

CLIMATE-READY VICTORIA

GIPPSLAND

How climate change will affect the Gippsland region and how you can be climate-ready



The Gippsland region has already become warmer and drier – a climate trend likely to continue into the future. Local residents, businesses and communities are changing the way they do things in response. Getting climate-ready involves understanding how climate change is likely to affect you and your region, and working out ways to adapt. Everyone can contribute to the Gippsland region's climate-ready future.

GIPPSLAND HAS BEEN GETTING WARMER AND DRIER. IN THE FUTURE THE REGION CAN EXPECT:



temperatures to continue to increase year round



more hot days and warm spells



fewer frosts



less rainfall in winter and spring



more frequent and more intense downpours



harsher fire weather and longer fire seasons



rising sea level



increased frequency and height of extreme sea level events



warmer and more acidic oceans

HOW WILL THESE CHANGES AFFECT YOU, AND WHAT CAN YOU DO ABOUT THEM?

This publication highlights the impacts climate change will have on the Gippsland region. It gives examples of how people are already becoming climate-ready, with links to more detailed information.

While this publication is about adapting to climate change, reducing your carbon emissions by reducing energy use and switching to renewable energy sources is also important in getting climate-ready. For more information on reducing your emissions, visit www.climatechange.vic.gov.au.

OUR CHANGING CLIMATE

GIPPSLAND AT A GLANCE

6 local government areas

approximately
259 000
5% of the state

41 375 km²
18%
of the state



RECENT CLIMATE

The Gippsland region has mild to warm summers with average maximum temperatures currently around 21 to 25°C. Winters are mild near the coast with average maximum temperatures of 12 to 15°C. Further inland, it is cooler in the foothills and cold in the mountains where there are frequent frosts and some snow.

Rainfall is comparatively high, but varies across the region. The southern flanks of the Great Dividing Range, the Strzelecki Ranges and the south-western and eastern parts of the region receive high rainfalls of 1000 to over 1600 mm a year, which falls as snow on the higher peaks in winter. Annual rainfall decreases to less than 600 mm in the central part of the region due to the rain shadow of Wilsons Promontory and the Strzelecki Ranges. East Coast Lows can deliver heavy downpours across eastern Gippsland and parts of western Gippsland.

For more information about some of the drivers of Victoria's climate, visit the [Climatedogs website](#).

CLIMATE VARIABILITY AND CHANGE

Our climate varies – it always has and always will. This climate variability means that some periods are cooler and wetter than average (as was the case in the 1970s), while others are hotter and drier (such as during the Millennium Drought). However, due to climate change, the long-term average is changing. Future climate will be different from that in the past.

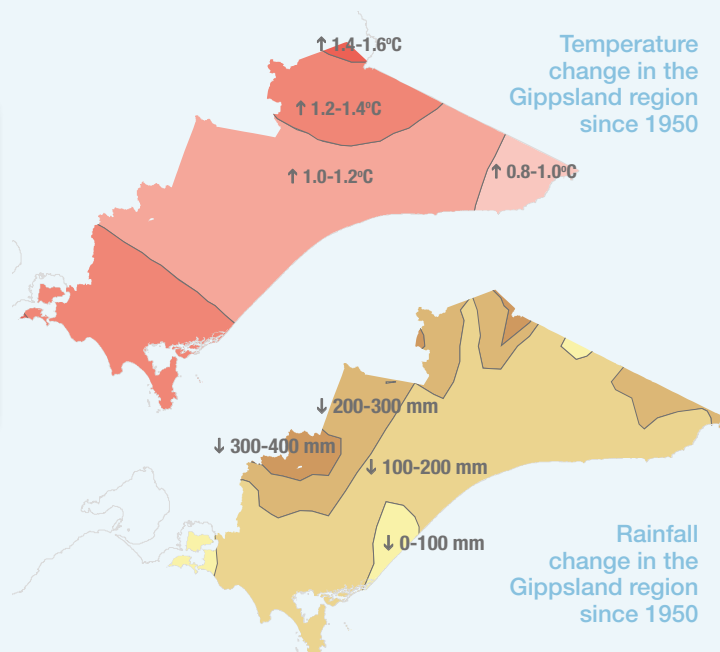
IT'S GETTING WARMER AND DRIER

Over the past 100 years, global surface air temperatures have risen by almost 1°C. Both the atmosphere and the oceans have warmed. Human activity is causing climate change, through our release of greenhouse gases from the burning of fossil fuels, land use change and agriculture. Atmospheric concentrations of carbon dioxide are now more than 40% higher than they were before industrialisation.

In the Gippsland region, the rate of warming has increased since 1960.

On average, rainfall has declined since the 1950s, especially in autumn. The harsh Millennium Drought (1996 to 2009) followed the wet decades of the 1950s and 1970s.

Sea level today is approximately 225 mm higher than in 1880. Sea surface temperatures have risen faster here than elsewhere on the Australian coastline. This is already affecting marine life.



HOW DO WE GET CLIMATE-READY?

Being climate-ready in the Gippsland region involves knowing the climate risks and impacts for the region, and making changes so that we can take advantage of the opportunities and reduce the negative impacts.

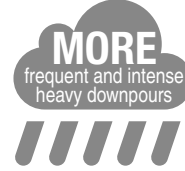
GIPPSLAND CLIMATE RISKS



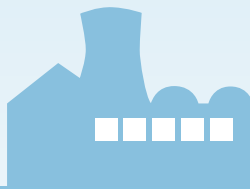
MORE
days of
extreme heat



HARSHER
fire weather



GETTING CLIMATE-READY AT A GLANCE



KEY CLIMATE RISKS

Primary production

- ↓ rainfall
- ↑ temperature
- ↑ hot days
- ↑ fire weather

Infrastructure

- ↑ sea level
- ↑ fire weather
- ↑ flooding
- ↑ hot days
- ↑ heatwaves
- ↑ storm surges

Tourism

- ↑ temperature
- ↑ fire weather
- ↑ heatwaves
- ↓ snow cover

Health and community

- ↑ heatwaves
- ↑ flooding
- ↑ fire weather
- ↑ solar radiation

Environment

- ↓ rainfall
- ↑ fire weather
- ↑ hot days
- ↑ sea level
- ↑ ocean acidification

POTENTIAL IMPACTS

- Reduced water security
- Changed distribution of pests and diseases
- Farm business affected by bushfire
- Changes in pasture growth

- Increased flood damage
- Increased maintenance costs
- Increased disruption to services

- Increased threats to tourism infrastructure
- Damage to popular environmental sites
- Reduced snow depths and shorter season
- Risks to tourists unfamiliar with conditions

- More stress on health and emergency services
- More heat-related deaths, particularly among the elderly and disadvantaged
- Mental health effects
- Changes in disease occurrence

- Amplification of existing threats to flora and fauna
- Changes to habitat
- Altered disturbance regimes
- Changing dynamics of invasive species
- Contraction of alpine ecosystems
- Reduced snow depth and cover

CLIMATE-READY ACTIONS

- Manage soil to retain stubble, carbon and water
- Adopt flexible grazing techniques to maintain groundcover
- Provide shelter for stock from extreme heat
- Increase on-farm storage of water
- Change crops and pasture varieties

- Construct floating jetties
- Relocate Seaspray Surf Life Saving Club
- Insure public assets
- Consider future climate and sea level rise when locating new infrastructure

- Develop year-round tourism options
- Multi-skill staff
- Implement emergency planning for tourist sites
- Prepare for changing seasonal demand

- Improve flood warning systems
- Develop property fire management plans
- Use existing social networks to support vulnerable community members
- Implement/use rural mental health care programs

- Protect refuge areas for fish and aquatic fauna
- Establish vegetation on stream and river banks
- Maintain groundcover
- Protect high quality remnants, and conduct targeted revegetation

GETTING CLIMATE-READY

HOW CLIMATE-READY ARE YOU?

Getting climate-ready is an ongoing process, and there's no single recipe for success. Many of the risks we face are not new. However, there are likely to be changes in duration, frequency and severity of some weather events, as well as changes to the climate.

To determine what's important to you and what climate change responses might work for your situation, consider these questions:

- ▶ How might you – your health, property, business, community, industry – be affected by:
 - higher temperatures and more frequent heatwaves?
 - less winter and spring rainfall, more time in drought, decreased water availability or flooding?
 - sea level rise, increased height of extreme sea level events and coastal erosion?
 - harsher fire weather?
- ▶ How might your services, suppliers, clients or customers be affected?
- ▶ Are you making any long-term decisions now that will be impacted by future climate change?
- ▶ What action could you take now to prepare? What are others in your region doing? What benefits have they experienced?
- ▶ Can you prioritise actions that also have other benefits, such as emissions reduction, financial, community or environmental advantages?
- ▶ Does climate change present any opportunities you can take advantage of?

The information, case studies and links in this brochure can help get you started.

CLIMATE-READY NOW

Victorians have always been good at managing the ups and downs of climate. Now that we have a clearer picture of the way in which climate is likely to change in future, there's lots that we can do to become climate-ready. Decisions we make now will affect how well we cope with the changing climate, which in turn will affect future economic and employment conditions. Decisions range from simple to complex, and some will need to be made sooner than others. Your decisions may depend on the local climate in your part of the region.



There are many good examples of communities in your region and in Victoria preparing for and adapting to climate change. The **i** links you directly to the source or visit www.climatechange.vic.gov.au for a full list of links.



PRIMARY PRODUCTION

The agribusiness sector is a significant employer and major driver of the region's economy, with over a third of Gippsland's business involved in agriculture and fishing. Lakes Entrance has the largest commercial fishing fleet in Victoria.

The dairy industry in Gippsland produces 21% of Australia's milk, with a large dairy-processing sector within the region. Gippsland also has a significant grazing industry based predominantly on beef, but also wool and prime lamb production. Horticultural production is significant and increasing, including potatoes and asparagus in the west, other vegetable production across the region and boutique wineries.

The sector is highly sensitive to reduced water supply and increased temperatures. Intensive animal industries will need to provide increased protection for stock from extreme temperatures. Pest and disease incidence is likely to change.

Climate change may present opportunities in Gippsland for some horticulture crops such as apples and brassicas if irrigation water is available.



Dairy Australia's Dairy Climate Toolkit provides comprehensive details of the practices that profitably reduce greenhouse gas emissions from dairy farm systems, and adaptation strategies such as addressing heat stress and responding to changes in pasture.



The Southern Livestock Adaptation project brought researchers, extension experts and producers together to look at a range of future climate scenarios and the impact on farm productivity and profitability. It examined impacts at a local farm level at 46 regional locations across southern Australia.





INFRASTRUCTURE

Gippsland has a major transport corridor of both road and rail which follows the east-west 'spine' of the region.

There is extensive energy generation and distribution infrastructure in the region's central corridor, providing over 80% of Victoria's electricity, and over 90% of Victoria's natural gas.

The region also supplies 60% of Melbourne's water, with the Thomson Reservoir fundamental to Melbourne's water supply and the Wonthaggi desalination plant providing future water security.

Transport infrastructure in the region will be increasingly exposed to periodic flooding and increased landslips closing roads. Long hot spells will weaken the road surface, increase maintenance costs and reduce safety.

Sea level rise in coastal communities will be an increasing challenge, with up to 78% of the Gippsland coast subject to coastal erosion.



The Western Port and Gippsland Lakes–Ninety Mile Beach Local Coastal Hazard Assessments provide information, modelling and data to assist in understanding impacts of erosion, coastal inundation and catchment flooding on existing and future scenarios, to assist the understanding of, and planning for, future climate risk. The tools support land use planning and decision-making about roads and utilities.



TOURISM

The region's extensive coastline, waterways, national parks and cultural heritage sites support a significant tourism industry, attracting over 10 million visitors annually. Important tourist destinations include Phillip Island, Wilsons Promontory, Gippsland Lakes, Mount Baw Baw and the Australian Alps, and Croajingolong and Tarra-Bulga National Parks.

Climate change has the potential to affect tourism through reduced snow cover, increased fire weather and community perception of fire danger, and other extreme events affecting environmental attractions. While snow making will offset some of the losses of natural snow, there will be fewer days where the temperature will be suitable for snow making.



Mount Baw Baw has worked to develop the resort as a year-round destination to counter the effects of a reduced snow season. 'Green season' activities such as cycling (including new mountain bike trails), bushwalking, disc golf, trail running and special events are promoted and have seen increased visitor numbers in summer.



HEALTH AND COMMUNITY

The Gippsland region has higher rates than the Victorian average of obesity, chronic disease, disability and high-risk health behaviours such as smoking. The region has an ageing population, with the number of people over 60 projected to be around 30% of the total by 2026.

Increased hot days and heatwaves will exacerbate existing health risks, putting greater pressure on hospitals and emergency services. Some community members are more vulnerable to the impacts of climate change and may need assistance to manage extreme heat, bushfires and flooding. More frequent extreme weather events and impacts on the economy and jobs due to climate change may also affect the mental health of the community.



Relationships Australia Victoria was funded by Gippsland Primary Health Network in 2014–15 to deliver Access to Allied Psychological Services (ATAPS) – Extreme Climatic Events. This program offered free counselling, group work and support to all Gippsland residents who suffered emotional distress due to events such as bushfire, floods and drought.



ENVIRONMENT

Gippsland's natural heritage includes snow fields, wilderness areas, rainforests, extensive lakes and beaches. The Gippsland Lakes, Corner Inlet and Western Port are listed as 'Wetlands of International Significance' under the Ramsar Convention, and provide significant tourism and recreation benefits.

With increases in demand for water, there will be a need to focus on protecting the world-class wetlands and surrounding environments. The region is home to the rare Long-footed Potoroo, a small marsupial restricted to the Gippsland rainforest. The impacts of climate change are likely to increase pressure on the Long-footed Potoroo and other threatened species.

Loss of biodiversity will place greater stress on the personal and economic wellbeing of communities.



The region's Catchment Management Authorities have developed climate change plans to provide further information about the impacts of climate change on natural resources, as well as identify priority actions for adaptation and mitigation. The East Gippsland plan has been released, with the West Gippsland plan to be available in 2016.



FUTURE CLIMATE

LOOKING AHEAD

Climate projections for the Gippsland region are based on sophisticated national and international **global climate models**. These models use the physical laws that govern the way the world's climate works to simulate the climate from high in the atmosphere to the depths of the oceans. The models run on some of the world's most powerful supercomputers, and successfully represent the important features of today's climate as well as those of past climate.

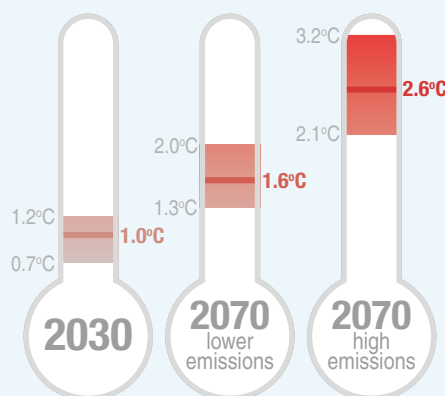
Maths and physics do not govern social and economic aspects of the future, so we don't know the impacts of population, the economy, policy decisions and technology on greenhouse gas emissions. To cover a range of possibilities, scientists use **emissions scenarios** called Representative Concentration Pathways (RCPs) to develop climate projections. These projections describe a **high emissions** future (using RCP8.5) and a **lower emissions** future (using RCP4.5). For the past 10 years we've tracked along the high emissions pathway. More information about how the projections were produced and guidance on their application are at climatechangeinaustralia.gov.au.

The climate is projected to continue to change over the coming century. The projections are given for **20-year periods centred on 2030 and 2070**, so the 2030 projections are for the period 2020–2039 and the 2070 projections are for the period 2060–2079. Given the similarity of the emissions scenarios up to 2030, only projections for the high emissions scenario for 2030 are used in this publication. Projections are represented as a change relative to the period 1986–2005.

UNDERSTANDING THE PROJECTIONS

The projections are presented as a **median (middle) value and a range** that excludes the lower and upper 10% of results.

For example, in 2070 under a high emissions scenario, annual average temperature is projected to rise by 2.6°C (2.1–3.2°C). In this case, the median temperature rise determined by all the models is 2.6°C; 90% of model results indicated a rise of at least 2.1°C and 90% of the model results indicated a rise of 3.2°C or less.



Projected annual average temperature changes for the Gippsland region

Our **confidence** in the projections is based on a combination of scientific understanding, past climate changes, evaluation of climate model performance and the extent of climate model agreement. Very high confidence indicates robust evidence and high model agreement.

very high confidence ****
high confidence ***
medium confidence **



TEMPERATURE

Average temperatures will continue to increase in all seasons ****

For the near future (2030), the annually averaged warming is projected to be around 0.7 to 1.2°C above the climate of 1986–2005. By the year 2070, the projected range of warming is 1.3 to 3.2°C, depending on future emissions.

There will be more hot days and warm spells ****

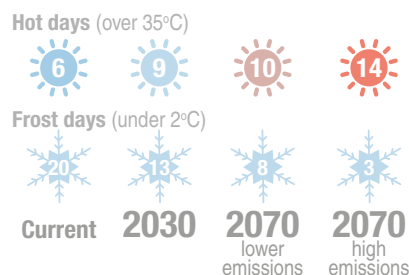
There will be a substantial increase in the temperature reached on hot days. There will be more hot days (greater than 35°C), and warm spells will last longer.

There will be fewer frosts ***

Frost-risk days will decrease.

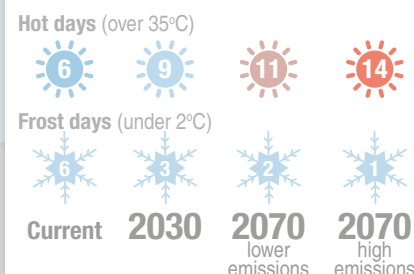
FUTURE CLIMATE TRARALGON

Average number of days per year



FUTURE CLIMATE ORBOST

Average number of days per year





RAINFALL

Natural climate variability will dominate any projected changes in the near future ***

In the near future (2030), year to year changes in rainfall will dominate trends caused by greenhouse gases. Recent research partly links the observed cool season rainfall reductions to climate change.

There is projected to be less rainfall in winter and spring ***

In 2070 under high emissions annual rainfall could decrease by up to 22% from that experienced in 1986–2005. Seasonally, there may be winter rainfall decreases of up to 22% and spring rainfall decreases of up to 38%.

By the middle of the century, and under high emissions, winter rainfall reductions will become evident against natural variability.

Changes to summer and autumn rainfall are possible but not clear, although there is a tendency for a decrease in autumn.

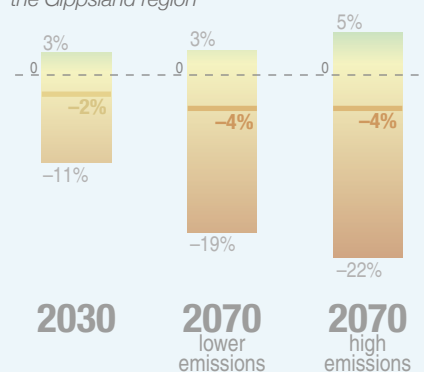
Conditions outside these projections are also possible, from either natural variability (such as extended drought) or climate changes that are outside the range we currently estimate.

Frequency and intensity of extreme rainfall events are projected to rise ***

Despite an overall trend of declining rainfall, more of the rain that does fall will be in increasingly extreme downpours. This is likely to lead to an increase in the incidence of flooding events, particularly in urbanised and small catchments.

Time spent in drought is projected to increase over the course of the century **

Projected annual average rainfall changes for the Gippsland region



FIRE WEATHER

Fire weather is projected to be harsher in the future ***

Fire weather is a measure of fuel dryness and hot, dry, windy conditions. An increase in frequency of very high and extreme fire danger days is projected.



MARINE AND COAST

Sea level will continue to rise ****

By 2030 the projected sea level rise for studied locations is 0.10 to 0.20 m above the 1986–2005 level.

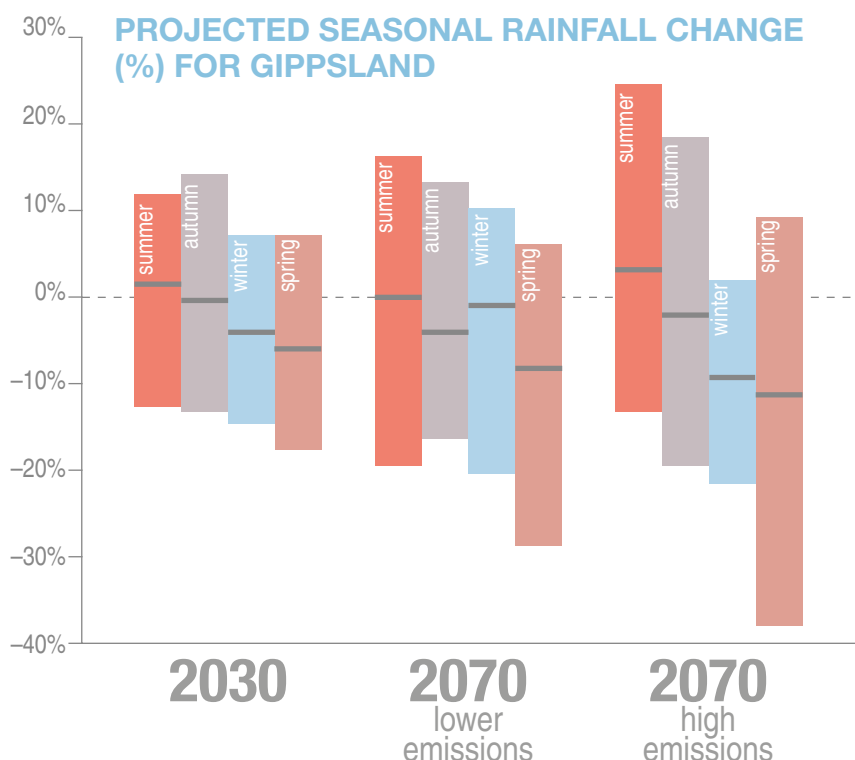
By 2070, sea level is projected to rise 0.21 to 0.48 m at studied locations under lower emissions and 0.27 to 0.59 m under high emissions. However, depending how much the Antarctic ice sheet melts, these levels may be higher.

Height of extreme sea level events will also increase ****

The ocean will get warmer and more acidic ****

Sea surface temperature is projected to increase in the range of 1.1 to 2.3°C by 2070 under high emissions. The sea will also become more acidic, with acidification proportional to emissions growth.

PROJECTED SEASONAL RAINFALL CHANGE (%) FOR GIPPSLAND



The bar indicates the range and the middle value is shown by the horizontal line.

More detailed information on these and other climate variables is available at www.climatechange.vic.gov.au

GIPPSLAND 2050

In 2050, under high emissions, the climate of Traralgon and Moe will be more like the climate of Tenterfield now; and Wonthaggi will be more like Lakes Entrance.

To find out what the climate will be like in the future where you live, use the Climate Analogues tool on the Climate Change in Australia website at www.climatechangeinaustralia.gov.au. The tool matches projected rainfall and maximum temperature with the current climate experienced in another location for 20-year periods centred on 2030, 2050 and 2090.

ARE YOU CLIMATE-READY?

There are many resources available to help you get climate-ready.

A full list of links to projects mentioned in this brochure is available at www.climatechange.vic.gov.au.

There are similar brochures for other Victorian regions and a statewide brochure, available at www.climatechange.vic.gov.au.

To find out more about what the Victorian Government is doing to make the state more climate-ready, or for more information about Victorian Government climate policy, visit www.climatechange.vic.gov.au.

Information about the impacts of climate change on water availability and supply is available from the Victorian Climate Initiative website at www.cawcr.gov.au/projects/vicci/.

Information about the changes in our climate since the beginning of last century and trends we're seeing now is available from the Bureau of Meteorology website at www.bom.gov.au.

Information about the future climate and its impacts, and adaptation strategies, is available from the Climate Change in Australia website, produced by CSIRO and the Bureau of Meteorology, at www.climatechangeinaustralia.gov.au.

Climate-ready Victoria: Gippsland, November 2015.

Climate change projections in this publication have been generated by CSIRO on behalf of the Victorian Government, and are based on national projections released by CSIRO and the Bureau of Meteorology. The Bureau of Meteorology has kindly supplied data on climatic trends. CSIRO has reviewed this publication.

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Photo credits: Ken Stepnell, Baw Baw Shire Council, Latrobe City Council

