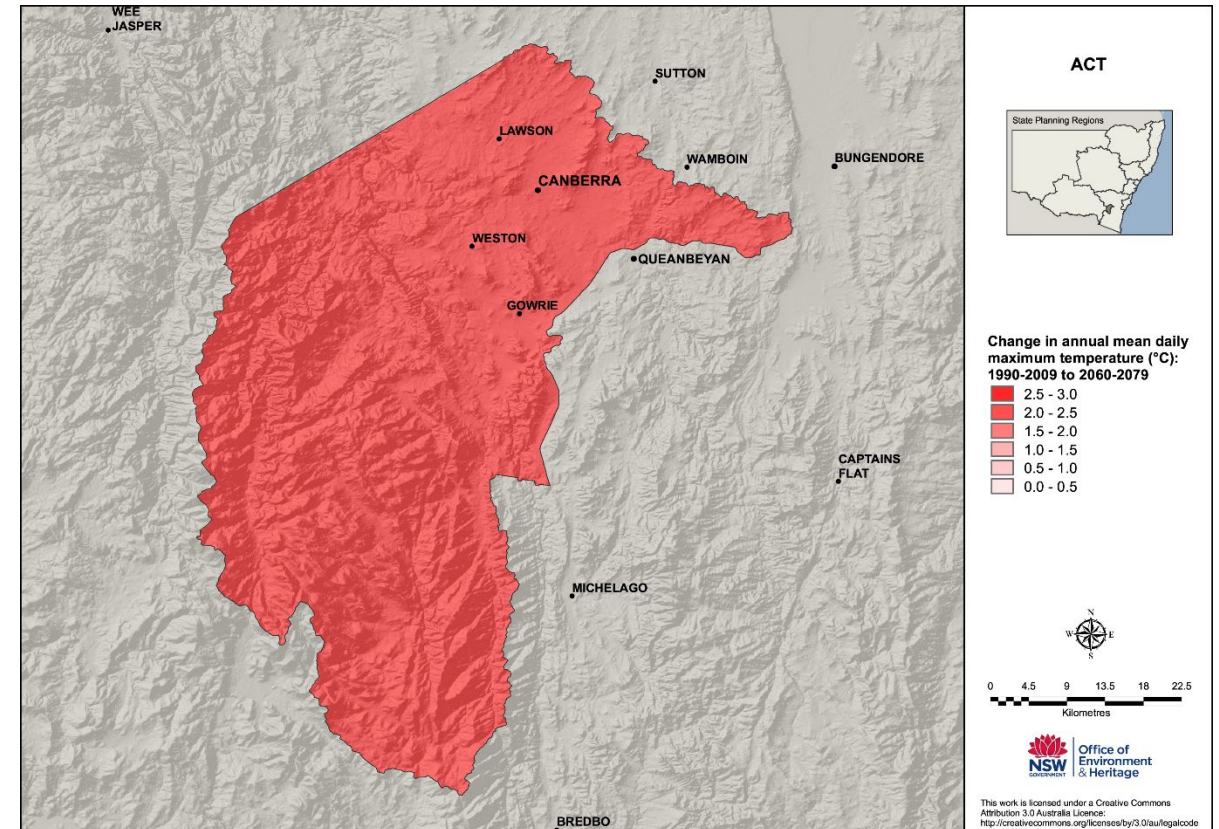
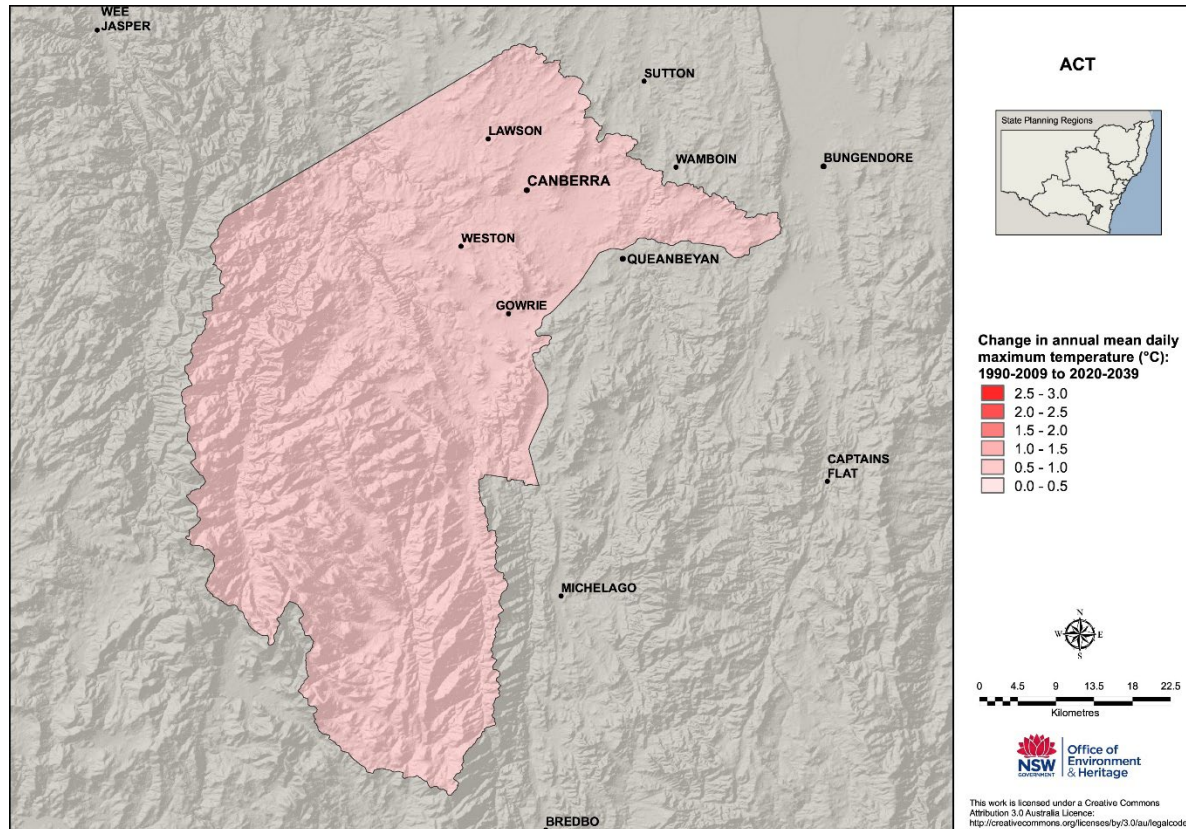


Figure A2: Change in annual mean daily maximum temperature for near and far future scenarios

Appendix A

Change in annual mean Forest Fire Danger Index (FFDI) in near and far future scenarios

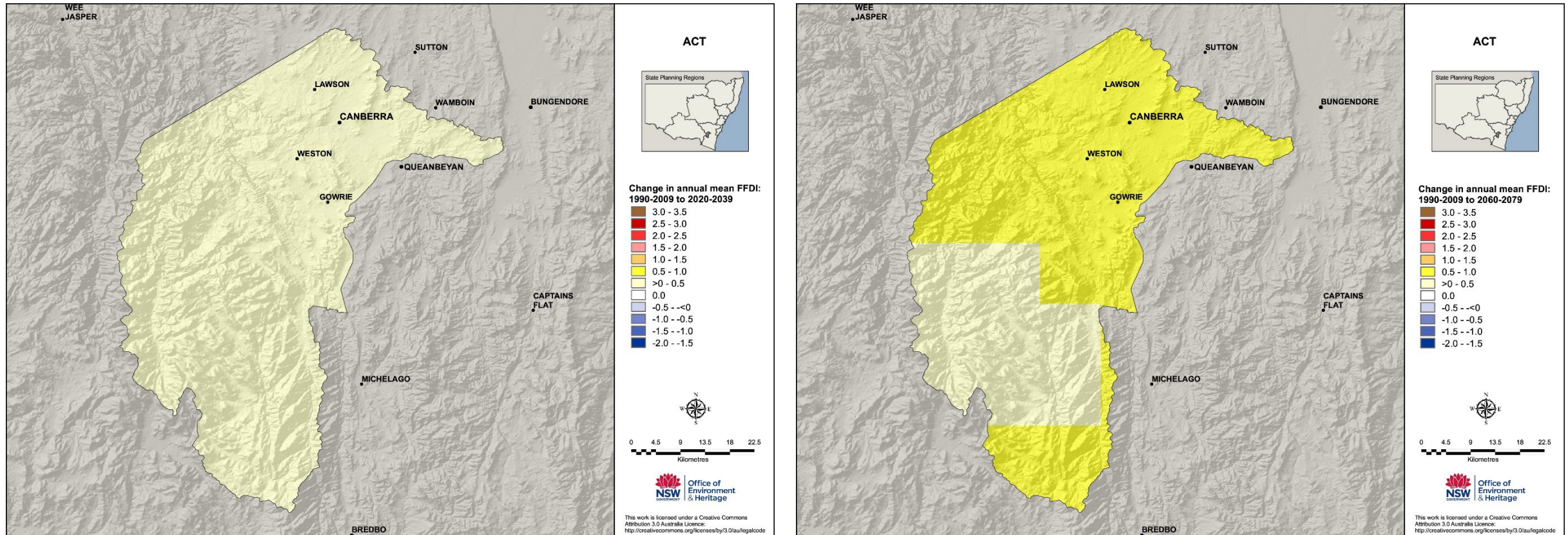
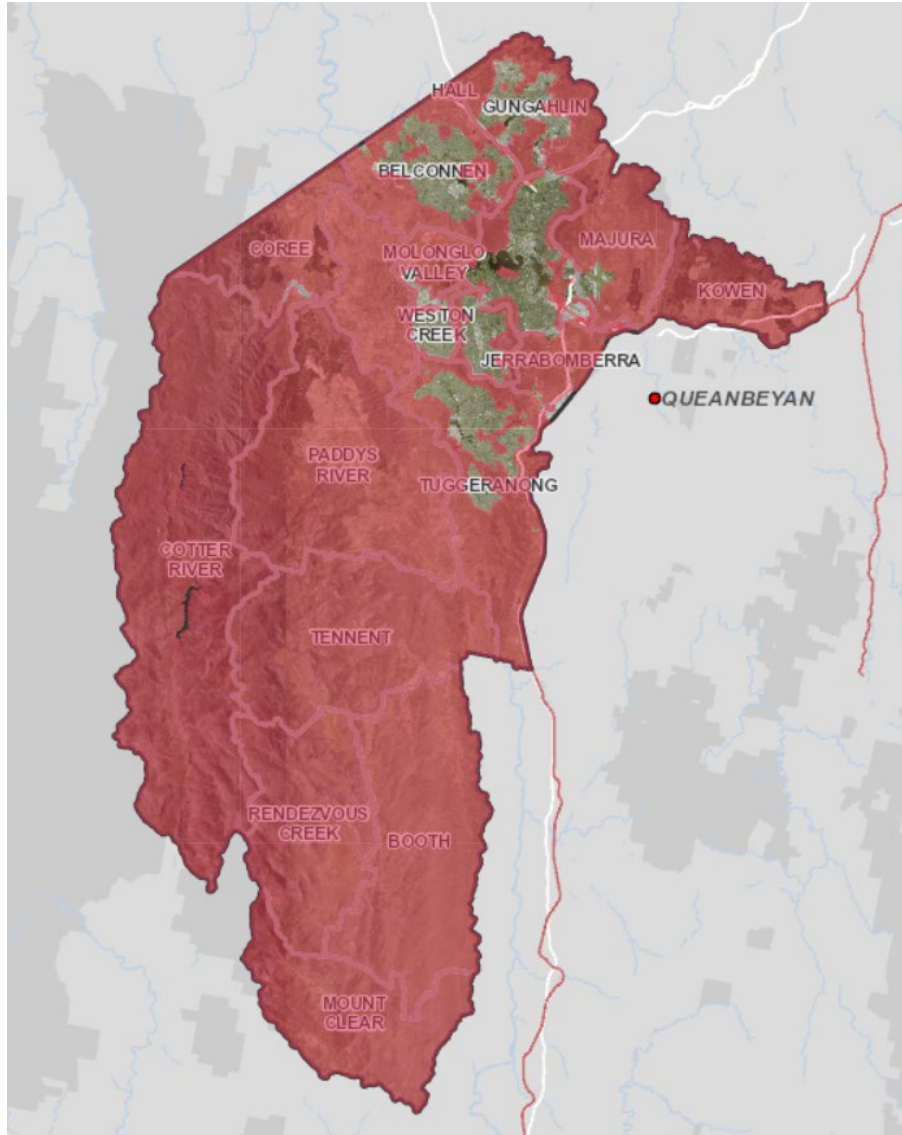


Figure A3: Change in annual mean Forest Fire Danger Index (FFDI) in near and far future scenarios

Appendix A

Current Bushfire Prone Areas in ACT in 2023



ACTmap*i* provides a single risk-based map, which shows (in red) the region of the ACT that poses a significant hazard to life and property due to bushfires.

Figure A4: Current Bushfire Prone Areas in ACT in 2023

Appendix B: Potential impacts of climate change

Table A1: Potential source water impact	
Quantity	<ul style="list-style-type: none"> Reduced streamflow into catchment (e.g. during vegetation re-growth and due to evapotranspiration) Reduced ability to share water with other users and difficulty meeting pumping rules for abstraction Increased use of water restrictions Water loss from increasing dam evaporation Increasing unauthorised water abstractions from network and raw water sources under drier conditions
Quality	<ul style="list-style-type: none"> Changes to the ecology introducing new species in catchments which may impact water quality Increased sediment, turbidity and nutrient loading in catchments, dams and water sources including increased algal blooms, pathogens and organics Contamination from bushfires and firefighting
Potential infrastructure impact	
Infrastructure damage	<ul style="list-style-type: none"> Damage to infrastructure from natural hazards such as storms, floods and bushfires cause disruption to operations and customers Increased rate of leaks and bursts in the network from thermal expansion/contraction and settling/subsidence Increased rate of failure of electrical equipment due to heat and storms
Capital projects	<ul style="list-style-type: none"> Disruptions to project timeframes, regulatory requirements and costs from natural hazards Difficulty in future planning from unexpected climatic changes e.g. higher east coast rainfall events from shifting ocean currents

Potential operational impact	
Sewer network	<p>Increased reactive maintenance from blockages and overflows in network due to tree root intrusion into pipes</p> <p>Increasing odour, pipe corrosion and safety risks due to increase in hydrogen sulphide concentration and increasing temperatures</p>
Lower Molonglo Water Quality Control Centre (LMWQCC) – Sewage Treatment Plant	<p>Unable to handle changes to sewer flow patterns caused by extreme events with current operational settings</p> <p>Need to reduce fugitive greenhouse emissions to prevent contributions to climate change</p> <p>Higher water temperatures lead to change in sludge volatiles affecting biosolids treatment performance</p> <p>Reduced agricultural demand for Agri-ash if unsuitable climatic conditions</p> <p>Damage to or loss of infrastructure from natural hazards prevents treatment of sewage</p> <p>Increase in odour complaints from customers and staff with increased heat</p>
Water network	<p>Increased water demand for urban firefighting to combat increasing bushfire hazards</p> <p>Faster decay rate of chlorine residuals change our chlorine dosing requirements with increasing temperatures</p> <p>Coagulation chemicals become less effective under increased temperatures</p> <p>Increasing water bursts from deterioration of water pipes under variable climate conditions</p> <p>Reduction in water volume and increased contamination incidents require higher frequency of switching between water sources and greater need to use the Murrumbidgee to Googong (M2G) pipeline, Cotter Pumping Station (CPS) and Murrumbidgee to Stromlo pipeline</p> <p>Fewer available days to run M2G due to low flows in Murrumbidgee River</p>
Emergency	<p>Increased need to support emergency management responses with water supply</p> <p>Difficulty providing adequate service levels during natural emergencies if infrastructure or operations are unavailable</p>
Energy	<p>Increased energy operating costs associated with increased pumping from less efficient water sources</p> <p>Increased energy system disruptions for continuity of essential services and critical assets</p> <p>Reduction in efficiency of solar energy generation</p> <p>Increased fuel costs associated with transportation (of equipment and products and personnel)</p>
Waste	<p>Changing regulations to improve and report circular economy and emissions metrics</p> <p>Increased clean up required after extreme events</p> <p>Increasing volumes of sludge waste from operational processes when treating poorer quality water</p>

Potential people and workplace impact

Staff

Limited staff available for critical positions because unfavourable climate affects workplace conditions and transport disruptions
 Staff unable to undertake physically demanding activity due to heat and sun exposure
 Increased exposure to greater health risks from natural hazards (e.g. asthma, mental health and heat stress)
 Increasing work-load for staff from increased adaptation/mitigation actions enacted
 Restriction to work sites during extreme events e.g. Forest Fire Danger Index (FFDI) > 30 restricts remote work and planned work
 Reduced productivity of staff from unfavourable climate affecting workplace conditions

Fleet

Government/shareholder expectation to transition to zero emission fleet

Potential customer and community impact

Customer expectation

Customer dissatisfaction from reduced levels of service (e.g. inability to consistently respond in a timely manner, potential health risks)
 Expectation that Icon Water will support surrounding region (e.g. match water restrictions, share or trade water etc.)
 Price of services may increase affecting affordability
 Increased community expectation to accelerate mitigation and adaptation to climate change
 Increased pressure or regulation to reuse water (including purified recycled water)

Demand

Increased urban canopy and greater use of cool and wet spaces increases water demand (e.g. cool zones, evaporative cooling)
 Unexpected population changes as climate change increasingly drives migration

Customer Resilience

Large and essential supply customers need assistance to build their climate resilience for water and sewer services
 Customer decentralisation of water and sewer systems reduces demand, revenue and sewer flow
 Household water use decreases with increasing awareness to improve resilience, reducing revenue and sewer flow

Potential natural environment impact	
Environmental flows	Higher environmental flow rates may be required to prevent unacceptable impact to the natural environment Decreased flows downstream of LMWQCC, due to increased reuse of outflow, may impact the environment
Land management	Increased sedimentation from flooding, bushfires and storms breach controls Intensive site land management required to manage changing climate (e.g. irrigation and weed management) Biodiversity management needs to adapt to changes in flora and fauna (e.g. invasive species, biodiversity decline, changes in breeding patterns) Increased environmental damage from sewer overflows associated with natural hazards
Potential external dependencies impact	
Supply chain	Lack of access to emergency supplies due to high demand from others Disruptions to timely delivery of critical supplies (e.g. chemicals, fuels and parts)
Other utilities	Loss of telecommunications from disruptions limits critical treatment works and remote operations Loss of power from disruptions prevents treatment, pumping and telecommunications
Finance	Financial costs of climate impact, decarbonisation and adaptation plans Assets become uninsurable from increasing frequency and intensity of natural hazards Introduction of a carbon tax increases operational, capital and procurement costs Instability of financial market limits access to finances Water security concerns increase cost of water abstraction and entitlements Increased demand for non-revenue water and wastewater services for vulnerable communities Increasing costs of insurance and workers compensation Costs passed on by goods/services providers mean increased costs to Icon Water and community
Regulation	Emissions (GHG) restricted under stricter regulations and expectation to meet more stringent targets including scope 3 Climate resilience becomes a primary focus of regulation imposing stricter operating conditions National reform of water management (e.g. introduction of national grid operator for water security) Requirement for climate disclosure in risk and financial reporting
Industry	Increased demand for water for food production and manufacturing in local area
Technology	Increased demand for hydrogen fuel production



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