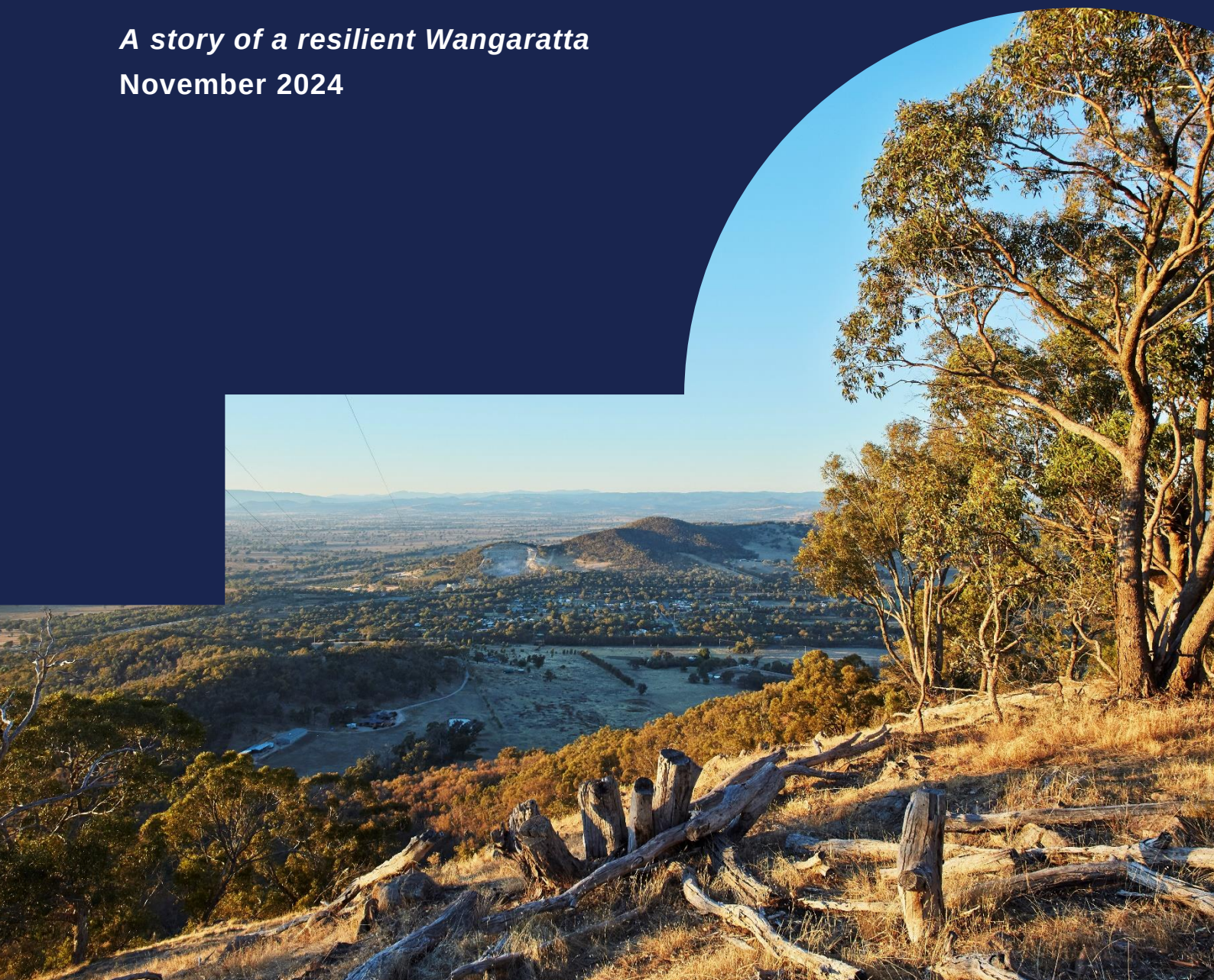
Rural City of Wangaratta

Draft Climate Adaptation Plan

A story of a resilient Wangaratta

November 2024



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Acknowledgement of Country

The Rural City of Wangaratta acknowledge the traditional custodians of the lands, on which our communities reside.

We pay our respect to their Elders past, present and emerging, and celebrate and respect their continuing cultures.

We are committed to walking beside all traditional owners as we move toward reconciliation.

[image placeholder]

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Executive Summary

The Rural City of Wangaratta Council (Council) has developed this comprehensive 10-year Climate Adaptation Plan (CAP) to address the significant challenges posed by climate change on Council's operations, assets, services, and activities. It is designed to enhance the resilience and adaptability of the Council, ensuring it can support the community to thrive amidst changing climate conditions.

The Municipality of Wangaratta (the Municipality) already experiences extreme weather events that are escalating in frequency and severity. In the future the Municipality is projected to experience higher average and extreme temperatures, longer and more severe heatwaves, lower annual average rainfall, increased time in drought and longer periods with more severe bushfire weather. Extreme rainfall events and flooding are also projected to increase in frequency and severity.

These climate changes are likely to result in increased impacts across the Municipality. Council assets, operations, and service delivery will face increased risks from climate change. Council assets may experience direct damage from extreme events and require more regular maintenance. Council may face difficulties in their operations and service delivery if staff are affected by the disaster, roads are blocked, or essential assets damaged. The increased severity and frequency of disaster events may also require Council to redirect funding from other activities to manage escalating impacts. Council assets and responsibilities considered in this plan include but are not limited to:



Council managed buildings

Parks, gardens and open spaces

Roads, bridges, footpaths, drainage & other infrastructure

Waste and recycling

Land use planning

Emergency response

Child and aged care services

At the same time, the community is likely to require increased support due to increased climate change impacts. The higher likelihood of heat-related distress, respiratory distress from bushfire smoke, physical injuries, and mental health difficulties is expected to impact community health and wellbeing. Notably, vulnerable people in the community are at greater risk of experiencing these impacts.

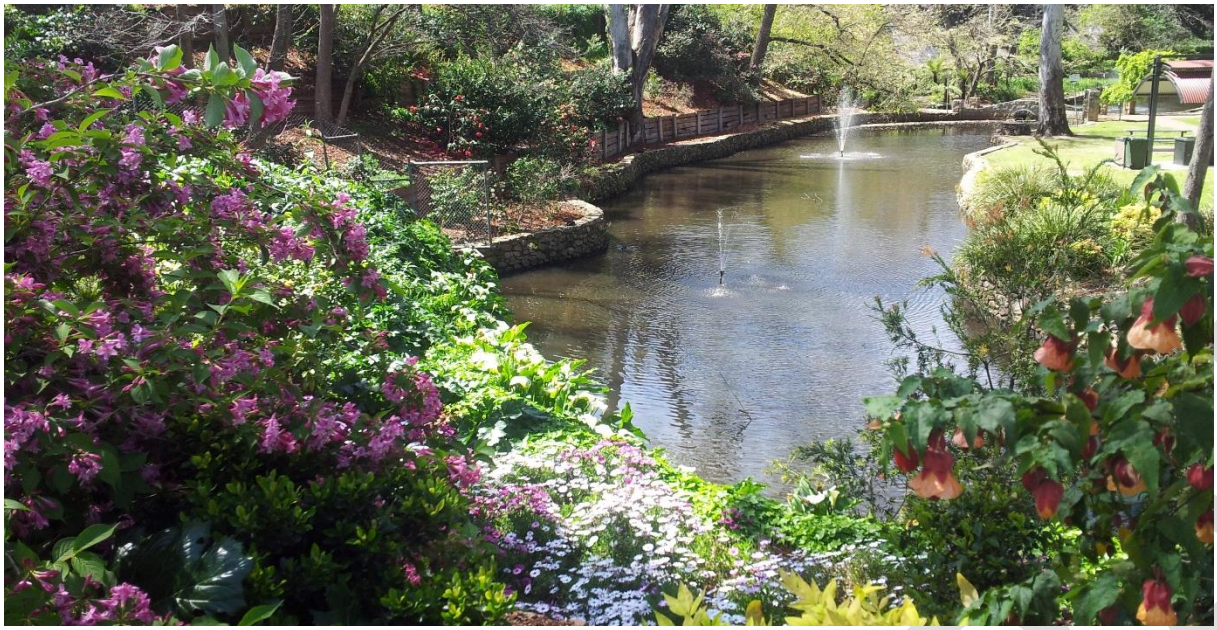
Climate change is also forecast to impact the natural environment, including assets that Council is responsible for. Higher temperatures and prolonged periods of drought are likely to cause stress to vegetation and wildlife, and extreme rainfall and storms may damage vegetation. The regional economy may suffer with limited productivity possible during heatwaves and other disasters, causing damage to businesses and their assets. The agricultural and viticulture industries, significant contributors to the Municipality's financial resilience, are particularly vulnerable due to their reliance on the natural environment. Tourism may be negatively impacted by increasing climate hazards as well.

Council recognises the importance of adapting to climate change to ensure it can continue to service its community in a way that supports social, economic and environmental sustainability and vitality. The challenges posed by climate change are significant and require an informed, targeted approach to

adaptation to effectively reduce climate risks. The development of this CAP to reduce the risks from climate change was included in the 2024–25 budget and was partly funded by Emergency Management Victoria's Risk & Resilience Program. It considers and is designed to work in parallel to existing Council plans, strategies, and policies.

This CAP is the result of extensive research and community and stakeholder engagement. It accounts for the projected changes in climate, climate risks, as well as the current and possible future social, natural, and economic context of Wangaratta.

The CAP presents 17 actions across five action areas that address over 50 risks identified in a climate change risk assessment. The actions range from updating plans and policies, to accounting for climate change in asset management and budgets, to promoting a resilient natural environment. Together, the actions provide a pathway for Council to reduce the risks and impacts from climate hazards on its operations, services, assets and activities, and to support a resilient and thriving community.



Lagoon in the Municipality

What this plan is

This Climate Adaptation Plan focuses on adaptation of Council's operations, assets, services and activities. It aims to reduce Council's risks from climate change and enable it to continue to efficiently and effectively serve the community.

What this plan is not

This is not a community climate adaptation plan. However, by reducing risks to Council operations, assets and services and creating resilience in Council activities, community will benefit from continuity of service and ongoing ability to use Council assets despite the increasing frequency and severity of climate-related weather events.

Background

RATIONALE

Surrounded by native bushland, agricultural pastures, and snow-capped peaks, the Rural City of Wangaratta offers a blend of city and country lifestyles. The Municipality is a welcoming community and home to over 30,000 people. However, like many local governments across the globe, Council faces significant challenges posed by climate change. Impacts from increased intensity, duration, and frequency of extreme weather events and unpredictable seasonal patterns threaten Council's ability to effectively and efficiently operate, deliver its services and maintain its assets. More broadly, climate change will cause impacts to the natural environment, agricultural productivity, tourism, and overall quality of life in the Municipality as well. Adapting to climate change is not only necessary, but imperative to ensure Council can meet its mandate, deliver its services, and support the ongoing wellbeing of the community into the future.

In response to these pressing challenges, Council has developed a 10-year Climate Adaptation Plan (CAP). The plan outlines the strategic approach Council will take to anticipate, prepare for, and respond to the impacts of climate change on its assets, operations, and service delivery. Built upon a foundation of research, robust community and stakeholder engagement, and a commitment to sustainability, the CAP outlines priority actions and timelines for implementation. This proactive, participatory approach aims to build a more resilient and adaptive Council, capable of supporting the community through any challenges the future climate may bring.

Adaptation is the process of adjusting to actual or expected climate and its effects to minimise harm or utilise opportunities.



Aerial view of the Municipality

Note, this plan has been developed based on physical climate risks only, based on existing climate modelling. Advice and recommendations made within this plan should be reviewed and updated as updated climate data becomes available.

PLAN OBJECTIVES

Proactive and targeted adaptation is required to effectively manage the risks from climate change and minimise impacts on Council's operations, assets, services and activities, thereby building community resilience.

The CAP aims to reduce the risks from climate change, including the increasing frequency and severity of extreme weather shocks and longer-term events. Through the actions identified, Council will be well placed to achieve its vision for climate change adaptation and resilience. Council and the community will be well prepared to respond, adapt, and continue to thrive.

Climate adaptation and resilience vision

Into the future, Council assets, operations, and services are resilient to climate change, fostering a prosperous and healthy community, economy, and natural environment

APPROACH TO CLIMATE ADAPTATION PLANNING

In the face of climate change, everyone—from government bodies to businesses, households, and individuals—shares a responsibility to adapt. As the level of government most intimately connected with its communities, councils are often the first responders to local climate impacts. Through careful stewardship of community resources, councils need to ensure that adaptation is grounded in the specific needs and circumstances of the region.

In adapting to climate change, councils need to integrate these objectives into their everyday operations. Local governments administer policies, regulations, and planning strategies that directly shape land use, risk management, and hazard mitigation. Partnering with regional bodies, councils contribute to environmental and economic initiatives that expand the reach and impact of adaptation efforts.

The services councils provide—from health and community safety to waste management and childcare—are integral to adapting to changing conditions. Ensuring Council operations, assets, and services are adapting to climate change, also supports resident's wellbeing and resilience. Additionally, councils oversee the infrastructure and public spaces that enable local businesses, industries, and users of these spaces to thrive.

Through these combined efforts and the development of this adaptation plan, the Rural City of Wangaratta strives to demonstrate climate change leadership in the region.

Planning Context

This CAP leverages existing plans, policies, and strategies, recognising the efforts already underway locally, regionally, nationally, and internationally, to reduce risks from climate change. The priority actions identified fit within the Municipality's planning context by building on existing emergency risk management strategies.

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Local context

Council has already taken steps to integrate climate change considerations within their plans, policies and strategies. Relevant key Council documents include:

- **Council Plan 2021–2025**: Describes the strategic objectives, actions to achieve the objectives, indicators for measuring progress, and resources required to implement the four-year plan (addressing climate change impacts via incorporation of strategic priority areas). The Council Plan also includes the Municipal Public Health and Wellbeing Plan with priorities related to climate change adaptation and emergency management.
- **Financial Plan 2021–2031**: Through this plan, Council commits to building climate-resilient infrastructure, consider future costs to adapting to climate change, and developing a detailed plan of actions that council can take to respond to climate change.
- **Budget 2024–2025**: Key initiatives in relation to climate change mitigation and adaptation activities within the budget include development and implementation of the climate adaptation plan and delivery of the environmental sustainability strategy actions.
- **Climate Adaptation and Mitigation Policy 2022–2025**: Taking a precautionary planning approach, this policy ensures Council's climate change actions reflect Council's operational and financial capacity and community expectations. Council is expected to provide support systems for emergency preparedness, response, and recovery activities following natural disasters.
- **Environmental Sustainability Strategy 2021-2026**: A plan for a healthy, resilient, and sustainable future across the Municipality, this strategy identifies multiple actions under priority areas to plan for and proactively mitigate against climate change impacts.
- **Asset Plan 2022-2032**: The plan identifies numerous climate change adaptation challenges and opportunities when managing Council's asset portfolio e.g., infrastructure upgrades to meet vulnerable infrastructure requirements to mitigate potential risks.
- **Wangaratta Planning Scheme**: The scheme is used to assess planning permit applications.

State context

This CAP aligns with the climate resilience objectives for 2050 outlined in the Victorian Government's Climate Change Strategy.

Other relevant Victorian state legislation includes:

- Climate Change Act 2017
- Environment Protection Act 2017
- Flora and Fauna Guarantee Act 1998
- Planning and Environment Act 1987
- Public Health and Wellbeing Act 2008
- Local Government Act 2020

National and international context

Climate change adaptation is enabled by efforts at the national and international levels. For example:

National:

- Climate Change Act 2022
- Environmental Protection and Biodiversity Conservation Act 1999
- National Climate Resilience and Adaptation Strategy

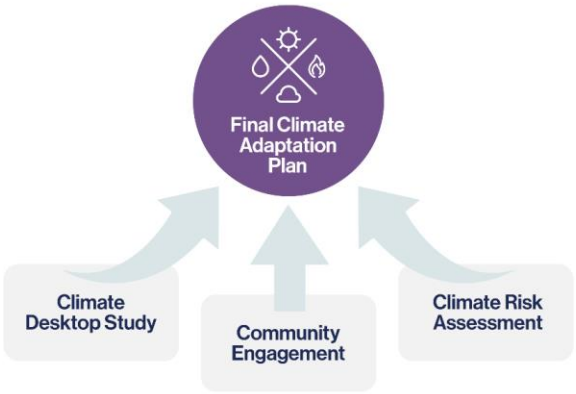
International:

- Paris Agreement 2015
- Sustainable Development Goals

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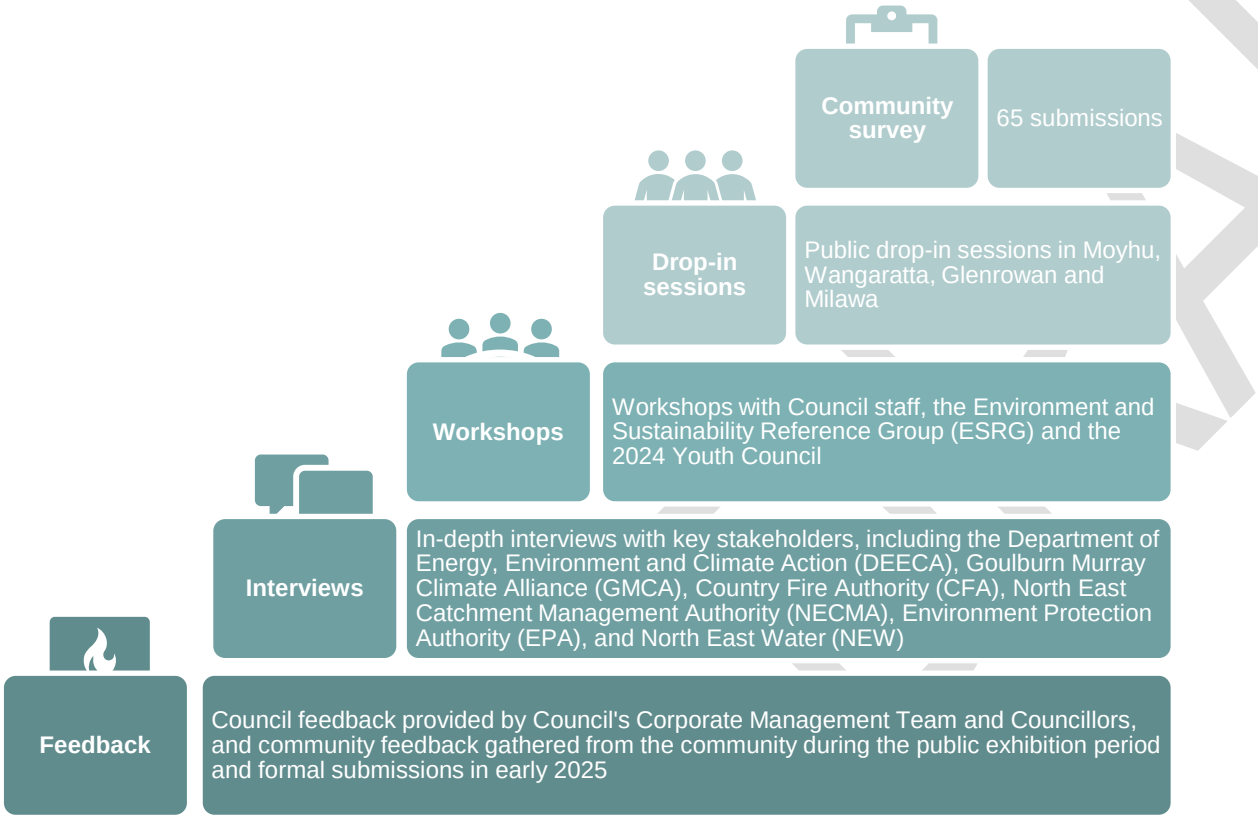
METHODOLOGY TO DEVELOP THE CAP

The CAP is the result of comprehensive community and stakeholder engagement, consultation with Council staff and extensive research including a climate risk assessment.



Community and Council consultation

Extensive consultation with the local community, key stakeholders, and Council staff was undertaken to inform the development of the CAP. Community surveys, drop-in sessions, workshops and interviews were undertaken throughout 2024. Additional community engagement will take place during the public exhibition period in early 2025.



Community sentiment highlighted climate action as an area of interest and concern. Across the engagement program, the following key themes were identified and are reflected throughout the CAP:



Climate desktop study

In parallel to the engagement program, a review of Council policies, plans and strategies was completed. Leading scientific research and community polling data such as the census were reviewed to develop a robust understanding of the region in the context of climate change and climate challenges.



Bush tucker garden

Climate risk assessment

Understanding the risks the Municipality faces from climate change is central to developing a targeted and effective CAP. Therefore, insights from the climate desktop study and consultation activities were used to develop a climate risk assessment.

55 climate risks that could impact the Municipality in the future were identified. They related to extreme temperatures and heatwaves, extreme rainfall and storms, flooding, and bushfire and were classified under four themes:



Risks were assessed based on projections for climate and natural hazards in a high and medium-emission scenario for 2030, 2050, and 2090. Findings from the risk assessment are outlined in the sections below.



Apex Park flood. Photo courtesy of the Wangaratta Chronicle

A Risk-Based Approach to Climate Adaptation

Understanding key concepts relating to climate risk can help Council pinpoint actions that assist the Municipality in achieving its vision for a resilient community capable of withstanding future climate-related shocks and stressors. Taking a proactive approach to reducing climate risk through climate adaptation and planning ensures Council can prepare for possible impacts and bring benefits to create a desirable and thriving city in the future.

This CAP is rooted in the consideration of 'climate risk', defined as situations where "the potential for adverse consequences for human or ecological systems" are felt within a system [1]. That is, the potential for negative consequences as a result of an acute or chronic event (shock or stressor). Risk evolves from the interaction between climate-related *hazards* with the *exposure* and *vulnerability* of the system to the hazard [1]. Hazards, exposure, and vulnerability are subject to uncertainty in terms of *consequence* (magnitude of the impact) and *likelihood* (chance of occurring).

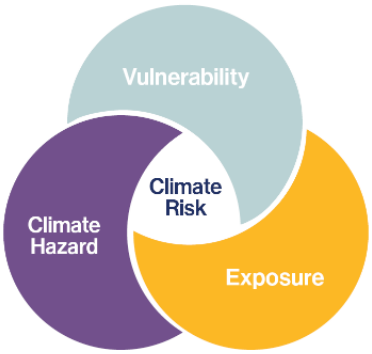


Figure 1: Climate risk framework. Based on IPCC.

Hazard

Hazards are the possible occurrence of natural or human-caused physical events that can lead to injury, health effects, property damage or loss, fatalities, loss of livelihood, disruption of services, ecosystem harm, or loss of environmental services. [2], e.g., Extreme rainfall, flood, bushfire.

Exposure

Exposure is the existence of people, livelihoods, species, environmental functions, services, resources, infrastructure, economic, social, or cultural assets within a location that could be adversely affected [2].

Vulnerability

Vulnerability is the predisposition to be adversely affected. This includes considerations of sensitivity (the degree to which an asset, system, or person may be affected by a hazard) and adaptive capacity of the asset, system, or person (that is, their ability to adjust to the hazard or cope with the change) [2]. Vulnerability can be determined by numerous factors including the materials an asset is made of, how often an asset is maintained, or the underlying health conditions of a population group.

WANGARATTA TODAY

Council's role is to serve and support the communities in its Municipality and it is best equipped to do so when it understands the make-up of these communities, their environment, and their future. This section presents a summary of these characteristics.

Socio-economic characteristics

Overall, the Municipality is a growing community. It is currently home to 30,002 people (as of 2023), with Wangaratta home to 19,712 residents.

The socio-economic profile reveals a low unemployment rate (2.9%) and moderate economic hardship, as reflected in the municipality's ranking (30th of 80) on the Victorian socio-economic disadvantage index. A 67% increase in homelessness since 2016 has also driven demand for specialised services, with over 600 residents seeking assistance. Education levels show that nearly half the population (44.1%) has completed Year 12 or equivalent, with 563 students attending university in 2021. Age distribution highlights the need for age-specific adaptation measures, as 31.2% of residents are 60 years or older, compared to 21.3% who are 17 or younger.

Culturally, the Municipality is diverse, with 1.8% of residents identifying as Indigenous, 9.07% born overseas (16% arriving in the past five years), and 5.2% speaking a language other than English at home, predominantly Italian. While only 0.6% of residents have limited English proficiency, these figures highlight the need for culturally inclusive climate adaptation efforts.

Health considerations are also significant, with high overall wellbeing scores (80.2 out of 100, above the Victorian average). However, 39.2% of residents report multiple health conditions, 10.7% identify with mental health issues, and over 2,200 people require daily assistance due to disabilities. Social challenges, including over 2,000 recorded family violence incidents, highlight additional areas for focused support.



Wangaratta Sports and Aquatic Centre

Environmental characteristics

The region is rich in scenic, natural spaces, with vital ecosystems supported by the Ovens and King Rivers which serve as key resources for both the community and local livelihoods. The Ovens River is a Heritage River and the Lower Ovens Wetland Complex (from Killawarra to Lake Mulwala, encompassing parts of the Warby Ovens National Park) is recognised as a nationally important wetland complex that contains over 1,800 individual wetlands. The river systems and wetlands support over 2,000 hectares of agricultural, horticultural, and cropping land. Other significant natural areas include the Mullinmur Billabongs, Lake Buffalo, and Lake William Hovell. Across the municipality, there are five distinct bioregions and 25 Ecological Vegetation Classes, 14 of which are endangered. Additionally, four federally protected vegetation communities and over 2,000 state-listed threatened plant and animal species underscore the region's environmental significance and the need for robust conservation within future climate adaptation plans.

Economic characteristics

Economically, the Municipality is driven by key sectors including agriculture, healthcare, education, manufacturing, and construction. The municipality provides 14,188 jobs, generating an annual economic output of $4.467 billion, with 81.2% of these jobs located in Wangaratta. Healthcare and social assistance are the largest employment sectors, with over 2,400 people (around 20% of local employment) engaged in these fields. Manufacturing leads economically, contributing $828 million annually and employing 1,250 people.



Glenrowan Ned Kelly Discovery Hub

This profile illustrates the need for a climate adaptation plan that addresses the socio-economic, health, environmental, and cultural requirements of the municipality, enhancing resilience while preserving vital ecosystems and supporting a diverse community.

WANGARATTA TOMORROW

As a community, the Municipality is already experiencing the impacts of climate change. Increased occurrences of severe drought, bushfire, storms, flood, and heatwave conditions pose significant challenges for the community, businesses, agricultural production, and natural ecosystems.

As a region, Council recognises the influence climate change has across its assets, operations and community life. Existing strategies recognise the importance of this global challenge. For example, the Council Plan 2021–2025 states that "the Rural City of Wangaratta will lead the way and collaborate with others to find the best way to mitigate and respond to climate change." [3] It aligns with community sentiment on what the future should look like and establishes Council's strategic priorities to achieve that future:

Leadership **Wellbeing** **Economy** **Environment** **Lifestyle** **Growth**

In addition to climate change, there are many other likely and possible changes across the region.



Tower at dusk

Social changes

By 2031, the population in the Municipality is expected to reach 32,220, growing at 0.6% per annum. However, it is also expected to be an ageing population [4]. There is likely to be an increased focus on people aging well at home which may change the general level of support the community requires, increase the need for climate resilient housing, and change the way disasters are prepared for and managed. As the population grows, educational expansion will also support future growth and professional development of the Municipality [5].

Environmental changes

Environmental changes will bring several challenges and opportunities for the region, requiring innovative and adaptive strategies. Changes include an increase in extreme rainfall events and flooding, more severe storm events, and longer and hotter bushfire seasons [6]. Further information is provided under the “Past and Future Climate Context” section below.

Economic changes

As the Municipality navigates the future, several economic changes are expected to reshape the region:

- Many of region’s key industries are expected to experience economic growth.
- A 30% expansion across the agriculture, forestry and fishing industry is expected [5].
- The healthcare and social assistance industry is the largest employer across the Municipality and is expected to grow due to the Municipality’s aging population, proximity to the Hume Freeway and access to air ambulance via the Wangaratta Aerodrome [5].
- Expansion of the healthcare and social assistance industries presents opportunities for skilled workforce development [7]
- There may be growing investment opportunities for food and beverage tourism [8].
- There may be growing transport activities as a central hub between Melbourne and Sydney is expected to be developed [9].
- There may be a decrease in working age residents.

Technological changes

Future opportunities may allow for the region to support manufacturing areas to grow and diversify, particularly around transport electrification and industrial decarbonisation [[9] and [10].] There are clean energy technology trends across the region including at the household level. Expansion of solar panels on houses, solar farms and increasing installation of community and household batteries is facilitating a transition away from gas in both household and industry.

Political changes

Legislative and political changes are rapidly evolving. New climate change legislation is coming to fruition on a regular basis since the development of the Climate Change Act in 2022. Council readily considers climate change within its planning documents as outlined in the “Planning Context” section.

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THE PAST AND FUTURE CLIMATE CONTEXT

The Municipality is generally considered to have a warm, temperate climate.

In the future, the climate in the Municipality is expected to change. Projections show higher temperatures with more extreme heatwaves, longer and more intense droughts, and increased intense rainfall, flooding and bushfires.

Temperatures	Heatwaves	Drought	Rainfall
Current	**Current**	**Current**	**Current**
The average number of days per year over 35°C is just over 9 days	The average duration of heatwaves is around 4 days	The number of consecutive dry months was 94 months	The average annual rainfall is around 906 mm
2030	**2030**	**2030**	**2030**
In 2030, the average number of days per year over 35°C is expected to increase to nearly 20 days*	In 2030, the average duration of heatwaves is expected to increase to nearly 6 days*	In 2030, the number of consecutive dry months is expected to reach around 145 months*	In 2030, the average annual rainfall is expected to decrease to around 756 mm*
2050	**2050**	**2050**	**2050**
In 2050, the average number of days per year over 35°C is expected to increase just over 29 days*	In 2050, the average duration of heatwaves is expected to increase to over 7 days*	In 2050, the number of consecutive dry months is expected to remain around 145 months*	In 2050, the average annual rainfall is expected to decrease further to around 748 mm*

**Under RCP8.5 and averaged across the entire Municipality*

The sections below explain the baseline current and projected future climate. The baseline current climate is the average weather conditions (1986-2005) from the Bureau of Meteorology and Victorian Climate Projections 2019, in line with best practice. Projected future climate has been identified for two 'time slices'. The data for 2030 represents the projected average conditions across the entire Municipality from 2015-2044 and the data for 2050 represents the projected average conditions across the entire Municipality from 2035-2064. These are averages, meaning the actual weather experienced each year and in different places during these periods will vary. Some years and places will have much more severe weather conditions while others will have less severe weather conditions. Two future climate scenarios are presented as well, showing the range of possibilities the Municipality could experience based on a medium global emissions scenario (Representative Concentration Pathway (RCP) 4.5) and a high global emissions scenario (RCP8.5). Future climate data has been externally modelled and is publicly available through Victoria's Future Climate Tool.

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Where specific data is not available, a qualitative description of the possible changes in characteristics of the climate variables is provided.

Extreme temperature

Throughout the year, on average the Municipality experiences around 9 days above 35°C and just over 1 heatwave lasting nearly 4 days. On average, the hottest day is 36.77°C [12]. The north of the region typically experiences more regular high temperatures than the south, with 6 to 7 days over 35 degrees in January [12].

In late January/early February 2009, Wangaratta experienced 5 consecutive days over 40°C. [13] *Extreme temperatures in 2019–20 reached 45.6°C on 31st January 2020* [14].

In the future, average daily temperatures and extreme temperatures are expected to increase (Figure 2) [12]. The number of days on average per year above 35°C is expected to increase to nearly 20 in 2030 and just over 29 by 2050 under RCP8.5 [12]. This represents a doubling and tripling of hot days on average each year, respectively. Heatwaves are also expected to increase in frequency, intensity, and duration (Figure 3) [12].

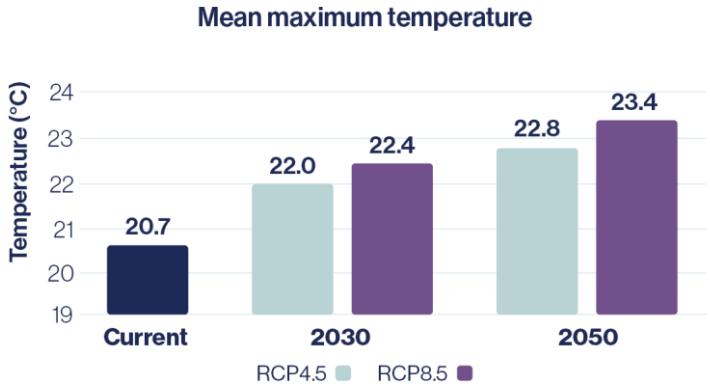


Figure 2. Projected average maximum temperature change, averaged across the entire Municipality

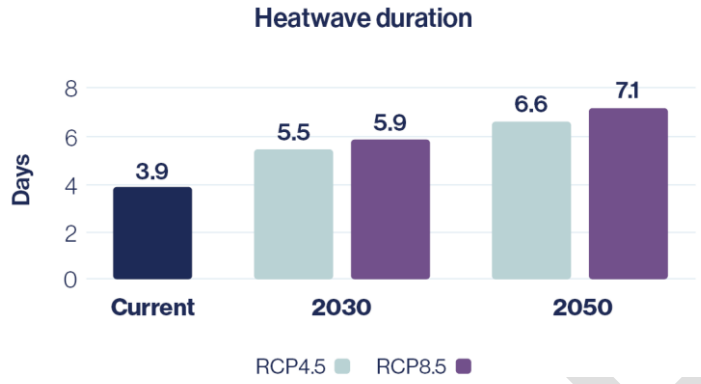


Figure 3. Projected heatwave duration change, averaged across the entire Municipality

Drought

The region spends a significant portion of time in drought. While the southern parts of the Municipality experience more months in drought than the northern areas, both spend multiple consecutive years impacted by drought [12]. The Municipality experienced 94 consecutive months of dry conditions during the baseline period, and 3 months of extreme dry conditions [12].

Drought from 2006-08 resulted in water restrictions and implementation of other water management strategies [15].

In the future, rainfall will continue to be variable but is generally expected to decline (Figure 4), particularly over winter and spring [12]. Droughts could become longer, more intense, and more severe (Figure 5) [16]. The Standardised Precipitation Index (SPI) is utilised to measure precipitation anomalies. In the case of droughts, SPI less than -1 indicates severe rainfall deficiencies, or meteorological drought.

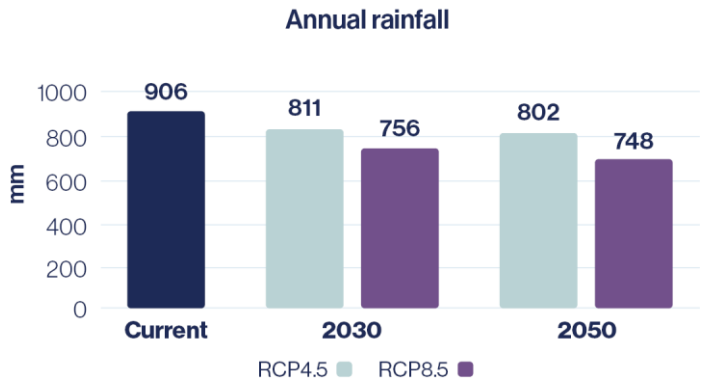


Figure 4. Projected annual rainfall change, averaged across the entire Municipality

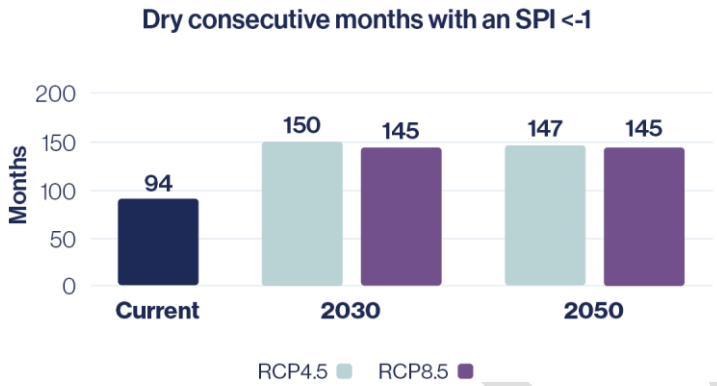


Figure 5. Projected dry consecutive months change, averaged across the entire Municipality.. Note the 6-month SPI was used. See the Victorian Climate Projections Technical Report for more information on this measure of drought.

Extreme rainfall and flooding

Average annual rainfall is about 906 mm and the Municipality experiences around 10 days of rain greater than 20 mm per year [12]. The Municipality experiences an average of 2 months of extreme wet conditions [12].

The south of the Municipality generally experiences more frequent very wet days (over 20 mm of rain) than the north on average. Southern parts may have 19 days annually with over 20 mm while areas to the north only have 5 days [12].

Storms in February 2024 left 1,742 houses and businesses without power [17].

Flood events with a 1% chance of happening every year show many of the towns and rural areas bordering the Ovens/King Rivers are vulnerable including Wangaratta, Laceby, Oxley Flats, and Whorouly (as well as Wangaratta Airport).

Flooding in October 2022 affected 6,509 ha of farmland, causing 440 ha of crop loss, and impacting 319 km of fencing [18].

In the future significant variability in rainfall in space and time is expected. For the Ovens Murray region, where the Municipality sits, it is projected that extreme rainfall events will become more intense [19]. It is generally expected that flooding will become more frequent and extensive [20].



Apex Park Flood. Photo courtesy of the Wangaratta Chronicle

Bushfires

The Municipality can be significantly affected by bushfire. Areas to the south, particularly the Alpine National Park area, are particularly exposed [21].

Bushfires in 2019-20 resulted in evacuation orders for local and regional residents, loss of pasture, smoke impacts to vineyards, and economic loss through reduced tourism [22].

In the future, as temperatures increase and the land gets drier, bushfires are expected to become more severe, more frequent, and last longer. The north-east and north-west will likely be most sensitive to these weather changes [21], however the Alpine National Park area is also likely to experience more frequent and severe bushfires due to the high fuel load.

CLIMATE CHANGE IMPACTS AND RISKS

Community voices on climate change impacts (feedback gathered during the community consultation):

"As a farmer, all of these extreme weather conditions have a massive impact on managing stock welfare and land health."

"Not that long ago I witnessed people affected by having to evacuate their homes due to bushfire danger which was related to severe drought… Sadly this scenario will be repeated in the not-too-distant future. We must be prepared."

"We are worried that flood mapping in our area doesn't take into account more extreme flooding that may happen as a result of climate change. Many of our neighbours think they are safe because they have not been flooded out yet, but waters have gotten close."

The climate risk assessment underpinning this CAP considered various hazards for the near (2030), medium (2050) and far future (2090). Risks were considered under a high emissions future (RCP8.5), or business as usual, and a medium emissions scenario (RCP 4.5) which considers moderate greenhouse gas emission reduction efforts. 55 risks were identified through the assessment process. Risks have been identified across four thematic areas:

1. **Council's assets, operations, and service delivery**
   This theme considers the human-made surroundings, structures, and supporting infrastructure controlled and operated by the Rural City of Wangaratta Council.
2. **Natural systems and biodiversity**
   This theme considers the impacts of climate change to biodiversity (flora and fauna, both native and introduced), culturally significant sites, and open spaces and recreational places.
3. **Community health and wellbeing**
   This theme considers the social aspects of society including people, communities, culture, institutions, support systems, and their interactions, as affected by the Rural City of Wangaratta Council.
4. **Regional economy**
   This theme considers production and consumption of goods and services, the financial and economic systems enabling this, and key economic industries and employers across the Rural City of Wangaratta Council.

Council's Assets, Operations and Services Delivery

Council manages a range of assets and services, which will require adaptation to reduce their vulnerability to climate-related natural hazards and ensure business continuity, particularly when staff are re-directed for emergency response and recovery. Council responsibilities include but are not limited to:

Council managed buildings

Parks, gardens and open spaces

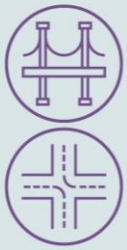
Roads, bridges, footpaths, drainage & other infrastructure

Waste and recycling

Land use planning

Emergency response

Child and aged care services



The Rural City of Wangaratta has been entrusted as custodians to 3,644 km² of land across the Municipality, valued at approximately $768 million. This includes:

- 728 km of sealed roads
- 406 bridges
- 220 buildings
- 159 sports grounds and playgrounds
- 5 landfills
- 87 water-sensitive urban designs
- 10 flood mitigation measures (pumps and levees)

Key Climate Change Impacts to Council Assets

The following climate change impacts have been identified to Council assets and operations:

Extreme temperatures, heatwaves & droughts

- Accelerated degradation of infrastructure including buildings, roads and the Aerodrome
- More regular maintenance, watering, and replanting needed for open spaces like parks

Extreme rainfall, storms, and floods

- Increased damage to infrastructure including buildings, bridges, roads and the Aerodrome from extreme rainfall, hail, wind, flooding, and impacts from flying debris such as branches
- Increased likelihood that the drainage capacity will be exceeded creating localised flooding and oversaturation of grassy open spaces
- The capacity of water and sewerage infrastructure may be exceeded

Bushfire

- Increased likelihood of damage to infrastructure including buildings, bridges, roads and the Aerodrome
- Increased disruption to essential services, like waste collection or road maintenance, due to bushfires and smoke
- Increased disruption to emergency services due to bushfires and smoke

Natural systems and biodiversity

Many of the Municipality's natural systems will be impacted by climate change, which will require careful monitoring, management and intervention. Impacts are likely to have flow on impacts to the community and regional economy as well. Natural systems include but are not limited to:

Native flora | **Native fauna** | **Waterways** | **Land and soil** | **Weeds and pests** | **Natural sites of cultural significance** | **Bush reserves (60+)**



Mount Cobbler, Alpine National Park

Key Climate Change Impacts to Natural Systems

The following climate change impacts have been identified to natural systems and biodiversity:

Extreme temperatures, heatwaves & droughts	Extreme rainfall, storms, and floods	Bushfire
• Increased heat related stress to wildlife • Increased dieback and mortality of vegetation may impact natural amenity and could worsen the heat island effect in built up areas • Contributes to an increased risk of bushfires • Increased prolonged periods of "low-flow" periods, reduced water quality, reduced habitat and potentially pooling or cease-to-flow periods	• Increased erosion and likelihood of new river channel creation impacting river health, habitat availability and quality • Increased likelihood of fish mortality from potential blackwater events • Increased frequency of landslips causing further degradation to the natural environment and potentially damaging other built assets	• Increased loss of wildlife and natural vegetation • Increased damage to culturally and naturally significant sites due to land clearing • Increased frequency of landslips causing further degradation to the natural environment and potentially damaging other built assets • Decreased water quality from increased sediment loads after fire, also impacting potable water offtake and treatment

Community health and wellbeing

The community has a diverse range of needs and Council understands that support must be fit-for-purpose. By identifying the different areas in which support is required, adaptation can be tailored to support resilience-building across the community. Some examples include:

Age | **Pre-existing health conditions** | **Disabilities** | **Mental health** | **Loneliness** | **Unhoused**



Bicycle lockers in Wangaratta

Key Climate Change Impacts to Community

The following climate change impacts have been identified for community health and wellbeing:

Extreme temperatures, heatwaves & droughts	Extreme rainfall, storms, and floods	Bushfire
• Increased heat related stress, illness, and deaths, particularly for the most vulnerable people in the community and people who work outdoors • Increased likelihood of power outages as the grid is overloaded, limiting the number of cool spaces to take refuge	• Increased damage to housing and other critical community infrastructure • Increased likelihood of power and telecommunications disruptions • Increased likelihood of disruption to Council services like childcare centres or waste collection • Increased likelihood of disruption to emergency services and healthcare provision • Increased mental health impacts from more frequent events	• Potential for significant loss of life and injury • Increased physical health impacts, including respiratory, or cardiac complaints due to smoke and poor air quality • Increased mental health impacts from more frequent and severe events • Increased likelihood of damage and loss of housing and other buildings the community relies on (e.g., health care centres) causing disruptions to health service provision

Regional economy

Maintaining a healthy economy through climate change induced natural hazard events is paramount to the resilience of the community and Council operations. The Municipality's key economic sectors include, but are not limited to:


Agriculture


Manufacturing


Healthcare


Education


Tourism


Construction


Transport and Distribution

Key Climate Change Impacts to the Regional Economy

The following climate change impacts have been identified to the regional economy:


Extreme temperatures, heatwaves & droughts

- Exposure to heat and heat stress related illnesses may impact safety and reduce productivity of outdoor workers, machinery operators
- Dryer soils and increased likelihood of erosion may affect the vitality of the agriculture and viticulture industries
- There may be less water available for irrigation for agriculture
- There may be reduced snow in the Alpine regions affecting tourism
- Increased power outages may cause increased business disruptions


Extreme rainfall, storms, and floods

- Increased damage to crops and livestock and related assets like sheds, fencing and machinery
- Increased soil erosion impacting productivity of agriculture and viticulture
- More frequent hailstorms, rain events and flooding could result in construction delays, damage to machinery, and increased costs from flood mitigation measures and insurance costs
- Increased likelihood of business disruption if supply chains are cut off, power is cut, or the buildings are damaged


Bushfire

- Increased likelihood of loss of crops, livestock and related assets like sheds, fencing and machinery
- Increased likelihood of business disruption if supply chains are cut off, power is cut, or the buildings are damaged
- Increased costs to protect, maintain, repair, and insure buildings and other infrastructure
- Reduced tourism during bushfire events
- Bushfires also have significant impacts via loss of burnt farmland, loss of fencing, and death of livestock, particularly across southern parts of the Municipality near the Alpine Region (Wangaratta Municipal Emergency Management Plan, 2021).

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A Climate Adaptation Plan for a Long-Term Resilient Wangaratta

Using the insights gathered in the community and stakeholder engagement activities, the desktop study and the risk assessment, 17 adaptation actions under five action areas were identified. The action areas reflect the objectives of the CAP on minimising climate risks to Council service delivery and operations and focus on actions within Council's sphere of influence. Therefore, the risk theme relating to Council was broken into two action areas on 'policies and operations' and 'infrastructure and assets'. The risk themes on the regional economy and community health and wellbeing were combined into a community focused action area. An additional action area on land use planning and development was identified. The natural environment risk theme remained an action area within the CAP.

In addition to these actions that focus on climate change adaptation specifically, it is important to note and acknowledge the role of mitigation and other sustainability activities for climate resilience as well. Reducing reliance on mains electricity through the installation of solar panels and batteries will reduce the risk of power outages. Pursuing a circular economy may increase the lifespan of landfills to boost their capacity to absorb increased waste after disaster events. Recognising these synergies across different areas of council operations is important and promoted with Action Area 1. The table below presents an overview of the five action areas.



Aerial view of the CBD and the River

Climate Adaptation Plan Action Areas

1	**Proactive Council, policies and operations**	Climate change will affect all aspects of Council operations and policies. To reduce impacts from climate change, it is important to ensure climate change adaptation is understood and considered across all of Council's work, staff and volunteers are more prepared to manage escalating and cascading disaster events, and an emergency communications plan is in place for when communications are disrupted.
2	**Future-proof Council infrastructure and assets**	Council buildings, infrastructure and assets must be resilient to a changing climate to ensure they can continue to function for use in the community. Council funding is limited, so by prioritising investment in critical infrastructure upgrades and identifying state and federal grants, it can support the development of a more resilient Wangaratta.
3	**Future-proof land use planning and development**	Land use planning and new infrastructure development is critical to the pursuit of a more resilient Wangaratta. Victoria's municipal based Planning Schemes are key documents that guide what can be considered by local planning decision makers and their ability to promote climate-resilient development.
4	**A prosperous, prepared and healthy community**	Council can support a prosperous, prepared, and healthy community that is well positioned to manage the impacts of climate change. Improving education on climate change, mental health supports, and business continuity during disasters will help the community thrive. Improved access to relief centres or neighbourhood safer spaces will help the community, and particularly the most vulnerable, manage during disasters.
5	**A resilient natural environment**	Our community and economy rely on a healthy natural environment. The natural environment presents opportunities for recreation as well as underpinning key industries such as agriculture and viticulture. Effective climate-smart land and water management on public and private land and utilising Traditional Knowledge will help ensure that the natural environment is resilient to projected climate changes.

ACTION AREA 1 – PROACTIVE COUNCIL, POLICIES, AND OPERATIONS

Climate change is going to affect all aspects of Council operations and policies. To reduce impacts from climate change, it is important to ensure that climate change adaptation is understood and considered across all of Council's work, that staff and volunteers are more prepared to manage escalating and cascading disaster events, and that there is an emergency communications plan in place for when telecommunications are disrupted.

By taking proactive steps, Council can mainstream climate change adaptation across its portfolio, likely increasing uptake of actions and unlocking innovative solutions in areas not typically considered relevant for adaptation. Further, Council will be better prepared to manage disaster events under a changing climate.

Benefits for the community

The community will benefit from a Council that prioritises climate change adaptation in all areas of its work, reducing risks across operations and assets. Assets will be more likely to remain operational, requiring less costly maintenance and Council will be more likely to be able to continue to deliver its services to the community. The community will also benefit during disasters from more prepared Council staff that have appropriate training and are resilient, with mechanisms in place for emergency communications when telecommunications services are disrupted.

Action 1.1 – Continue to integrate climate change adaptation and lessons learned in existing Council plans, policies, strategies and budget

Climate risk is already considered in existing Council plans and strategies, including a Business Continuity Policy and Plan (2023) that considers disruptions to council's services due to climate event disruptions (fire/flood/extreme weather). However, this should be extended to consideration of climate change adaptation and budgeting for actions to drive faster action on reducing the risks. Lessons learned should also be integrated into policies, plans and strategies to promote more effective adaptation.



Wangaratta Government Centre

Action 1.2 – Improve staff and volunteer capacity to manage disaster relief and recovery activities in the context of climate change

Climate-related disaster events are becoming more frequent, extreme and complex where multiple hazards occur at the same time or in succession. Council can advocate and account for this in emergency management training. Further, hazard-specific emergency management plans should be developed in collaboration with relevant stakeholders. These plans should outline procedures to manage and respond to different hazard events, trigger points for action, and a list of staff trained to implement the procedures. As heatwaves are becoming more frequent, severe, and are extremely harmful to the community, a specific heatwave policy should also be developed. Given the escalating nature of climate disasters, staff and volunteers must be supported in their mental and physical health as well, particularly through trauma-informed responses and training.

Action 1.3 – Develop an Emergency Management Communications Plan

Telecommunications towers have limited back-up energy supply, meaning that in disasters with extended grid outages, phone lines and mobile service may be disrupted. While the Neighbourhood Safer Places have Sky Muster Satellite services, they must be connected to power to operate. An emergency management communications plan that outlines how Council will communicate with its staff, with other agencies, and with people in the Municipality, particularly with vulnerable people, should be developed to effectively manage telecommunications outages. Ensuring ongoing access to power where required for communication during a power outage should be a key consideration.



Lions Park

ACTION AREA 2 – FUTURE PROOF COUNCIL INFRASTRUCTURE AND ASSETS

Council buildings, infrastructure and assets must be resilient to a changing climate to ensure they can continue to be used by the community. However, Council's limited funding means it must identify which assets should be prioritised for upgrades. Council can also prepare grant funding applications in advance, enabling it to meet short submission timeframes and maximise the chance of increasing budgets for urgent infrastructure upgrades.

Further, establishing a record management system to track the costs of repair and maintenance to Council assets after disasters will enable Council to better plan for the costs of climate change in the long-term financial plan and provide evidence of funding needs. Finally, developing sustainable infrastructure policies will support the climate-resilient development of new assets so that damage is minimised in disaster events, even under a changing climate.

Benefits for the community

The community will benefit from having less interrupted access to Council assets including public buildings, open space, the Aerodrome, roads, and bridges, despite the increasing frequency and severity of disaster events. The community will benefit from a Council that is well prepared to access funding opportunities when they arise to use for upgrades and repair of critical assets. Further the community will benefit from timelier repair and renewal of Council assets as Council is better able to assess and integrate the future costs of climate change into its standard budget planning processes.

Action 2.1 – Create a prioritisation list for upgrading existing council assets

Council funding is limited and must be prioritised to ensure key assets are upgraded, enhanced or maintained. Council should consider a three-pronged approach to developing a prioritisation list and schedule: assessing climate-related vulnerability/sensitivity (e.g., using the GMCA assessment, see page 32 for key findings), assessing criticality (e.g., the bridges that meet the definition of a 'critical asset' in the Bridge Asset Management Plan) and reviewing the current maintenance schedule. Together, these assessments can be integrated into the Asset Management Plan and should provide a climate-resilient approach to asset renewal.

Action 2.2 – Develop plans and applications for funding for infrastructure upgrades that can be submitted when funding is available

Council should use the Asset Management Plan and prioritisation of assets to develop infrastructure upgrade plans and applications for funding for a range of hazards. These should be developed in advance of funding availability to maximise the likelihood of successfully applying for funding, particularly during disaster relief and recovery where Council staff are likely to be extremely busy.

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Action 2.3 – Create a system to record the costs of repairing and replacing infrastructure after severe weather events

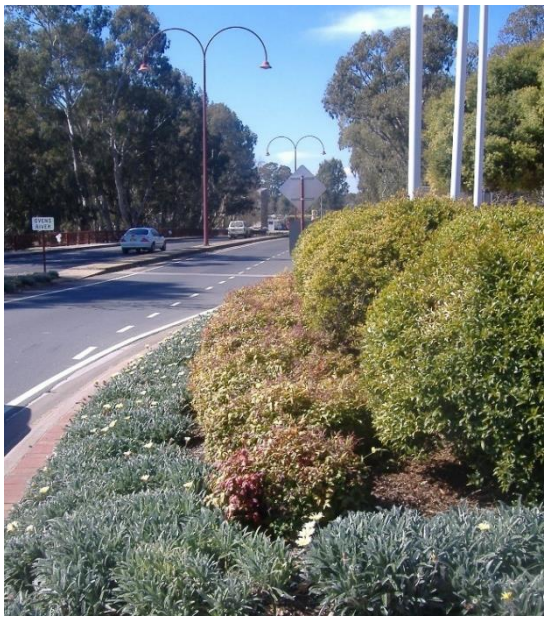
Council should create a system to record the costs of repairing and replacing infrastructure after severe weather events to help improve understanding of the future costs of climate change when events are likely to be more frequent and severe. Understanding these baseline costs could form the basis of a cost-benefit analysis of resilient reconstruction. The system should be incorporated into existing asset management technology, e.g., TechnologyOne, and should contribute to budget processes.

Action 2.4 – Develop sustainable infrastructure policies and plans and update the Sustainable Council Building Policy to continue to ensure climate-resilient design is incorporated into asset renewal, and new council construction

Council should build on and improve how it integrates climate-resilient design across its asset portfolio by developing sustainable infrastructure policies and updating the Sustainable Council Building Policy to include more specific outcomes related to climate change and the changing nature of hazard events.

Action 2.5 – Develop guidance on how to integrate climate change into infrastructure management plans

Given the diverse challenges climate change may bring and the complexity of integrating this knowledge into asset renewal and construction, Council should procure guidance on how to integrate climate considerations into its infrastructure management plans. This includes specific information on how to ensure Council assets can withstand the impacts of the projected extreme rainfall events, heatwaves, and dry periods for the region.



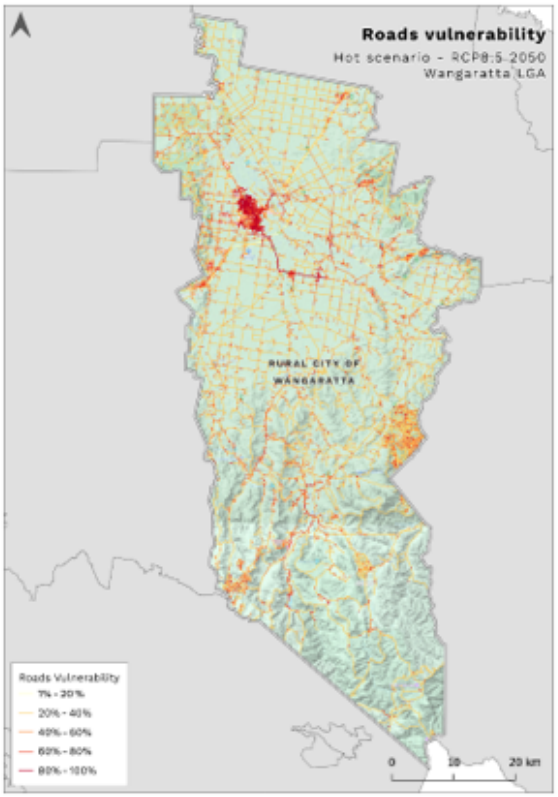


Municipality roads and library

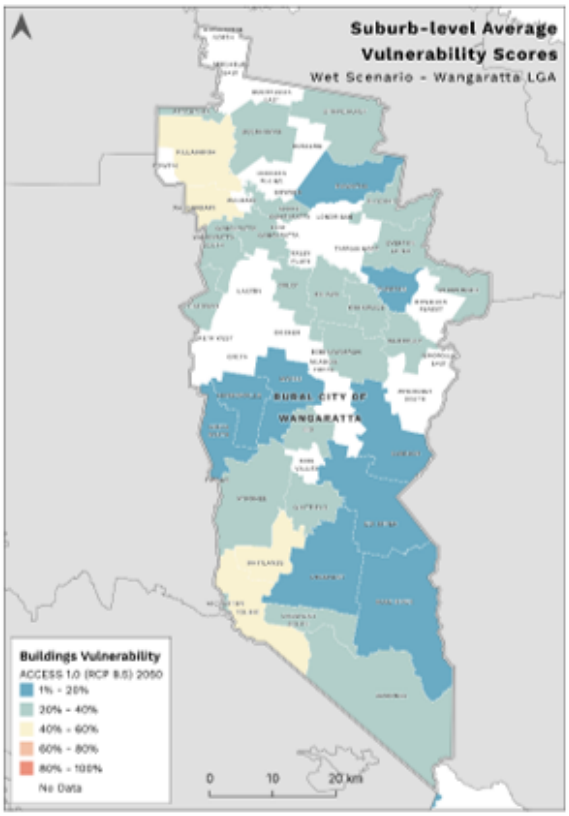
GMCA Resilient Public Estate Report key findings

For the RCP8.5 wet scenario in 2050:

- Buildings in Killawarra, Wangandary, Whitlands, and Tolmie will have highest vulnerability on average
- Bridges in Wangaratta South, Oxley, and Docker will have highest vulnerability on average
- Open space in Whorouly will have highest vulnerability on average
- Roads in Waldara have highest vulnerability on average



RCP8.5 Hot Scenario – road vulnerability.
Source: GMCA Resilient Public Estates Report



RCP8.5 Wet Scenario – building vulnerability.
Source: GMCA Resilient Public Estates Report

For the RCP8.5 hot scenario in 2050:

- There are large areas of more vulnerable open space in Murmungee, Wabonga, Wangaratta South, Killawarra, Wangandary, and Wangaratta
- There are many roads with higher vulnerability in Wangaratta, Carboor, and Tolmie, and towards the south of the LGA

For the RCP8.5 dry scenario in 2050:

There are large areas of more vulnerable open space in Murmungee, Wabonga, Wangaratta South, Killawarra, Wangandary, and Wangaratta. Additionally, Springhurst, Eldorado, Boorhaman, and North Wangaratta are already the drier areas in RCoW and are likely to experience decreasing average annual rainfall in the future

ACTION AREA 3 – FUTURE-PROOF LAND USE PLANNING AND DEVELOPMENT

In addition to future-proofing council assets, Council should pursue climate-resilient land use planning and development through advocacy with other councils to improve Victoria's Planning Schemes and national building regulations. Victoria's municipal based Planning Schemes are key documents that guide what can be considered by local planning decision makers and the ability they have to promote climate-resilient development [23]. However, currently climate risk and climate adaptation are poorly integrated into the Schemes [23]. Alongside limitations in national building regulations, Council's ability to enforce climate-resilient development in land use planning and development is restricted which can lead to instances where new buildings create or worsen climate-related risks.

Joining with other councils and interested stakeholders and periodically updating hazard and risk modelling will also place Council in a strong position to advocate for the necessary changes to the Planning Schemes that will enable climate-resilient future developments.

Benefits for the community

The community will benefit from land use planning and development that is resilient to climate change and does not worsen existing risks like the heat-island effect or flooding. As the population and the Municipality grows, it is important to ensure that new housing developments incorporate climate change considerations for the health and wellbeing of residents and visitors. Additionally, the community will benefit from having access to updated hazard modelling to help them make decisions, such as where to live, and manage personal climate risks.



Whitfield streetscape

Action 3.1 – Advocate for better integration of climate change in state and national planning and building legislation and policies

Council should join the Council Alliance for a Sustainable Built Environment to work with other local councils and advocate for changes to state and national planning and building legislation and policies that better accounts for climate change. As climate risk and climate adaptation are poorly integrated into Victoria's Planning Schemes [23], and construction codes dictate what is mandatory to consider in developments, Council's ability to enforce locally relevant climate-resilient development that minimises the urban heat island effect, prevents new or worse flood risks, prevents new or worse water shortage risks, prevents risk of communities being isolated due to their single road being cut off, and other risks throughout the Municipality, is currently limited beyond creating guidelines and recommendations.

Action 3.2 – Work with stakeholders to periodically revise hazard and risk modelling for decision making and share outputs with the community

To keep up to date with the best available science and climate information, hazard and risk modelling should be periodically updated to account for new knowledge and modelling techniques. This information should contribute to advocating that the Victorian Government amend their Planning Schemes generally and creating Planning Scheme Amendments for Council. It is also important for Council to make informed decisions on the management of its assets and ensure the emergency management plans are sufficient. Helping the community understand their exposure to hazards and climate risks should enable them to make informed decisions as well, thereby reducing their reliance on Council.

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ACTION AREA 4 – A PROSPEROUS, PREPARED, AND HEALTHY COMMUNITY

Council can support a prosperous, prepared, and healthy community that is well positioned to manage the impacts of climate change. Broadly, each action in this Plan has the potential to improve health and well-being of the community. Specifically, improving education on climate change, mental health support services, and business continuity during disasters will help the community thrive. Improved access to relief centres or neighbourhood safer spaces will further strengthen the community, and particularly the most vulnerable members, manage during disaster events.

Benefits for the community

The community will benefit from increased understanding of climate change and how to plan and prepare for associated impacts. For example, the community will better understand how and where to access relief centres or mental health support services, improving people's ability to manage during and immediately after disasters and building reserves of resilience in non-disaster times. Small business owners and by extension the broader community who rely on them for employment, goods, and services provision, will also benefit from improved business continuity.

Action 4.1 – Create a communications plan with relevant partners to promote mental health services, particularly for rural and remote communities who have experienced a disaster

Many resources already exist to support mental health for people and communities in Council's Grit and Resilience Program. However, results from the community survey showed that community and individual mental wellbeing are highly impacted by disasters and remain a key concern in the context of climate change due to the impact of disaster events directly and general climate anxiety. A communications plan to promote mental health services and continue to normalise seeking support could be useful to ensure the community is aware of the services available and increase willingness to seek support. It should also be used to support advocacy activities to increase funding for trauma-informed support services.

Action 4.2 – Improve community access to relief centres

The Municipality has six emergency relief centres, five in or around Wangaratta city centre and one in Whitfield [24]. These cater for the wide diversity of needs in the municipality including children, pets, people with disabilities, and people experiencing domestic violence. The Municipality also has five neighbourhood safer spaces in Cheshunt, Eldorado, Glenrowan, Springfield and Whitfield that act as places of last resort when individuals' bushfire plans have failed [25].

However, the GMCA Resilient Public Estate Project identified several areas with high numbers of vulnerable people (defined as those over 65 and under 4 years old) in the areas around Milawa, Tolmie, Whorouly, and Peechelba. These areas would benefit from additional relief centres of neighbourhood safer spaces. Additionally, the capacity of Council to operate more than one relief centre is currently stretched. With increasing and more widespread disasters, increased funding provisions in the Long-Term Financial Plan to run more than one centre at a time during major disaster would improve community access to this service.



Wangaratta Parklands Relief Centre

Action 4.3 – Improve access to financial coaching and resources that improve business continuity strategies for small businesses

Business continuity is central to maintaining the viability of businesses that are facing increasing climate events that result in power outages, supply chain disruptions, and direct damage to assets. While some resources exist such as those listed in the Municipal Emergency Management Plan [24], Council should improve access to financial coaching focused on business continuity which may help businesses manage the impacts of disasters and continue to serve the community long after the disaster has passed.

Action 4.4 – Collaborate with partners to enhance community outreach efforts on climate change awareness and adaptation

To enable the community to take action to reduce the impacts of climate risks, Council should continue to share information about climate change, hazards, risks and preparedness and planning for response and recovery by leveraging existing and potentially introducing new education programs and tools. Council could work with and develop community leaders and other groups to support this outreach. Council should also review the effectiveness of its communication with the community and implement changes in its communication strategies: in the community survey over 25% of respondents said they did not know that services were available to them after a disaster.

ACTION AREA 5 – A RESILIENT NATURAL ENVIRONMENT

The community and economy of the Municipality rely on a healthy natural environment. It provides opportunities for recreation and social connectedness and underpins key industries such as agriculture and viticulture. Effective climate-smart land and water management on public and private land and utilising Traditional Knowledge will help ensure that the natural environment is resilient to projected climate changes.

Benefits for the community

There are many diverse benefits for the community from a resilient natural environment. For example, the community will benefit from improved water management that facilitates consistent access to water and minimises the frequency and severity of flooding. The community will benefit from improved natural amenity and a landscape that is less susceptible to other major hazard events such as bushfires. Directly, the community will benefit from increased knowledge on climate-resilient species and be able to take personal actions to improve the resilience of their home gardens. Landowners also have a huge potential to contribute to the overall resilience of the community and Municipality through hazard mitigation activities on their land and climate risk preparedness to reduce the impacts of hazards when they do occur. A strong agricultural sector also contributes to the financial resilience of the Municipality.

Action 5.1 – Work with local emergency authorities to improve the distribution of information to landowners on how to develop climate-resilient land management plans

Landowners should be prepared to manage the increasing frequency and severity of climate hazards including flood, bushfires, heat, and drought. Council can support landowners to create their own proactive and forward-thinking plans by improving the distribution of relevant climate change adaptation information and strategies. This would be beneficial for landowners, soil and land conservation, and the region more broadly which relies on agriculture and viticulture.

Action 5.2 – Develop a Climate Adaptive Planting Project

A list of recommended tree species was developed as part of the GMCA Naturally Cooler Towns Project and Council has an Urban Tree Plan identifies the benefits of urban forests on reducing the impacts of climate change. Council should build on this and develop a list of climate smart shrubs and grasses that can withstand climate hazards, create a cooler microclimate, promote soil stability in droughts and floods and act as a wind break in higher winds. Lists of climate appropriate plants should then be utilised by Council in vegetation programs and shared with the community to promote climate resilience on private land as well.

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The natural environment in the Municipality

Action 5.3 – Develop an Integrated Water Management (IWM) Plan with relevant partners

Council should develop an IWM Plan that considers compounding pressures of population growth and climate change, potable, rain, storm, recycled and groundwater in one cohesive document. An IWM Plan can enable goals across the social, economic, and natural domains to be achieved through mitigating drought and flood hazards and their impacts. Council already implements some water management strategies through its Sustainable Buildings Policy and there are some overlapping actions in this plan (Action 7 and the Sustainable Drainage Infrastructure Policy) but would benefit from an integrated strategy that considers all elements of the water cycle under one plan.

Action 5.4 – Work with Traditional Owners to mitigate and reduce the impacts of climate change hazards

Council should continue to work with Traditional Owners to incorporate cultural knowledge and practices in bush reserve management plans for the municipality. Indigenous land management practices are successfully reducing the probability and severity of climate-related hazards across Australia, particularly for bushfires and drought. Council, NEW, and other local organisations are working with Traditional Owners to implement cultural land management practices like burning and watering, recognising the benefits these techniques bring to the region. Activities that engage Traditional Owners can also enhance wellbeing and have benefits for Indigenous Communities. It is important that projects with First Nations people are First Nations led and owned. Council recognises that this requires ongoing strengthening of its relationships with Traditional Owners.

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Monitoring and Evaluation

Monitoring and evaluation (M&E) of the CAP are important to understand whether and how actions are being implemented and whether they are achieving their objectives. By undertaking M&E, Council can understand what is working, what isn't, and what to reprioritise so that they can remain on a climate-resilient trajectory.

Action 1 directly addresses embedding M&E into the annual reporting process. By doing so, Council will be accountable to achieving the actions laid out in this CAP. Tools that may be used to collect information for each measure include:

- Assessments at the end of activities
- Community surveys
- Interviews with the community and key stakeholders
- Case studies
- Self-evaluation

As the future is uncertain, it is also important to repeat the climate risk assessment periodically. This will help Council identify reduction in risks and potentially attribute this to their activities. Further, the risk assessment would enable identification of any new risks that have arisen due to unexpected climate changes or other changes in the social, natural, economic, or built environments. The revised risk assessment would drive a revised climate adaptation plan as well.

Suggested measures can be found in Table 1. Improvements in these measures would indicate that the climate resilience is improving.

Table 1: Suggested success measures by action

Action	Suggested success measures
Action Area 1: Proactive Council, policies, and operations	
1.1 Continue to integrate climate change adaptation and lessons learned in existing Council plans, policies, strategies, and budget.	• Environmental and Sustainability Strategy links with the CAP • The CAP is reviewed yearly in line with budget cycles • M&E of CAP is integrated into the Annual Reporting cycle • Adaptive capacity of Council improves over time
2.2 Improve staff and volunteer capacity to manage disaster relief and recovery activities in the context of climate change	• Municipal Emergency Management Plan is updated to include yearly simulations of disaster events • Multi-agency, multi-council disaster simulations are held at pre-defined intervals • Emergency management plans are developed for flooding, extreme rainfall, storms, bushfire and heatwaves and shared with the community • Heatwave policy is developed • Percent of staff that feel well prepared to respond in any hazard context • Percent of staff and volunteers that state they know how to access mental health support after disasters if needed

	• Wait times for trauma-informed counselling services
1.3 Develop an Emergency Management Communications Plan	• Emergency Management Communication Plan is developed • Working phone tree is established so that all identified vulnerable community members can be contacted
Action Area 2: Future-proof Council infrastructure and assets	
2.1 Create a prioritisation list for upgrading existing council assets	• Prioritisation list is created • Number of prioritised assets upgraded to be climate resilient
2.2 Develop plans and applications for funding for infrastructure upgrades that can be submitted when funding is available	• Percent of assets on the prioritisation list that are included in at least one plan or drafted application for funding
2.3 Create a system to record the costs of repairing and replacing infrastructure after severe weather events	• System to record the costs of climate-related maintenance and repair is created • All relevant staff use the system to record the costs of climate-related maintenance and repair of assets • Accurate summary of costs of climate-related maintenance and repair of assets able to be calculated each year and factored into budget processes
2.4 Develop sustainable infrastructure policies and plans and update the Sustainable Council Building Policy to continue to ensure climate-resilient design is incorporated into asset renewal, and new council construction	• A Sustainable Transport Infrastructure Policy is developed • A Sustainable Drainage Infrastructure Policy is developed • The Sustainable Building Policy includes consideration of major flood events that exceed the current State Government overlays • Both policies include provision to consider relocation or decommissioning of assets • Percent of built (buildings and infrastructure) assets that integrate climate resilient design
2.5 Develop guidance on how to integrate climate change into infrastructure management plans	• Council staff are capable of integrating climate change considerations into infrastructure management plans
Action Area 3: Future-proof land use planning and development	
3.1 Advocate for better integration of climate change in state and national planning and building legislation and policies	• Number of advocacy activities on updating Victoria's planning schemes to account for climate change • Victorian Planning Provisions are updated to better integrate climate change adaptation

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3.2 Work with stakeholders to periodically revise hazard and risk modelling for decision making and share outputs with the community	• Provision for updated climate modelling included in the long-term financial plan • Modelling for flood risk considering climate change is completed • Modelling for urban heat island effect in each built up area considering climate change is completed • Work to better understand bushfire risk under climate change is completed • Modelling of risk of community isolation is completed • Modelling of compounding disasters/multi-hazard risk is completed • Number of community events to share information on updated information
Action Area 4: A prosperous, prepared, and healthy community	
4.1 Create a communications plan with relevant partners to promote mental health services, particularly from rural and remote communities who have experienced a disaster	• Post Disaster Toolkit is developed • Number of media articles that discuss where and how to access mental health support
4.2 Improve community access to relief centres	• Percent of communities with high numbers of vulnerable people have access to a relief centre or neighbourhood safer space in their community
4.3 Improve access to financial coaching and resources that improve business continuity strategies for small businesses	• Percent of businesses accessing business continuity learning resources • Number of businesses implementing climate adaptation to ensure continuity through a disaster • Percent of businesses that close within 12 months after a disaster event in their area
4.4 Collaborate with partners to enhance community outreach efforts on climate change awareness and adaptation	• Number of community climate change outreach events held each year
Action Area 5: A resilient natural environment	
5.1 Work with local emergency authorities to improve the distribution of information to landowners on how to develop climate-resilient land management plans	• Number of landowners reached through the awareness campaign

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5.2 Develop a Climate Adaptive Planting Project	• List of climate-smart shrubs and grasses is developed and appropriate for the local context • Number of events attended or website visits where the recommended species lists are shared with the public • Percent of new Council plantings that are on the recommended species lists
5.3 Develop an Integrated Water Management (IWM) Plan with relevant partners	• IWM Plan is developed
5.4 Work with Traditional Owners to mitigate and reduce the impacts of climate change hazards	• Percent of bush reserve management plans that incorporate cultural knowledge • Other metrics as defined by First Nations people

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Annexes

1. Additional information on adaptation actions
2. Glossary of terms
3. List of acronyms
4. References

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Adaptation actions – additional information

Action Area 1 – Proactive Council, policies, and operations					
Action	**Timeframe**	**Cost***	**Funding mechanism**	**Responsible Directorate**	**Suggested steps to implement**
1.1 Continue to integrate climate change adaptation and lessons learned in existing Council plans, policies, strategies and budget	1-2 years	Very low	Council funded budget	Sustainability & Culture	1. All Council policies, plans and strategies, and in particular, The Environmental and Sustainability Strategy, should complement the CAP and explicitly include **consideration** of climate change adaptation (as well as risk). Budget processes should include **review** of the Climate Change Adaptation Plan so that actions are considered in each Annual Budget cycle and long-term financial plan. 2. **Report** on adaptation monitoring and evaluation (M&E) (using measures in this CAP) as part of the Annual Reporting process on a yearly basis beginning in 2025-26 or as a stand-alone report. 3. **Complete** the adaptive capacity checklist provided by How Well Are We Adapting every 2-3 years to track the adaptive capacity of Council and ensure knowledge and capability to integrate climate change adaptation in their work areas is maintained through staff turnover.
1.2 Improve staff and volunteer capacity to manage disaster relief and recovery activities in the context of climate change	1-2 years	Low	Council funded budget, multi-agency budgets, alternative sources of funding (e.g., grants)	Community & Infrastructure	1. **Advocate** that the Municipal Emergency Management Plan is updated to include a predefined yearly schedule of emergency response operations simulations considering escalating disaster frequency and severity in the context of climate change (e.g., severe storms resulting in damage to council assets and energy/internet outages, followed by bushfires triggered by lightening). Community volunteers or community members should be included where possible. Include consideration of visitors and tourists who may not know what to do during extreme events. Ensure all relevant staff attend at least one simulation per year. Advocate for consideration of recovery coordination and trauma-informed response training for all involved in disaster management and recovery. 2. **Work with** the State Government and Voluntary agencies to continue to develop and implement emergency management plans for each hazard that identifies trigger points for action across the Municipality (including when assets will stop being maintained), responsibilities including lead agency and community responsibilities and roles, building on the Municipal Emergency Management Plan. Consider the needs of the most vulnerable people in the community when developing these plans. Share plans with the community regularly so they are informed.

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					3. **Continue to develop** a heatwave policy or plan in conjunction with heat-health experts, that identifies temperature-based triggers for action in Council to keep the community safe including alerts, keeping more public facilities open longer (e.g., libraries), and providing water in public places. Consider how to reach and ensure the safety of the most vulnerable in the community, for example by using phone trees to check on community members or providing transport to cooler places.
1.3 Develop an Emergency Management Communications Plan	1-2 years	Moderate	Future Council funded actions, alternative sources of funding (e.g., grants), shared funding from partner organisations	Community & Infrastructure	1. **Undertake** a cost benefit analysis of different transportable communication tools such as satellite phones and Starlink and determine which is the best for the Municipality context. 2. **Consider installing** an emergency phone in each small town to be used to establish communication between communities, Council and emergency services. 3. **Investigate the feasibility** of installing permanent generators at Whitfield, Eldorado, and Glenrowan Neighbourhood Safer Places (NSP) (and any new NSP) so that the Sky Muster satellite services remain operational during a power outage. 4. **Develop** a phone tree in partnership with community, identifying key community members that may hold a satellite phone or alternative communication method (including one provided by Council) and would be able to check on and communicate with vulnerable community members including those with vision, hearing, or mobility disabilities (if it is safe to do so). 5. **Develop** a budget bid for satellite phones, portable Starlink devices or other alternative communication strategy or incorporate funding requirements into long term financial plan.
Action Area 2 – Future-proof council infrastructure and assets					
Action	**Timeframe**	**Cost***	**Funding mechanism**	**Responsible Directorate**	**Suggested steps to implement**
2.1 Create a prioritisation list for upgrading existing council assets	3-5 years	Very low	Council funded budget	Community & Infrastructure	1. **Identify** which communities and rural properties are only serviced by one or two roads that may be cut off in a disaster through modelling. 2. **Create** a priority list of council assets based on their contribution to the basic operations and function of Council, and community wellbeing. 3. **Use information** from steps 1 and 2, the GMCA assessment (see below for key findings), and asset management schedule to create a list of priority assets to be upgraded to be climate resilient.

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					4. **Create** budget bids for infrastructure upgrades of the most critical assets. 5. **Incorporate** plans for asset upgrades into the long-term financial plan.
2.2 Develop plans and applications for funding for infrastructure upgrades that can be submitted when funding is available	3-5 years	Low to Moderate**	Council funded budget	Community & Infrastructure	1. **Identify staff** to lead the development of plans and applications. These staff could be from across each directorate. 2. **Draft plans** and applications for funding for infrastructure upgrades that could be submitted after disaster events or when grants are available. Use the list of prioritised assets to identify which to draft first. 3. After disaster events or when grants are identified, **tailor** to the requirements of the funding available and submit the applications.
2.3 Create a system to record the costs of repairing and replacing infrastructure after severe weather events	3-5 years	Low to Moderate	Council funded budget	Corporate & Leisure	1. **Procure** a software developer to develop a system of recording costs of climate-related maintenance into existing asset management technology or create a new system if required. 2. **Train** maintenance staff and managers on how to use the software. 3. **Estimate** the future costs of climate change once enough data is collected, by applying multipliers to costs and integrate into budget planning.
2.4 Develop sustainable infrastructure policies and plans and update the Sustainable Council Building Policy to continue to ensure climate-resilient design is incorporated into asset renewal, and new council construction	3-5 years	Low**	Future Council funded actions, requires funding (business case may be required), alternative sources of funding (e.g., grants)	Community & Infrastructure	1. **Undertake** a landscape scan to understand what policies and plans already exist. 2. **Develop** a Sustainable Transport Infrastructure Policy for roads, bridges, and the Aerodrome. • **Undertake** modelling and consult with engineers to understand the requirements of the infrastructure to be climate resilient for heat risk to roads and Aerodrome infrastructure and flood risk to the Aerodrome, roads, and bridges. 3. **Develop** a Sustainable Drainage Infrastructure Policy for the drainage and stormwater systems • **Undertake** hydraulic modelling and consult with engineers to understand the capacity and future requirements of the drainage and stormwater systems. 4. **Develop** a Regional Climate Resilient Waste Management Plan to better manage waste in the context of climate change • **Undertake** a region-wide study on the impacts on climate-related disaster on waste generation and the capacity of current landfills to absorb increased amounts of waste

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					generated by disasters. Based on this study, **develop** a plan to address any issues identified. 5. **Update** the Sustainable Council Building Policy to include consideration of a flood overlay for a flood that has a 0.5% chance of happening each year when upgrading or approving new Council assets. 6. In all Policies **include a provision** for considering whether the asset should be relocated or decommissioned due to the expense to upgrade or continually maintain or repair after hazard events.
2.5 Develop guidance on how to integrate climate change into infrastructure management plans	3-5 years	Low to Very High	Alternative sources of funding (e.g., grants)	Community & Infrastructure	7. Procure development of specific guidance on how to integrate climate change considerations into infrastructure renewal, maintenance and in new Council developments, considering different hazards. For example, how to integrate the specific increases in extreme rainfall and flood depth the Municipality is likely to experience into upgrading roads in Waldara or bridges in Wangaratta South, Oxley, and Docker (potential Very High cost). And/or 8. Procure the development of general guidance on how to integrate climate change considerations into infrastructure renewal, maintenance and in new Council developments. For example, guidance on typical or best practice methods to integrate increased flood frequency and severity into road and bridge maintenance. This would not be bespoke to the Wangaratta context (and therefore has a potentially Low to Moderate cost)
Action Area 3 – Future-proof land use planning and development					
Action	**Timeframe**	**Cost***	**Funding mechanism**	**Responsible Directorate**	**Suggested steps to implement**
3.1 Advocate for better integration of climate change in state and national planning and building legislation and policies	1-2 years	Low	Council funded budget	Sustainability & Culture	1. **Join** the Council Alliance for a Sustainable Built Environment to join with other local councils and advocate for changes to state and national planning and building legislation and policies that better accounts for climate change including: • Advocating to the state government to give all climate risks that have the potential to threaten life, for example flooding, the same priority in land use and planning decision making across Victoria. • Preventing new developments from worsening the heat island effect and flood risks. • Ensuring new developments include climate-smart design including recycled water infrastructure.

					• Expanding the flood overlays to include consideration of increasing flood probabilities, worsening severities, and larger extents due to climate change. In the absence of specific flood modelling incorporating climate change for the region, NECMA advises that the best available representation of future flood risk is the 0.5%AEP flood event (a flood that has a 0.5% chance of happening each year) for the Wangaratta Urban Waterways (provisions currently consider 1%AEP flood events). Incorporate recommendations into the Wangaratta Planning Scheme as relevant. • Updating Planning Provisions regularly based on best available climate change science.
3.2 Work with stakeholders to periodically revise hazard and risk modelling for decision making and share outputs with the community	6+ years	Moderate	Council funded budget, alternative sources of funding (e.g., grants)	Sustainability & Culture	1. **Undertake** a landscape scan to understand the recency of available modelling and the extent it considers climate change. 2. **Integrate** GMCA Resilient Public Estate outputs into Council mapping software (Intramaps) to better enable Council to use it for decision making. 3. **Work with** NECMA to ensure flood modelling accounts for climate change under multiple emissions scenarios (e.g., RCP4.5 and RCP8.5) and hazard return periods (a one in 100-year flood (1%AEP) and one in 200-year flood (0.5%AEP). 4. **Work with** relevant stakeholders to improve understanding of bushfire risk under multiple emissions scenarios. 5. **Procure** heat modelling to understand urban heat island effect for each built up area in the Municipality under multiple emissions scenarios. 6. **Procure** modelling to understand which communities and households have low redundancy in their road networks and are likely to be isolated if a road is blocked (linked with Action 4). 7. **Procure** modelling of multi-hazard risks. For example, heatwaves and drought increasing the risk of bushfire. Work with local emergency services to determine appropriate hazard/risk scenarios. 8. **Share findings** of modelling with the community through community exhibitions and other public events (such as the Wangaratta Show). 9. **Work with** surrounding Councils and GMCA to understand if there is shared demand for this work to share the costs. 10. **Use the findings** of modelling in advocacy to the Victorian Government to update the Victoria Planning Provisions. **Update** local planning schemes in the short term, including appropriate community engagement.

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					11. **Incorporate** provision for updated modelling into the long-term financial plan.
Action Area 4 – A prosperous, prepared, and healthy community					
Action	**Timeframe**	**Cost***	**Funding mechanism**	**Responsible Directorate**	**Suggested steps to implement**
4.1 Create a communications plan with relevant partners to promote mental health services, particularly for rural and remote communities who have experienced a disaster	3-5 years	Low	Council funded budget, shared budget with partnering organisations, alternative sources of funding (e.g., grants)	Community & Infrastructure	1. **Undertake** a landscape scan to understand the state of communication on mental health services in the Municipality. 2. **Work in consultation** with the Grit & Resilience Consortium that has relevant stakeholders for the municipality. 3. **Create** a Post Disaster Toolkit for the staff of Rural City of Wangaratta Council. 4. **Create** a communications plan to share information on available mental health support services with the community, focusing on rural and remote communities who may require online services or telehealth and communities that have recently experienced a disaster. Include a variety of communication tools and languages to cater for the diversity of the Municipality.
4.2 Improve community access to relief centres	6+ years	Moderate	Future Council funded actions, requires funding (business case may be required), alternative sources of funding (e.g., grants)	Community & Infrastructure	1. **Identify** Council buildings or other privately owned buildings in vulnerable communities without relief centres or neighbourhood safer spaces that could act as a refuge of last resort in a disaster. Use the Neighbourhood Safer Places (Bushfire Places of Last Resort) Plan – V2.1 checklist to determine suitability. 2. **Incorporate** funding provisions for operating more than one relief centre or neighbourhood safer space during a major disaster in the long-term financial plan to minimise the consideration of costs of keeping the community safe.
4.3 Improve access to financial coaching and resources that improve business	6+ years	Very low to Moderate	Council funded budget, alternative sources of	Sustainability & culture	1. **Run** a survey or stakeholder engagement to understand knowledge gaps and needs of small business owners regarding business continuity in the context of climate-related disasters. Which hazards and impacts have the most extreme consequences?

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continuity strategies for small businesses			funding (e.g., grants)		2. **Reach out** to financial planners or advisors in the region and the Financial Advice Association of Australia to see if they would be able to support business continuity training and workshops for local businesses. 3. **Identify** existing relevant business continuity learning resources that address business owners concerns and gaps in knowledge (for example ADAPTWEST climate change checklists for businesses). Share with the community via email, newsletters, workshops or other activities, partnering with local financial advisors if possible. The basis of this training may build upon learnings from published studies on business continuity planning and management by The World Bank and the Global Facility for Disaster Reduction and Recovery. 4. **Consider** procuring a consultant to create bespoke materials, if specific to the Municipality business context if existing resources do not address community needs, support from financial advisors is not available, or if funding opportunities are identified. Disseminate via workshops or reports to the community. NOTE: This could significantly increase the cost of this action into the 'moderate' category. 5. **Advocate** for the State Government to improve incentives for businesses to address their climate risks including increasing rebates for solar systems and batteries to maintain basic business functions through mains power outages or increasing tax incentives to reduce climate risks like retrofitting flooring to tiles including up the walls to be flood resilient.
4.4 Collaborate with partners to enhance community outreach efforts on climate change awareness and adaptation	1-2 years	Low	Council funded budget, shared budget with other organisations	Sustainability & Culture	1. **Identify** community leaders and partners including as DEECA (who have an action on community education in the Hume Regional Climate Adaptation Strategy), CFA (who already publish extensive public materials on climate change) and RCoW Youth Council who could be partners in community outreach on adaptation. Ensure they are provided relevant training and support. 2. **Provide** information on hazard and risk modelling that is accessible and understood by the community. Incorporate updates as new modelling becomes available, ensuring this is shared in a timely manner. 3. **Share** information on how people can reduce their risks including programs that subsidise energy efficiency measures, solar, batteries, and insultation in homes, particularly targeting vulnerable community members and contexts where it is necessary to stop outdoor activities and work (such as in extreme heat events). 4. **Share** information on how to access support, including mental health support (linking to Action 10).

					5. **Investigate** the feasibility of sharing information on climate change through a range of activities such as workshops to explain hazard maps, webinars on the impact of climate change on biodiversity, stalls at community events such as the Wangaratta Show and Farmers Markets on climate change and how Council is addressing it (this Plan). Consider inviting community members periodically to emergency event simulations (linking with Action 9).
Action Area 5 – A resilient natural environment					
Action	**Timeframe**	**Cost***	**Funding mechanism**	**Responsible Directorate**	**Suggested steps to implement**
5.1 Work with local emergency authorities to improve the distribution of information to landowners on how to develop climate resilient land management plans	1-2 years	Low	Council funded budget	Sustainability & Culture	1. **Engage** with local emergency authorities such as the CFA, NECMA, and NEW to develop awareness campaigns for landowners on how to develop climate-resilience management plans for different hazards. Material to share could include short-term emergency management actions such as bushfire management where extensive guidance and knowledge already exists, but also long-term actions such as selection of appropriate vegetation, benefits of agroforestry, diversifying the business, and other innovative climate-resilience strategies.
5.2 Develop a Climate Adaptive Planting Project	6+ years	Low	Future Council funded actions, alternative sources of funding (e.g., grants)	Sustainability & Culture	1. **Develop** a list of climate-smart shrubs and grasses to compliment the recommended tree species list. 2. **Share** the lists and information about the benefits of planting climate-smart plants with the public through websites, brochures, and stalls at public events such as the Wangaratta Show (linking with Action 13). 3. **Lead** by example by committing to integrate the recommended species list into the Tree Management Manual and ensuring the listed species are used in new Council planting projects. 4. **Create** a vegetation planting program to increase canopy cover and climate-resilient shrubs and grasses for Council managed parks and gardens in the northern areas of the Municipality.

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5.3 Develop an Integrated Water Management plan with relevant partners	6+ years	Low**	Future Council funded actions, alternative sources of funding (e.g., grants), shared funding with other stakeholders	Community & Infrastructure	1. **Undertake** a landscape scan to understand what work towards and IWM has already been completed. 2. **Work with** NEW and NECMA to develop an IWM plan. 3. **Upgrading** levees and managing flood risk to open space assets in Whorouly should actively considered in the IWM Plan or broken out into their own bespoke plans. 4. **Identify** activities from the IWM plan that need to be integrated into the long-term financial plan. 5. **Leverage** findings from Action 6 on modelling the capacity and future requirements of the drainage and stormwater systems if already complete. If not, include provisions for it within the IWM.
5.4 Work with Traditional Owners to mitigate and reduce the impacts of climate change hazards	3-5 years	Moderate	Future Council funded actions, alternative sources of funding (e.g., grants), shared funding with other stakeholders	Sustainability & culture	1. **Investigate** opportunities and feasibility of engaging a First Nations subcontractor to lead engagement with First Nations groups in the region to establish what projects are already ongoing and where gaps may exist in the Municipality. Ensure enough time is allowed for meaningful engagement. Also, leverage existing relationships between NEW, other councils and relevant First Nations groups if possible and appropriate. 2. **Work with** Traditional Owners to incorporate cultural knowledge and practices in bush reserve management plans for the municipality. For example, reducing the prevalence of Eucalypts in specific areas to manage fuel loads. 3. **Identify** actions that require funding and develop budget bids or incorporate into long term financial plan.

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Glossary

Climate Adaptation	The process of adjusting to actual or expected climate and its effects to minimise harm or utilise opportunities [26].
Climate Mitigation	Interventions aimed at reducing greenhouse gas emissions.
Consequence	Magnitude of the impact.
Disaster	A serious sudden accident/disruption of the functioning of a community or a society at any scale due to hazardous events or natural catastrophe interacting with conditions of exposure, vulnerability and capacity, leading that cause great human, material, economic, and/or environmental losses and damages [26].
Exposure	The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected [26]
Hazard	The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, damage/loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources [26]
Likelihood	Chance of a risk occurring.
Municipality	Refers to the Wangaratta Local Government Area governed by the Rural City of Wangaratta. Also referred to as 'the LGA' and 'the Region' throughout the Report [26].
Representative Concentration Pathway	Climate change scenarios used in climate models (IPCC) to generate data about possible future climates. It usually refers to the portion of the greenhouse gas concentration pathway extending up to 2100. Provide one of many possible scenarios that would lead to specific radiative forcing characteristics [26].
Resilience	The capacity of interconnected social, economic and ecological systems to cope with a hazardous event, trend or disturbance, responding or reorganising in ways that maintain their essential function, identify and structure [26].
Risk	The potential for adverse consequences for human or ecological systems. In the context of climate change, risks can arise from potential impacts of climate change as well as human responses to climate change [26].
Scenario Analysis	Scenario analysis is a process for identifying and assessing the potential implications of a range of plausible future states under conditions of uncertainty [27].
Sensitivity	Sensitivity is the degree to which human and systems could be harmed by the exposure to risks (climate risks in this report context).
Shock	Disruptive short-term events that negatively impact assets, wellbeing, livelihood, and safety [28].
Stressor	Long-term pressures with no clear beginning or end which weaken a systems overall stability and increase its vulnerability [28].
Trend	A general direction in which something is developing or changing.
Vulnerability	The propensity or predisposition to be adversely affected [28]

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Acronyms

$	Australian Dollars
%	Per cent
&	And
+	Plus
AEP	Annual Exceedance Probability
AV	Ambulance Victoria
BF	Risks relating to bushfires
CAP	Climate Adaptation Plan
CFA	Country Fire Authority
DEECA	Department of Energy, Environment and Climate Action
DJPR	Department of Jobs, Precincts and Regions
e.g.,	For example,
EPA	Environment Protection Authority
ESRG	Environment and Sustainability Reference Group
EVCs	Ecological Vegetation Classes
FL	Risks relating to flooding
GMCA	Goulburn Murray Climate Alliance
ha	Hectare(s)
IPCC	Intergovernmental Panel on Climate Change
IWM	Integrated Water Management
km	Kilometre(s)
LGA	Local Government Area
M&E	Monitoring and Evaluation
MAR	Managed Aquifer Recharge
mm	Millimetres
NA	Not Available
NECMA	North East Catchment Management Authority
NEW	North East Water
°C	Degrees Celsius
RCoW	Rural City of Wangaratta
RCP	Representative Concentration Pathway(s)
RNST	Risks relating to rain and storms
RSPCA	Royal Society for the Prevention of Cruelty to Animals
SPI	Standardised Precipitation Index
TMP	Risks relating to temperature
VCCEM	Victorian Council of Churches Emergencies Ministry
VIC	Victoria
VicPol	Victoria Police

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