NARCliM

NSW GOVERNMENT

North Coast

Climate Change Snapshot

environment.nsw.gov.au

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. The NSW Government acknowledges the Bundjalung, Gumbayngirr, Dunghutti, Nganyaywana, Biripi and Yaegl Aboriginal people from the North Coast region as having an intrinsic connection with the lands and waters. The landscape and its waters provide the First Nations people with essential links to their history and help them to maintain and practise their traditional culture and lifestyle.

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 to 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 wisdom at this pivotal moment in time.

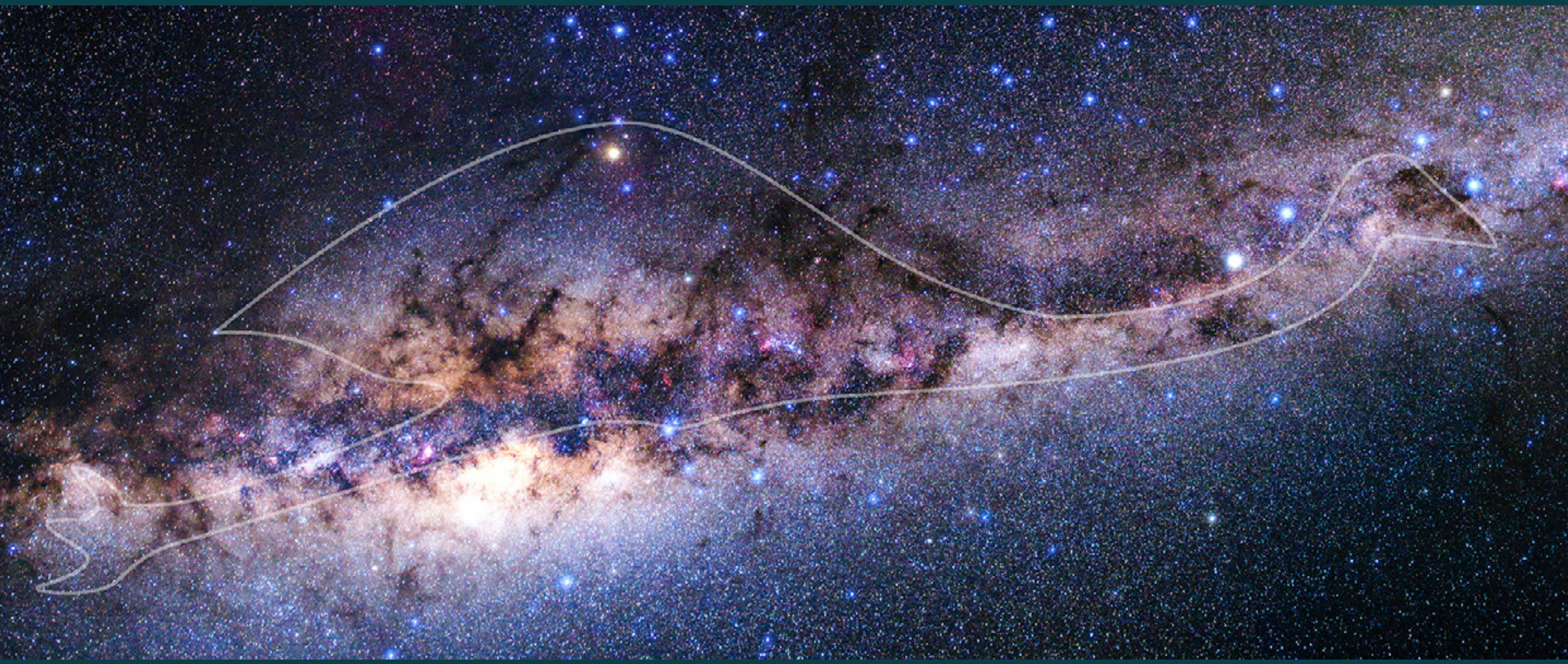

Photo caption:
The Emu in the Sky is an Aboriginal constellation that is made up of the dark clouds of the Milky Way. With the movement of the earth, the position of the Emu in the Sky changes throughout the year. Aboriginal people in some nations across NSW and Australia relate the position of the Emu 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. Detailed climate projection information is available through the AdaptNSW Interactive Map and the Climate Data Portal.

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 the North Coast region 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

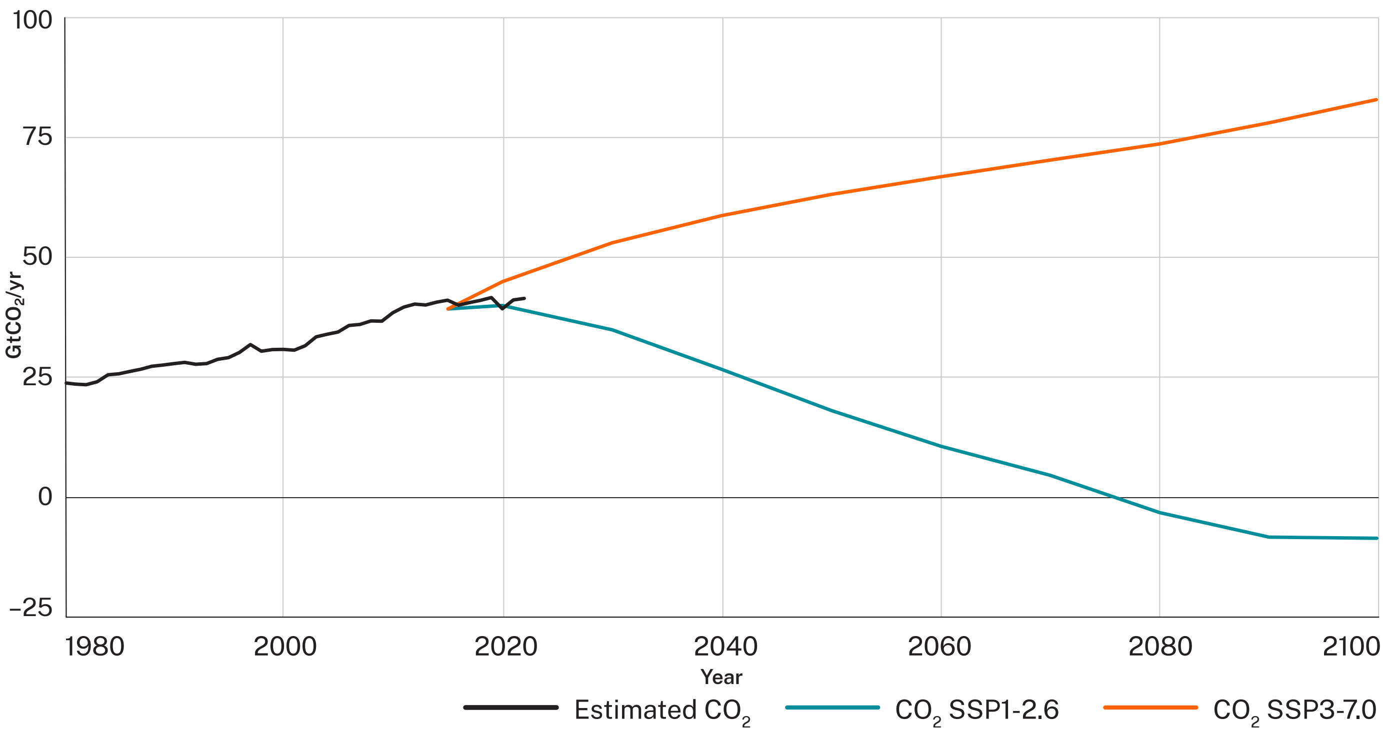
Shared Socioeconomic Pathways (SSPs) are the most recent emissions scenarios adopted in the IPCC's Sixth Assessment Report.

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 AdaptNSW.

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
North Coast

Low-emissions scenario

Average temperature increase

↑ **1.1°C**
2050

↑ **1.2°C**
2090

Hot days per year will increase by:

5.9 2050 | **6.0** 2090

Sea level will rise by:

19cm 2050 | **40cm** 2090

Severe fire weather days per year will increase by:

0.4 2050 | **0.2** 2090

High-emissions scenario

Average temperature increase

↑ **1.7°C**
2050

↑ **3.4°C**
2090

Hot days per year will increase by:

8.6 2050 | **19.4** 2090

Sea level will rise by:

23cm 2050 | **59cm** 2090

Severe fire weather days per year will increase by:

0.5 2050 | **0.7** 2090

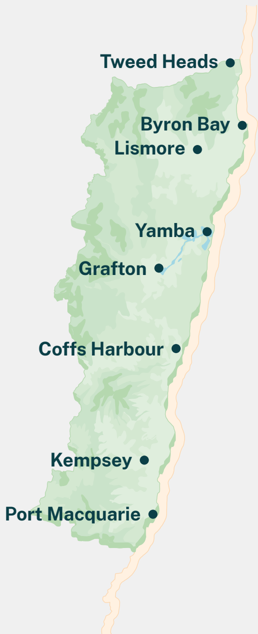
Regional impacts

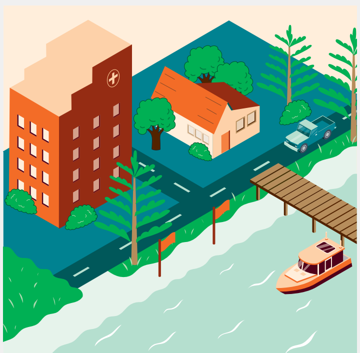
Rainforest

Changes to rainfall

Agriculture

Increase extreme heat



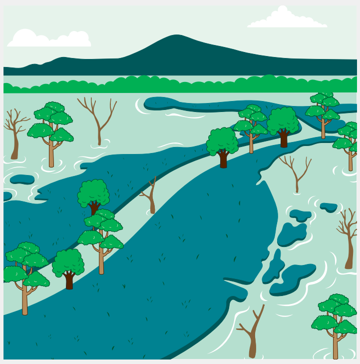


Inundated by rising sea levels

Coastal settlements

Inundated by rising sea levels

Low-lying floodplains



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 the North Coast

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.

The North Coast region of NSW extends from Port Macquarie to the Queensland border, and west to the Great Dividing Range and hinterland. It includes the regional centres of Coffs Harbour, Grafton and Lismore and the towns of Ballina, Byron Bay and Tweed Heads.

Current climate

The North Coast region is characterised by its subtropical to temperate climate, influenced by its proximity to the coast and surrounding geographical features. The topography of the region and its coastal setting results in climate conditions that vary across the region. The area experiences warm humid summers and mild winters, with much of the rainfall generally falling in summer and autumn. It is very wet along the coast, especially in the north, but drier inland. Summers are warm across the region, with cool winters in the foothills and along the Great Dividing Range.

The range of altitude, rainfall and temperature in the region gives rise to great diversity in natural environments. The North Coast is one of the most biologically diverse regions in NSW, containing parts of the World Heritage Area, Gondwana Rainforests of Australia the Lord Howe Island Group and a high number of threatened species and ecological communities. The region has multiple large river systems including the Richmond, Tweed, Clarence, Macleay and Hastings rivers. The region also includes 49 coastal lakes and estuaries, 900 wetlands and 70 littoral rainforests.

Tabel 1. Baseline climate for the North Coast

	Average temperature	Hot days	Cold nights	Rainfall	Severe fire weather days
Observed	18.3°C	4.4	14.9	1238mm	0.6
Historical model	17.6°C	6.3	12.2	1175mm	0.9

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]

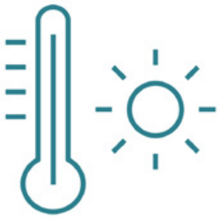
Temperature

The North Coast 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 mean temperature and maximum temperature in the North Coast region was 2019, when average temperature was 1.0°C above the 1990–2009 average.[2]

3.4°C

rise in average temperature across the North Coast by 2090 under a high-emissions scenario



6 of 10

warmest years on record have occurred since 2013

Projections

Across the North Coast region, average temperatures will increase throughout this century (Figure 2).

Under a low-emissions scenario, the average temperature increase across the region is projected to be less than 0.1°C between 2050 and 2090. However, a major temperature increase of 1.7°C is projected during the same period under a high-emissions scenario. 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).

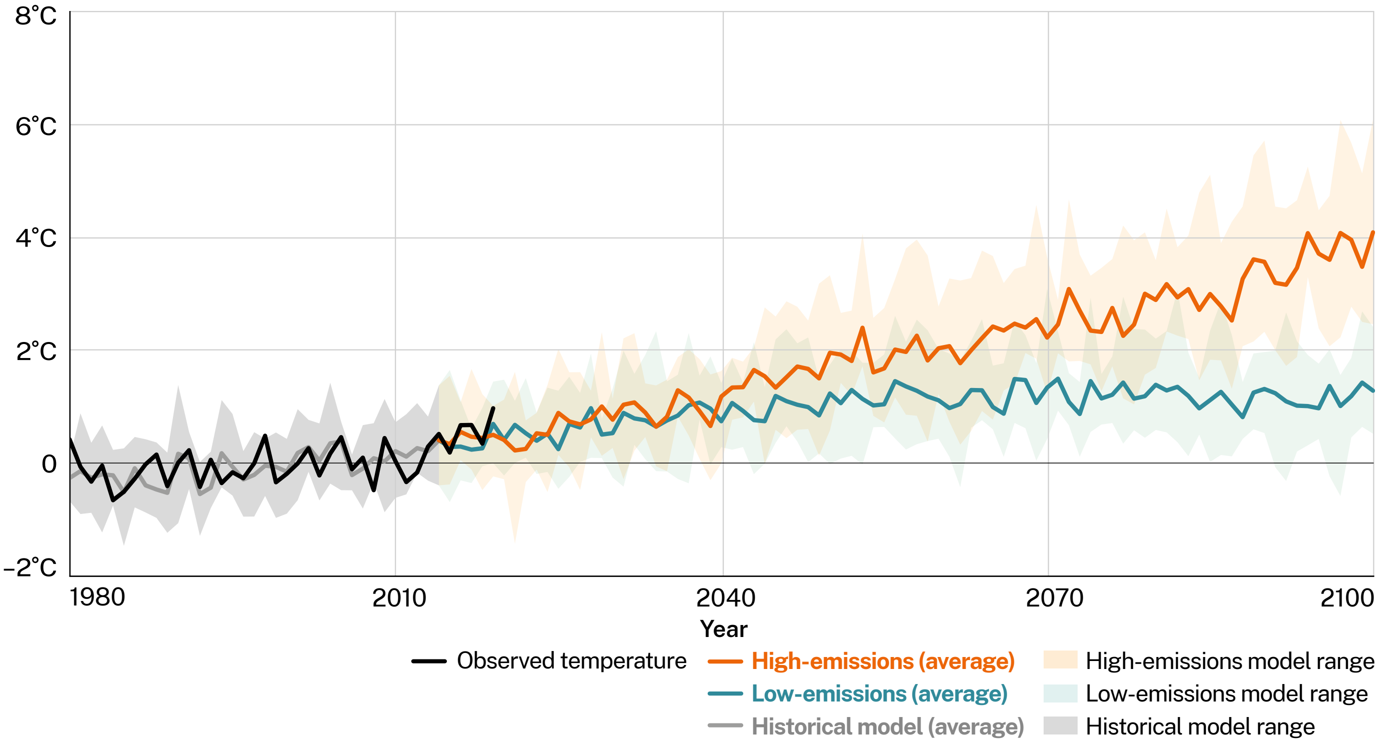
Temperature increases are expected in all parts of the region (Figure 3) and across all seasons. The ocean's moderating influence results in somewhat lower temperature increases along the coast compared to inland areas. Inland areas of the region, including towns such as Grafton and Casino, will experience the greatest increases in temperature. By 2090, Grafton is likely to experience an increase in temperature of 1.3°C under a low-emissions scenario and 3.4°C under a high-emissions scenario. Byron Bay is likely to experience an increase in temperature of 1.1°C under a low-emissions scenario and 3.2°C under a high-emissions scenario.

Table 2. Projected annual average temperature increase – North Coast

	2050		2090	
	Low-emissions	High-emissions	Low-emissions	High-emissions
Temperature	**1.1°C** (0.6–1.7°C)	**1.7°C** (1.1–2.8°C)	**1.2°C** (0.5–2.0°C)	**3.4°C** (2.4–4.8°C)
Maximum temperature	**1.2°C** (0.6–1.9°C)	**1.9°C** (1.1–3.1°C)	**1.3°C** (0.5–2.3°C)	**3.4°C** (2.3–4.9°C)
Minimum temperature	**1.1°C** (0.6–1.6°C)	**1.7°C** (1.1–2.6°C)	**1.2°C** (0.6–1.9°C)	**3.5°C** (2.5–4.9°C)

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

Figure 2. Historical and projected average temperature change – North Coast

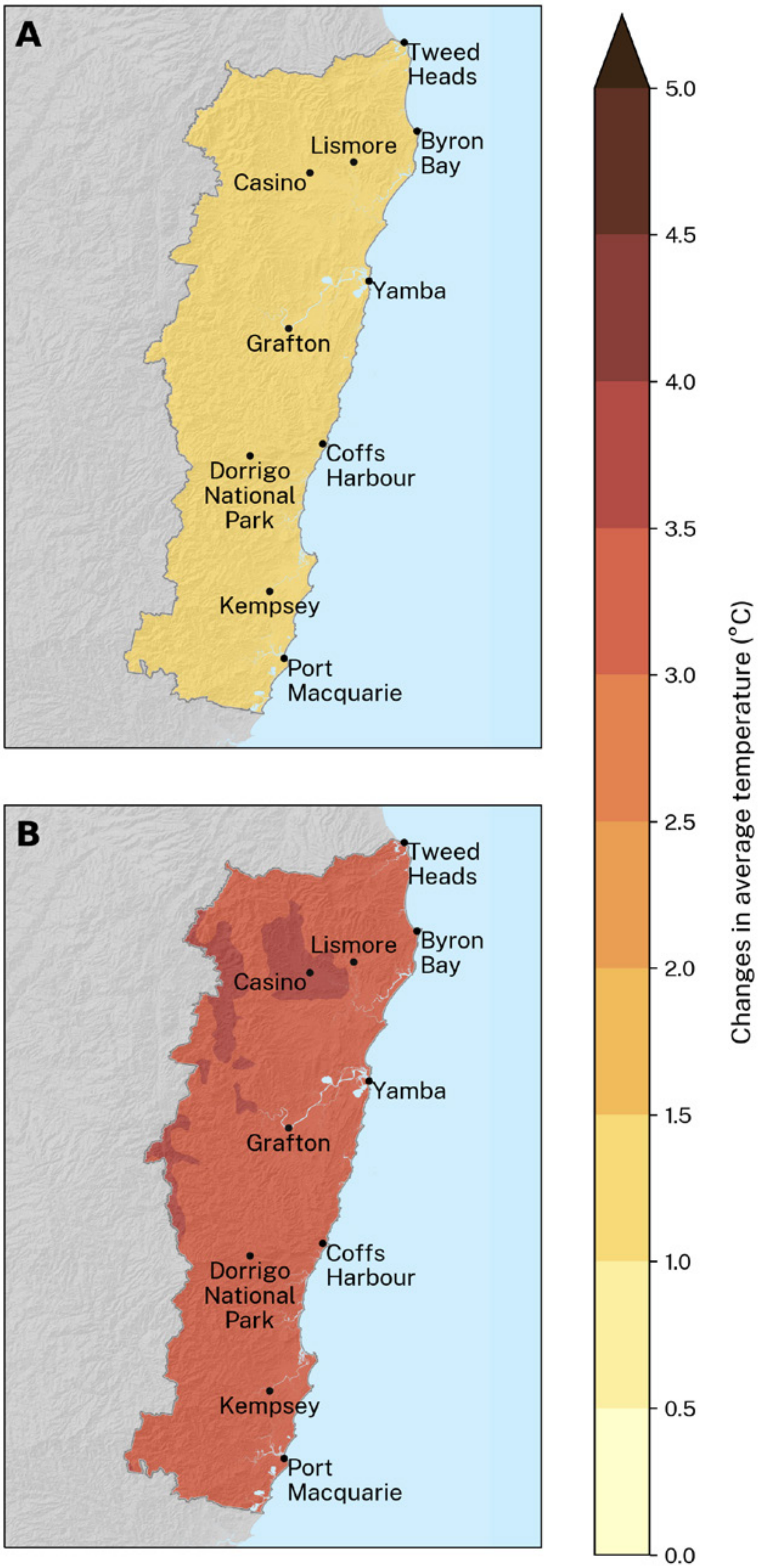


The shading around the graphs

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 3. Projected change in average temperature by 2090 for the North Coast 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 equal to or above 35°C increase the incidence of illness and death – particularly among vulnerable people. Seasonal changes in hot days could have significant impacts on bushfire danger, infrastructure and native species.

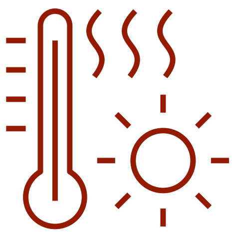
Projections

Generally, the number of hot days in the North Coast region increases further inland. During the baseline period, areas near the coast had on average 1–2 hot days per year. Inland areas such as Grafton had on average 10.2 hot days per year, whereas higher elevation inland areas such as Dorrigo National Park averaged 1.6 hot days per year.

The number of hot days will increase for the North Coast region 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 in summer.

Under a low-emissions scenario, there is a minimal increase in the number of hot days between 2050 and 2090, with less than 1 additional hot day projected across the region. However, an increase of 10.9 additional hot days is projected under a high-emissions scenario during the same period (Table 3.)

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



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

By 2090, the North Coast could experience four times the number of hot days per year under a high-emissions scenario.

The changes will occur across all of the region. Low-lying inland areas including Casino and Grafton are projected to experience the greatest increases in the number of hot days (Figure 5.) Coastal areas will experience a relatively lower increase due to the moderating influence of the ocean. By 2090, Grafton is projected to experience 8.6 additional hot days per year under a low-emissions scenario and 26.3 additional hot days per year under a high-emissions scenario. A high-emissions scenario is projected to more than triple Grafton's baseline period average of 10.2 hot days per year. Comparatively, on the coast, Byron Bay's baseline period average is 1.6 hot days per year. By 2090, Byron Bay is projected to experience an additional 1.0 hot days per year under a low-emissions scenario and 5.1 additional hot days per year under a high-emissions scenario.

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

2050		2090	
Low-emissions	High-emissions	Low-emissions	High-emissions
5.9 days (3.1 to 9.4 days)	**8.6 days** (3.4 to 16.9 days)	**6.0 days** (1.2 to 13.0 days)	**19.4 days** (10.2 to 32.0 days)

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

Figure 4. Historical and projected change in annual number of hot days – North Coast

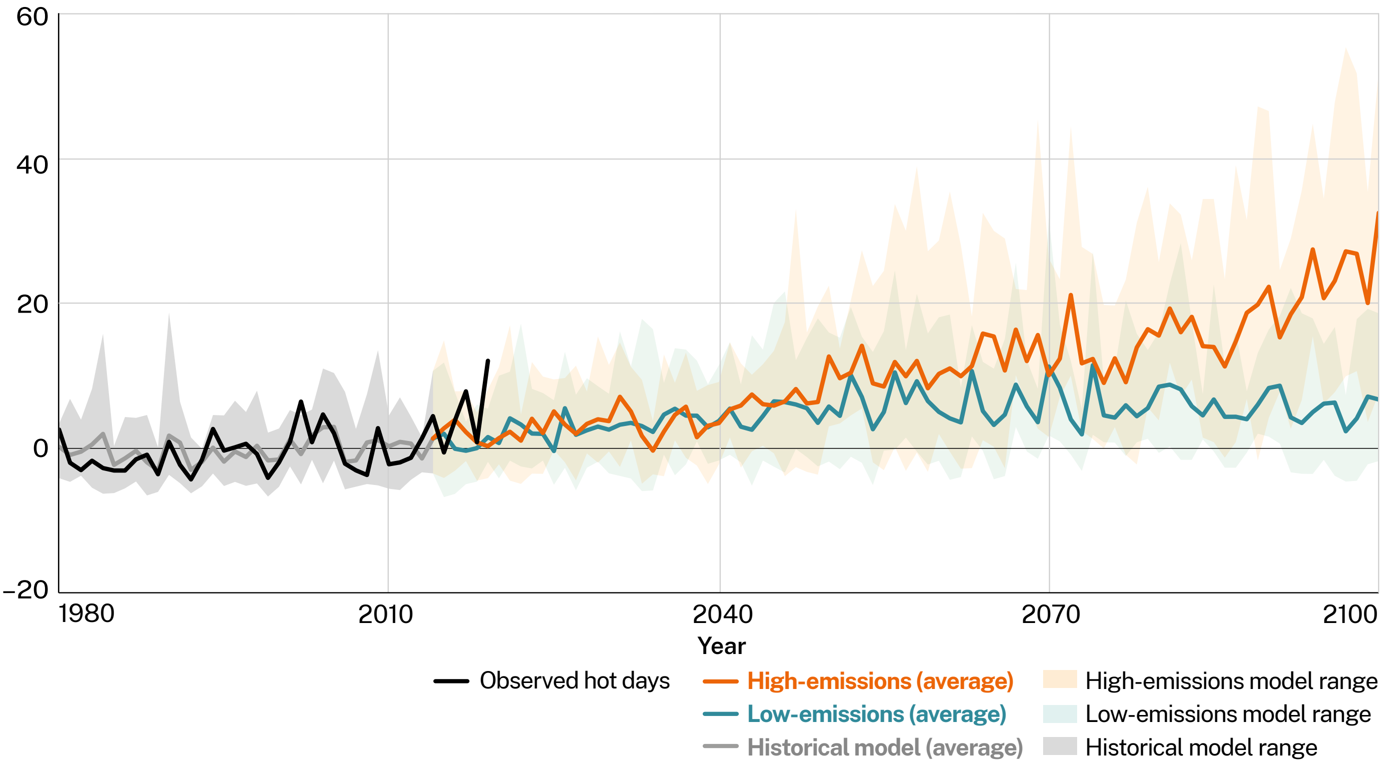
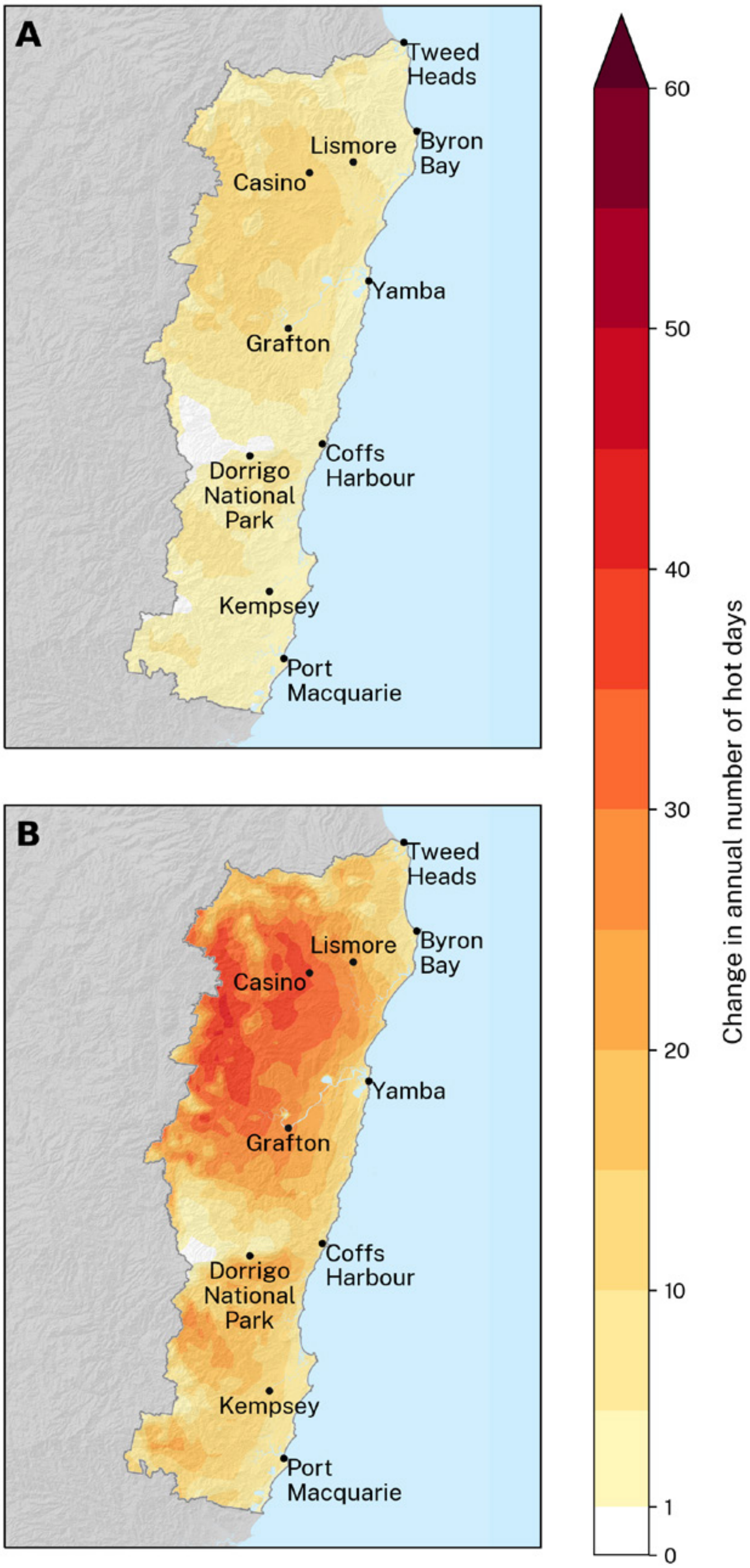


Figure 5. Projected change in annual number of hot days by 2090 for the North Coast under A) a low-emissions scenario and B) a high-emissions scenario



Cold nights

Cold nights will decrease

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

Projections

Cold nights in the North Coast region generally occur in inland areas. During the baseline period, areas such as Casino and Grafton had on average 2 cold nights per year. Higher elevation areas near Dorrigo National Park had on average more than 26 cold nights per year. Areas along the coast do not typically experience cold nights, except for some of the coast near Coffs Harbour, which had on average 2 cold nights per year. The number of cold nights will decrease for the North Coast region by 2050 for both a low-emissions and a high-emissions scenario, with an even greater decrease by 2090 under 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.

Cold nights will particularly decrease in the hinterland west of Coffs Harbour (Figure 7). The greatest decreases are projected to occur for Dorrigo National Park and Guy Fawkes River National Park. By 2090, Dorrigo National Park is projected to have 11.7 fewer cold nights per year under a low-emissions scenario and 23.5 fewer cold nights per year under a high-emissions scenario. A high-emissions scenario is projected to reduce Dorrigo National Park's cold nights average by more than 90%.

Under a high-emissions scenario, the number of cold nights across the North Coast could reduce by 90% by 2090.

Under a high-emissions scenario, hinterland areas in the west could experience a decrease of more than 50 cold nights per year by 2090.

Under a low-emissions scenario, the number of cold nights across the North Coast could reduce by less than 50% by 2090.

Cold nights

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

2050		2090	
Low-emissions	High-emissions	Low-emissions	High-emissions
5.0 days (2.4 to 7.4 days)	**7.6 days** (5.2 to 9.8 days)	**5.6 days** (2.8 to 7.6 days)	**11.0 days** (9.2 to 13.4 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 cold nights – North Coast

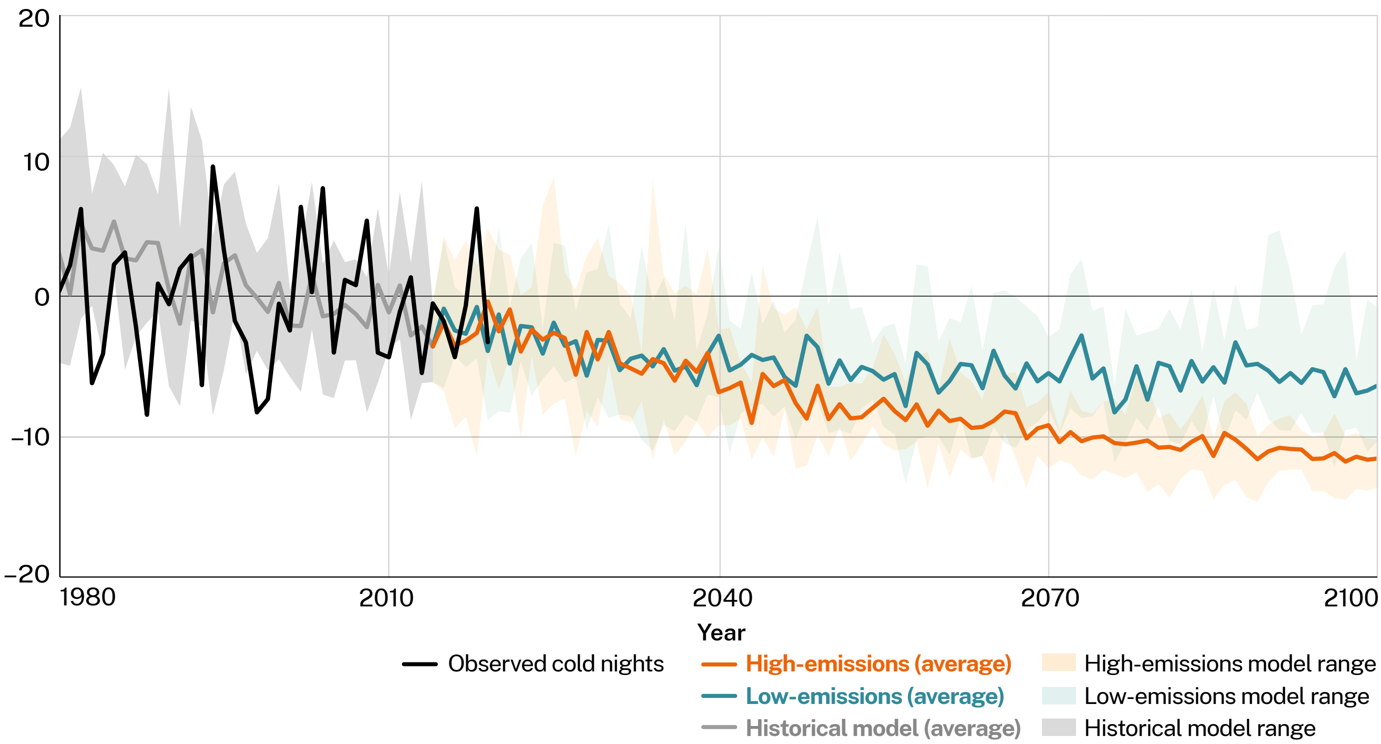
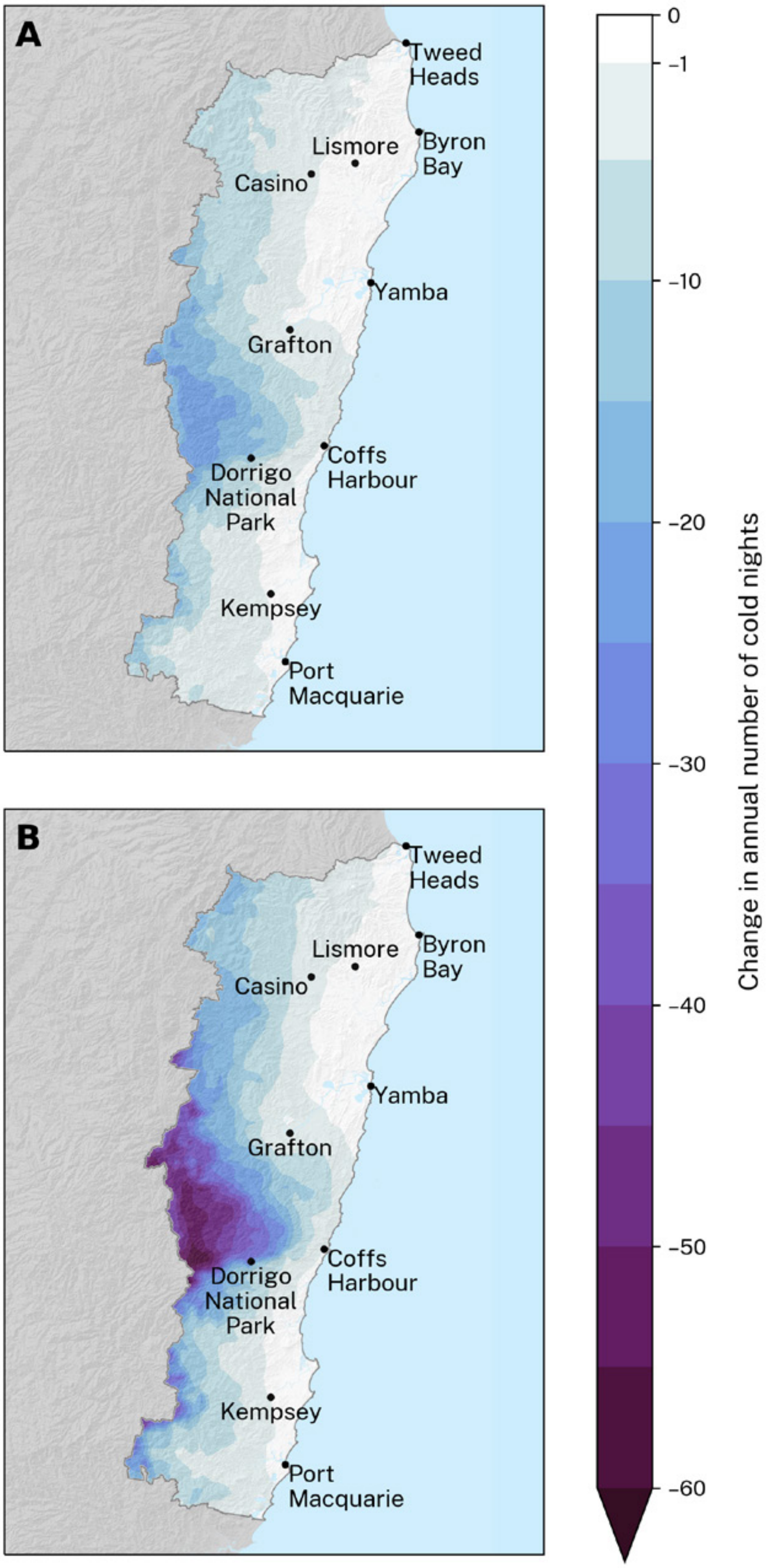


Figure 7. Projected change in annual number of cold nights by 2090 for the North Coast under A) a low-emissions scenario and B) a high-emissions scenario



Rainfall

Rainfall is projected to remain variable

Climate change will influence rainfall patterns and 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.

NSW has experienced rainfall extremes in recent decades, with significant impacts on communities, infrastructure and natural ecosystems.

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.

Annual rainfall across the North Coast region averages about 1240mm.[2] Rainfall is highest in the far north of the region. Higher elevation areas of the region and other areas of the coast also experience high rainfall. Lower elevation inland areas such as Casino experience relatively lower rainfall. Annual rainfall occurs mostly in summer and autumn, with winter and spring typically being drier. The driest year on record was 2019, with an average of only 570mm across the region.[2]

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.

Annual average rainfall in the region is projected to remain variable throughout this century (Figure 8). By 2090, on average, annual rainfall is projected to decrease by 6% under a low-emissions scenario and by 3% under a high-emissions scenario (Table 5). Changes to average rainfall will occur in all seasons, with the largest decreases occurring in winter (Table 5).

Under a high-emissions scenario, average winter rainfall could decrease and average spring rainfall could increase across the North Coast. By 2090, on average, winter rainfall is expected to decrease by 13% under a low-emissions scenario and by 18% under a high-emissions scenario, with areas in the west of the region expected to experience greater decreases. For average winter rainfall, Kempsey is expected to experience a decrease by 16% under a low-emissions scenario and by 18% under a high-emissions scenario. Byron Bay is expected to experience a decrease by 8% under a low-emissions scenario and by 10% under a high-emissions scenario. Coffs Harbour is projected to experience an average rainfall increase of approximately 7%.

On average, summer, spring and autumn rainfall is projected to change by 10% or less across the region by 2090 under both a low-emissions scenario and a high-emissions scenario (Table 5). Refer to the Interactive Map for further seasonal information.

Table 5. Projected change to average rainfall – North Coast

	2050		2090	
	Low-emissions	High-emissions	Low-emissions	High-emissions
Annual	**–6.0%** (–12.1% to +10.9%)	**–11.5%** (–26.1% to +11.9%)	**–6.0%** (–18.3% to +5.9%)	**–3.0%** (–25.6% to +19.6%)
Summer	**–5.3%** (–18.3% to +9.2%)	**–13.4%** (–34.1% to +8.3%)	**–8.7%** (–20.8% to +10.3%)	**+1.4%** (–23.5% to +33.2%)
Autumn	**–5.6%** (–28.6% to +22.2%)	**–11.5%** (–31.7% to +13.1%)	**–2.1%** (–21.1% to +18.1%)	**–3.4%** (–25.4% to +32.1%)
Winter	**–15.8%** (–30.4% to +5.2%)	**–22.1%** (–41.4% to +7.8%)	**–13.3%** (–35.1% to +11.6%)	**–18.2%** (–54.4% to +23.1%)
Spring	**+0.2%** (–14.2% to +14.1%)	**+1.5%** (–27.8% to +36.7%)	**–1.0%** (–19.9% to +18.7%)	**+0.9%** (–33.3% to +29.1%)

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

Figure 8. Historical and projected change to average rainfall – North Coast

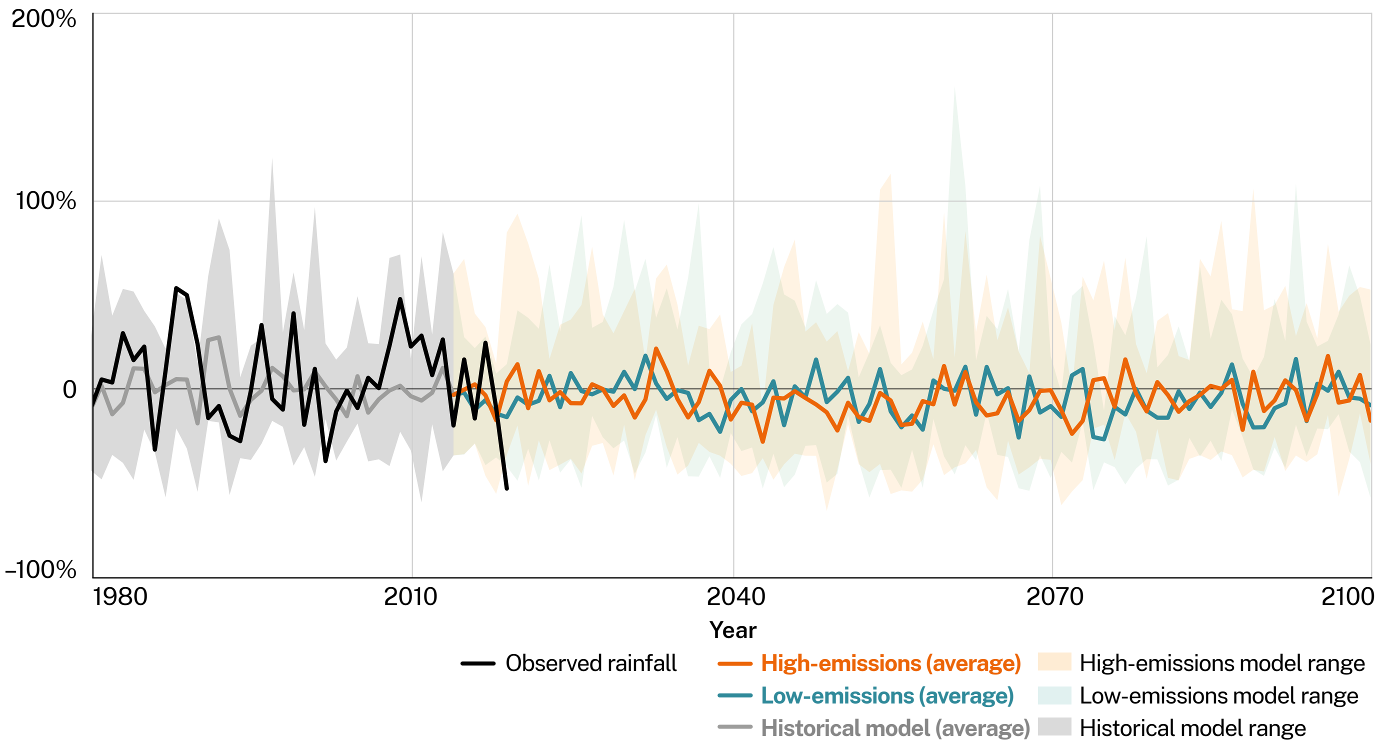
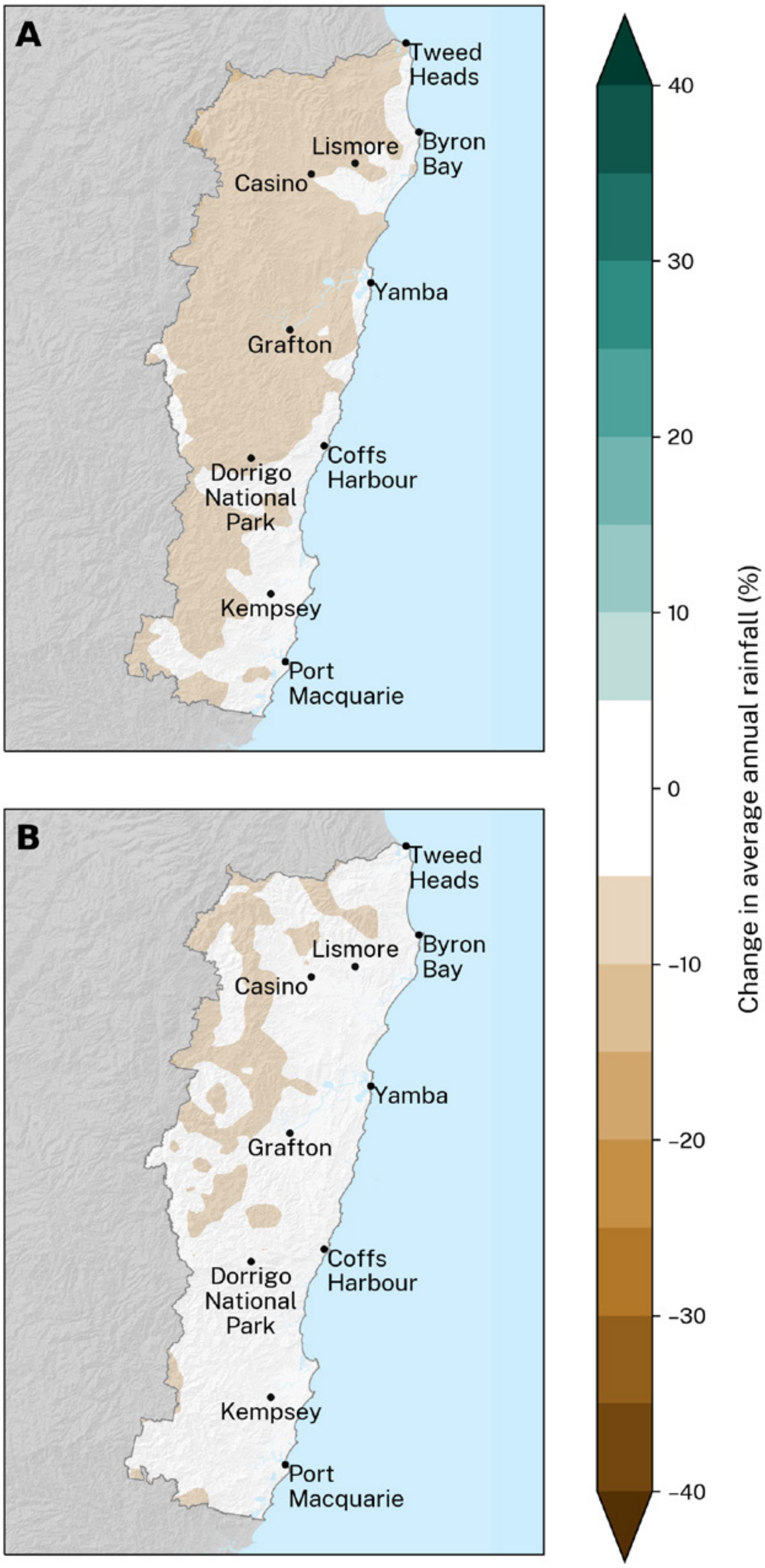


Figure 9. Projected change to average rainfall by 2090 for the North Coast under A) a low-emissions scenario and B) a high-emissions scenario



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] The number of severe fire danger days observed for the North Coast region is 0.6 days per year on average.[2] The number of severe fire danger days is generally low across the region. The record number of severe fire danger days in a year was 1994 with 5.1 days on average across the region.[2] A year of notable severe fire weather was also recorded in 2019, with approximately 3.6 days on average across the region, including 1 day recorded at the Yamba station and 6 days recorded at the Casino station.[4]

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 simulated 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 slightly increase for the North Coast region by 2050 for 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, with the largest increase in spring.

Under a high-emissions scenario, the number of annual severe fire weather days across the North Coast could nearly double by 2090, with the largest increase in spring.

Increases to severe fire weather days are projected to occur across some of the region. The greatest increases are projected to occur in inland areas in the north of the region including Grafton (Figure 11). By 2090, Grafton is projected to experience 0.4 additional severe fire weather days per year under a low-emissions scenario and 1.2 additional severe fire weather days per year under a high-emissions scenario. Grafton's number of severe fire weather days per year is projected to notably increase under a high-emissions scenario, compared with the baseline period average of 2.5 severe fire weather days per year.

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

2050		2090	
Low-emissions	High-emissions	Low-emissions	High-emissions
0.4 days (–0.1 to 1.3 days)	**0.5 days** (–0.3 to 1.8 days)	**0.2 days** (–0.7 to 0.9 days)	**0.7 days** (–0.1 to 2.7 days)

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

Figure 10. Historical and projected change to annual number of severe fire weather days – North Coast

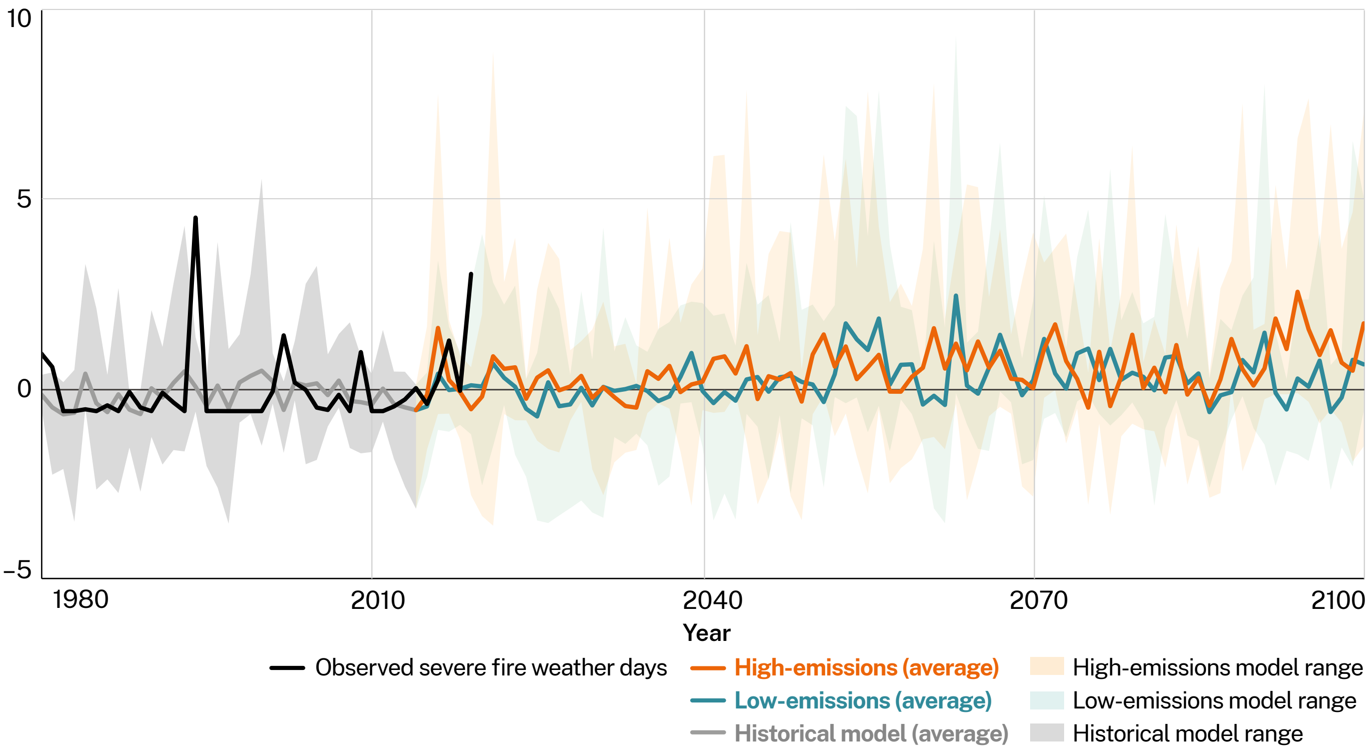
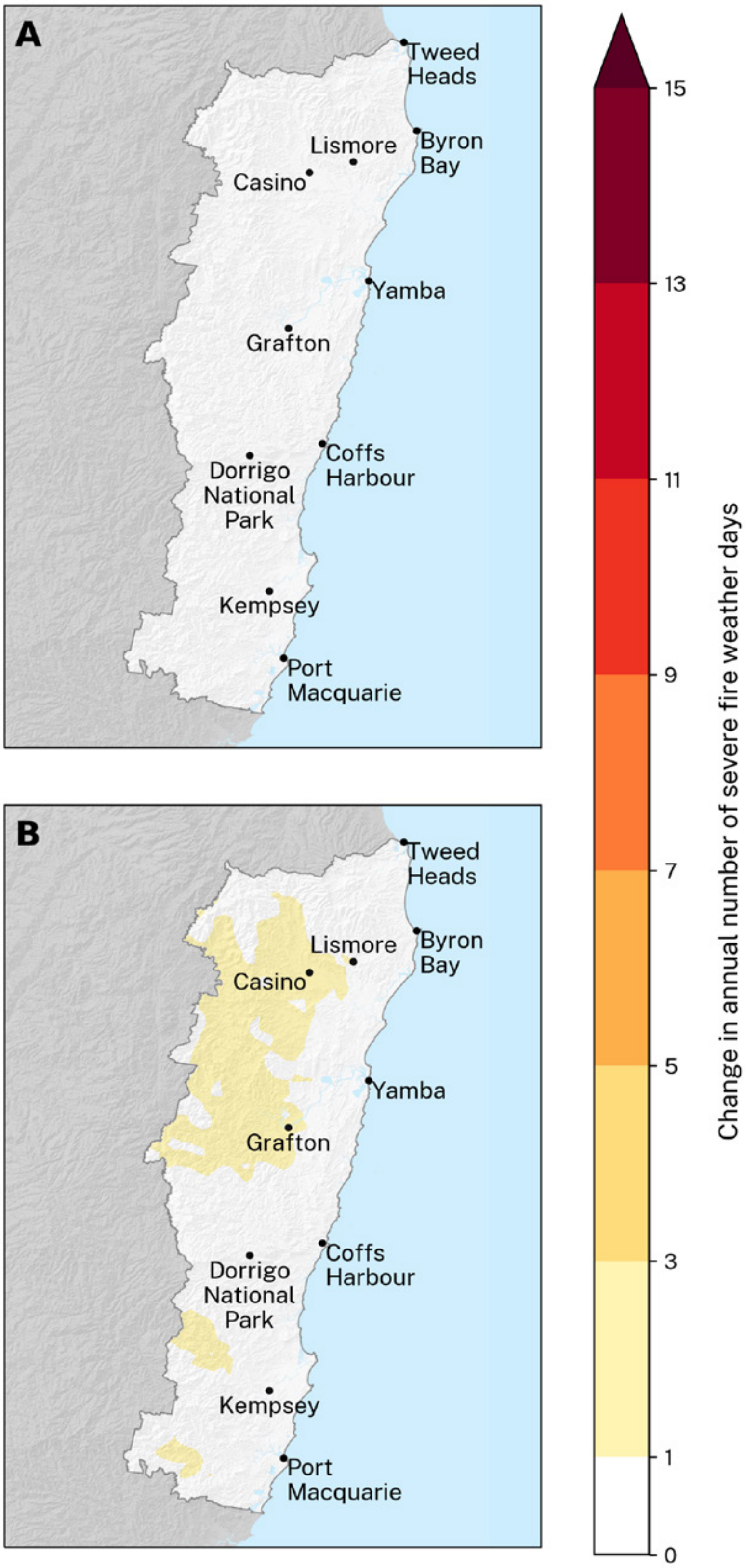


Figure 11. Projected change to annual number of severe fire weather days by 2090 for the North Coast under A) a low-emissions scenario and B) a high-emissions scenario



Sea-level rise

Sea-level rise will accelerate

Sea levels are rising and are projected to have a major impact on coastal communities in NSW over the 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. 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.

Sea-level rise of 3.7mm/year has already led to increases in inundation of streets in some NSW coastal communities.[5,6]

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 for the North Coast is projected to continue rising under all emissions scenarios. At Yamba, sea level is projected to rise by 14–26cm under a low-emissions scenario and by 17–30cm 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 31–65cm under a low-emissions scenario and 55–97cm under a high-emissions scenario. Even greater sea-level rise will occur by 2150, with a projected rise of 45–108cm under a low-emissions scenario and 90–177cm under a high-emissions scenario.

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 Yamba, this low-confidence modelling indicates a potential upper limit of sea-level rise of 42cm by 2050, 1.7m by 2100 and 5.0m 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 the North Coast

Climate change is already impacting the North Coast region, particularly through increased temperatures and sea-level rise. Climate change will continue impacting a variety of important economic, cultural and environmental values across the region.

Sea-level rise

Rising sea levels threaten low-lying coastal areas, increasing the risk of beach erosion, coastal and tidal inundation and saltwater intrusion into freshwater sources. Several areas around the region are particularly vulnerable to erosion, including Byron Bay, Lake Cathie and Wooli. Beach erosion will impact threatened species such as marine turtles and shorebirds, which nest on beaches. The North Coast region contains significant areas of low-lying coastal floodplains such as the Richmond and Clarence rivers, which are vulnerable to reduced floodplain drainage and prolonged inundation, particularly where land is below the low-tide level and floodplain drainage infrastructure is aging.[7,8] Increased inundation of these areas from sea-level rise will have major impacts on land use and productivity, particularly under a high-emissions scenario.

Bushfires

The region also experienced significant impacts during the 2019–2020 bushfire season with extensive impacts to communities, infrastructure and natural ecosystems. Over 880,000 hectares of the region were burnt and 10,706 buildings were impacted, including 414 homes which were destroyed.[9] There were 36 premature deaths, as well as 48 cardiovascular disease and 146 respiratory disease hospitalisations across the region from poor air quality caused by the bushfires.[10] Large areas of bushland experienced extreme fire severity, including the Nymboi-Binderay, New England, Guy Fawkes River, Werrikimbe and Willi Willi National Parks.[11] Significant areas of previously unburnt rainforest that form part of the Gondwana Rainforests of Australia World Heritage Area were burnt. There were also significant impacts on biodiversity including 71 plant species, 4 threatened ecological communities and over 100 animal species including many threatened species such as the brush-tailed rock-wallaby, rufous scrub-bird and parma wallaby.[11] Severe fire danger 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.

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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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