

State of the
Climate
2018

Future Climates
Australia

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Australian Government
Bureau of Meteorology



Managing climate risk:

A rapidly changing landscape

World Economic Forum — Global Risks Report 2018

Top 10 risks in terms of Likelihood

- 1 Extreme weather events
- 2 Natural disasters
- 3 Cyberattacks
- 4 Data fraud or theft
- 5 Failure of climate-change mitigation and adaptation
- 6 Large-scale involuntary migration
- 7 Man-made environmental disasters
- 8 Terrorist attacks
- 9 Illicit trade
- 10 Asset bubbles in a major economy

Top 10 risks in terms of Impact

- 1 Weapons of mass destruction
- 2 Extreme weather events
- 3 Natural disasters
- 4 Failure of climate-change mitigation and adaptation
- 5 Water crises
- 6 Cyberattacks
- 7 Food crises
- 8 Biodiversity loss and ecosystem collapse
- 9 Large-scale involuntary migration
- 10 Spread of infectious diseases

Categories

-  Economic
-  Environmental
-  Geopolitical
-  Societal
-  Technological

Source: World Economic Forum Global Risks Perception Survey of Almost 750 experts and decision-makers in the World Economic Forum's multistakeholder communities

Note: Survey respondents were asked to assess the likelihood of the individual global risk on a scale of 1 to 5; 1 representing a risk that is very unlikely to happen and 5 a risk that is very likely to occur. They also assess the impact on each global risk on a scale of 1 to 5 (1: minimal impact, 2: minor impact, 3: moderate impact, 4: severe impact and 5: catastrophic impact). See Appendix B for more details. To ensure legibility, the names of the global risks are abbreviated; see Appendix A for the full name and description.



Clear impacts are already apparent



Increased frequency, intensity, duration and extent of heatwaves



Longer fire season with more extreme fire danger days



More time spent in drought and hotter droughts



Greater proportion of rainfall from heavy rainfall events



Increased frequency of coastal storm surge inundation and recession



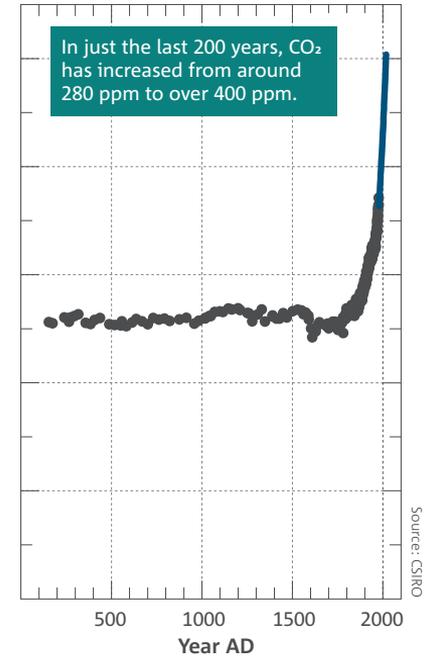
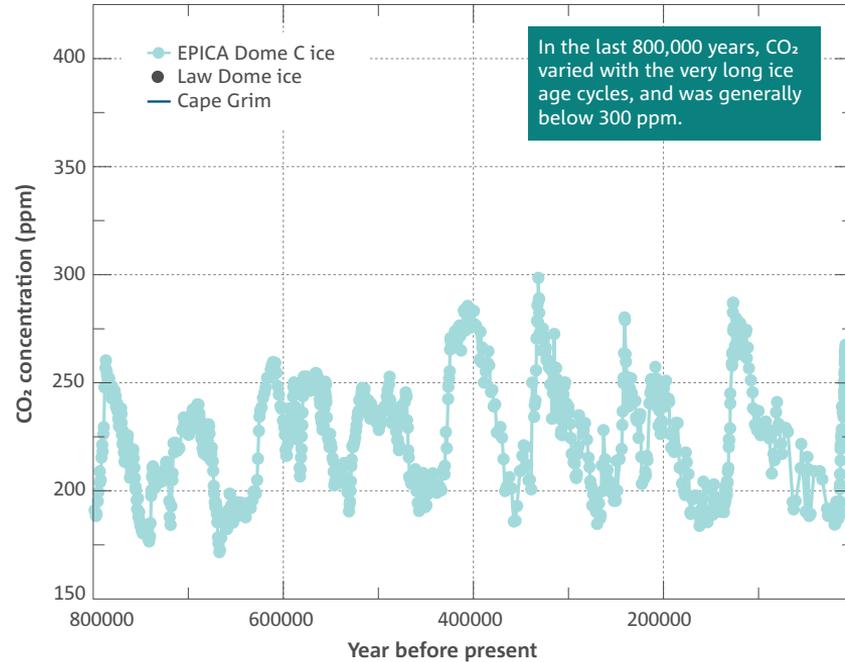
Prolonged high ocean temperatures



Greenhouse gases



Atmospheric carbon dioxide concentrations

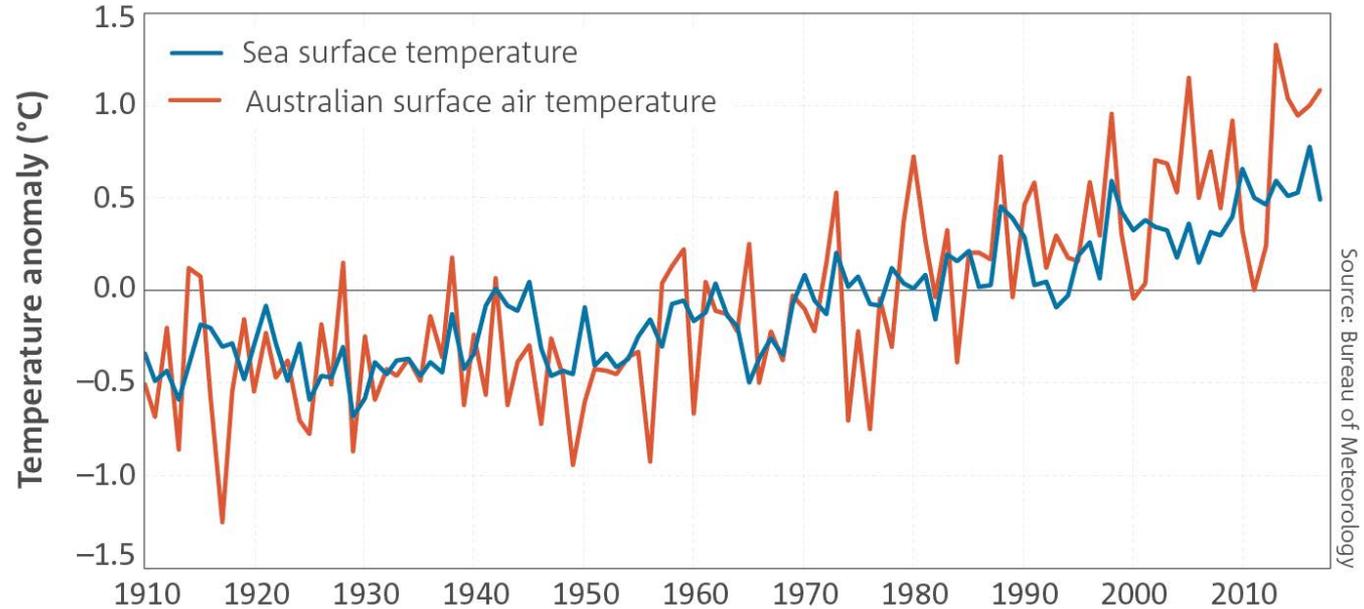


Current CO₂ levels probably unprecedented in >2M year

Australia's changing climate



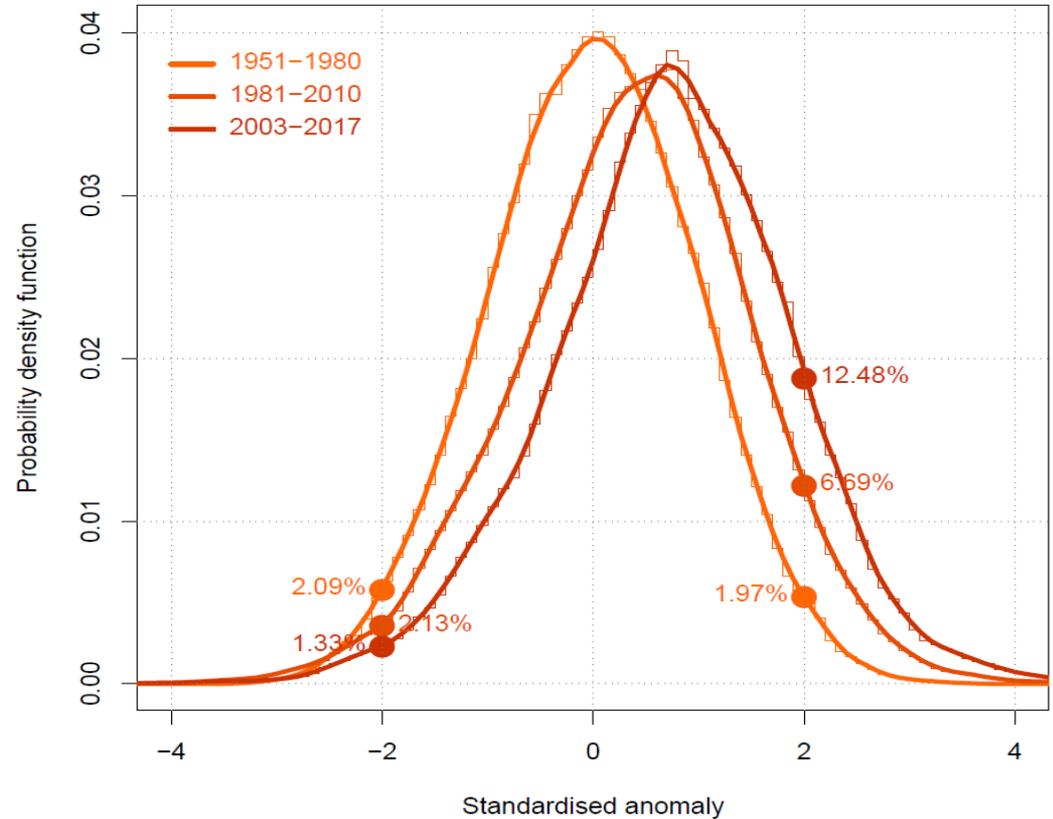
Temperature



Rise of 1.4°C in Australian land surface temperatures

Why does 1°C matter?

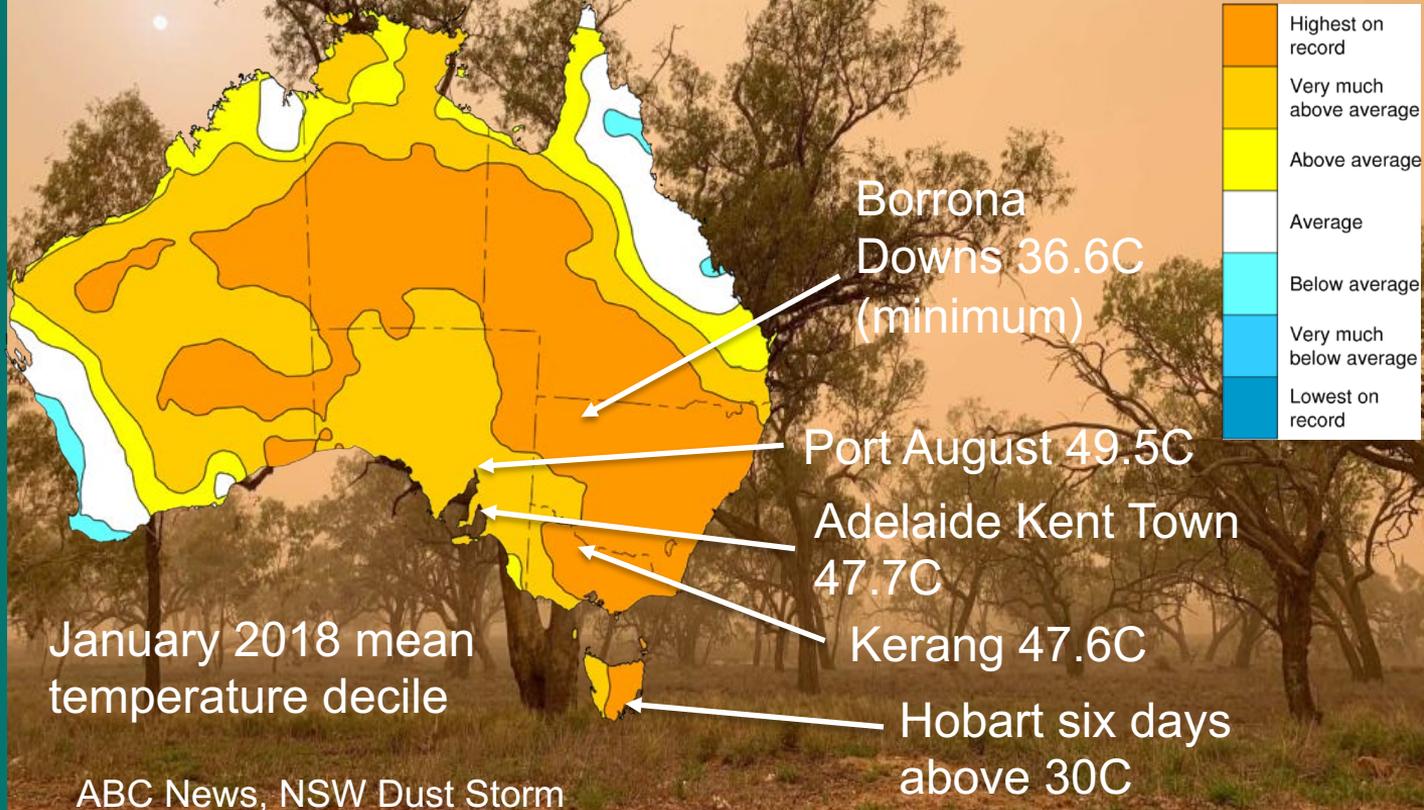
Increase in temperature has increased the occurrence of very warm monthly daytime temperatures



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January 2019: Australia's hottest month on record

Averaged across the country, 8 of the 10 warmest days occurred during January 2019



Impacts?

- Human health
- Agriculture
- EM sector
- Need for cooling
- Cost of power
- Tourism

Queensland flying fox species decimated by record heatwave

'As far as we know, [the spectacled flying fox] has never suffered heat deaths before,' ecologist says



▲ Conservationists estimate more than 4,000 spectacled flying foxes have died this week in the heatwave. Photograph: Marc McCormack/EPA

What caused the blackouts in Melbourne, and do Victorians need to get used to power cuts?

By Dan Harrison
Updated Mon at 9:23am



PHOTO: More than 200,000 Victorians had their power interrupted on Friday. (ABC News: Zalka Rizmal)

Mass fish die-off in Darling River could impact fish numbers in other states

ABC Riverland, By Sowabeh Haniffa and Nadia Isa
Updated 15 Jun 2019, 4:13pm



PHOTO: Experts believe the mass die-off of Murray cod in NSW will impact fish numbers in other states. (Facebook: Rod Mackenzie)

Climate change costs will have knock-on effect on interest rates, Reserve Bank warns

7:30 By Laura Tingle
Updated Tue at 10:50pm

The Reserve Bank has warned it will have to take the impact of climate change into account when setting interest rates.

"The economy is changing all the time in response to a large number of forces." Guy Debelle said in a keynote address to the Centre for Policy Development.

"Monetary policy is always having to analyse and assess these forces and their impact on the economy.

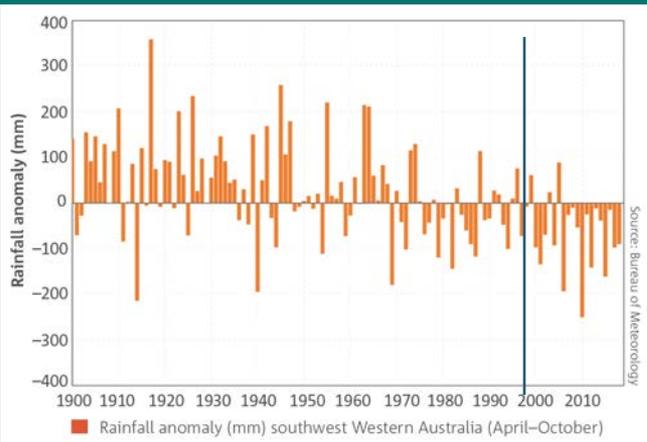


PHOTO: Reserve Bank Deputy Governor Guy Debelle delivering his speech to the Centre for Policy Development. (ABC News)

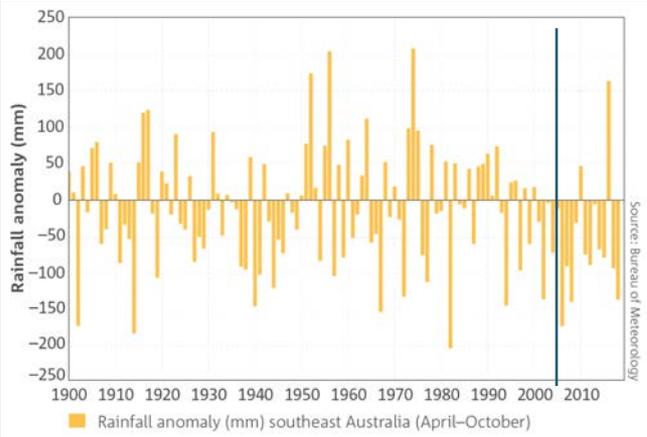
The current drought has had a dramatic effect on economic output, reducing farm output by 6 per cent..



IOCI

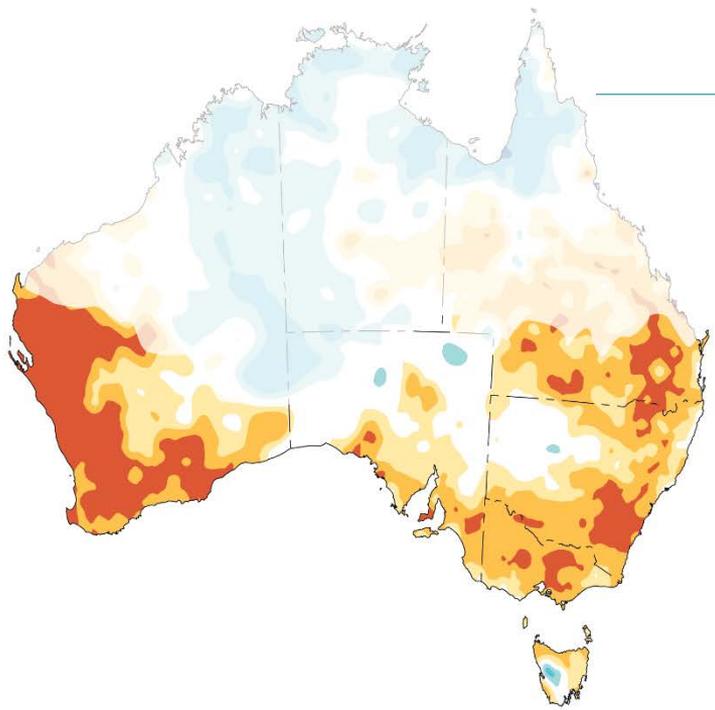
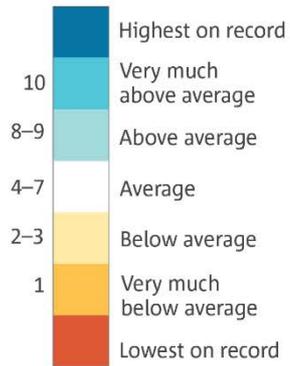


SEACI



Rainfall

Rainfall decile ranges



20 year April-October rainfall deciles: declines in south



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Southern Australia's decline an example of good adaptation in cities?

The Indian Ocean Climate Initiative (IOCI) research partnership established in 1998.

The South Eastern Australian Climate Initiative (SEACI) research partnership established in 2005.

Cost of desalination plants



Melbourne	\$3.5bn
Sydney	\$2.4bn
Adelaide	\$1.83bn
Gold Coast	\$1.2bn
Perth	\$955m



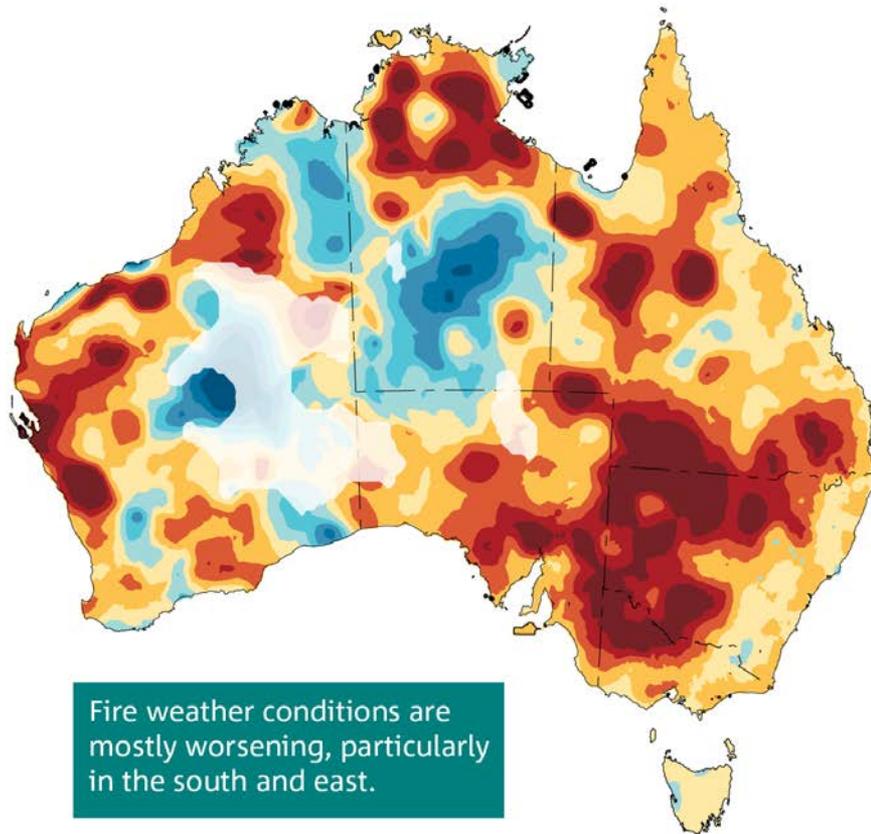
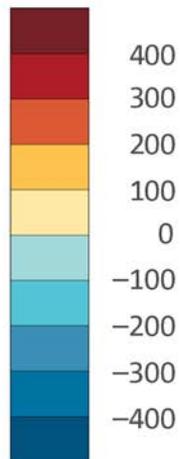
Lake Hume 2007. Source Image: Wikipedia

Australia's changing climate



Fire weather

Forest Fire
Danger Index
points/decade



Fire weather conditions are mostly worsening, particularly in the south and east.

Source: Bureau of Meteorology



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Longer more intense fire seasons

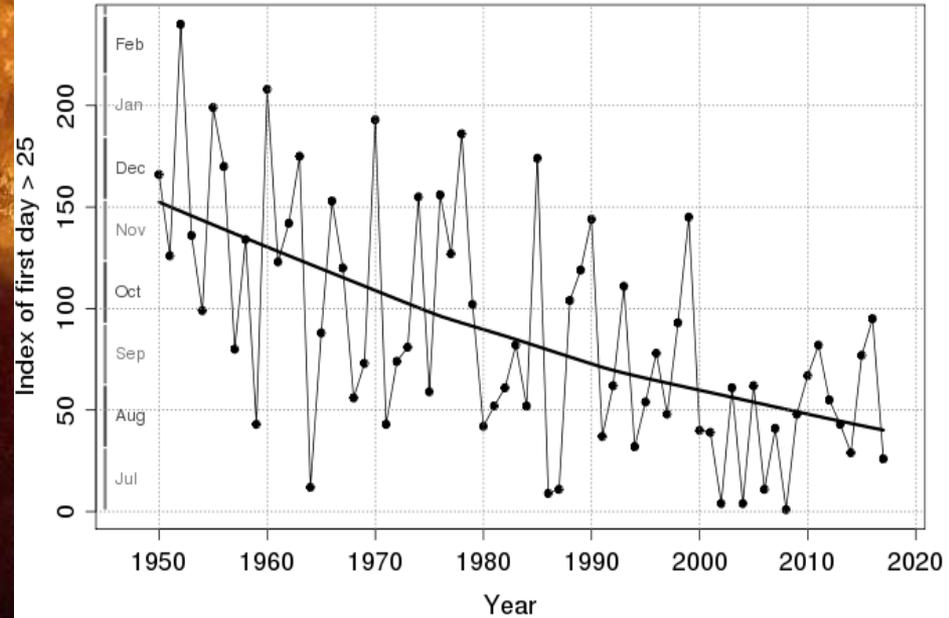


Bega Valley,
15 August
2018 (ABC)



Albany, 25 May
2018 (ABC)

Earliest day with south-coastal NSW daily FFDI > 25



Ranch Fire California,
August 2018 (SFGate)

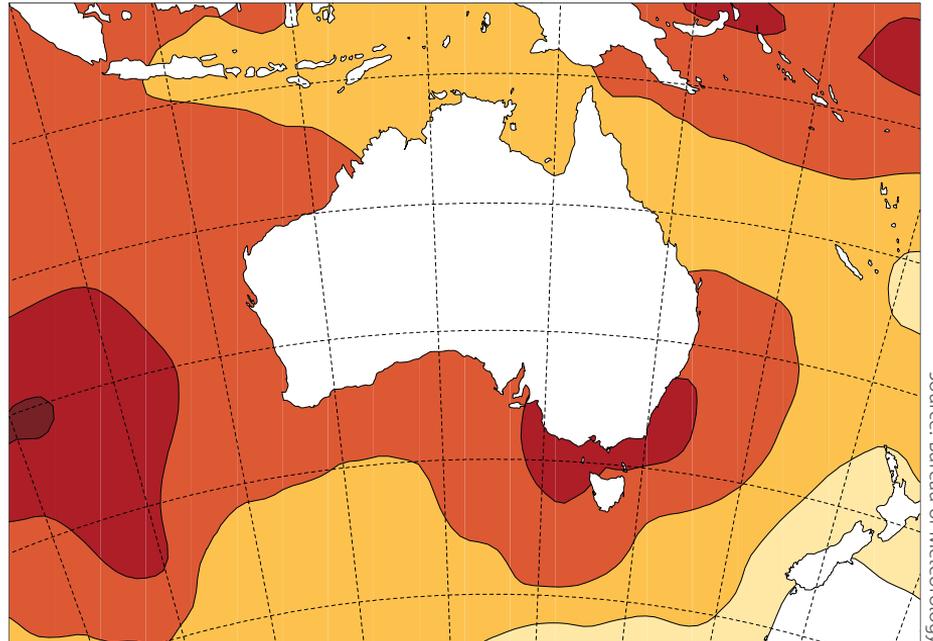
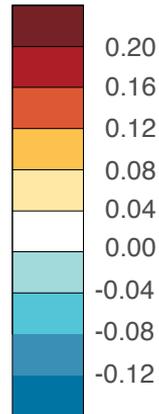
Oceans



Sea surface temperature

The ocean surface around Australia has warmed, especially to the southeast.

Sea surface temperature
(°C/decade)



Source: Bureau of Meteorology

Oceans



Collaroy Beach, 2016



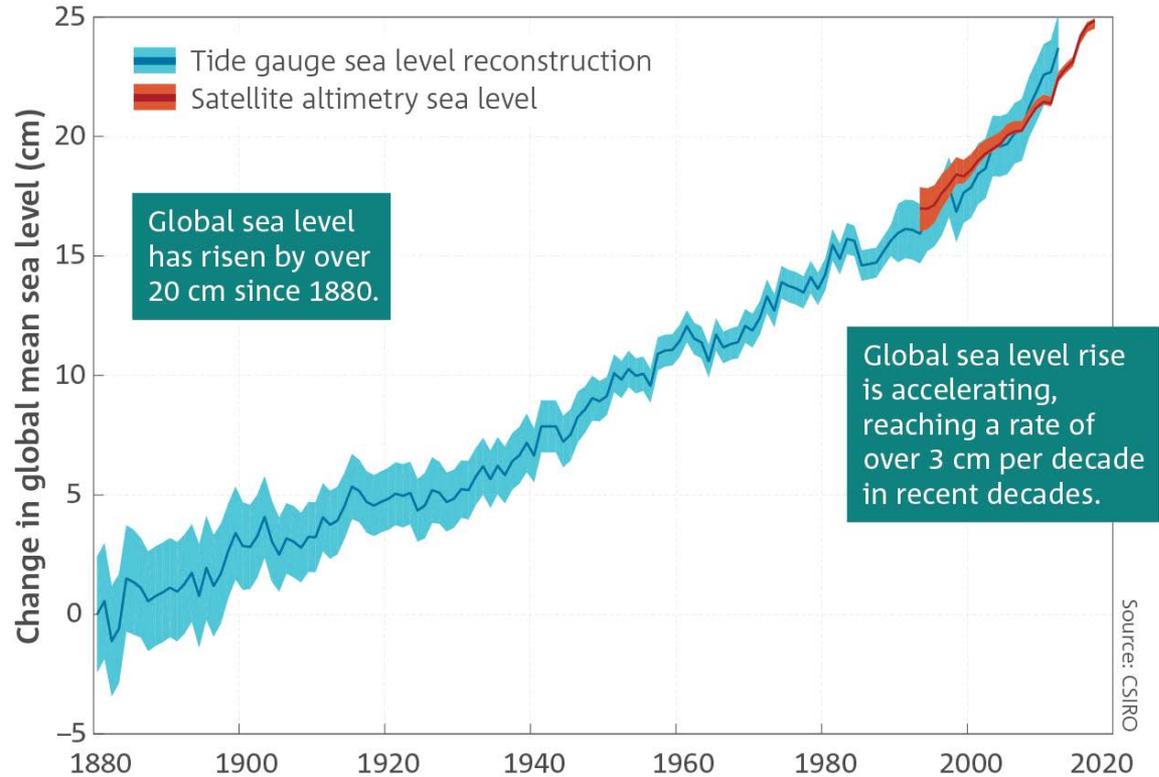
Altona Beach, 2014



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Sea level

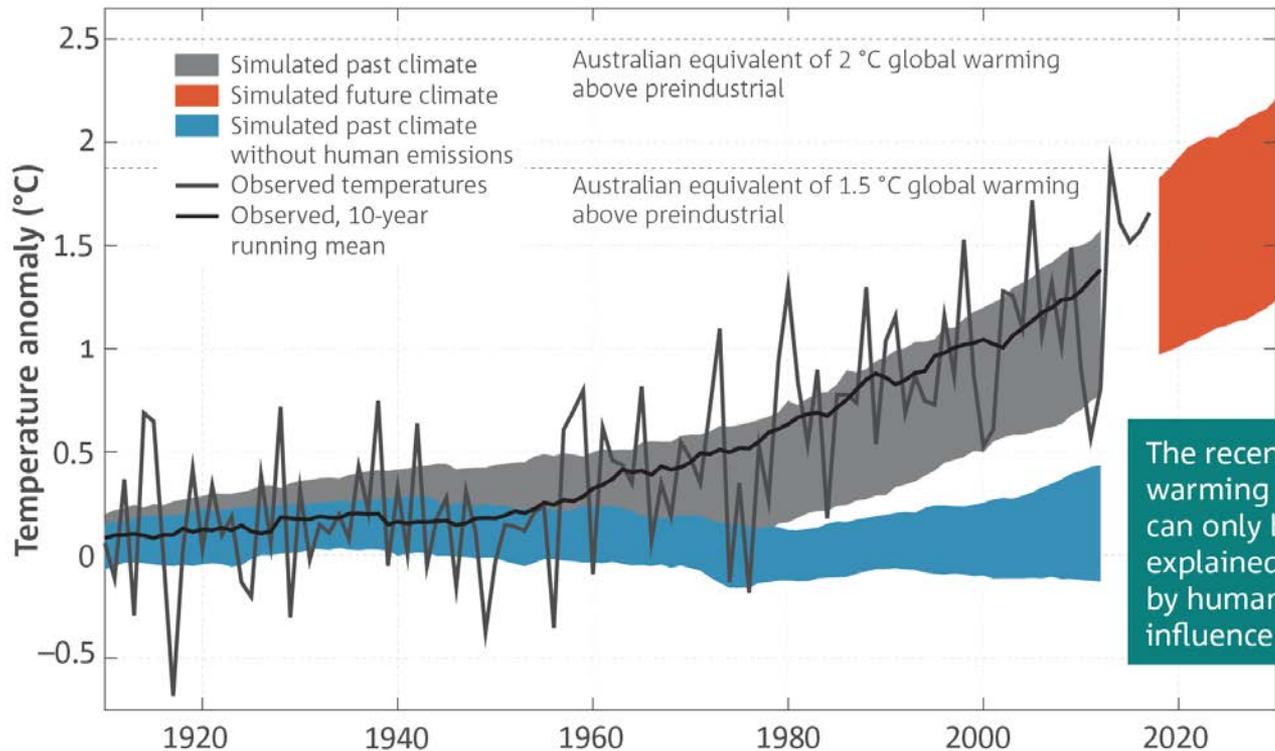


What are our options?

"belief in climate change is optional, but participation is mandatory"

*Jim Beever,
southwest Florida
Regional Planning
Council*

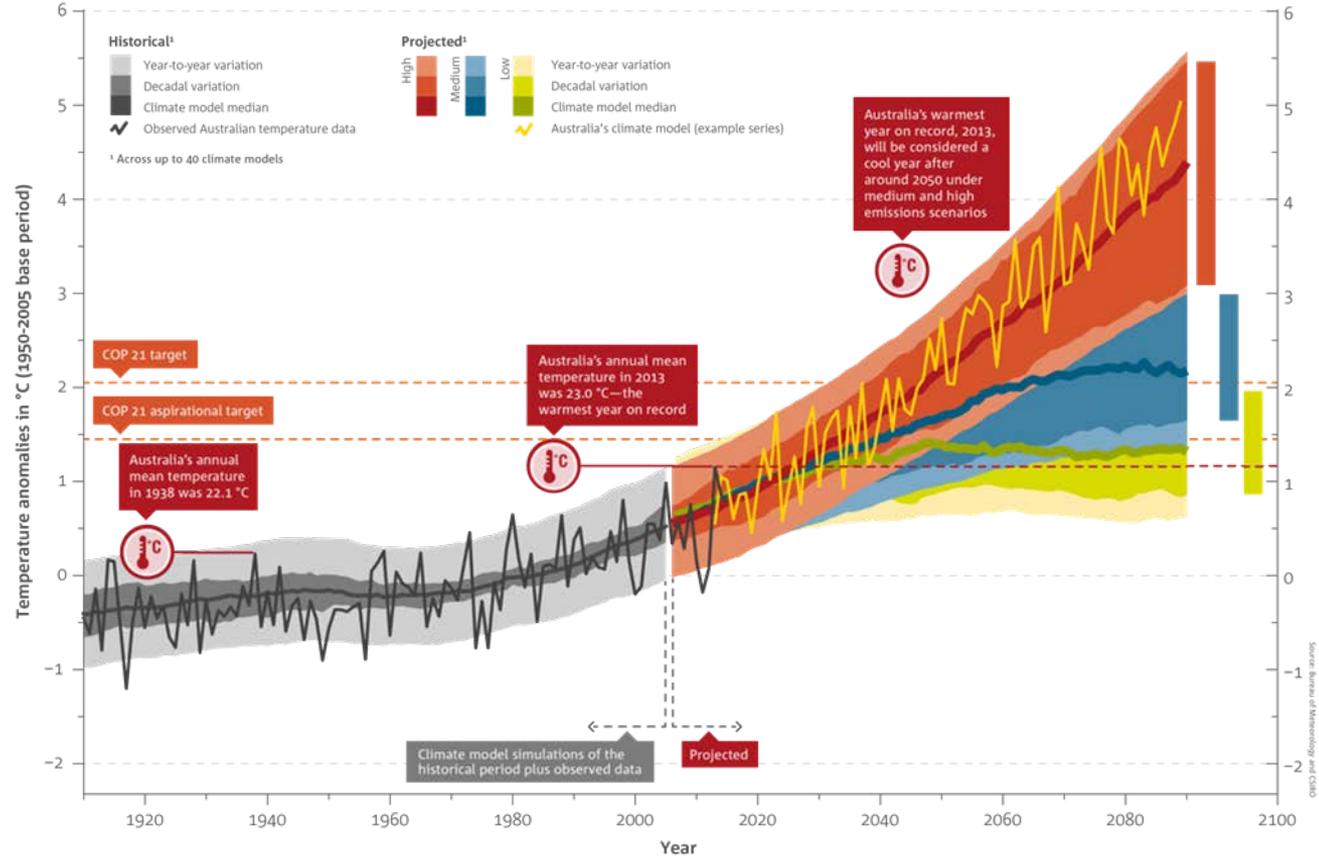
Climate change is with us and impacts will accumulate



Australia's climate: large future change likely?



Australian temperature projections



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What will the future look like

Click on
'PROJECTIONS AND DATA'

<https://www.climatechangeinaustralia.gov.au/en/climate-projections/climate-futures-tool/projections/>



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CLIMATE CHANGE IN AUSTRALIA

 <p>GETTING STARTED</p> <p>Support and guidance for use of information and data.</p>	 <p>CLIMATE CAMPUS</p> <p>Learn about the underpinning science of climate change, modelling and projections.</p>	 <p>PROJECTIONS AND DATA</p> <p>Explore Australia's projected climate and access model data. Register for data access.</p>	 <p>IMPACTS AND ADAPTATION</p> <p>Learn about possible regional impacts on natural resources and management responses.</p>
 <p>NEWS & UPDATES</p> <p>Keep up to date on datasets, enhancements, and downtime.</p>	 <p>HISTORIC CLIMATE CHANGE</p> <p>Learn about observed climate change over Australia.</p>	 <p>REGIONAL CLIMATE CHANGE EXPLORER</p> <p>Summary of climate change projections for Australian regions.</p>	 <p>PUBLICATIONS LIBRARY</p> <p>Download technical and regional reports and other publications.</p>

CLIMATE CHANGE IN AUSTRALIA



CSIRO



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Climate change in Australia

Click on
'CLIMATE ANALOGUES'



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CLIMATE PROJECTIONS

Climate change projections show how Australia's climate may change in the future. Using up to 40 global climate models, the projections found here represent the most comprehensive analysis of Australia's future climate ever undertaken.

Climate projections are spatially focussed around natural resource management regions (or clusters) for which information, data and reports are available. Use the [data exploration](#) tools found on this site to see what climate models are projecting about future climate change for Australia.

Also available is a range of model outputs (to registered users) including climate model data formulated for use in further studies or applications.



CLIMATE ANALOGUES

The Climate Analogues tool is used to explore what the future climate would be like in a location of your choice. Future climate is described as the current climate of another town or city that is in another location (within Australia).

[Climate Analogues](#)



COASTAL AND MARINE

Coasts and marine ecosystems are important for Australia. Seven of the eight analysis clusters have coastlines. This section allows users to read about and explore projections for the coastal and marine environments including sea level rise, sea surface temperatures, aragonite saturation and ocean chemistry.

[Marine Explorer](#)



CLIMATE FUTURES TOOL

A multi-purpose tool to support advanced users of climate projections data to obtain appropriate climate model data for detailed impact assessments.

[Climate Futures](#)



CLIMATE THRESHOLDS

The number of days above or below particular thresholds of temperature or rainfall is a useful way to describe extremes of climate. Use this tool to generate maps and tables of past and future threshold exceedances.

[Thresholds](#)



Climate change in Australia

Make use of the 'Analogue Explorer'

ABOUT CLIMATE ANALOGUES

Identification of areas that experience similar climatic conditions, but which may be separated in space or time (i.e. with past or future climates) can be helpful when starting to consider adaptation strategies to a changing climate. Locating areas where the current climate is similar to the projected future climate of a place of interest (e.g. what will the future climate of Melbourne be like?) is a simple method for visualising and communicating the impact of projected changes.

TOOL: Analogue Explorer

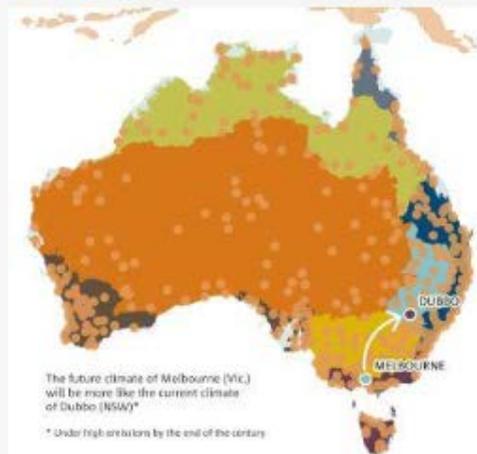


The climate analogue tool matches the proposed future climate of a region of interest with the current climate experienced in another region using annual average rainfall and maximum temperature (within set tolerances). This approach was used to generate the analogue cases presented as examples in each of the [cluster reports](#).

The results from applying changes to annual temperature and rainfall settings in the [analogue explorer](#) capture sites of broadly similar annual maximum temperature and water balance. Users can refine the search for analogues by including potentially important differences in rainfall occurrences and other factors, such as rainfall seasonality (per cent of annual rainfall that falls in summer) and temperature seasonality (difference in summer and winter temperature). (See the tab at top right of the map interface in the analogue explorer).

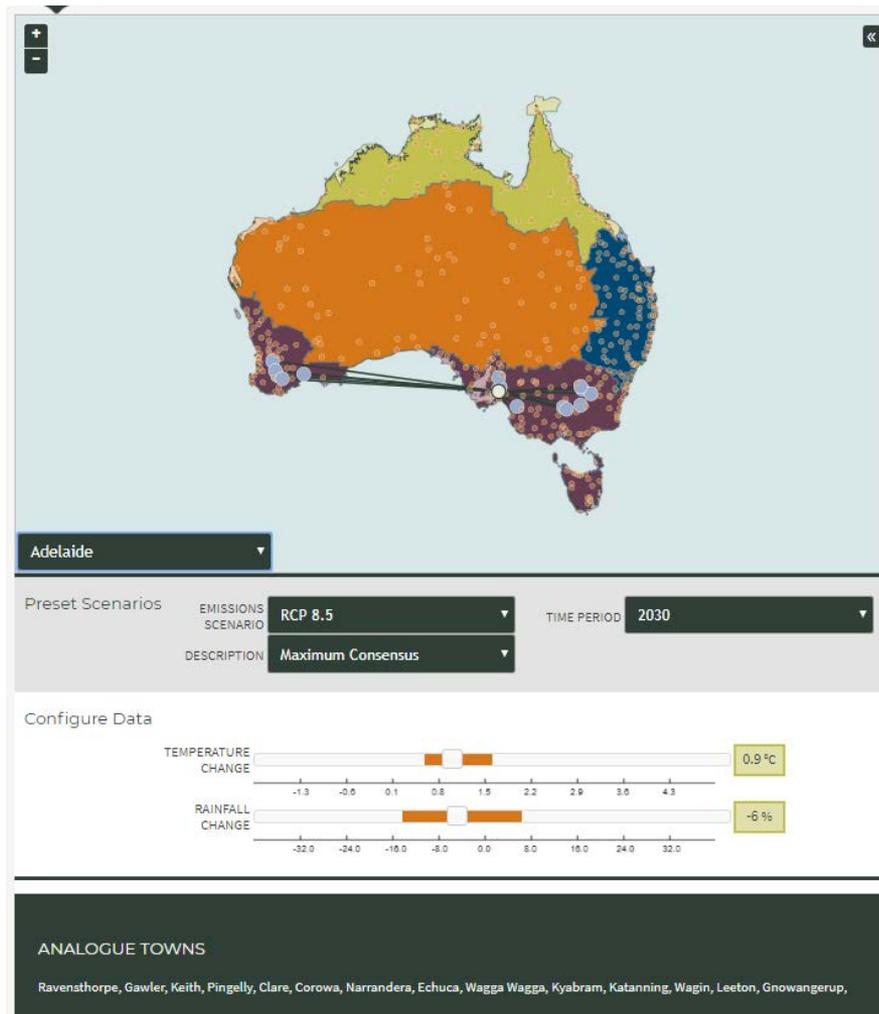
The depiction on the right shows that after a 3 °C increase in annual maximum temperature and a 15 percent decrease in annual rainfall Melbourne's future climate matches the current climate in Dubbo (NSW). This could occur under high emissions by the end of the century.

NB: It is important to note that other potentially important aspects of local climate are not matched when using this approach, such as frost days or and other local climate influences. Furthermore, for agriculture applications, solar radiation and soils are not considered. Thus we advise against the analogues being used directly in adaptation planning without considering more detailed information.



Climate change in Australia

Make use of the 'Analogue Explorer'

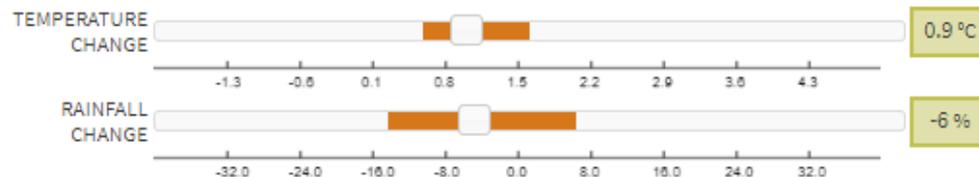


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Climate change in Australia

By 2030 expected conditions under a high emissions future

Configure Data

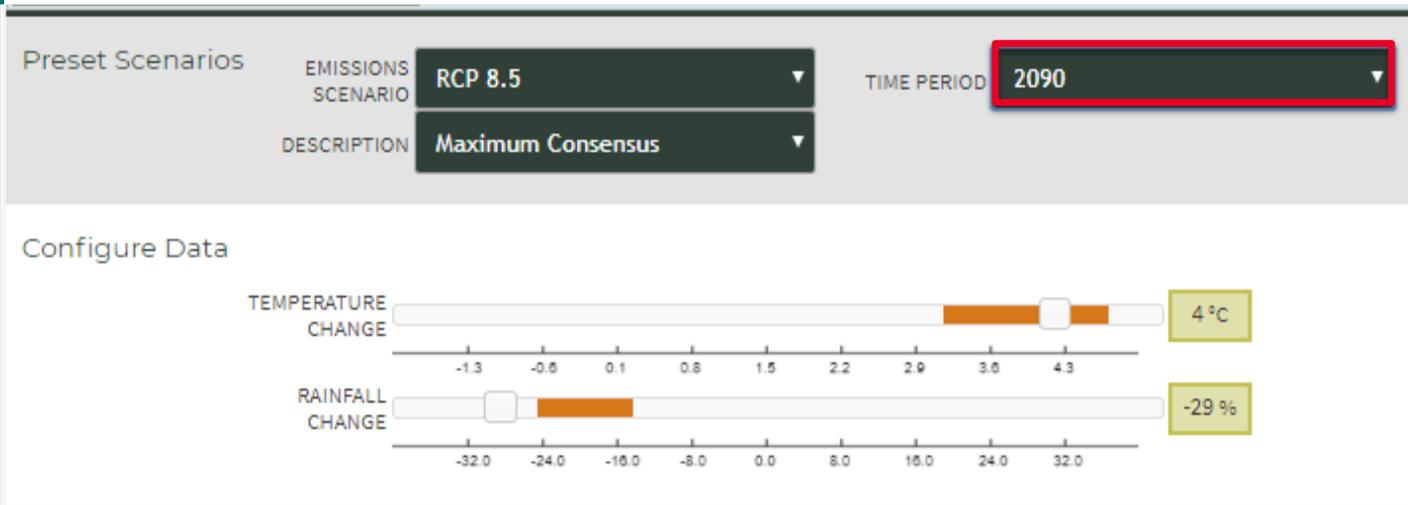
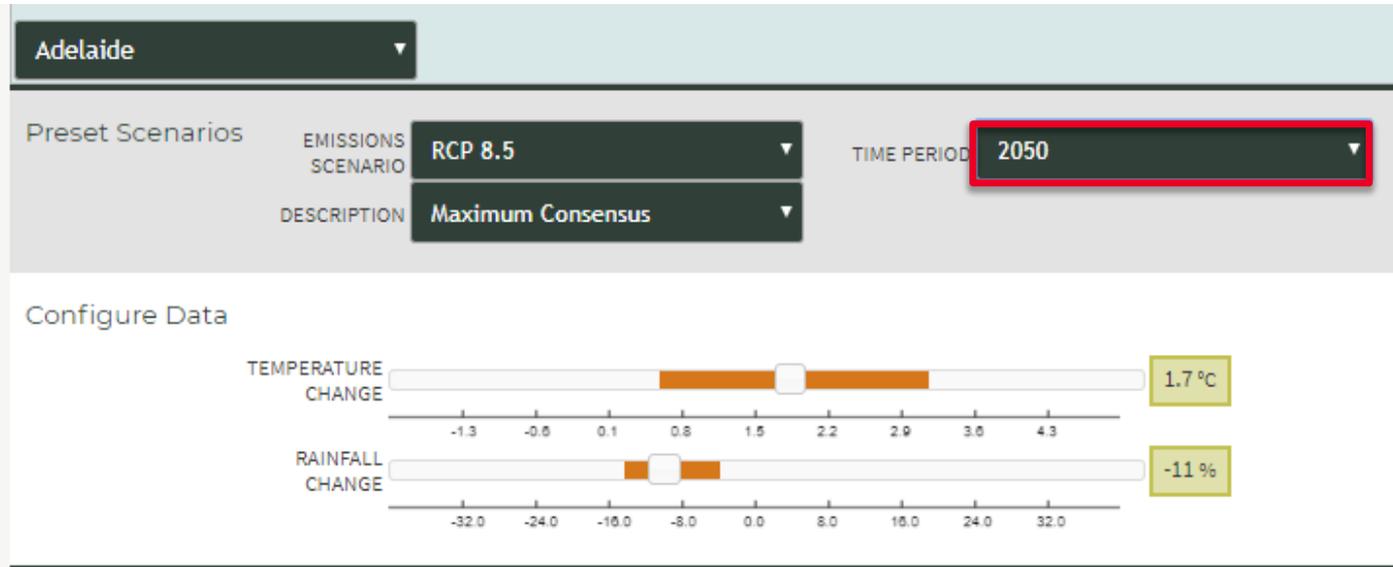


Under a high emissions scenario temperature likely to increase between 0.6 to 1.6 C at Adelaide by 2030.....median 0.9 C increase

Rainfall between -15% and +7 %. Median -6%

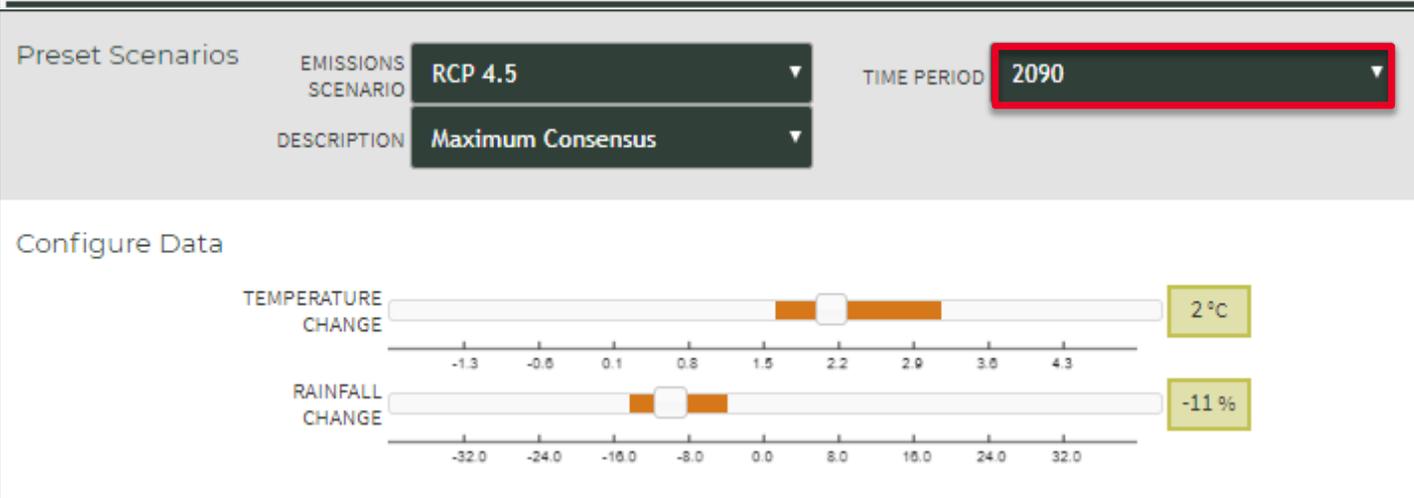
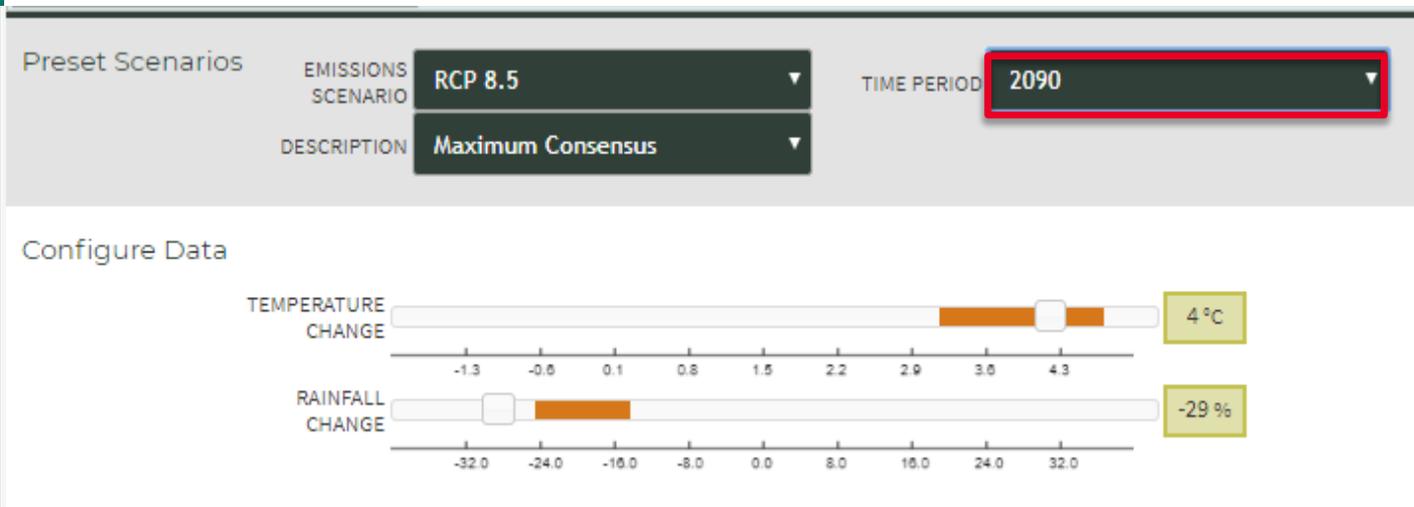
Climate change in Australia

High emissions 2050 and 2090



Climate change in Australia

Differences between high emissions (top) and mid range emissions (bottom)



Thank you



More information

www.bom.gov.au/state-of-the-climate

www.csiro.au/state-of-the-climate



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