

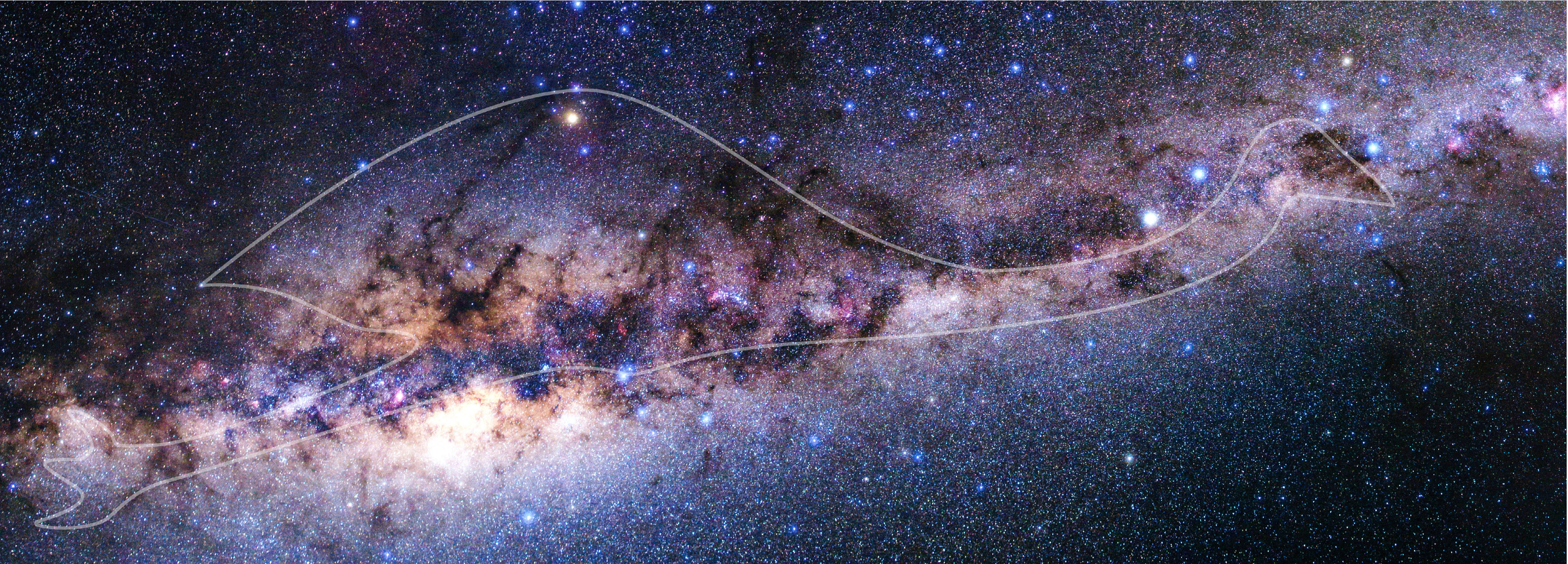
New South Wales

Climate Change Snapshot



Photo caption:

The Emu in the Sky is an Aboriginal constellation that is made up of the dark clouds of the Milky Way. With the movement of the Earth, the position of the Emu in the Sky changes throughout the year. Aboriginal people in some nations across NSW and Australia relate the position of the Emu in the Sky to the breeding behaviour of the emu on the land. Cultural astronomy teaches us about the relationship between the sky and land; and that we are all interconnected.



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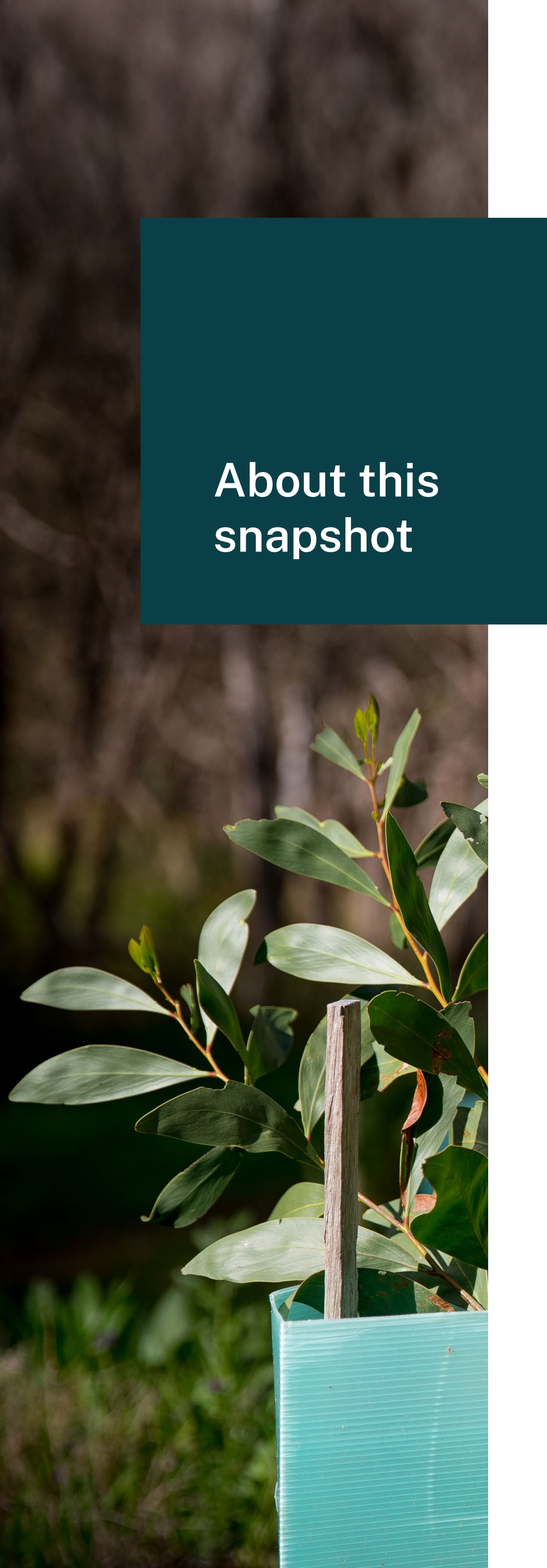
Acknowledgement of Country

The NSW Government acknowledges First Nations people as the first Australian people and the traditional owners and custodians of the country's lands and water. Australia's First Nations people have lived in NSW for over 60,000 years and have significant spiritual, cultural and economic connections with its lands, waters, seas and skies.

They are the first astronomers and scientists who have been listening, reading and understanding natural processes and caring for Country for generations.

We pay respects to Elders past and present and acknowledge the significance of their traditional knowledge in adapting to changes in climate over tens of thousands of years.

We recognise the importance of their cultural knowledge and guidance at this pivotal moment in time.



About this snapshot

The New South Wales (NSW) and Australian Regional Climate Modelling (NARClIM) project delivers high-resolution climate change projections for NSW and south-east Australia.

This snapshot provides the latest NARClIM2.0 climate projections for NSW under low, medium and high emissions scenarios for the middle of the century (2050) and end of the century (2090). It includes projections for key climate variables including temperature, average rainfall, hot days (days $\geq 35^{\circ}\text{C}$), cold nights ($< 2^{\circ}\text{C}$), and severe fire weather days (Forest Fire Danger Index > 50). The projections help illustrate potential climate changes and their impacts, as well as associated climate risks.

NSW is already experiencing climate change. This document provides local-scale climate modelling insights to help NSW communities understand and plan for the impacts of climate change on their infrastructure, environment and way of life; and to support informed planning, risk assessment and action.

This snapshot offers a high-level overview, with more detailed data available through the [AdaptNSW Interactive Map](#), [Climate Data Portal](#) and [AdaptNSW](#).

How to use this snapshot

While there are several different ways to engage with the information in this snapshot, here are some key things to consider:

- **Explore each climate variable across scenarios** – review projections under low (SSP1–2.6), medium (SSP2–4.5), and high (SSP3–7.0) emissions scenarios to understand how climate risk differs depending on emissions pathways (Shared Socioeconomic Pathways, SSPs).
- **Compare scenario-based changes over time** – examine how each climate variable responds to different emissions scenarios for the middle of the century (2050) and the end of the century (2090) to understand how risks may evolve.
- **Identify where projections of climate variables align or diverge** – look for patterns across emissions scenarios and timeframes to see where risks remain consistent and where they escalate or diverge significantly.

Time periods in this snapshot

The projections for each time period represent averaged data across all climate models used for NARClIM for a 20-year period:

- **Baseline period: baseline** → The modelled average for each climate variable from 1990–2009, used for comparison with future projections.
- **Middle of the century: ‘2050’ projection** → The projected average for each climate variable for 2040–2059.
- **End of the century: ‘2090’ projection** → The projected average for each climate variable for 2080–2099.



About this snapshot

NARClIM climate projections

NARClIM is NSW's regional climate modelling project. NARClIM combines carefully selected global and regional climate models through a process known as dynamical downscaling, to generate detailed, locally relevant climate projections. These simulate a range of plausible future climates, helping to inform climate risk assessments and support planning at local and regional levels.

Launched in 2024, NARClIM2.0 provides nation-leading climate model data that span the range of plausible future changes in climate. It offers:

- climate projections out to the year 2100, and simulations of the past climate from 1951 to 2014
- 4-km scale projections for south-east Australia
- 20-km scale projections for the broader Australasian region
- projections for key climate variables and extremes.

There is more information [About NARClIM](#), as well as specific information on [Downscaling in NARClIM](#) and [Global and regional climate models used by NARClIM](#) at AdaptNSW.

Methods and uncertainty

To help address future uncertainty, NARClIM2.0 is built on a selection of emissions scenarios, global climate models and regional climate models that, together, capture a range of climates that could occur. This is referred to as the NARClIM model ensemble. The NARClIM2.0 model ensemble is made up of different combinations of 5 global climate models and 2 regional climate models, giving 10 model combinations in total.

The data presented in this snapshot is generally an average for different 20-year time periods (e.g. the 2050 projection is the average for the 2040–2059 time period). Time series data are presented as annual averages. Combining multiple models through averaging and other statistical methods produces better projections by providing a comprehensive representation of possible future climate scenarios.

To ensure that NARClIM models adequately simulate regional climate, scientists use them to simulate the past climate and compare the results with actual observations. Outputs undergo rigorous quality control and scientific technical peer review.

There is more information on [The NARClIM modelling methodology](#) and [NARClIM data processing, testing and validation](#) at AdaptNSW.

Mental health support

Climate change information can be distressing for some readers, with many Australians of all ages experiencing significant eco-anxiety. For supporting information, please visit the [Black Dog Institute](#) or [Australian Psychological Society](#) or speak with your local healthcare provider.

About this snapshot

Shared Socioeconomic Pathways

NARClIM2.0 uses Shared Socioeconomic Pathways (SSPs), which are the most recent emissions scenarios adopted in [Coupled Model Intercomparison Project Phase 6 \(CMIP6\)](#) models and used in the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report.

The SSPs are a type of storyline-based emission scenario that estimate the world's future emissions and how these will affect the climate. SSPs outline different global development trajectories based on factors such as population, economic growth, education, urbanisation and land use, and technological advancement.¹ By analysing SSPs, we can better understand the long-term consequences of today's decisions and determine if we are heading toward higher-risk scenarios.²

For more information on emissions scenarios visit [Emissions scenarios used by NARClIM](#) on AdaptNSW and [Summary for policymakers report](#) by the IPCC.

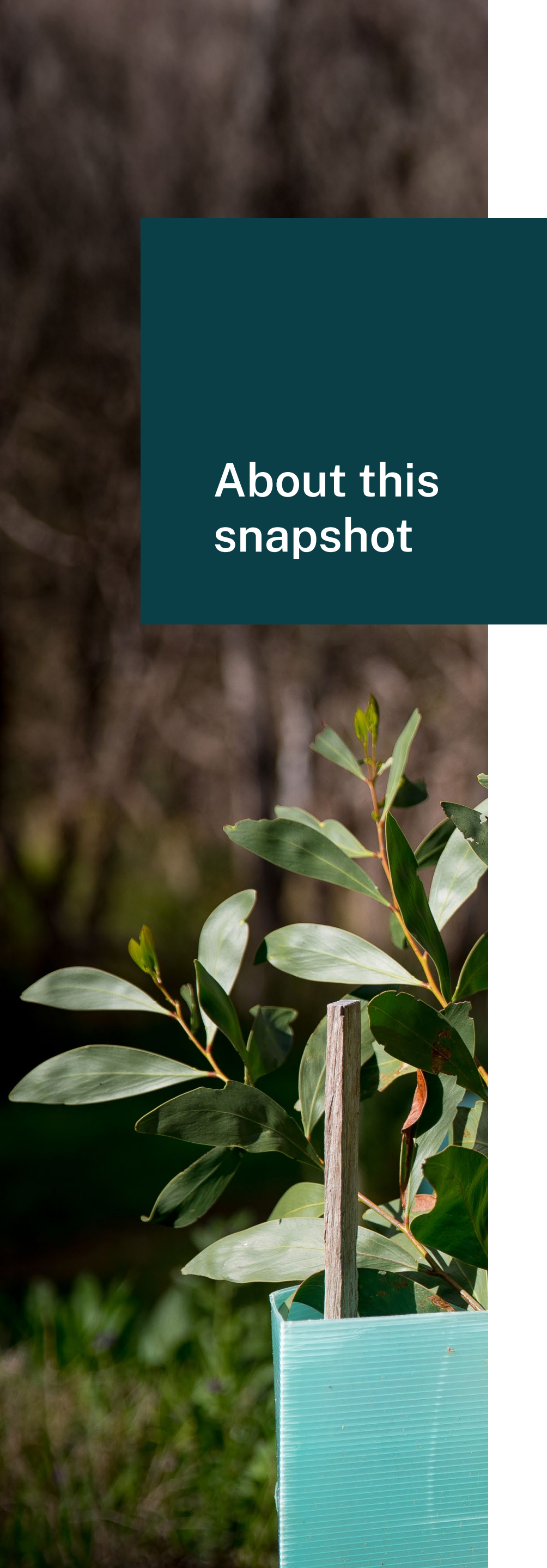
Why do we use 3 SSPs?

The future is uncertain. There are many plausible futures on the horizon, and the one we reach depends on the path we take to get there. NARClIM provides projections for 3 SSPs (low-, medium- and high-emissions), each representing a distinct future with varying levels of climate risk.

Considering a range of SSPs and understanding where these scenarios align or diverge – in both the middle of the century (2050) and the end of the century (2090) – helps inform better planning and decision-making. NARClIM data highlights just how stark the differences between futures can be.

For more information about how to integrate this information into your risk assessments see [Climate risk ready guide](#) and [Limitations and appropriate use](#) on AdaptNSW.





About this snapshot

Understanding the baseline period

To assess future climate projections, a climate baseline is used. This is a reference point which future change is relative to. In this snapshot, the baseline is the 20-year period from 1990 to 2009. This period is termed the baseline period to represent the average climate across those 2 decades.

A 20-year baseline averages out natural climate variability and avoids misleading comparisons with unusually hot, cold, wet or dry years. Using a fixed reference point prevents issues that may arise from using shifting reference points to compare future change against.

Climate during the baseline period is described in 2 ways in this snapshot:

- **Historical model:** The NARClIM2.0 simulation of past climate conditions.
- **Observed:** What was actually measured using weather station data during this period.

These 2 values are similar but not the same. Climate models aim to capture long-term patterns and trends, rather than matching observations perfectly. Observed values give context for comparison of the historical model with what it was in reality.

Looking backwards from the baseline

Before the baseline period, +0.84°C of observed warming had already occurred across NSW and the Australian Capital Territory (ACT) since records began. This is the difference between the 20-year average temperature of the 2 periods centred on 1920 (1910–1929) and 2000 (1990–2009). The Bureau of Meteorology’s national climate records for temperature begin in 1910, making 1910–1929 the first available 20-year average for comparison with the baseline.

Consider the following when incorporating past warming into future projections:

- Warming before the baseline (+0.84°C) is not included in projections of future change.
- Warming after the baseline period is already included in future projections and should not be added again.

Looking forwards from the baseline

Use the historical model values in Table 1 as the baseline when interpreting both middle of the century and end of the century climate projections in this snapshot.

By comparing future projections to the historical model baseline values, we ensure the projected changes reflect genuine shifts, instead of also including the small differences between the modelled and observed data.

Table 1. Baseline climate for NSW

	Average temperature	Average maximum temperature	Average minimum temperature	Hot days	Cold nights	Rainfall	Severe fire weather days
Observed	17.7°C	24.6°C	10.9°C	37.6 days	33.6 days	520 mm	8.3 days
Historical model	17.6°C	23.7°C	11.9°C	37.9 days	30.8 days	465 mm	9.5 days

Table 1 outlines the annual average values for the baseline period in this snapshot. All observed data is calculated from Bureau of Meteorology products. Long-term temperature change data is from the long-term temperature record.³ Observed information and data in graphs come from Australian Gridded Climate Data (AGCD).⁴

Climate of NSW

The climate of NSW underpins a diverse array of important lifestyles, industries and natural ecosystems. A stable climate is critical to support a range of values in NSW, including our unique biodiversity, recreational activities and food systems.

NSW has a diverse climate (Figure 1). It contains regions varying from arid regions in the west that receive low rainfall, to alpine regions in the south-east which receive snow in winter. The north-east of the state is humid and subtropical, and receives high summer rainfall and relatively dry winters. The south experiences rainfall due to cold fronts and lows crossing south-eastern Australia during cooler months.

Rainfall generally decreases from the east to the west of NSW (Figure 2). The long-term rainfall record (1900–2023) shows that NSW has experienced considerable variations, with periods of wetter and drier conditions.⁴

The coast of NSW is influenced by the East Australian Current, which moderates air temperatures and provides moisture for rainfall. Moist onshore winds deposit precipitation on the steeply rising terrain of the Great Dividing Range, enhancing rainfall near the coast. The dry north-west receives most of its highly variable rainfall through irregular, high-intensity rainfall.

NSW is Australia's most populous state and over 71% of the NSW population live in major cities. Recent population growth has been greatest in Metropolitan Sydney, as well as the Hunter and North Coast regions.^{5,6}

Working-aged people (15–64) make up 64.3% of the population, while children and adolescents (0–14) represent 18.2%, and people aged 65 and over represent 17.4% of the state's total.⁶

At almost \$700 billion, NSW is Australia's largest state economy, accounting for around a third of the nation's economic output.⁷ The largest industries in NSW, by employment, are health care and social assistance (14.4%), retail trade (9%), professional (8.9%), education and training (8.8%) and construction (8.6%). Together these industries account for half of all employment in the state.⁶

NSW's climate has provided the foundation for many of the state's current social, economic and ecological systems. These systems will be impacted by increased temperatures, more hot days, fewer cold nights, greater fire danger and higher rainfall variability. The following pages outline the projected changes in these key climate variables across NSW.

Figure 1. Annual average temperature (°C) observed across NSW for 1990–2009²

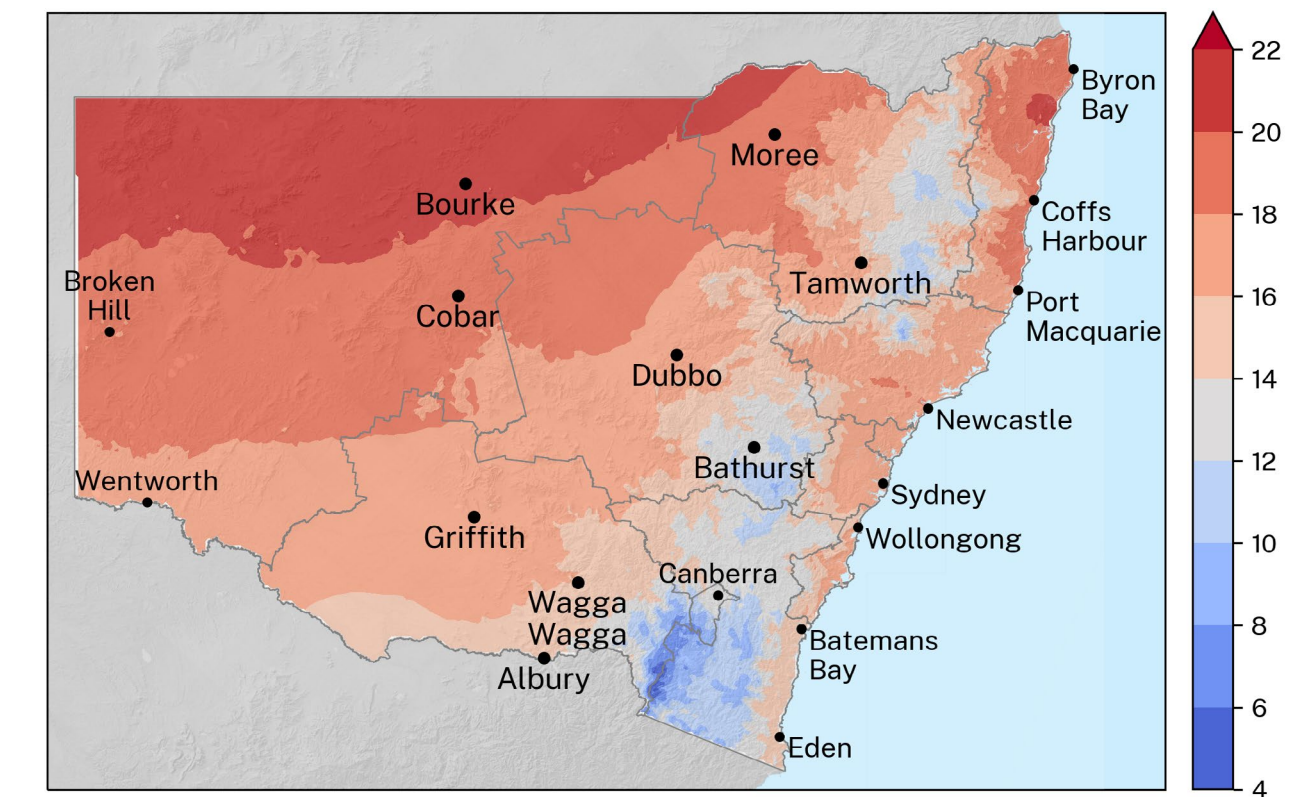
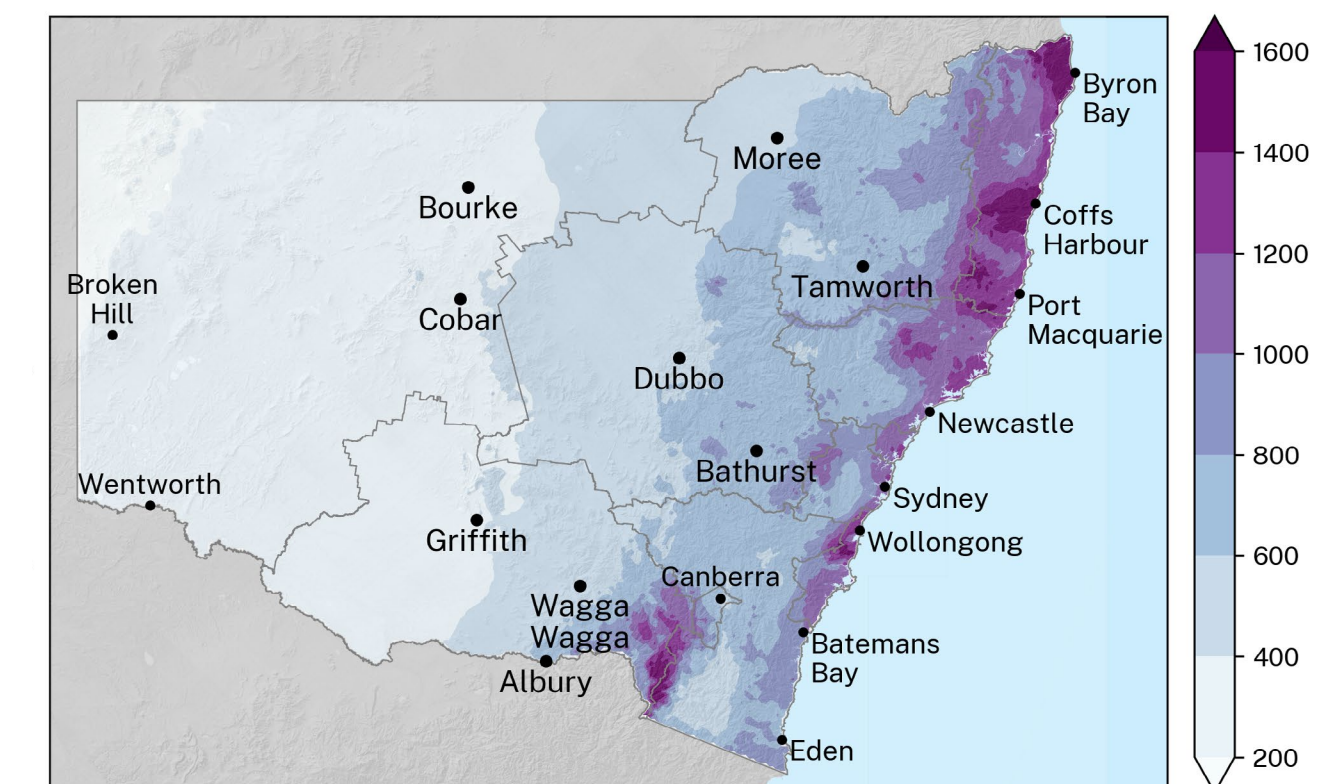


Figure 2. Annual average rainfall (mm) observed across NSW for 1990–2009²





PROJECTED CHANGES



Increase in average temperature

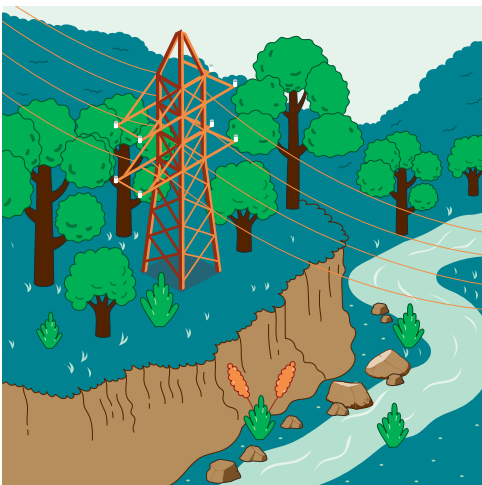
Increase in hot days per year

Decrease in cold nights per year

Increase in severe fire weather days per year

Low-emissions scenario		Medium-emissions scenario		High-emissions scenario	
2050	2090	2050	2090	2050	2090
+1.2°C +1.3°C		+1.6°C +2.7°C		+2.0°C +4.0°C	
+14.8 +15.9		+18.3 +31.7		+23.1 +45.5	
-9.3 -10.6		-11.9 -19.1		-14.6 -24.1	
+3.2 +3.5		+3.4 +7.2		+5.3 +9.4	

NSW IMPACTS

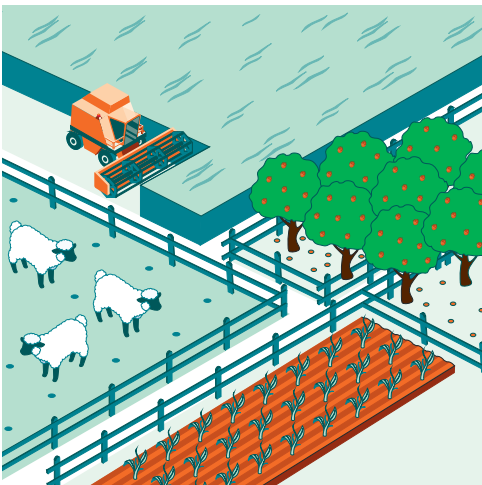


Bushland

Increased severe fire weather

Water supply

Changes to rainfall



Agriculture

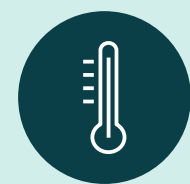
Increased extreme heat

Alpine ecosystems

Decrease in cold nights



Data is based on NARClIM2.0 projections for SSP1–2.6 (low-emissions), SSP2–4.5 (medium-emissions) and SSP3–7.0 (high-emissions) and is presented relative to the baseline period of 1990–2009. Values presented are averages across the NARClIM2.0 model ensemble, and do not represent the full range of plausible climate futures. Climate change impacts are used to highlight how NSW is likely to be affected by climate change, and impacts are not limited to the examples provided.



Temperature

In NSW, 8 of the 10 warmest years on record since 1910 have occurred since 2013.



4.0°C

rise in average temperature across NSW by 2090 under a high-emissions scenario.

Temperatures are projected to be higher by 2050 under a high-emissions scenario than by 2090 under a low-emissions scenario.

NSW is getting warmer

Temperature is the most robust indicator of climate change. In NSW, 8 of the 10 warmest years on record since 1910 have occurred since 2013. The warmest year on record for both average temperature and maximum temperature in NSW was 2019, when the average temperature was 1.2°C above the 1990–2009 baseline average.

Projections

Across NSW, average temperatures will increase throughout this century (Figure 3).

Temperature increases are expected in all parts of the state, with the greatest increases inland, including the Far West, New England and North West, and Central West and Orana regions (Figure 4). The coastal regions are likely to experience a smaller but still notable temperature increase due to the moderating effect of the ocean. Notably, the temperature projections for 2050 under a high-emissions scenario are expected to exceed the projections for 2090 under a low-emissions scenario (Table 2).

Table 2 and Figure 3 provide more information on how the projections differ across the 3 scenarios, and Figure 4 provides information on regional differences by 2090 across the 3 scenarios.





Temperature

Table 2. Projected annual average temperature increase – NSW

2050

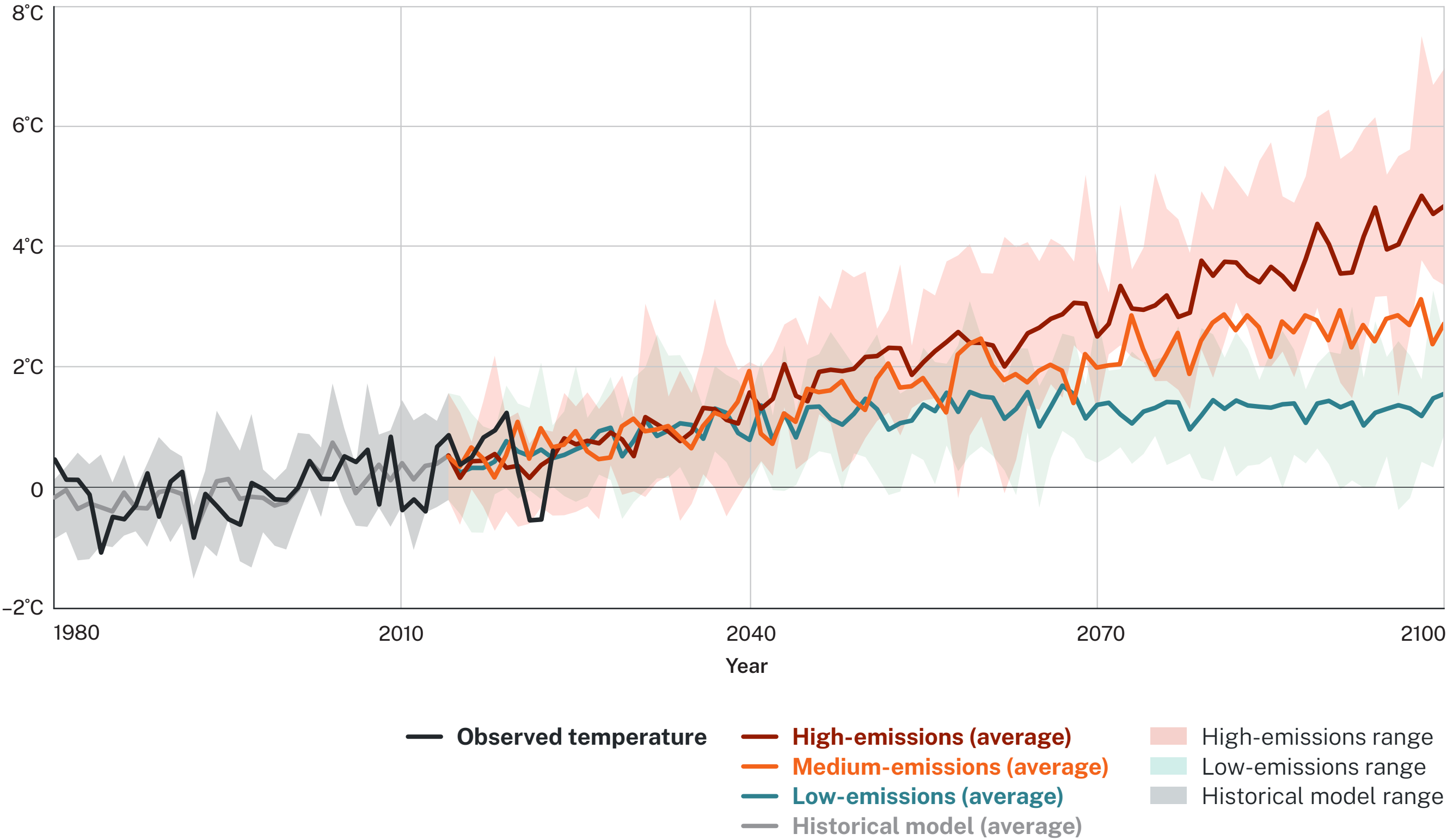
	Low-emissions	Medium-emissions	High-emissions
Temperature	1.2°C (0.6°C to 1.7°C)	1.6°C (1.1°C to 2.0°C)	2.0°C (1.0°C to 2.9°C)
Maximum temperature	1.3°C (0.6°C to 1.8°C)	1.6°C (1.1°C to 2.1°C)	2.0°C (1.1°C to 3.0°C)
Minimum temperature	1.1°C (0.6°C to 1.6°C)	1.6°C (0.9°C to 2.1°C)	1.9°C (0.9°C to 2.6°C)

2090

	Low-emissions	Medium-emissions	High-emissions
Temperature	1.3°C (0.6°C to 2.1°C)	2.7°C (1.9°C to 3.8°C)	4.0°C (2.7°C to 5.5°C)
Maximum temperature	1.4°C (0.6°C to 2.2°C)	2.8°C (1.9°C to 3.9°C)	3.9°C (2.8°C to 5.6°C)
Minimum temperature	1.3°C (0.7°C to 1.9°C)	2.6°C (1.9°C to 3.7°C)	3.9°C (2.6°C to 5.4°C)

The bold number is the ensemble average for the period. Underneath the average is the ensemble range. Temperature increases are additional to the historical model baselines of 17.6°C for average temperature, 23.7°C for average maximum temperature and 11.9°C for average minimum temperature.

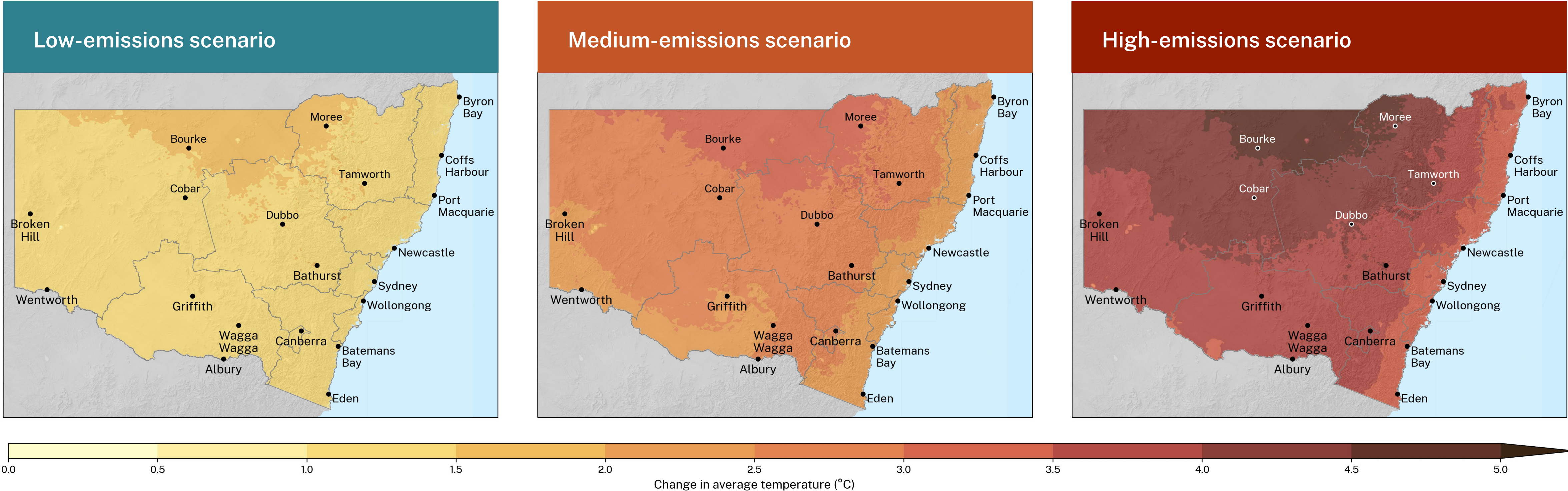
Figure 3. Historical and projected average temperature change – NSW

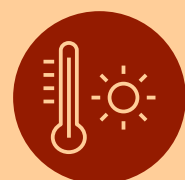




Temperature

Figure 4. Projected change in average temperature by 2090 for NSW





Hot days

Changes to temperature extremes often have more pronounced impacts than changes in average temperatures.

Hot days will become more frequent

Prolonged hot days, where maximum daily temperatures are equal to or above 35°C, increase the incidence of illness and death – particularly among vulnerable people. Seasonal changes in the number of hot days could have significant impacts on bushfire danger, infrastructure and native species.

Projections

Across NSW, the average number of hot days per year will increase throughout this century (Figure 5).

The number of hot days will increase for NSW by 2050 for all emissions scenarios, with an even greater increase by 2090 under a medium-emissions scenario and a high-emissions scenario (Table 3). The number of hot days is projected to increase across spring, summer and autumn, with the largest increase expected during summer.

Increases in the number of hot days are expected for all regions across the state, particularly for the Far West, New England and North West, and Central West and Orana regions (Figure 6). During the baseline period, these regions had a range of 20–65 hot days annually. By 2090, these regions are projected to experience an additional 15–30 hot days

2x

The number of hot days across NSW is projected to more than double by 2090 under a high-emissions scenario.

Higher maximum temperatures affect health through heat stress and exacerbate existing health conditions.

per year under a low-emissions scenario, 25–50 additional hot days under a medium-emissions scenario and 40–60 additional hot days per year under a high-emissions scenario.

Coastal regions of NSW experience fewer hot days compared to warmer inland regions, but these regions will still see a proportionally large increase in the number of hot days under all emissions scenarios. By 2090, the number of hot days for coastal regions is projected to increase on average by an additional 5–10 days per year under a low-emissions scenario and by an additional 15–25 days per year under a high-emissions scenario.

Between 2050 and 2090, a relatively small increase in the number of hot days is projected across NSW under a low-emissions scenario. However, an additional 13.4 hot days per year under a medium-emissions scenario and 22.4 hot days per year under a high-emissions scenario are projected during the same period.

Table 3 and Figure 5 provide more information on how the projections differ across the 3 scenarios, and Figure 6 provides information on regional differences by 2090 across the 3 scenarios.



Hot days

Table 3. Projected increase in average annual number of hot days – NSW

2050

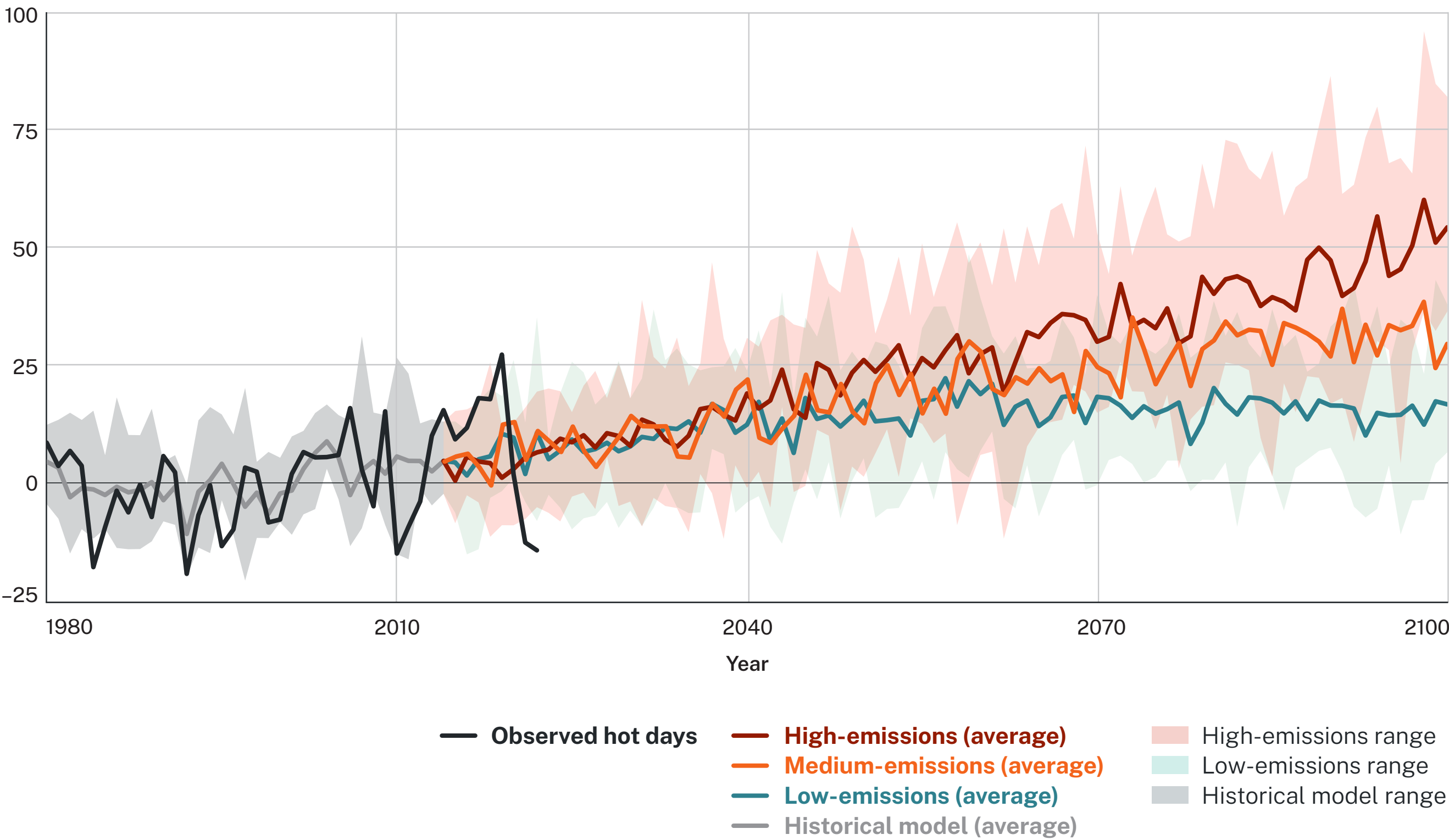
Low-emissions	Medium-emissions	High-emissions
14.8 days (4.5 to 24.2 days)	18.3 days (9.7 to 24.2 days)	23.1 days (8.4 to 35.7 days)

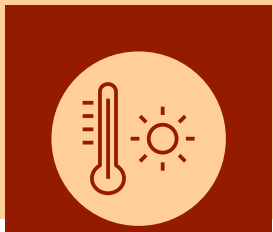
2090

Low-emissions	Medium-emissions	High-emissions
15.9 days (6.4 to 28.5 days)	31.7 days (18.7 to 46.8 days)	45.5 days (27.6 to 69.1 days)

The bold number is the ensemble average for the period. Underneath the average is the ensemble range. Hot day increases are additional to the historical model baseline of 37.9 hot days.

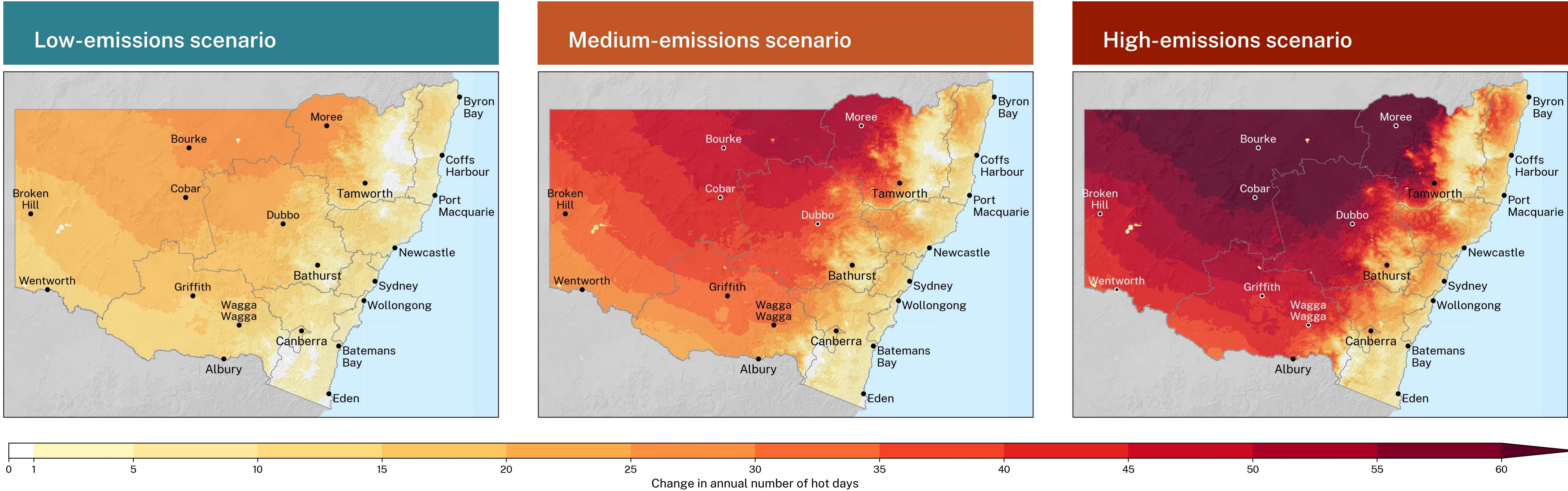
Figure 5. Historical and projected average annual number of hot days – NSW

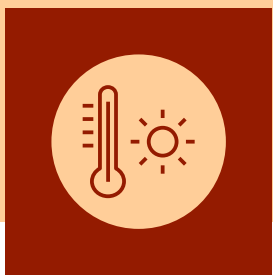




Hot days

Figure 6. Projected change in annual number of hot days by 2090 for NSW





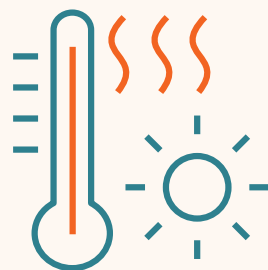
Increased heat stress

Heatwaves have been responsible for more human deaths than any other natural hazard, including bushfires and floods. Heatwaves occur when both maximum and minimum temperatures are unusually hot over 3 days, compared to the previous month and historical weather. Heatwaves in 2011 and 2019 led to a 14% rise in NSW hospital admissions.⁹ In 2009, the heatwave in Victoria preceding the 2009 bushfires led to 374 deaths, with the bushfires directly responsible for 173 deaths.⁹

The NSW outdoor workforce is highly vulnerable to more hot days, including major industries like construction which accounts for nearly 10% of jobs in the state. Workers regularly exposed to extreme heat face greater risks of fatigue, reduced concentration, and workplace accidents.^{10,11} Heat also reduces productivity. Australian outdoor workers lose tens of thousands of work hours each year due to heat stress.¹²



By 2090, Metropolitan Sydney could experience more than triple the number of hot days per year under a high-emissions scenario.



By 2090, areas of north-west NSW could experience hot days for nearly one-third of the year under a high-emissions scenario.



The increasing urbanisation of cities in NSW also presents a risk of amplifying the temperature increase from climate change through new built structures, the materials used in the built structures and vegetation removal to accommodate urban growth. Climate change impacts on urban heat intensity will be worse under a high-emissions scenario.¹³





Cold nights

Cold nights are important for snow in alpine areas and the viability of important plant species, including some temperate fruits.

Cold nights will decrease

Cold nights are those where the minimum temperature drops below 2°C. These are important for the viability of some important plant species. For example, some common temperate fruit species require sufficiently cold winters to produce flower buds.

Projections

Across NSW, the average number of cold nights per year will decrease throughout this century (Figure 7).

The number of cold nights will decrease for NSW by 2050 for all emissions scenarios, with an even greater decrease by 2090 under a medium-emissions scenario and a high-emissions scenario (Table 4). The number of cold nights is projected to decrease across autumn, winter and spring, with the largest decreases in winter.

Under a low-emissions scenario, there is a small decrease of 1.3 fewer cold nights per year projected across the state between 2050 and 2090. However, decreases of 7.2 fewer cold nights per year under a medium-emissions scenario and 9.5 fewer cold nights under a high-emissions scenario are projected during the same period (Table 4).

Under a high-emissions scenario, the number of cold nights across NSW could reduce by more than 70% by 2090.

Alpine areas in the south-east could experience a greater than 50% reduction in the number of cold nights per year by 2090.

The greatest reductions in the number of cold nights are projected along the Great Dividing Range, including the Snowy Mountains (Figure 8). Under a low-emissions scenario, by 2090 these regions could see a decrease of 20–30 cold nights per year compared to the baseline period average. Under a medium-emissions scenario, by 2090 these regions could see a decrease of 40–60 cold nights per year. Notably, a high-emissions scenario could lead to over 70 fewer cold nights per year in some alpine areas. Such a considerable reduction in the number of cold nights would cause profound impacts on alpine ecosystems across the state. In contrast, the western slopes and plains are projected to experience moderate changes, while coastal NSW and the Far West region are projected to experience minor decreases in the number of cold nights.

Table 4 and Figure 7 provide more information on how the projections differ across the 3 scenarios and Figure 8 provides information on regional differences by 2090 across the 3 scenarios.



Cold nights

Table 4. Projected decrease in average annual number of cold nights – NSW

2050

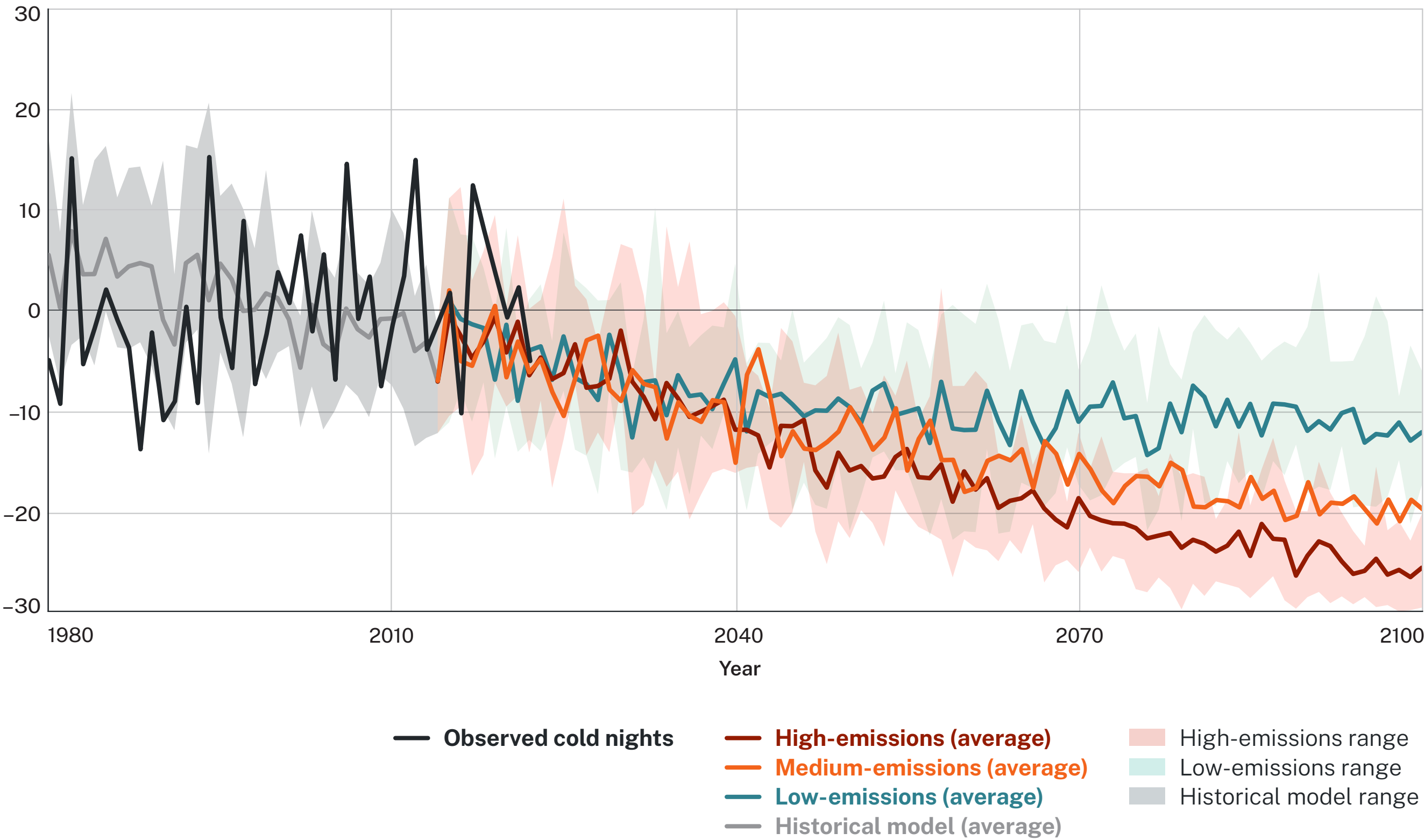
Low-emissions	Medium-emissions	High-emissions
9.3 days (5.7 to 13.4 days)	11.9 days (7.5 to 15.2 days)	14.6 days (7.3 to 18.3 days)

2090

Low-emissions	Medium-emissions	High-emissions
10.6 days (6.1 to 13.9 days)	19.1 days (14.6 to 23.8 days)	24.1 days (19.1 to 28 days)

The bold number is the ensemble average for the period. Underneath the average is the ensemble range. Cold night decreases are relative to the historical model baseline of 30.8 cold nights.

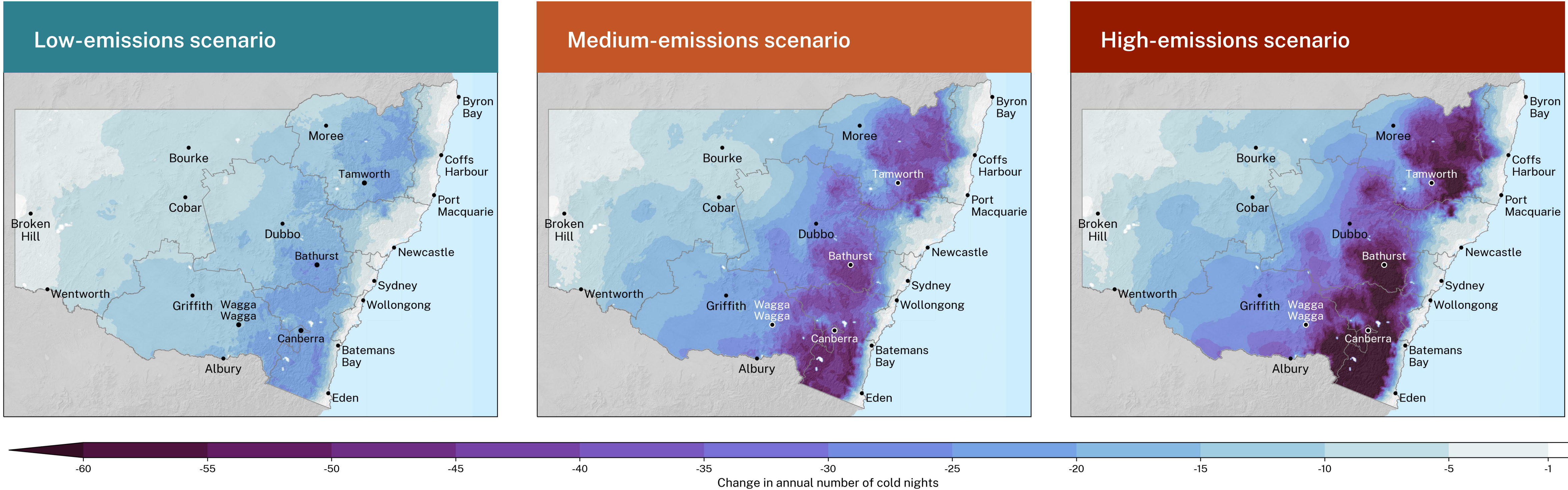
Figure 7. Historical and projected change in annual number of cold nights – NSW





Cold nights

Figure 8. Projected change in annual number of cold nights by 2090 for NSW





Cold nights

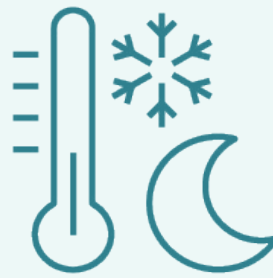
Decreased cold nights

The alpine regions of NSW face significant impacts from a decrease in the number of cold nights. Snow cover plays a critical role in shaping alpine and subalpine ecosystems, influencing both the competitive advantage of native species and the exclusion of feral species such as cats, rabbits, pigs and horses at higher elevations.¹⁴ These ecosystems have minimal adaptive capacity to a decrease in the number of cold nights and subsequent loss of snow cover, as they already occupy the highest elevations and cannot migrate to other areas.^{14,15}

Increased minimum temperatures and a reduction in the number of cold nights will have significant impacts on snow cover and snow depth. Natural snow depth in alpine areas has declined by 30% since the 1950s and years with persistent heavy snow cover have become rare.¹⁶



Significant impacts on alpine biodiversity can be expected from reduced snow cover, such as reducing available habitat for the endangered mountain pygmy possum.



Under a low-emissions scenario, the number of cold nights across NSW could reduce by more than 30% by 2090.



Continued decline in snow depth and more variable rainfall could have significant impacts on the Snowy Mountains Scheme, which generates hydro-electric power and provides water for irrigation. Further reductions in natural snow depth, particularly under a high-emissions scenario, are likely to impact alpine biodiversity that depends on long-lasting snow cover and to restrict recreational opportunities, affecting local economies dependent on snow-based tourism.





Rainfall

Rainfall is projected to remain variable

Climate change will influence rainfall patterns and the total amount of rainfall that NSW receives. These changes may have widespread impacts on water security, agricultural productivity and native species' reproductive cycles. For example, subtropical rainforest communities in the north may contract due to more variable rainfall and changes to humidity and evapotranspiration.

Modelling rainfall is more difficult than modelling temperature due to the complexities of the weather systems that generate rain. NARClIM projections capture a range of plausible climate futures under the 3 emissions scenarios, including wet and dry outcomes. This means that rainfall is inherently more variable in the NARClIM projections than temperature, and the full range of rainfall projections should be taken into account. This can be explored further on the [AdaptNSW Interactive Map](#).

NSW has experienced rainfall extremes in recent decades. There was an intense drought from 2017–2019 and the Millennium Drought from 2001–2009 also featured dry years. Conversely, 2022 was the second wettest year on record for NSW.

This snapshot provides data on average rainfall change and does not provide data on rainfall extremes or the impacts of climate change on flooding.

A large decrease in average winter rainfall is projected for coastal regions, decreasing by 30% by 2090 under a high-emissions scenario.

Projections

NSW is expected to experience a slight drying trend in average rainfall throughout this century based on average annual rainfall. However, there are a wide range of possible outcomes for all annual and seasonal projections of rainfall (Table 5 and Figure 9). Changes to rainfall are likely to occur in all seasons (Table 5), with variation across different regions (Figures 10 to 14). The most notable change is a large decrease in average winter rainfall for coastal regions, particularly for Metropolitan Sydney, Central Coast, Illawarra Shoalhaven and Hunter regions. There is also a notable decrease in average spring rainfall for southern inland regions including the Riverina Murray, the ACT and the inland areas of the South East and Tablelands regions.

By 2090, average summer rainfall is projected to decrease under a low-emissions scenario and a medium-emissions scenario. However, some areas in the New England and North West, and Central West and Orana regions are projected to experience an increase in rainfall of up to 15% under a high-emissions scenario.

By 2090, average autumn rainfall is projected to slightly increase by up to 15% in some areas of the South East and Tablelands, and North Coast regions under all emissions scenarios. Refer to the [Interactive Map](#) for further seasonal information.

By 2090, a minor decrease in average winter rainfall is projected for NSW. However, winter rainfall is projected to decrease in coastal regions by 20% under a low-emissions scenario, 25% under a medium-emissions scenario and 30% under a high-emissions scenario.

By 2090, average spring rainfall is projected to decrease by approximately 20% for most inland regions including the Riverina Murray, Central West and Orana, and ACT under all emissions scenarios. However, some areas of the North Coast region are projected to experience a slight increase of up to 10% under both a low-emissions scenario and a high-emissions scenario.

Table 5 and Figure 9 provide more information on how the projections differ across the 3 scenarios, and Figures 10 to 14 provide information on regional differences by 2090 across the 3 scenarios by season.



Table 5. Projected change to average rainfall – NSW

	Low-emissions	Medium-emissions	High-emissions
Annual	-10.2% (-21.9% to +6.7%)	-8.6% (-24.3% to +15.5%)	-15.5% (-32.8% to +2.7%)
Summer	-9.3% (-25.9% to +23.5%)	-6.6% (-24.3% to +48.0%)	-17.9% (-40.1% to +24.7%)
Autumn	-10.3% (-26.9% to +7.6%)	-3.1% (-26.8% to +23.4%)	-12.9% (-36.3% to +21.6%)
Winter	-10.6% (-22.9% to +23.9%)	-15.2% (-31.0% to +10.9%)	-17.3% (-41.0% to +9.8%)
Spring	-11.2% (-34.2% to +15.4%)	-10.9% (-40.1% to +25.8%)	-13.0% (-39.2% to +7.2%)

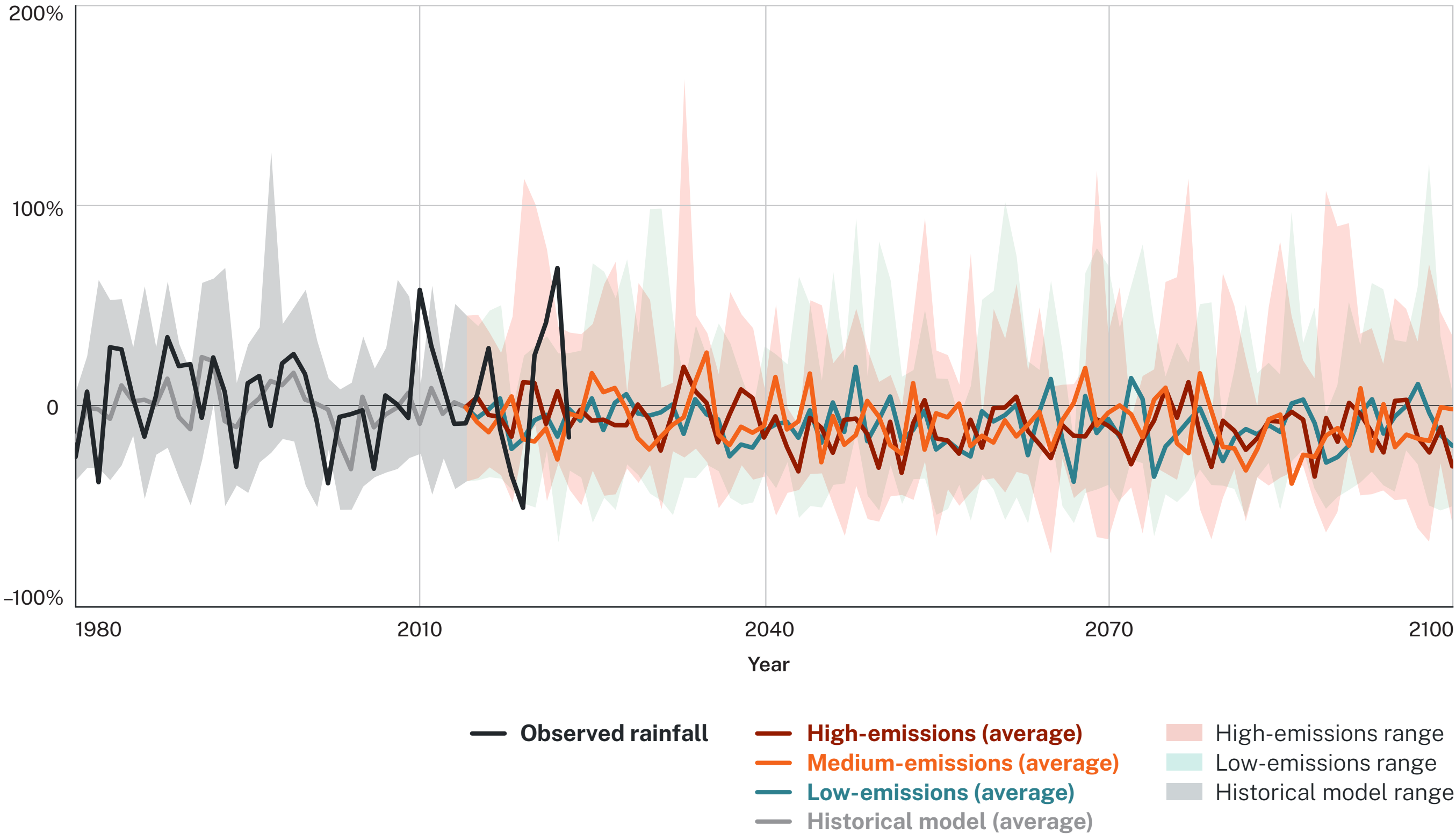
2050

	Low-emissions	Medium-emissions	High-emissions
Annual	-10.1% (-20.0% to +14.4%)	-16.4% (-31.4% to +11.0%)	-11.6% (-38.6% to +35.6%)
Summer	-13.6% (-37.1% to +32.4%)	-13.6% (-29.6% to +44.5%)	-3.9% (-32.9% to +43.8%)
Autumn	-5.2% (-25.3% to +20.6%)	-10.1% (-32.6% to +15.4%)	-9.5% (-30.5% to +43.9%)
Winter	-5.0% (-29.4% to +31.9%)	-23.4% (-42.7% to +35.7%)	-17.7% (-52.3% to +52.6%)
Spring	-15.6% (-29.7% to +19.8%)	-20.5% (-35.3% to +19.0%)	-18.6% (-44.6% to +31.9%)

2090

The bold number is the ensemble average for the period. Underneath the average is the ensemble range. Percentages changes in annual average rainfall are relative to the historical model baseline of 465 mm. Average summer rainfall is relative to a baseline of 146 mm, average autumn rainfall is relative to a baseline of 113 mm, average winter rainfall is relative to a baseline of 102 mm and average spring rainfall is relative to a baseline of 103 mm.

Figure 9. Historical and projected change in average rainfall – NSW





Rainfall

Figure 10. Projected change to average annual rainfall by 2090 for NSW

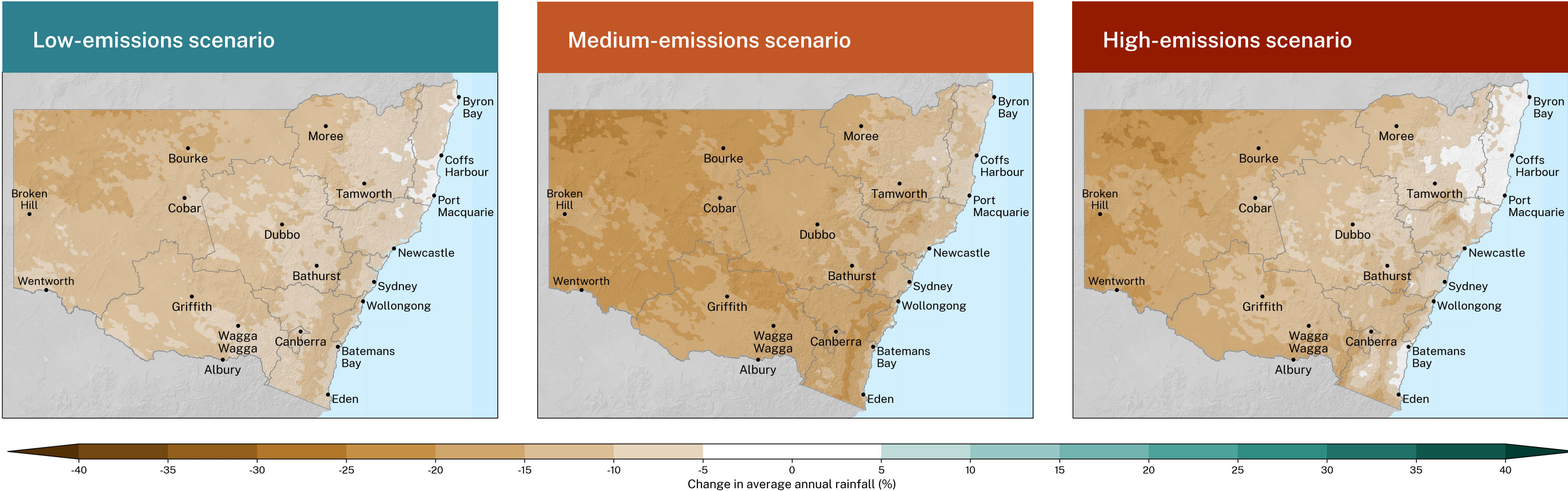
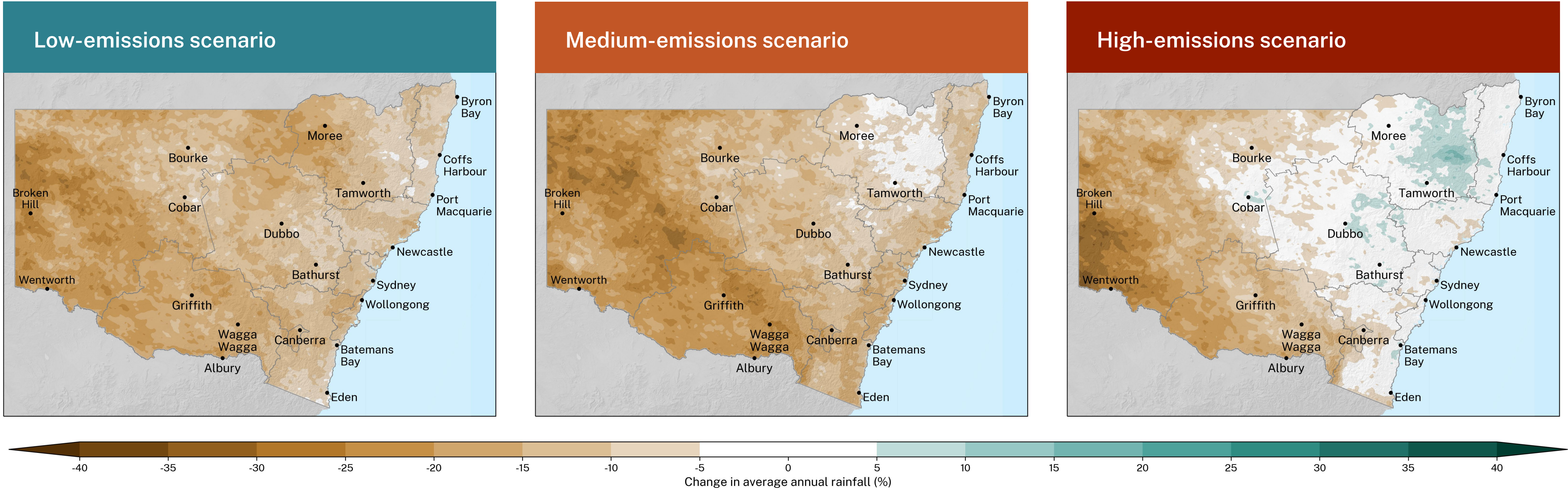




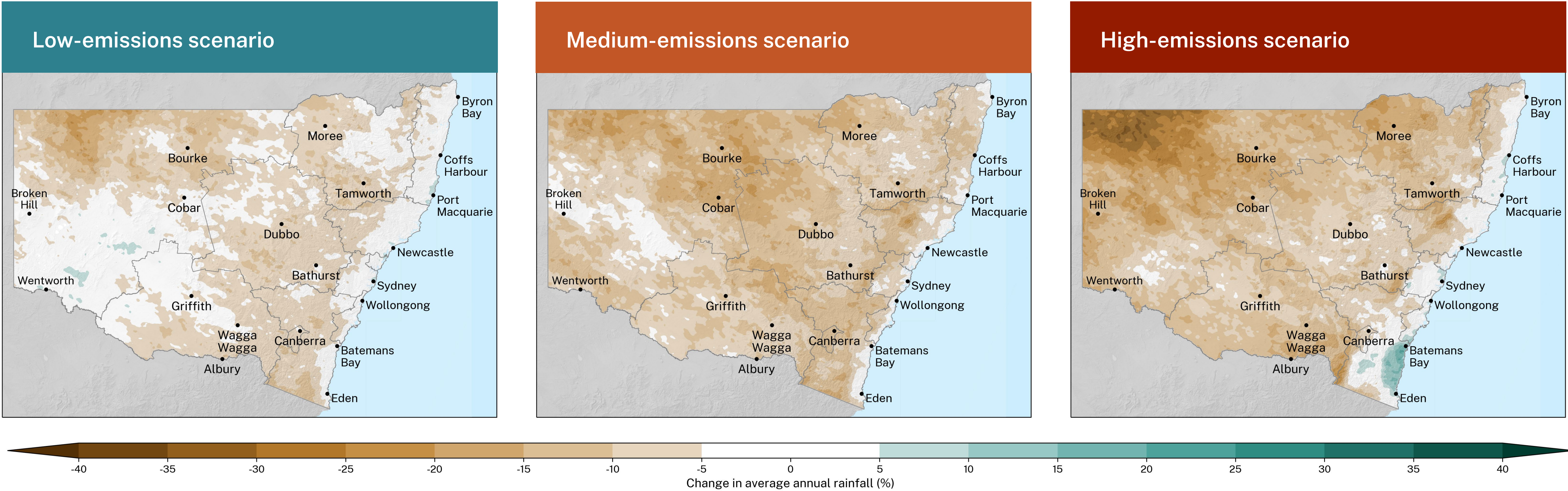
Figure 11. Projected change to average summer rainfall by 2090 for NSW





Rainfall

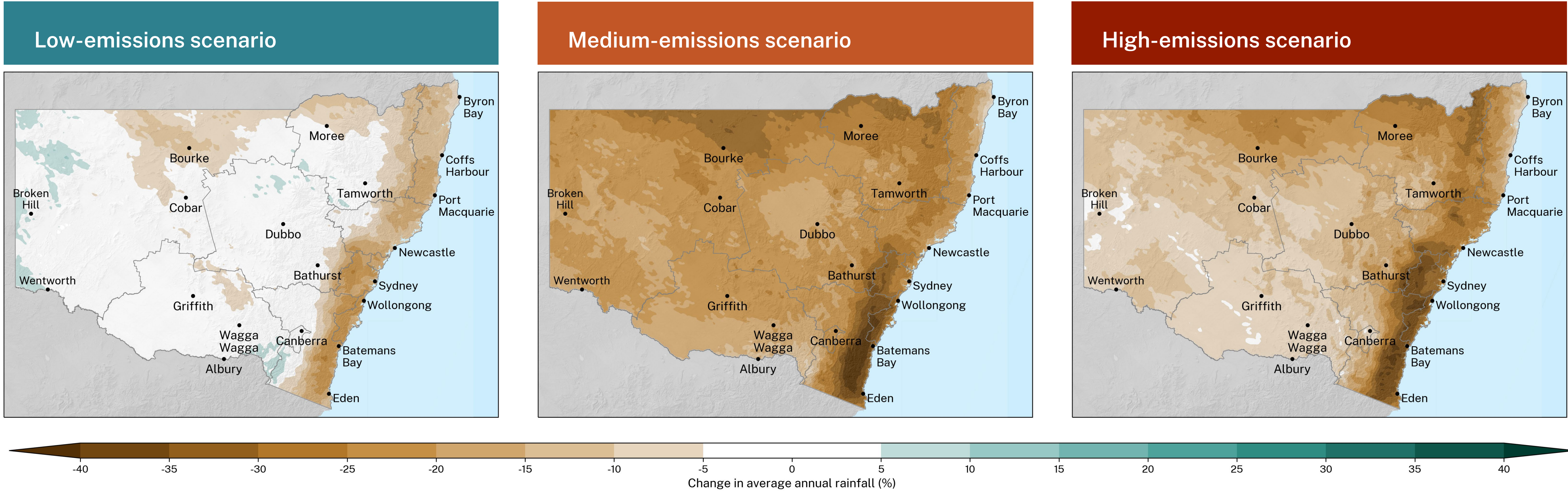
Figure 12. Projected change to average autumn rainfall by 2090 for NSW





Rainfall

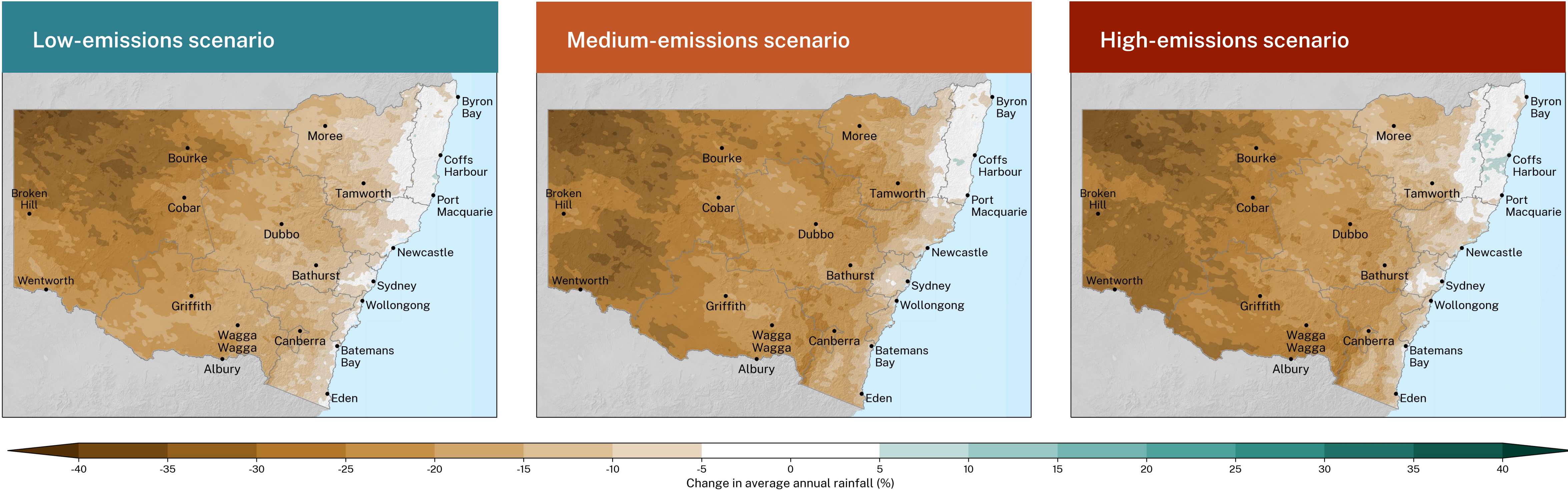
Figure 13. Projected change to average winter rainfall by 2090 for NSW





Rainfall

Figure 14. Projected change to average spring rainfall by 2090 for NSW





Rainfall

Changes to rainfall

NSW faces growing challenges to town water supply due to projected changing rainfall patterns. While Australia's rainfall is naturally variable – driven by systems like El Niño-Southern Oscillation, the Indian Ocean Dipole and the Southern Annular Mode – climate change is expected to increase this variability, bringing longer dry spells and heavier rainfall in larger wet-dry swings.^{17,18}

Across southern Australia, long-term declines in rainfall have already led to reduced streamflow.¹⁷ Less streamflow creates a higher risk of toxic algal blooms, which are more likely to occur and last longer in warmer, low-flow conditions.^{16,19} These changes put water quality and supply at risk, making it harder to deliver safe and reliable water to communities.¹⁹

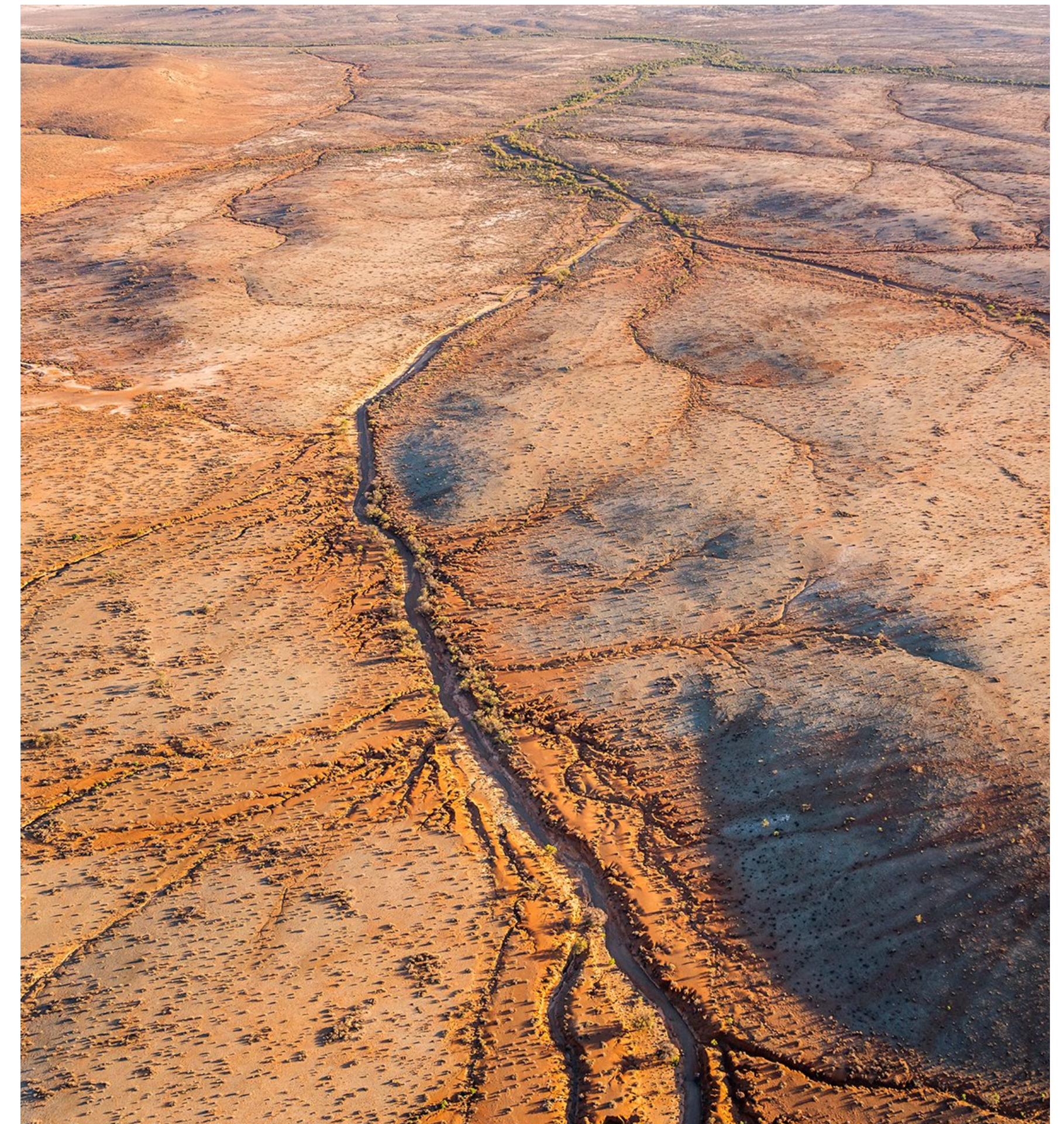
The ecological character of the NSW Central Murray Forests Ramsar wetlands has already been impacted by the reduced frequency, extent and duration of spring floods from water extraction and climate change, which has caused a significant decrease in waterbird breeding.²⁰



By 2090, average winter rainfall is projected to decrease by approximately 25–30% for coastal regions under both medium-emissions and high-emissions scenarios.



Changes to rainfall and increased temperatures could have significant impacts on water supplies and internationally significant wetlands across the state, due to increased evapotranspiration and a shift in seasonal patterns. There is the potential for an increased risk of lower inflows in key river catchments across the state, including the Barwon–Darling, Clarence, Macquarie and Murray rivers, under a dry climate change scenario.¹





Severe fire weather

Severe fire weather will increase

The Forest Fire Danger Index (FFDI) represents an estimate of fire weather risk. FFDI is calculated from temperature, relative humidity and wind speed, as well as an index representing fuel dryness.

Severe fire weather (FFDI greater than 50) is most likely in summer and spring. Fire weather was the strongest determining factor of house loss during the Black Summer bushfires.²² FFDI was monitored by weather stations across NSW and the ACT until the introduction in 2022 of the Australian Fire Danger Rating System. FFDI is used in this snapshot as it can be simulated using the NARcliM projections, whereas data used by the Australian Fire Danger Rating System currently cannot. FFDI also provides a long history of data and gives context to the NARcliM projections.

Projections

Across NSW, the average number of severe fire weather days per year will increase throughout this century (Figure 15).

The number of severe fire weather days will increase for NSW by 2050 under all emissions scenarios, with an even greater increase projected by 2090 under a medium-emissions scenario and a high-emissions scenario (Table 6). The number of severe fire weather days is projected to increase during spring and summer. The largest increases are typically expected in summer, although some regions have a greater increase during spring.

Increases to severe fire weather days will occur across most of NSW, with many regions projected to experience a doubling or even tripling of severe fire weather days by 2090 under a high-emissions scenario. During the baseline period, NSW had on average 9.5 severe fire weather days per year. Between 2050 and 2090, an increase of 0.3 severe fire weather days is projected across NSW under a low-emissions scenario (Table 6). By 2090, 3.8 additional severe fire weather days are projected under a medium-emissions scenario and 4.1 additional severe fire weather days per year are projected under a high-emissions scenario. Under both a medium-emissions scenario and a high-emissions scenario, the number of annual severe fire weather days could nearly double across NSW by 2090, with slightly more severe fire weather days under a high-emissions scenario.

3x

Some regions in NSW could experience more than triple the number of severe fire weather days per year by 2090.

Fire weather was the strongest determining factor of house loss during the Black Summer bushfires.²²

The greatest increases will occur for areas west of the Great Dividing Range (Figure 16), where areas such as Bourke in the Far West region are projected to experience an increase of 19.0 additional severe fire weather days per year under a high-emissions scenario. The number of severe fire weather days per year is projected to approximately double under a high-emissions scenario, compared with Bourke's baseline period average of 18.8 severe fire weather days per year.

Some coastal regions are also projected to experience increases in severe fire weather days under a medium-emissions scenario and a high-emissions scenario, with limited changes expected under a low-emissions scenario. By 2090, Nowra in the Illawarra Shoalhaven region is projected to experience 0.8 additional severe fire weather days per year under a low-emissions scenario, 1.8 additional severe fire weather days under a medium-emissions scenario and 2.1 additional severe fire weather days per year under a high-emissions scenario. During the baseline period Nowra experienced an average of 2.1 severe fire weather days per year and a high-emissions scenario could double the number of severe fire weather days per year.

Table 6 and Figure 15 provide more information on how the projections differ across the 3 scenarios, and Figure 16 provides information on regional differences by 2090 across the 3 scenarios.



Table 6. Projected increase in average annual number of severe fire weather days – NSW

2050

Low-emissions	Medium-emissions	High-emissions
3.2 days (–0.3 to 6.7 days)	3.4 days (–0.1 to 7.6 days)	5.3 days (1.5 to 11.3 days)

2090

Low-emissions	Medium-emissions	High-emissions
3.5 days (0.3 to 8.6 days)	7.2 days (4.0 to 12.9 days)	9.4 days (3.4 to 18.7 days)

The bold number is the ensemble average for the period. Underneath the average is the ensemble range. Severe fire weather increases are additional to the historical model baseline of 9.5 severe fire weather days.

Figure 15. Historical and projected change in annual number of severe fire weather days – NSW

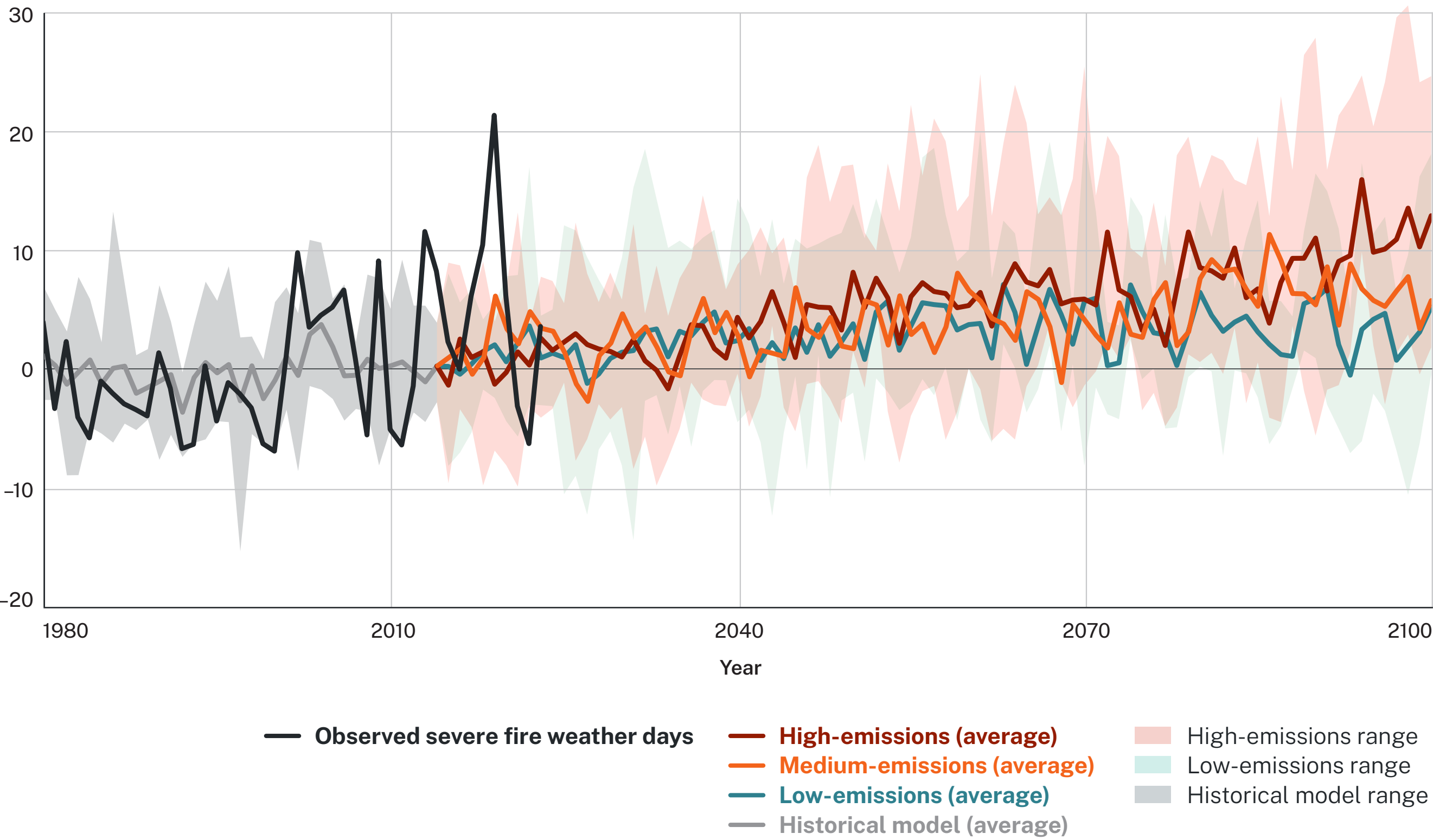
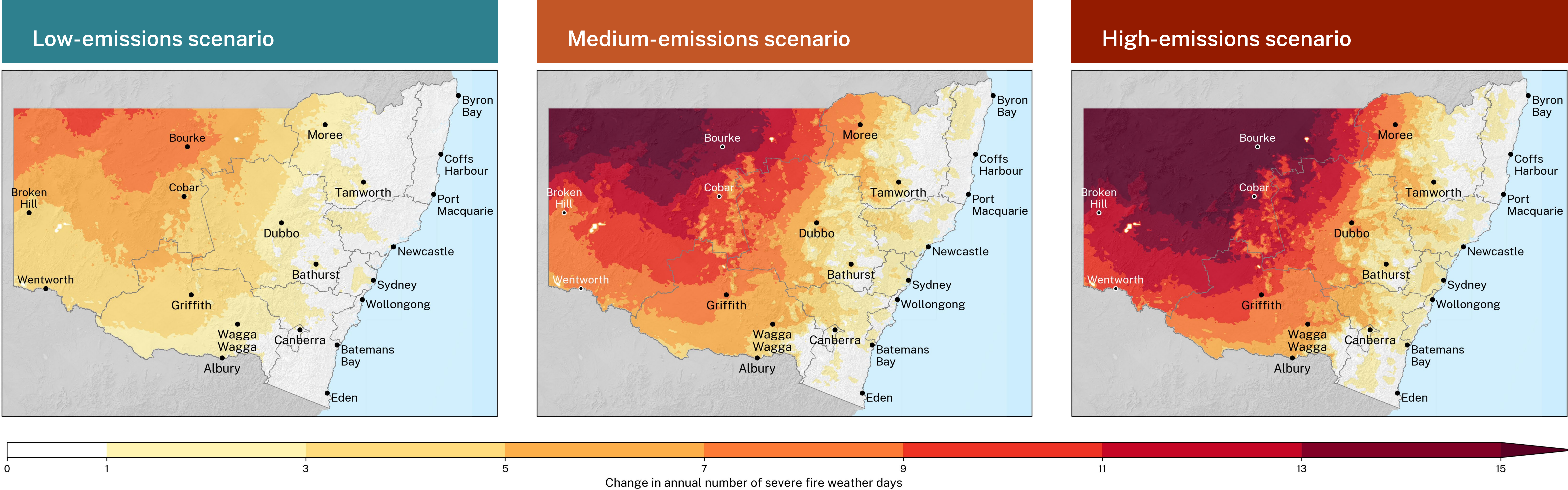




Figure 16. Projected change to average annual number of severe fire weather days by 2090 for NSW





Bushfires

The 2019–20 bushfire season caused extensive damage to communities, infrastructure and natural ecosystems. Approximately 2,500 homes were destroyed, 26 lives were directly lost from the fires, and there were 247 premature deaths from the impacts of bushfire smoke and poor air quality.^{23,24} Over 5.5 million hectares were burnt across the state, including 54% of the Gondwana Rainforests of Australia World Heritage Area and 81% of the Greater Blue Mountains World Heritage Area.^{24,25}

Ecosystems most vulnerable to fire were severely affected, including 21% of all NSW alpine vegetation and 37% of all NSW rainforests. At least 293 threatened animal species and 680 threatened plant species were affected by the fires.²⁴



Under a high-emissions scenario, the number of annual severe fire weather days could double across NSW by 2090.

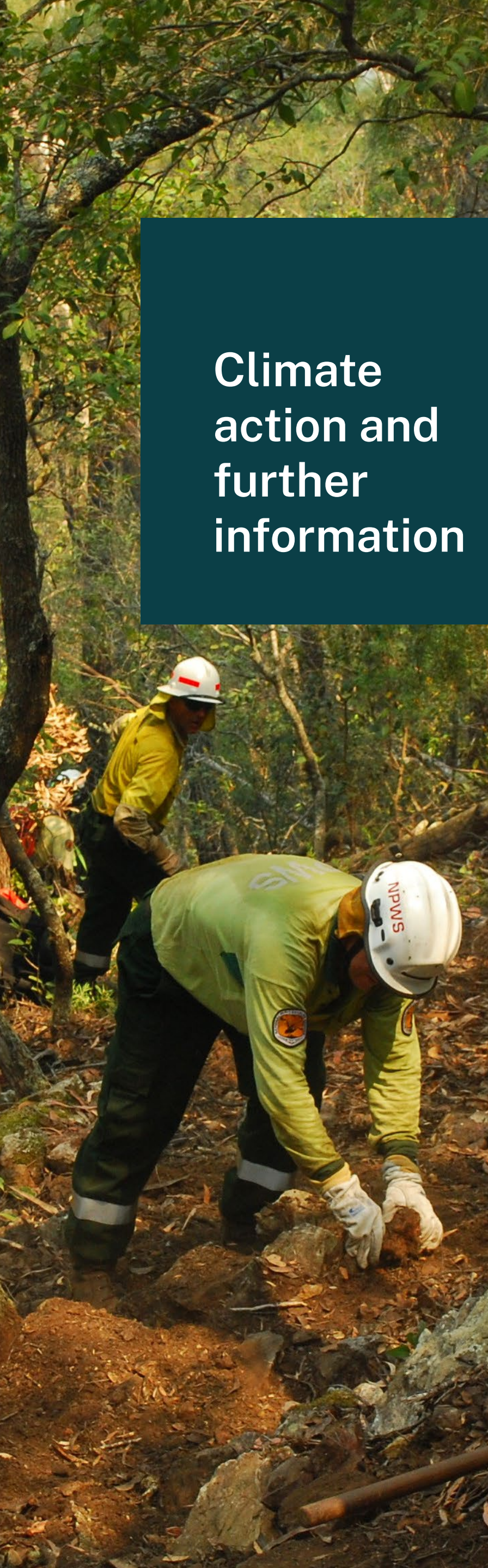


Under a medium-emissions scenario, the number of annual severe fire weather days could also substantially increase across NSW by 2090.



Severe fire weather days, which create the underlying conditions for large-scale bushfires, are expected to become more common in the future, particularly under a high-emissions scenario. Climate change is also expected to reduce the interval between severe fire weather, increase fire intensity, and shorten the window for safe fire management activities.¹⁹ For communities on the bushland-urban interface, the increased occurrence of severe fire weather heightens risks to people, homes and infrastructure.²⁶





Climate action and further information

Climate action

The NARClIM projections for the low-, medium- and high-emissions scenarios highlight the stark difference in climate change impacts that will be experienced under each scenario. The differences provide a reminder of the required action across the world to reduce emissions, and specifically within NSW to meet our legislated Net Zero by 2050 emissions reduction targets. This is our best chance at ensuring the future projections under the high-emissions scenario are avoided. The NARClIM projections highlight the importance of taking action to adapt to the impacts of climate change. For more resources on reducing emissions and adapting to the impacts of climate change, visit [Adapt NSW](#).

Additional resources

- For information on other climate change impacts, including sea level rise, visit [AdaptNSW](#)
- [Climate change resources for local government](#) on AdaptNSW
- Generate detailed climate information based on your local government area using [SEED](#)
- [Climate Data Portal](#)
- [NARClIM case studies](#)
- [Climate Risk Ready Guide](#)
- [Local government climate change action in NSW: a guide to leadership](#)

Further information

NARClIM projections are delivered with support from: the ACT, South Australian, Victorian and Western Australian governments; National Computational Infrastructure; Murdoch University; and the University of New South Wales. Detailed information on the methodology and application of the projections can be found on the AdaptNSW website. Climate change information in this snapshot is delivered as part of the NSW Government’s commitment to ‘Publish regularly updated and improved local level climate change projections’ under Action 3 of the [NSW climate change adaptation strategy](#).

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