NARCliM

New South Wales

Climate Change Snapshot

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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.

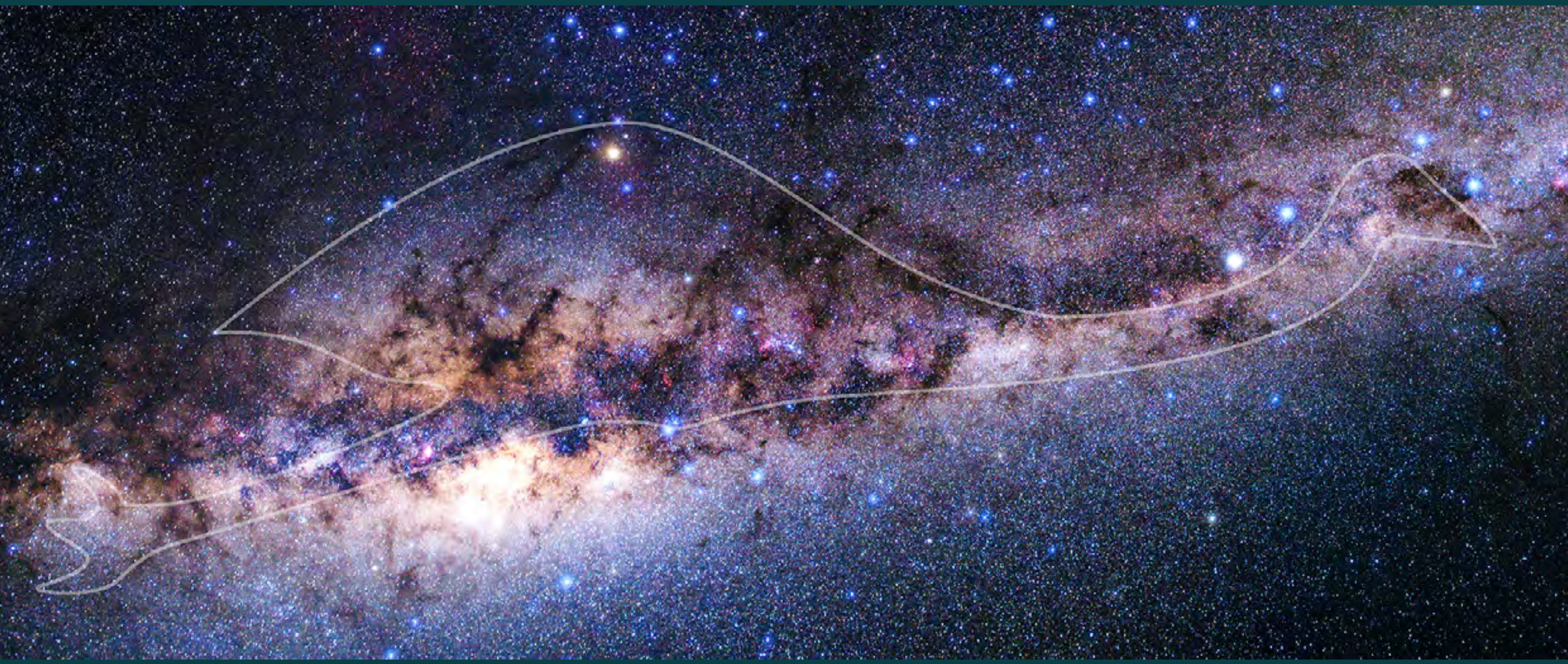

Photo caption:
The Emu in the Sky is an Aboriginal constellation that is made up of the dark clouds of the Milky Way. With the movement of the earth, the position of the Emu in the Sky changes throughout the year. Aboriginal people in some nations across NSW and Australia relate the position of the Emu 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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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 summarises the latest NARCliM2.0 projections for temperature, average rainfall, hot days 35°C and above, cold nights under 2°C and severe fire weather (Forest Fire Danger Index greater than 50) at a 4km resolution for NSW and the Australian Capital Territory (ACT). There is information for both a low-emissions scenario (SSP1-2.6), and a high-emissions scenario (SSP3-7.0) to the year 2100 to show the range of plausible climates that may be experienced, depending on our actions to reduce greenhouse gas emissions. The snapshot also summarises the latest projections for sea-level rise, derived from the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report released in 2021.

Understanding current warming

NSW and the ACT have already warmed by 1.4°C since national records began in 1910.[1] This local warming figure represents surface air temperature over land in NSW and is not directly comparable to average estimates of global warming which include surface air temperature over both land and ocean. Surface warming occurs faster over land than the ocean. Significant impacts from climate change are already occurring in NSW and are expected to be felt more widely in the future, particularly if concerted global effort is not taken to reduce greenhouse gas emissions and adapt to the expected impacts of climate change.

How to use this snapshot

This snapshot provides a summary of plausible future climate change in NSW relative to a baseline of average climate from 1990–2009. The projections for 2050 represent averaged data for 2040–2059 and projections for 2090 represent averaged data for 2080–2099. In translating the projections, it is important to consider the previous historical changes that occurred prior to 1990–2009. For example, national temperature records indicate that NSW has warmed by 0.84°C between 1910–1930 and the 1990–2009 baseline.[1]

Modelling climate change at a local level provides detailed insights into how NSW communities, built environments and natural environments will continue to be impacted by climate change. Information in this snapshot can be used in conjunction with detailed information that is available through the AdaptNSW Interactive Map and the Climate Data Portal.

NARCliM climate projections

NARCliM2.0 projections provide nation-leading climate model data that span the range of plausible future changes in climate for south-east Australia at a 4km resolution, and for the broader Australasian region at a 20km resolution. NARCliM2.0 projections are the next generation of NARCliM, building on previous generations delivered in 2014 and 2021. NARCliM is the NSW Government's trusted source of climate information and data for all audiences and sectors. Detailed information on NARCliM can be found 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 selected global climate models and 2 regional climate models, giving 10 model combinations in total. Unless otherwise specified, the presentation of data in this snapshot is averaged across a 20-year period from the NARCliM model ensemble.

Combining multiple models through averaging and other statistical methods produces better projections by providing a comprehensive range 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 modelling project and scientific methods at AdaptNSW.

Shared Socioeconomic Pathways

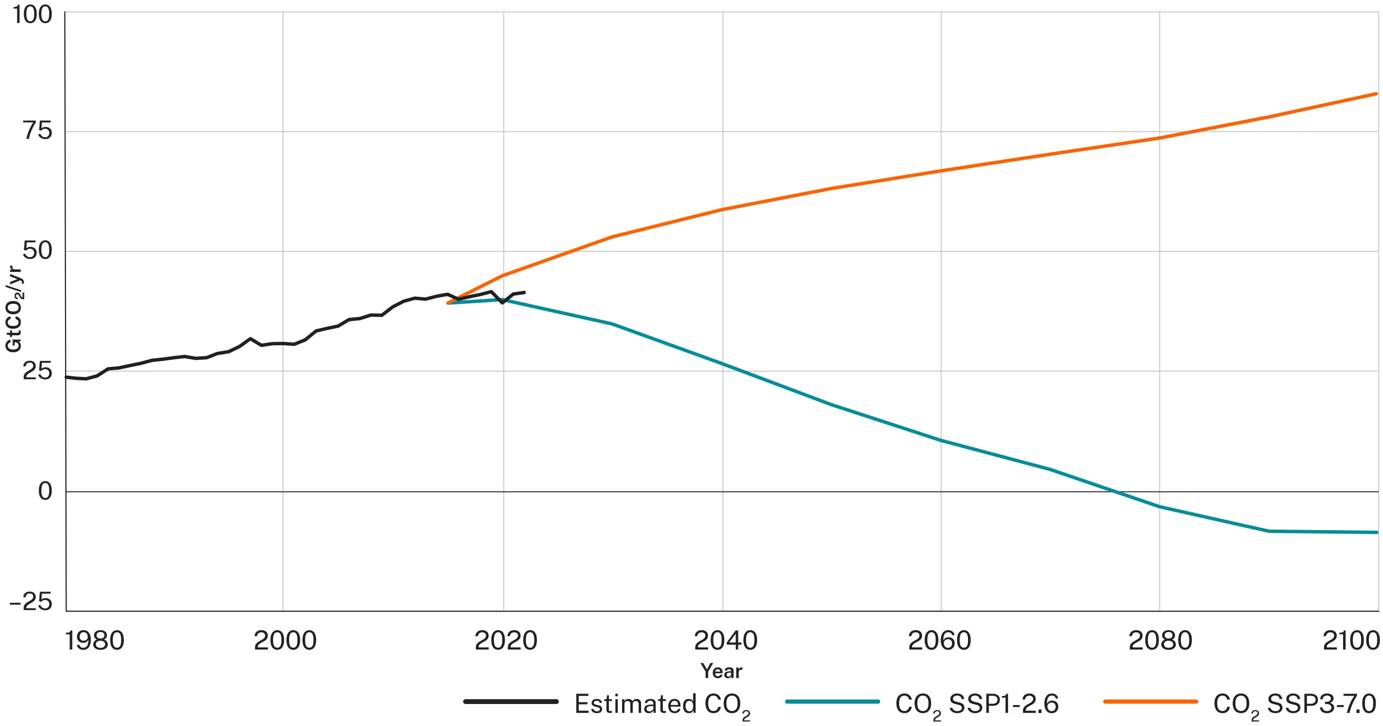
Shared Socioeconomic Pathways (SSPs) are the most recent emissions scenarios adopted in the IPCC's Sixth Assessment Report.

The SSPs describe how greenhouse gas emissions and socioeconomic factors – such as population, economic growth, education, urbanisation and land use – may change in the future. Global carbon dioxide emissions modelled for a low-emissions scenario and a high-emissions scenario are displayed below (Figure 1). For more information on emissions scenarios, visit _.

SSP1-2.6 describes a low-emissions future with a global transition towards sustainable and equitable development.

SSP3-7.0 describes a high-emissions future of regional conflict and development where countries do not collaborate on tackling climate change and do not focus on sustainable and equitable development.

Figure 1. Human-caused global emissions of carbon dioxide – past and projected



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.

Projected changes
New South Wales

Low-emissions scenario

Average temperature increase

↑1.2°C
2050

↑1.3°C
2090

Hot days per year will increase by:

2050	2090
14.8	15.9

Cold nights per year will decrease by:

2050	2090
9.3	10.6

Severe fire weather days per year will increase by:

2050	2090
3.2	3.5

High-emissions scenario

Average temperature increase

↑2.0°C
2050

↑4.0°C
2090

Hot days per year will increase by:

2050	2090
23.1	45.5

Cold nights per year will decrease by:

2050	2090
14.6	24.1

Severe fire weather days per year will increase by:

2050	2090
5.3	9.4

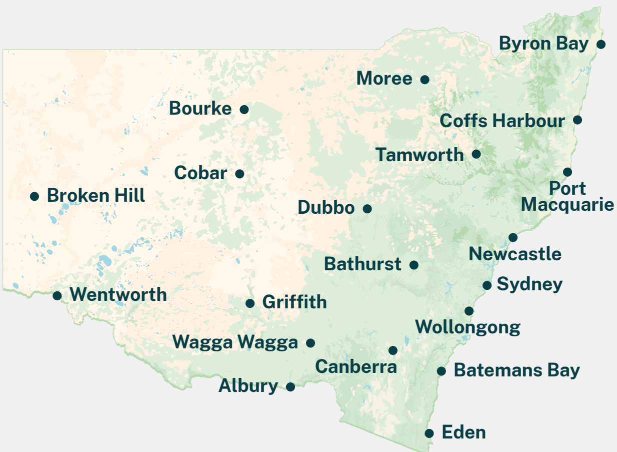
Regional impacts

Bushland

Increased severe fire weather

Coastal towns

Inundated by rising sea levels



Increased extreme heat

Agriculture

Decrease in cold nights

Alpine ecosystems

Data is based on NARCliM2.0 (2024) projections for SSP1-2.6 (low-emissions) and SSP3-7.0 (high-emissions) and is presented relative to the historical climate baseline of 1990–2009. The projections for 2050 represent averaged data for 2040–2059 and projections for 2090 represent averaged data for 2080–2099. Values presented are averages across the NARCliM2.0 model ensemble, and do not represent the full range of plausible climate futures. Regional climate change impacts are used to highlight how the region is likely to be affected by climate change, and impacts are not limited to the examples provided. Sea-level rise data is from the IPCC's Sixth Assessment Report is presented relative to a baseline of 1995–2014.

Climate of NSW

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

Current climate

NSW has a diverse climate. 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 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 3). The long-term rainfall record (1900–2023) shows that NSW has experienced considerable variations, with periods of wetter and drier conditions.[2]

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.

Table 1. Baseline climate for NSW

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

Table 1 outlines the annual average values for the 1990–2009 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.[1] Observed information and data in graphs come from Australian Gridded Climate Data (AGCD).[2]

Figure 2. Annual average temperature (°C) observed across NSW for 1990–2009[2]

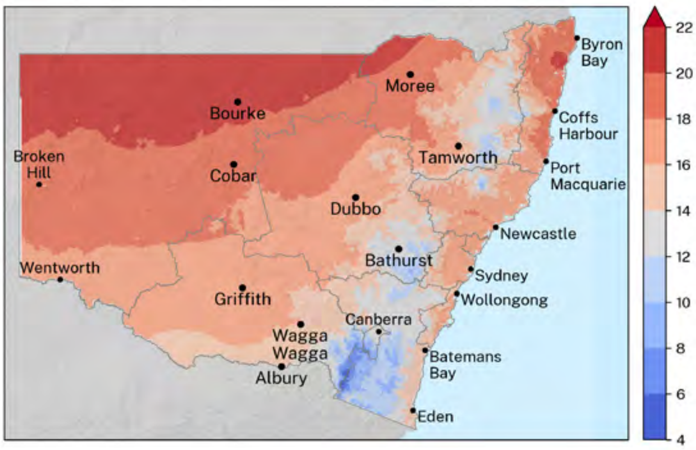
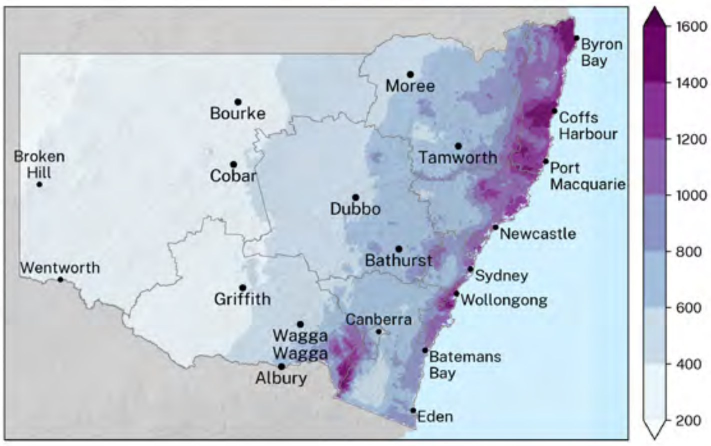


Figure 3. Annual average rainfall (mm) observed across NSW for 1990–2009[2]



Temperature

NSW is getting warmer

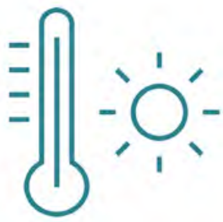
Temperature is the most robust indicator of climate change. In NSW, 6 of the 10 warmest years on record since 1910 have occurred since 2013. The warmest year on record for both average temperature and maximum temperature was 2019, when average temperature was 1.2°C above the 1990–2009 average.[2] In NSW, temperature has been increasing in recent decades. Between 1910 when national records began and the 1990–2009 baseline, temperature has risen by 0.84°C.[1]

Projections

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 5). 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).

4.0 °C

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



6 of 10

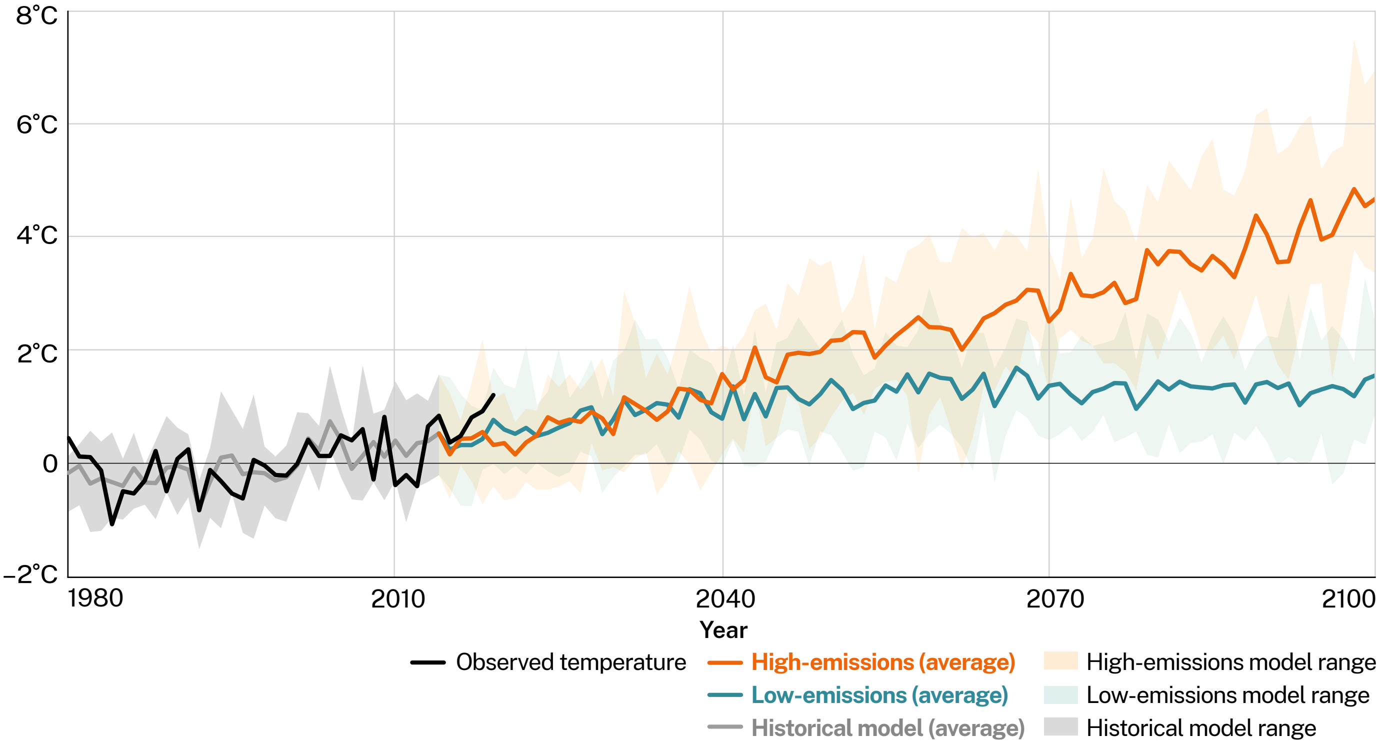
warmest years on record have occurred since 2013

Table 2. Projected annual average temperature increase – NSW

	2050		2090	
	Low-emissions	High-emissions	Low-emissions	High-emissions
Temperature	**1.2°C** (0.6–1.7°C)	**2.0°C** (1.0–2.9°C)	**1.3°C** (0.6–2.1°C)	**4.0°C** (2.7–5.5°C)
Maximum temperature	**1.3°C** (0.6–1.8°C)	**2.0°C** (1.1–3.0°C)	**1.4°C** (0.6–2.2°C)	**3.9°C** (2.8–5.6°C)
Minimum temperature	**1.1°C** (0.6–1.6°C)	**1.9°C** (0.9–2.6°C)	**1.3°C** (0.7–1.9°C)	**3.9°C** (2.6–5.4°C)

The bold number is the ensemble average for the period. Underneath the average is the ensemble range.

Figure 4. Historical and projected average temperature change – NSW

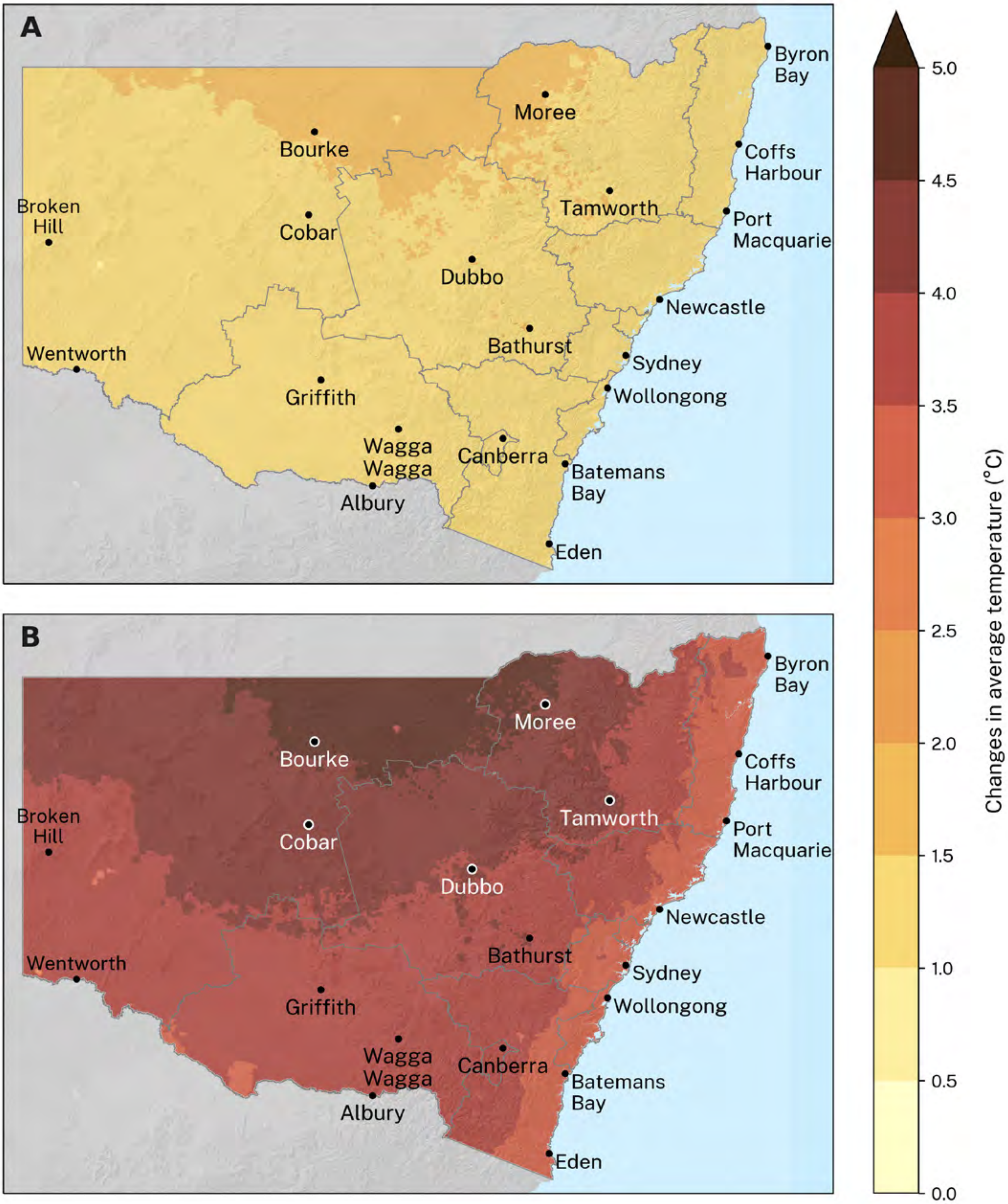


The shading around the graphs

The climate change projections presented in this snapshot are relative to the historical climate baseline of 1990–2009. The graphs provide a projected annual average for the 2 emissions scenarios.

The range of plausible climate futures across the NARCliM model ensemble is shown by light shading. For historical climate data, both recorded observational data (dark line) and modelling of the past climate in NARCliM2.0 (grey) are presented.

Figure 5. Projected change in average temperature by 2090 for NSW under A) a low-emissions scenario and B) a high-emissions scenario



Hot days

Hot days will become more frequent

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

Generally, the number of hot days in NSW increases as you move further inland. Along the coast, there are fewer than 10 hot days on average per year, while inland in north-western NSW there are more than 80 hot days each year.[2] In NSW, the number of hot days has been increasing in recent decades.

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

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

Projections

The number of hot days will increase for NSW by 2050 for both a low-emissions and a high-emissions scenario, with an even greater increase by 2090 under 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 7). By 2090, these regions are projected to experience an additional 15–30 hot days per year under a low-emissions scenario and 40–60 additional hot days per year under a high-emissions scenario. During the baseline period, these regions had a range of 20–65 hot days annually.

By 2090, areas of north-west NSW are expected to experience hot days for nearly one-third of the 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 significant increase in the number of hot days under both a low-emissions scenario and a high-emissions scenario. By 2090, the number of hot days along the coast is projected to increase by an additional 10 days per year under a low-emissions scenario and by an additional 30 days per year under a high-emissions scenario in some areas. Between 2050 and 2090, a minimal increase in the number of hot days is projected across NSW under a low-emissions scenario. However, an additional 20 hot days per year are projected under a high-emissions scenario during the same period.

Hot days

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

2050		2090	
Low-emissions	High-emissions	Low-emissions	High-emissions
14.8 days (4.5 to 24.2 days)	**23.1 days** (8.4 to 35.7 days)	**15.9 days** (6.4 to 28.5 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.

Figure 6. Historical and projected change in annual number of hot days – NSW

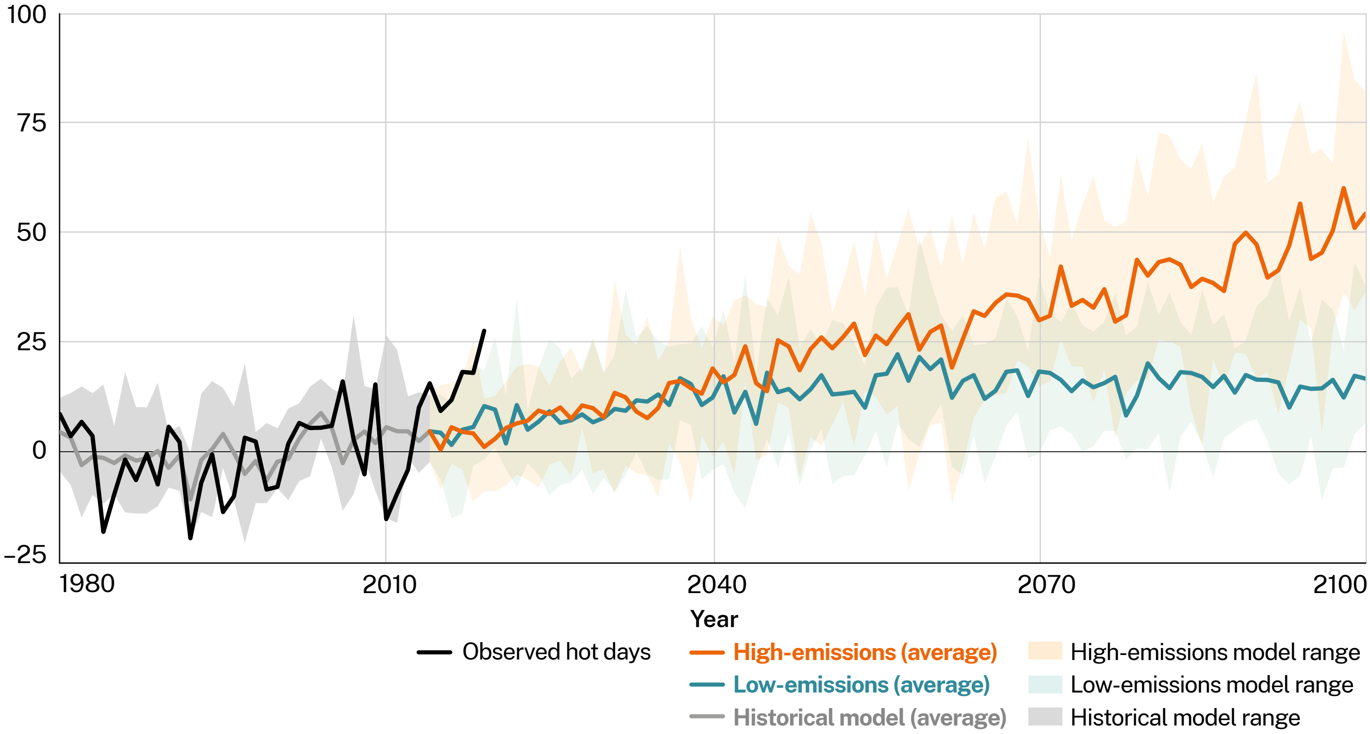


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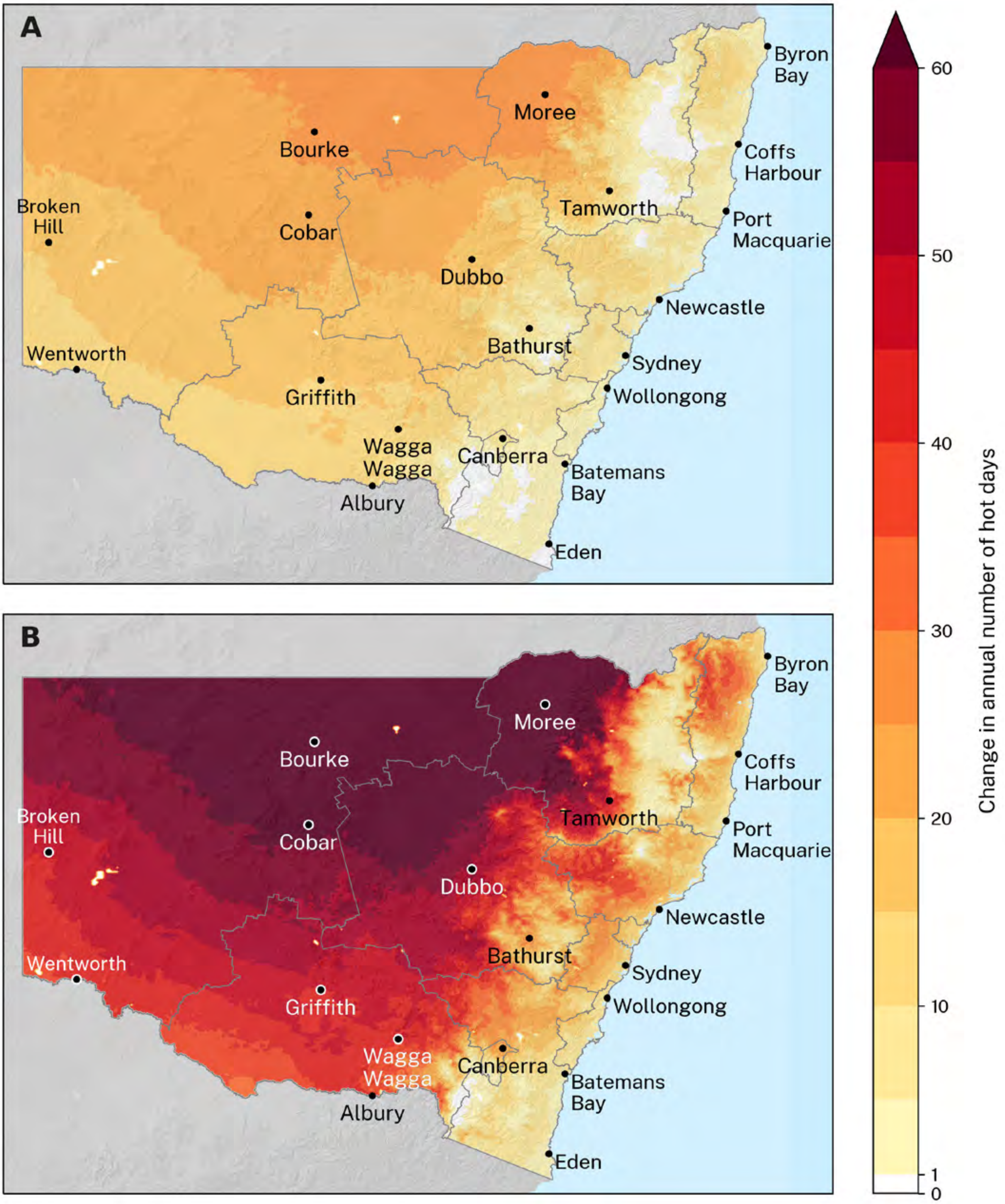
Figure 7. Projected change in annual number of hot days by 2090 for NSW under A) a low-emissions scenario and B) a high-emissions scenario



Cold nights

Cold nights will decrease

Cold nights are those where the minimum temperature drops below 2°C. These are important for the survival of some important plant species. For example, some common temperate fruit species require sufficiently cold winters to produce flower buds and alpine ecosystems in the mountainous south-east are reliant on cold nights.

Generally, the number of cold nights in NSW is highest for the Snowy Mountains and higher elevation areas of the Great Dividing Range. Some areas experience on average more than 140 cold nights per year.[2] West of the Great Dividing Range, the number of cold nights decreases. Along the coast, there are typically few cold nights each year, with higher prevalence on the far south coast and inland areas adjacent to the coast.

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 annual number of cold nights by 2090.

Under a low-emissions scenario, the number of cold nights across NSW could reduce by less than 35% by 2090.

Projections

The number of cold nights will decrease for NSW by 2050 for both a low-emissions and a high-emissions scenario, with an even greater decrease by 2090 under a high-emissions scenario (Figure 8). 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, a decrease of 9.5 fewer cold nights per year is projected under a high-emissions scenario during the same period (Table 4).

The greatest reductions in cold nights are projected along the Great Dividing Range, including the Snowy Mountains (Figure 9). Under a low-emissions scenario, by 2090 these regions could see a decrease of 20–30 cold nights per year, while a high-emissions scenario could lead to over 70 fewer cold nights per year in some alpine areas. Such a considerable reduction in 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. Projected decrease in average annual number of cold nights – NSW

2050		2090	
Low-emissions	High-emissions	Low-emissions	High-emissions
9.3 days (5.7 to 13.4 days)	**14.6 days** (7.3 to 18.3 days)	**10.6 days** (6.1 to 13.9 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.

Figure 8. Historical and projected change in annual number of cold nights – NSW

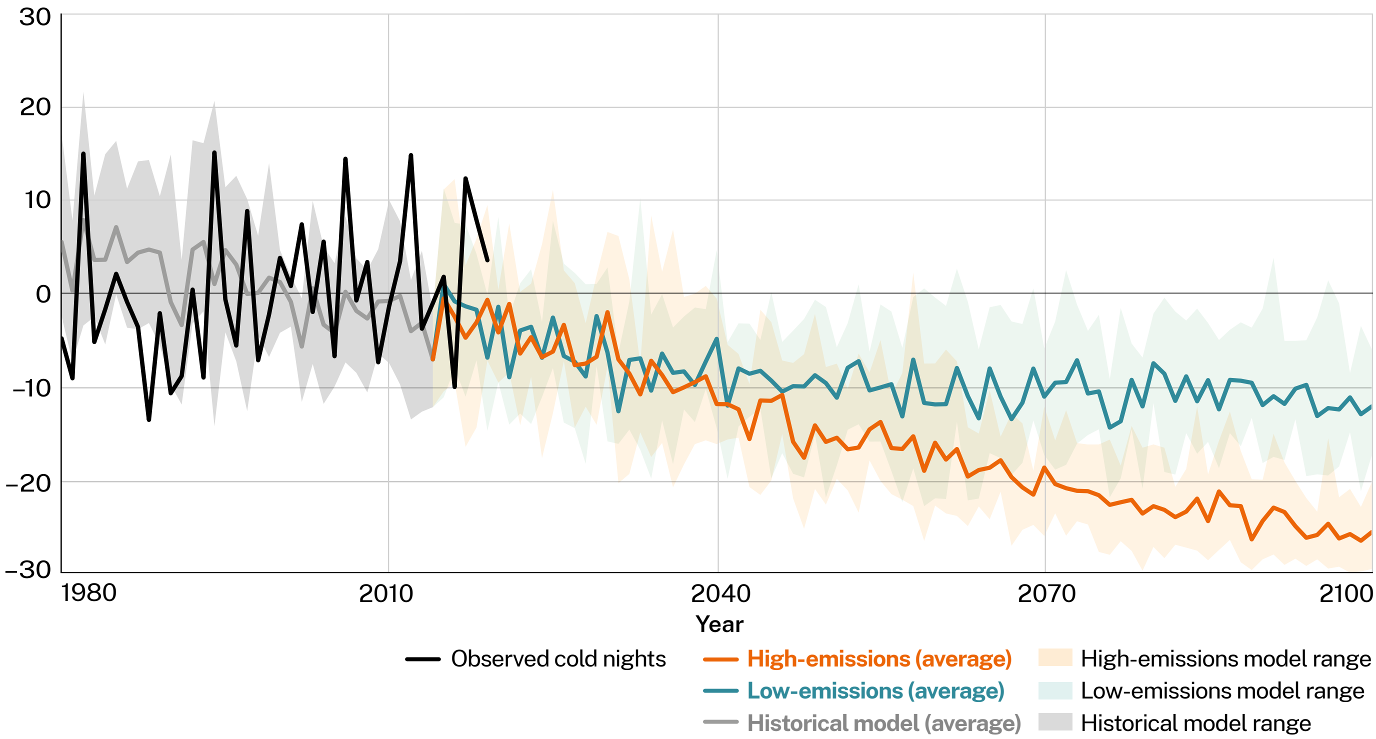
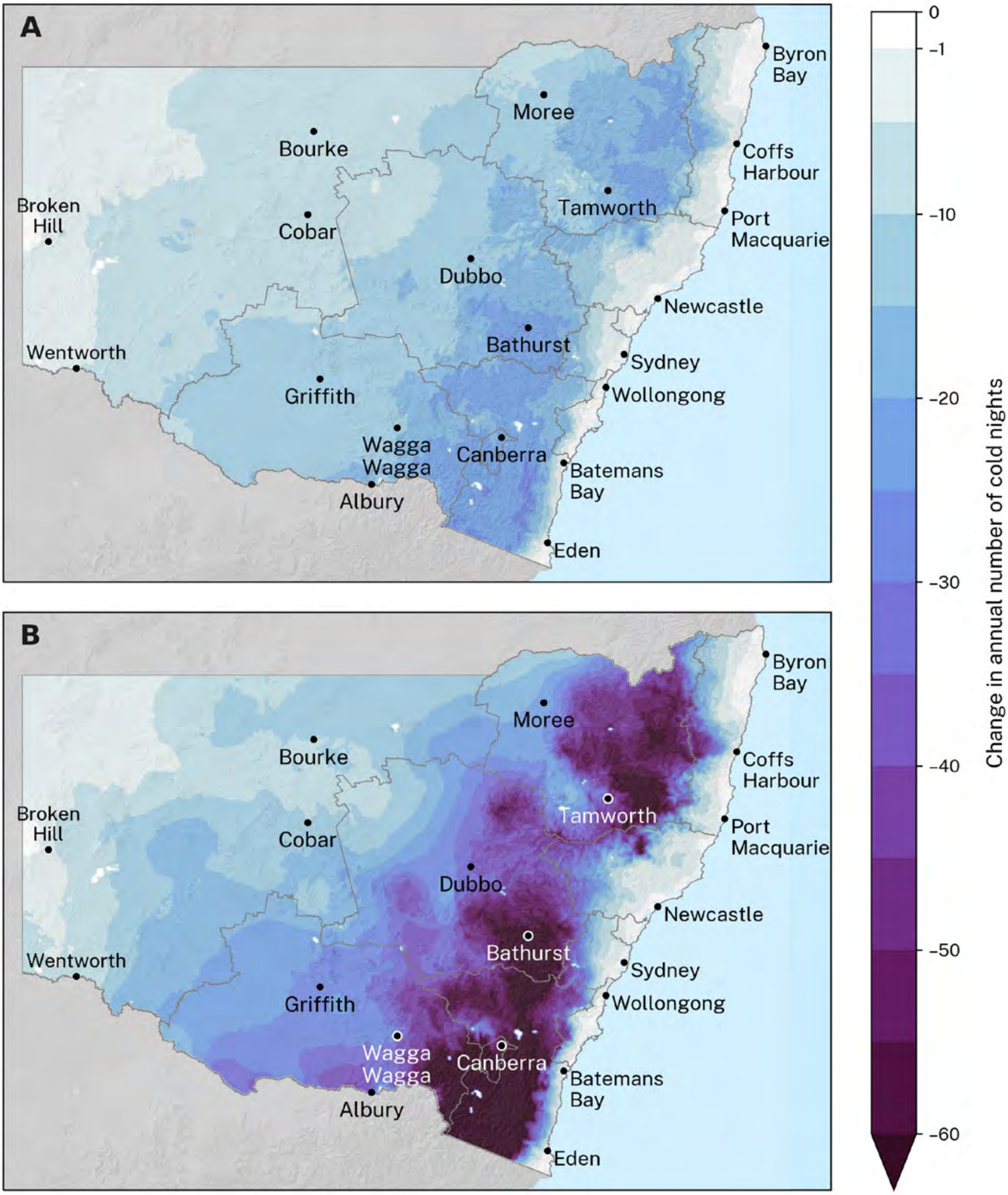


Figure 9. Projected change in annual number of cold nights by 2090 for NSW under A) a low-emissions scenario and B) a high-emissions scenario



Rainfall

Rainfall may slightly decrease but 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. Eucalypt woodlands and riverine plains in the interior west could struggle to cope with drier conditions.

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.

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 2 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.

Projections

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

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 (Figure 10). Changes to rainfall are likely to occur in all seasons (Table 5), with variation across different regions (Figure 11). The most notable change is a large decrease in average winter rainfall for coastal regions, particularly for Metropolitan Sydney, the 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.

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 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 both a low-emissions scenario and a high-emissions scenario. 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.

By 2090, average summer rainfall is projected to decrease under a low-emissions scenario. However, some areas in the New England, 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 both a low-emissions scenario and a high-emissions scenario. Refer to the Interactive Map for further seasonal information.

Table 5. Projected change to average rainfall – NSW

	2050		2090	
	Low-emissions	High-emissions	Low-emissions	High-emissions
Annual	**–10.2%** (–21.9% to +6.7%)	**–15.5%** (–32.8% to +2.7%)	**–10.1%** (–20.0% to +14.4%)	**–11.6%** (–38.6% to +35.6%)
Summer	**–9.3%** (–25.9% to +23.5%)	**–17.9%** (–40.1% to +24.7%)	**–13.6%** (–37.1% to +32.4%)	**–3.9%** (–32.9% to +43.8%)
Autumn	**–10.3%** (–26.9% to +7.6%)	**–12.9%** (–36.3% to +21.6%)	**–5.2%** (–25.3% to +20.6%)	**–9.4%** (–30.5% to +43.9%)
Winter	**–10.6%** (–22.9% to +23.9%)	**–17.2%** (–41.0% to +9.8%)	**–5.0%** (–29.4% to +31.9%)	**–17.7%** (–52.3% to +52.6%)
Spring	**–11.2%** (–34.2% to +15.4%)	**–13.0%** (–39.2% to +7.2%)	**–15.6%** (–29.7% to +19.8%)	**–18.6%** (–44.6% to +31.9%)

The bold number is the ensemble average for the period. Underneath the average is the ensemble range.

Figure 10. Historical and projected change to average rainfall – NSW

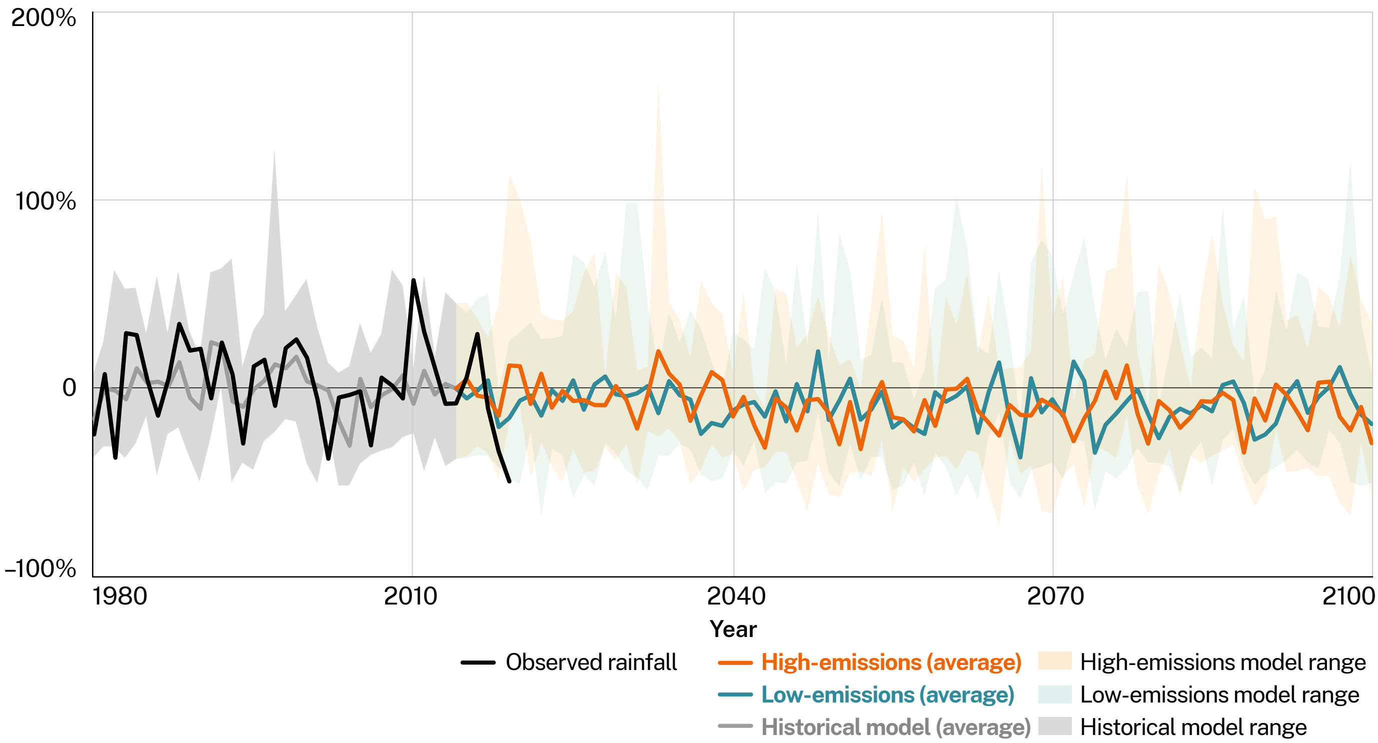
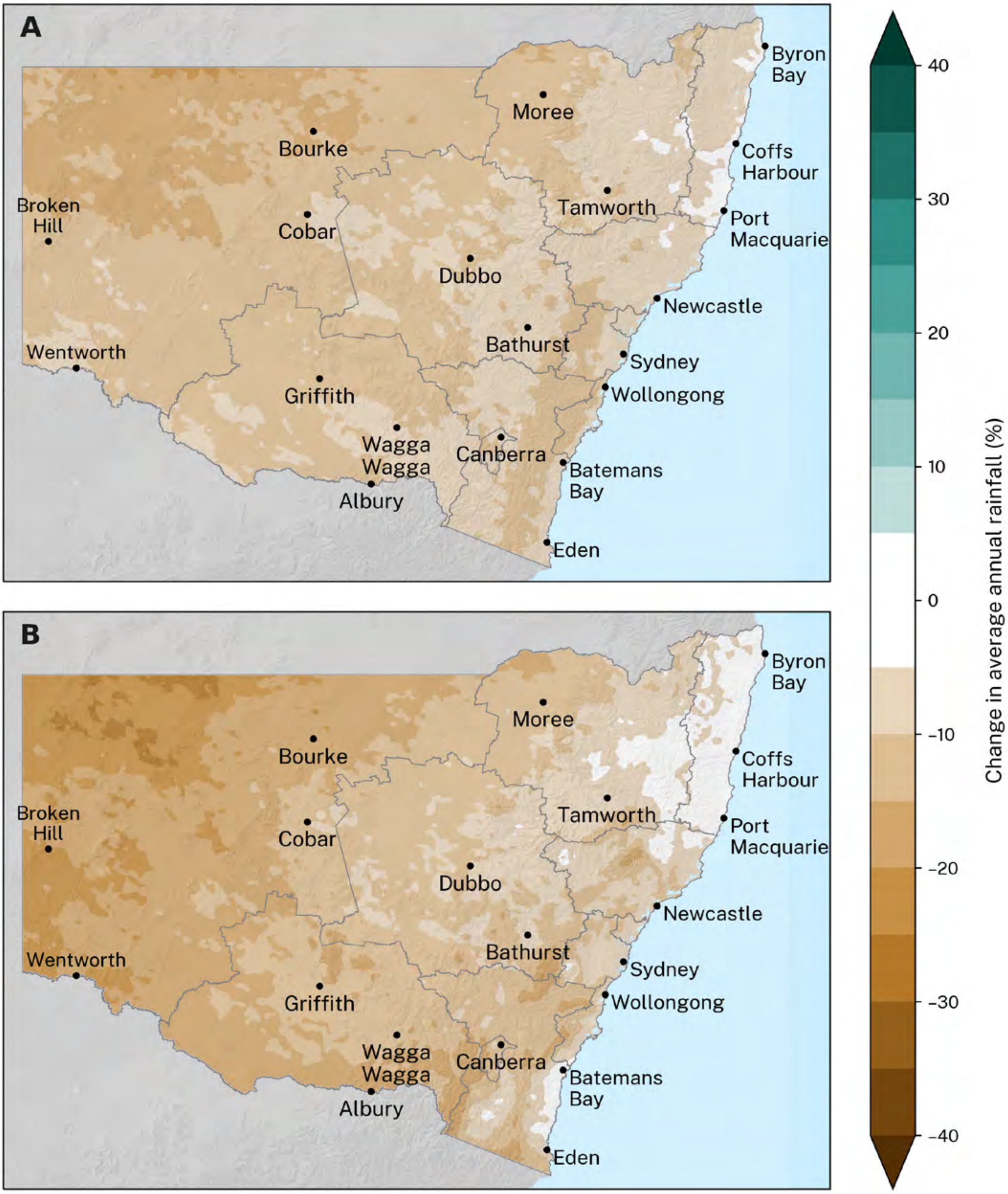


Figure 11. Projected change to average rainfall by 2090 for NSW under A) a low-emissions scenario and B) a high-emissions scenario



Severe fire weather

Severe fire weather will increase

The Forest Fire Danger Index (FFDI) represents an estimate of fire weather risk. The FFDI is calculated from temperature, relative humidity and wind speed, as well as a number 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.[3] Temperate forests are also vulnerable to severe fire weather. The average number of severe fire danger days observed across NSW and the ACT from 1990–2009 was 8.3 days, ranging from 0.3 days per year in the ACT to 15.2 days per year in the Far West.[2] In NSW, the number of severe fire weather days has been increasing in recent decades.

Fire weather was the strongest determining factor of house loss during the Black Summer bushfires.[3]

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 calculated using the NARCliM projections, whereas data used by the Australian Fire Danger Rating System cannot. FFDI also provides a long history of data and gives context to the NARCliM projections.

Projections

The number of severe fire weather days will increase for NSW by 2050 under both a low-emissions and a high-emissions scenario, with an even greater increase projected by 2090 under 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, 0.3 days increase in the number of severe fire weather days is projected across NSW under a low-emissions scenario (Table 6). However, 9.4 additional severe fire weather days per year are projected under a high-emissions scenario for 2090, an increase of 4.1 additional severe fire weather days between 2050 and 2090 and nearly double the amount of severe fire weather days across the state.

2x

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

3x

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

The greatest increases will occur for areas west of the Great Dividing Range (Figure 13), 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. The number of severe fire weather days per year is projected to approximately double under a high-emissions scenario, compared with the 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 high-emissions scenario, with limited changes expected under a low-emissions scenario. By 2090, Nowra in the Illawarra Shoalhaven region is projected to experience 0.7 additional severe fire weather days per year under a low-emissions scenario and 1.9 additional severe fire weather days per year under a high-emissions scenario. Currently, Nowra experiences an average of 1.9 severe fire weather days per year and a high-emissions scenario could double the number of severe fire weather days per year.

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

2050		2090	
Low-emissions	High-emissions	Low-emissions	High-emissions
3.2 days (–0.3 to 6.7 days)	**5.3 days** (1.5 to 11.3 days)	**3.5 days** (0.3 to 8.6 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.

Figure 12. Historical and projected change to annual number of severe fire weather days – NSW

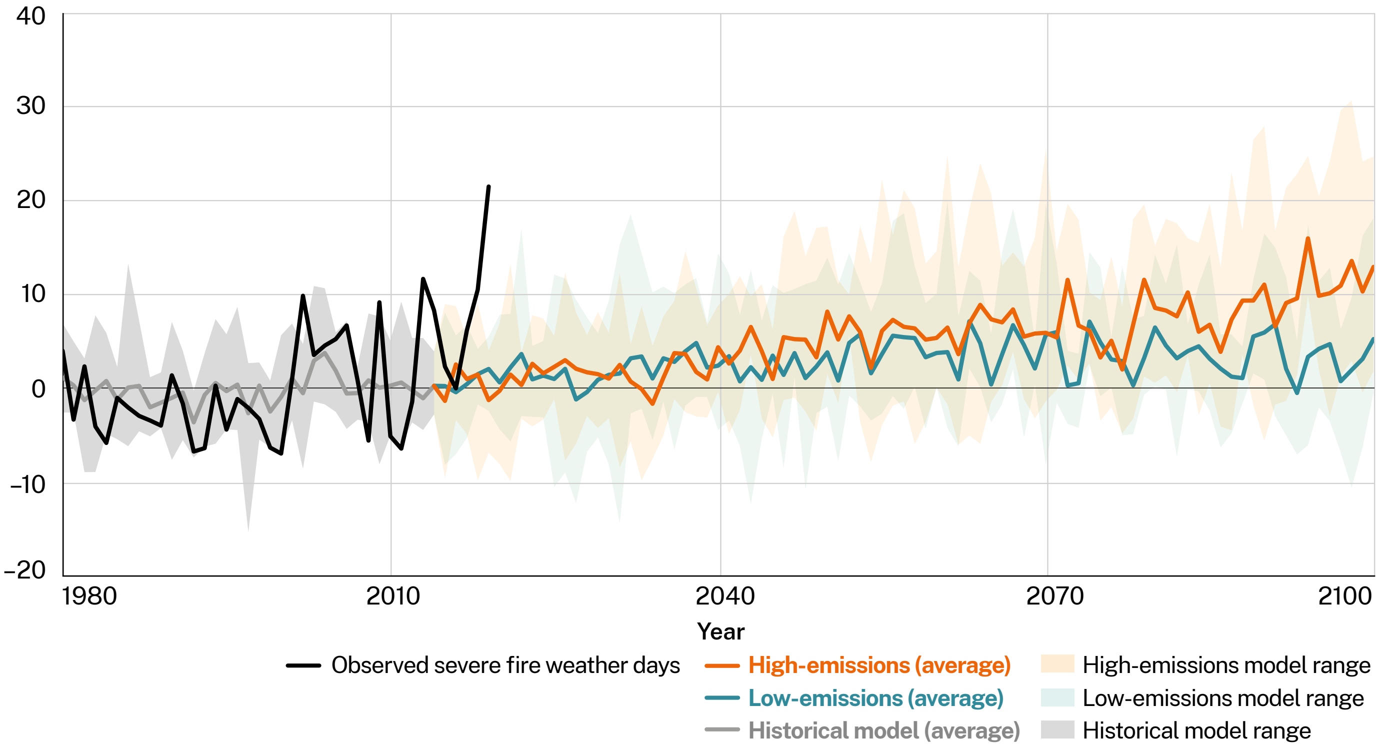
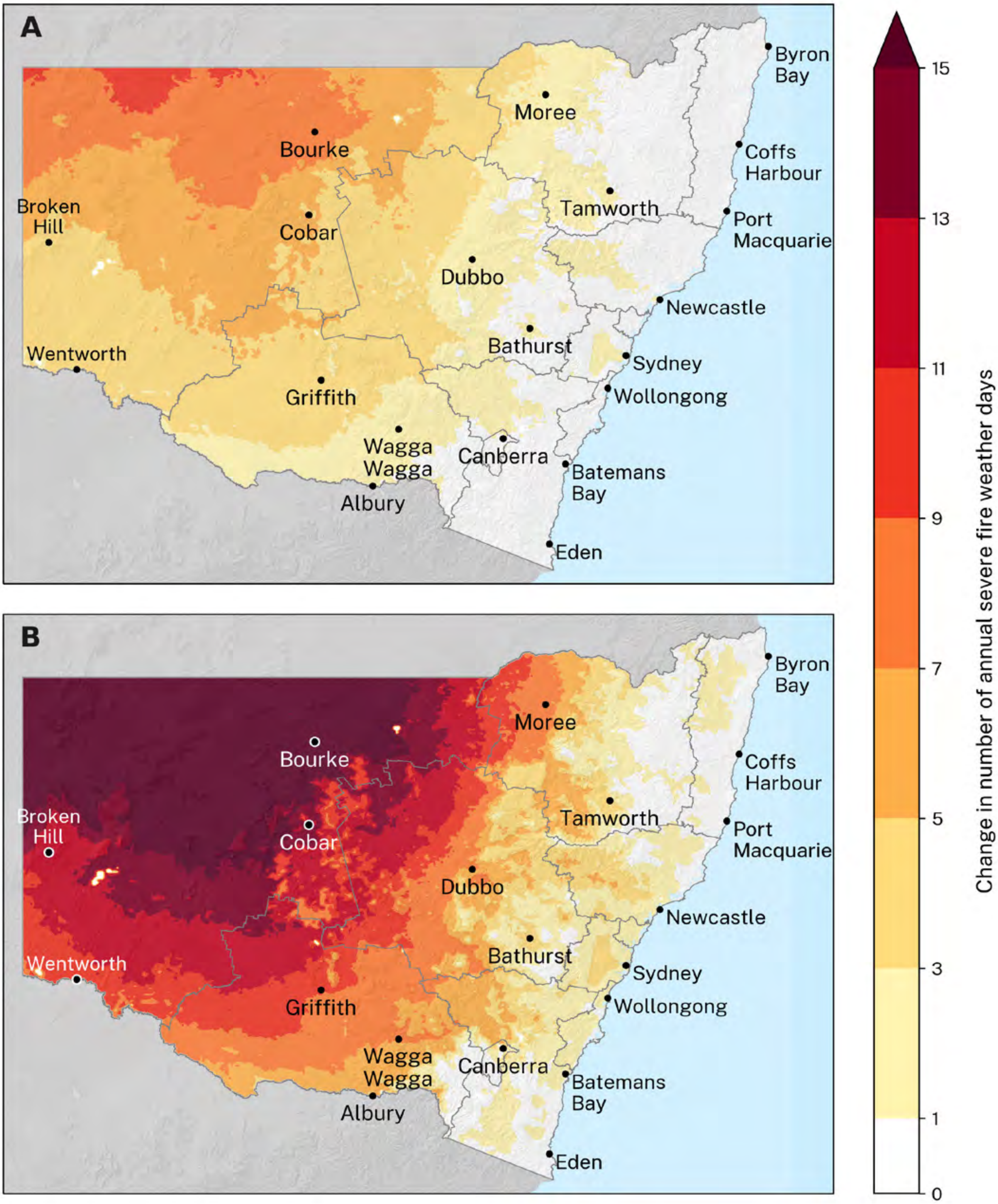


Figure 13. Projected change to annual number of severe fire weather days by 2090 for NSW under A) a low-emissions scenario and B) a high-emissions scenario



Sea-level rise

Sea-level rise will accelerate

Sea levels are rising and projected to have a major impact on coastal communities in NSW over coming decades. At the NSW baseline sea-level monitoring gauge at Port Kembla, average sea level has been rising at a rate of approximately 3.7mm/year since 1991.

Sea-level rise of 3.7mm/year has already led to increases in inundation of streets in some NSW coastal communities.[4,5]

The 'likely' range of sea-level rise is presented here by the low (SSP1-2.6) and high (SSP3-7.0) emissions scenarios, to correspond with the NARCliM climate projections. This likely range was assessed by the IPCC as data within an uncertainty interval of 66%. A broader range of projections and uncertainty is available in the 2021 IPCC Sixth Assessment Report.

Sea level along the NSW coast is projected to continue rising under all emissions scenarios. At Port Kembla, sea level is projected to rise by 11–24cm under a low-emissions scenario and by 16–28cm under a high-emissions scenario by 2050 relative to a baseline period of 1995–2014.

Later in the century, sea-level rise is projected to accelerate under both emissions scenarios, with significantly faster acceleration under a high-emissions scenario. Sea-level rise by 2100 is projected to be 24–56cm under a low-emissions scenario and 50–91cm under a high-emissions scenario. Even greater sea-level rise will occur by 2150, with a projected rise of 33–93cm under a low-emissions scenario and 84–165cm under a high-emissions scenario.

There are only small differences in projected sea-level rise across the NSW coast, with slightly higher rates in the north. Yamba is expected to experience an additional 5cm of sea-level rise by 2100 under a high-emissions scenario compared to Port Kembla.

These projections do not factor in contributions from ice-sheet instability, which have high uncertainty. The IPCC addresses this uncertainty by providing modelling explained in a low-likelihood, high-impact storyline assessed as 'low-confidence'. At Port Kembla, this low-confidence modelling indicates a potential upper limit of sea-level rise of 55cm by 2050, 2.3m by 2100 and 5.4m by 2150.

Sea-level rise will continue for centuries to millennia due to the longer-term response of the oceans and ice sheets to climate change.

In the longer term, the IPCC indicates sea level will rise for centuries to millennia due to continuing deep ocean warming and ice-sheet melt remaining elevated for thousands of years. If global warming is limited to 1.5°C, average sea level will rise by about 2–3m worldwide. For 2°C warming, sea-level rise of 2–6m is expected, and for 5°C warming, 19–22m is expected.

Climate change impacts on NSW

Climate change is already affecting the social, economic and natural welfare of NSW and will increasingly affect the environment, our quality of life and other important values in every part of the state.

Increased heat stress

Temperature extremes and heatwaves have more pronounced impacts on human health, infrastructure and the environment than changes to average temperatures.

Heatwaves occur when both maximum and minimum temperatures are unusually hot over 3 days, compared to the previous month and historical weather. Heatwaves have been responsible for more human deaths than any other natural hazard, including bushfires and floods. Heatwaves in 2011 and 2019 led to a 14% rise in NSW hospital admissions.[6] In 2009, the heatwave in Victoria preceding the 2009 bushfires led to 374 deaths, with the bushfires directly responsible for 173 deaths.[7]

The increasing urbanisation of cities in NSW also presents a risk of amplifying the mean 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.

Fewer cold nights

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 over a third since the 1950s and years with persistent heavy snow cover have become rare. Continued decline in snow depth is likely to 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 restrict recreational opportunities, affecting local economies dependent on snow-based tourism.

Changes to rainfall

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.[8] For example, the ecological character of the NSW Central Murray Forests in the Murray Murrumbidgee region have 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.[9] Climate change could further exacerbate these impacts, particularly under a high-emissions scenario.

Bushfires

The 2019–2020 bushfire season caused extensive damage to communities, infrastructure and natural ecosystems. Approximately 2500 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.[10,11] Over 5.5 million hectares were burnt across the state, including 54% of the Gondwana Rainforests World Heritage Area and 81% of the Greater Blue Mountains World Heritage Area. [11,12]

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.[11] 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.[12]

Sea-level rise

Rising average sea level and the related increase in extreme events threaten coastal communities through hazards. Such hazards include the permanent submergence of land, coastal erosion and shoreline recession, loss of coastal ecosystems, impeded drainage, the salinisation of soils and water, and more frequent, extensive and deeper coastal flooding. These hazards threaten infrastructure and coastal and estuarine natural ecosystems.[13]

Communities, infrastructure and natural ecosystems are also expected to be increasingly vulnerable to the impacts of sea-level rise in the future, particularly under a high-emissions scenario. By 2061, an estimated 39,000–46,000 NSW properties could be exposed to coastal erosion or inundation. Annual costs from property damage and loss of land are projected to be $1–1.5 billion.[14]

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Climate action and information

Climate action

The NARCliM projections for the low-emissions scenario and the high-emissions scenario 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 AdaptNSW.

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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