

Victoria's Climate Futures: The context for strategy

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MACQUARIE
University

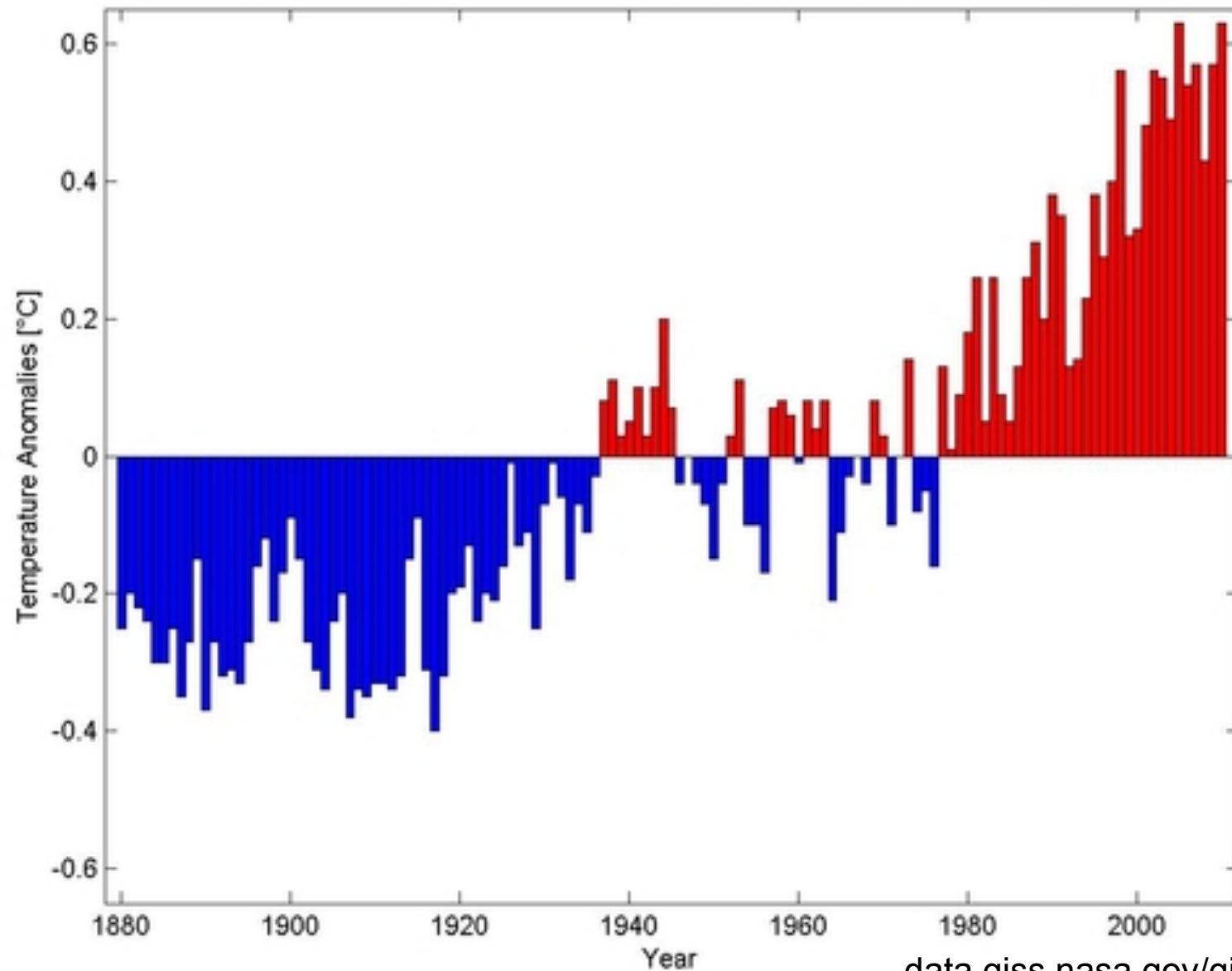


Outline

- Observed changes: global, Australia, VIC
- Projected changes
- Tools for planning

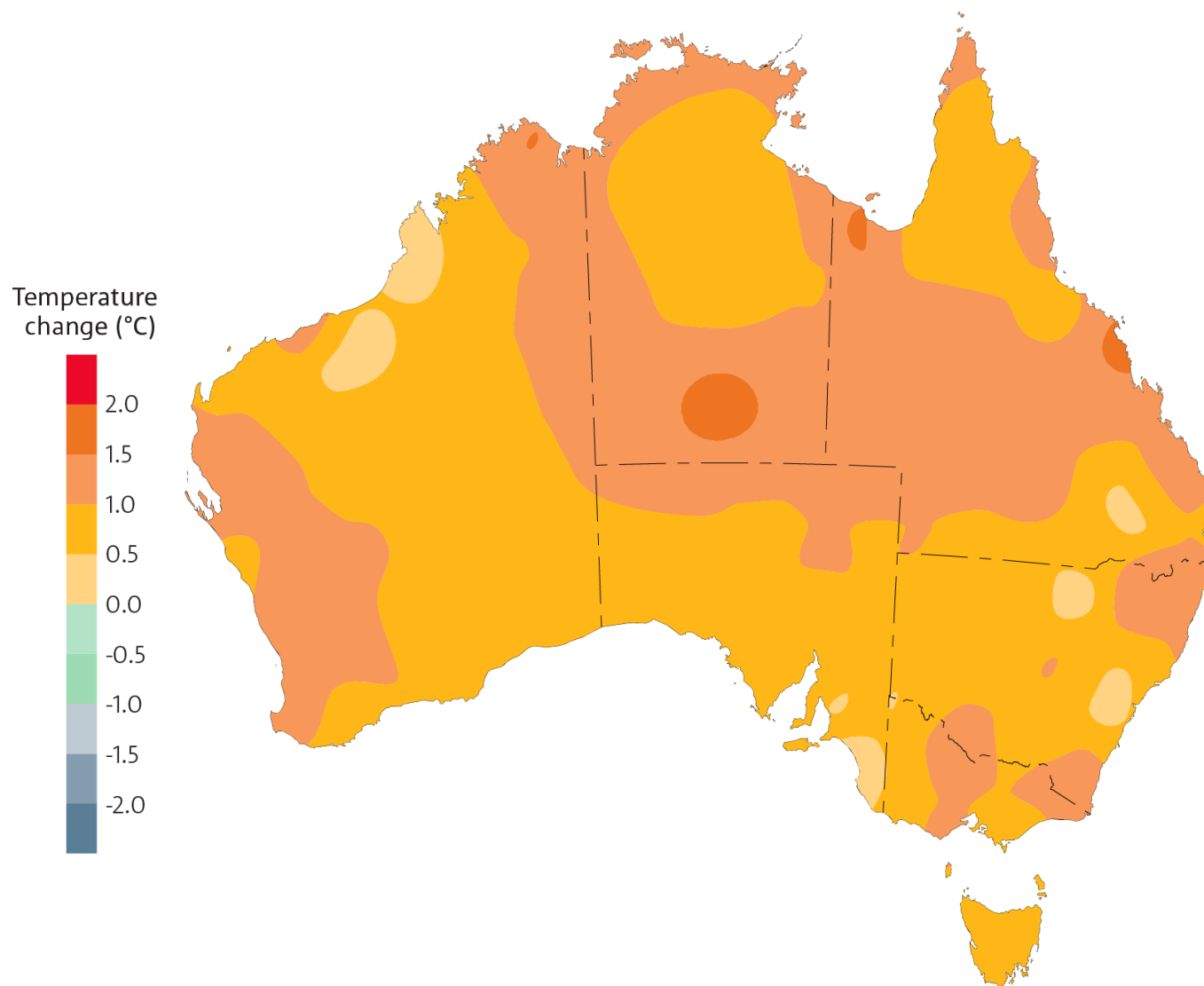


Observed temperatures: global



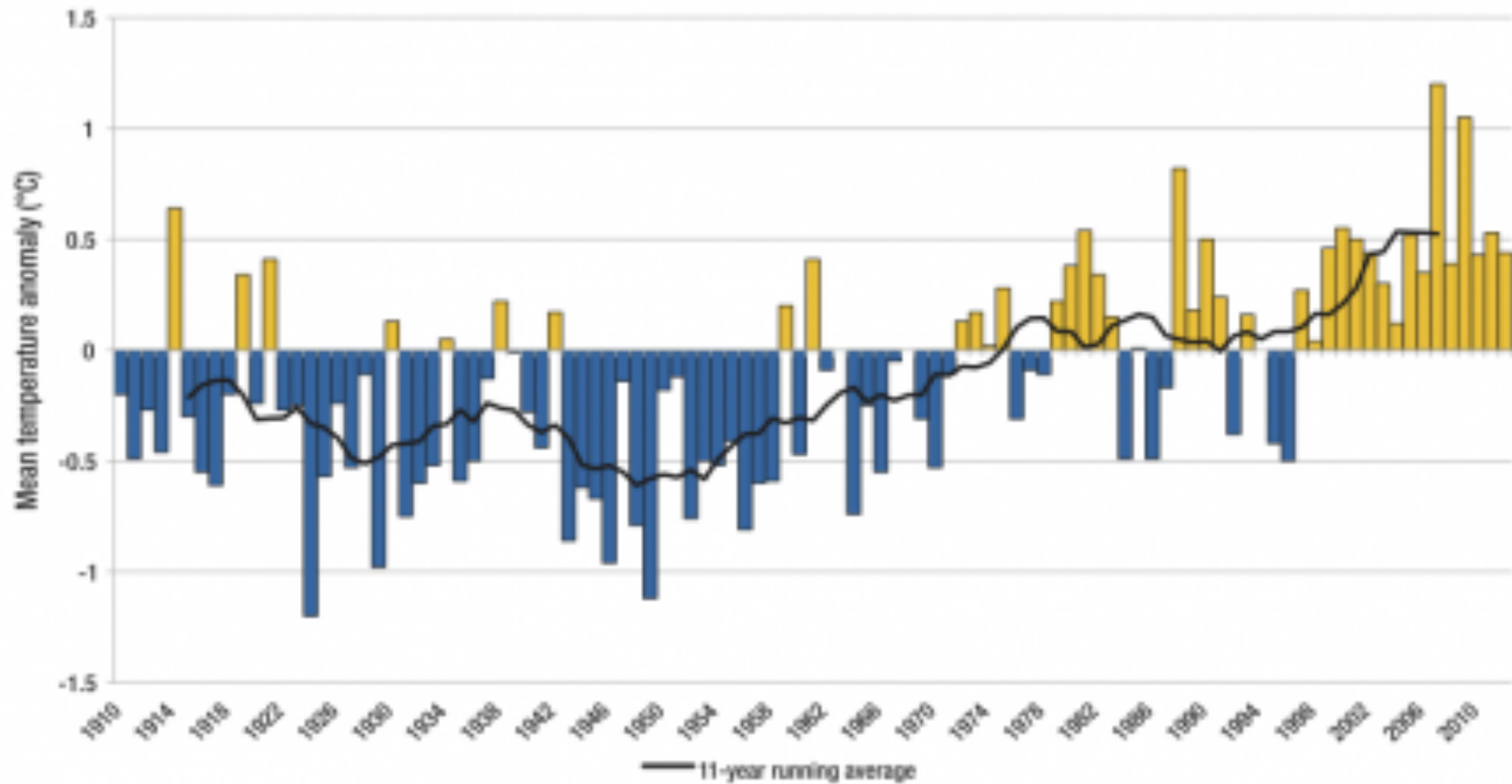
data.giss.nasa.gov/gistemp

Observed temperatures: Australia (1910-2013)

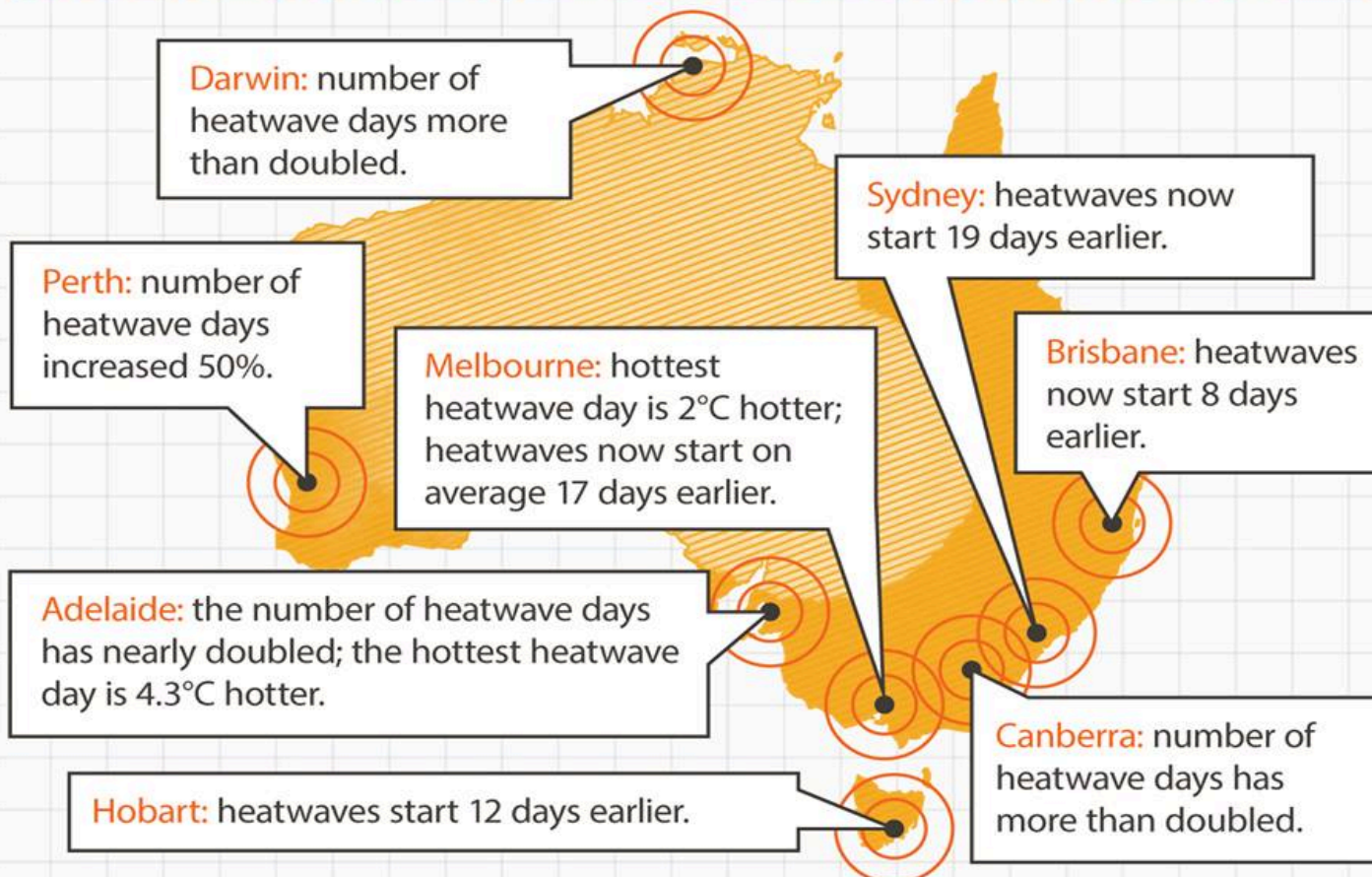


BoM 2014 <http://www.bom.gov.au/state-of-the-climate/>

Observed temperatures: Victoria



AUSTRALIA'S CAPITAL CITIES ARE EXPERIENCING HOTTER, LONGER, MORE FREQUENT HEATWAVES.



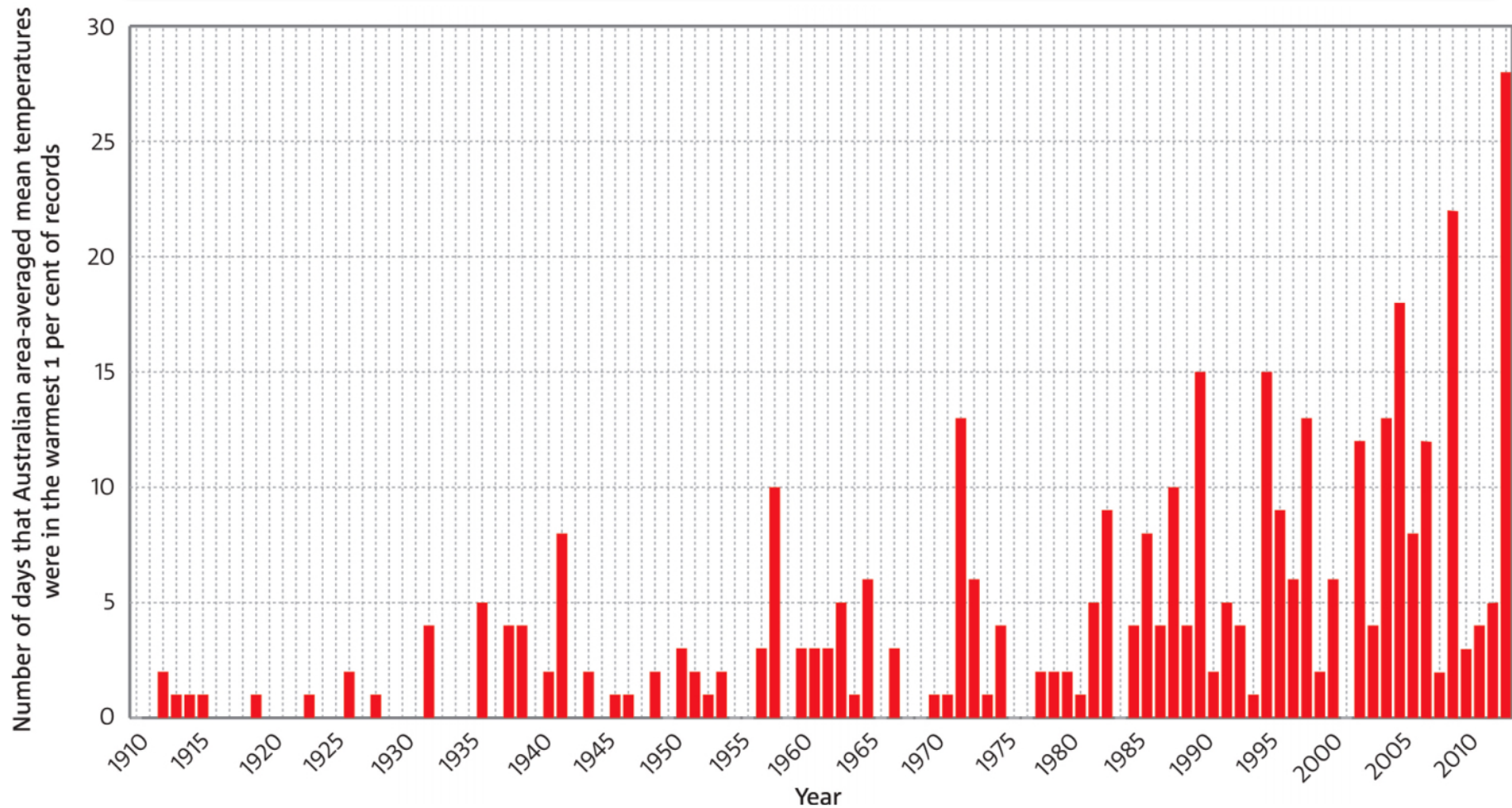
Compares heatwaves between 1950-1980 and 1981-2011. Source: Data from Perkins and Alexander 2013



CLIMATECOUNCIL.ORG.AU

| crowd-funded science information

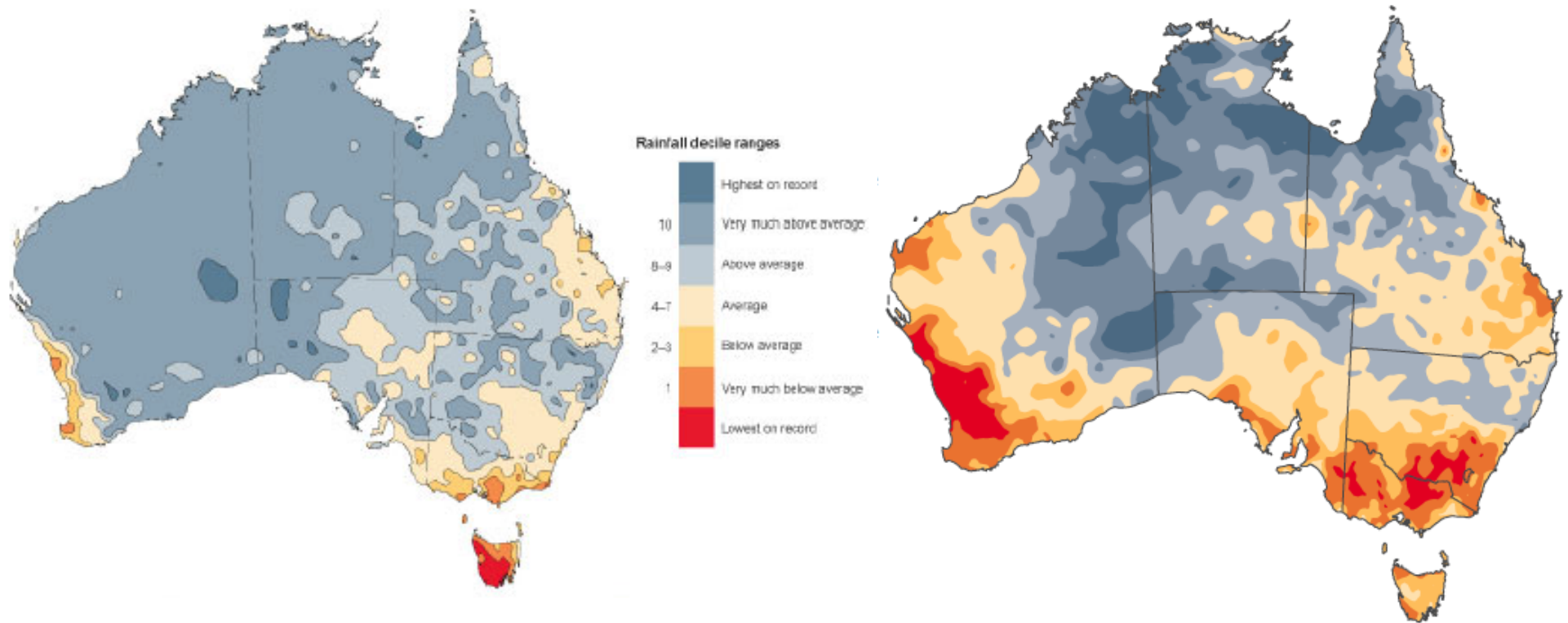
No. days p.a. when Australia area-averaged daily mean temperature >99th percentile (1910-2013)



(CSIRO & BoM 2014)

<http://www.climatechangeinaustralia.gov.au/en/>

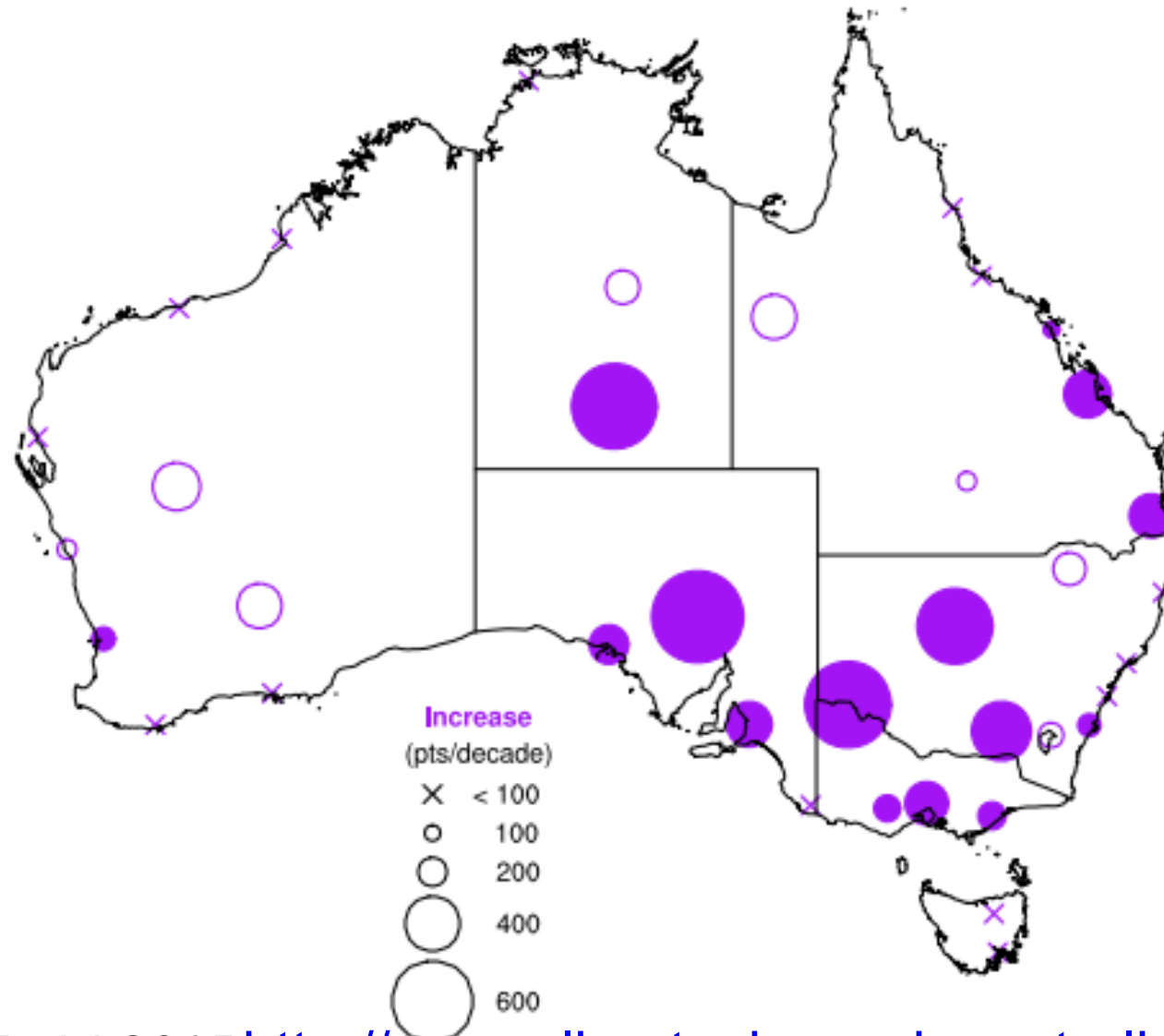
Observed rainfall trends (1997-2013 relative to 1900-2013)



October-April

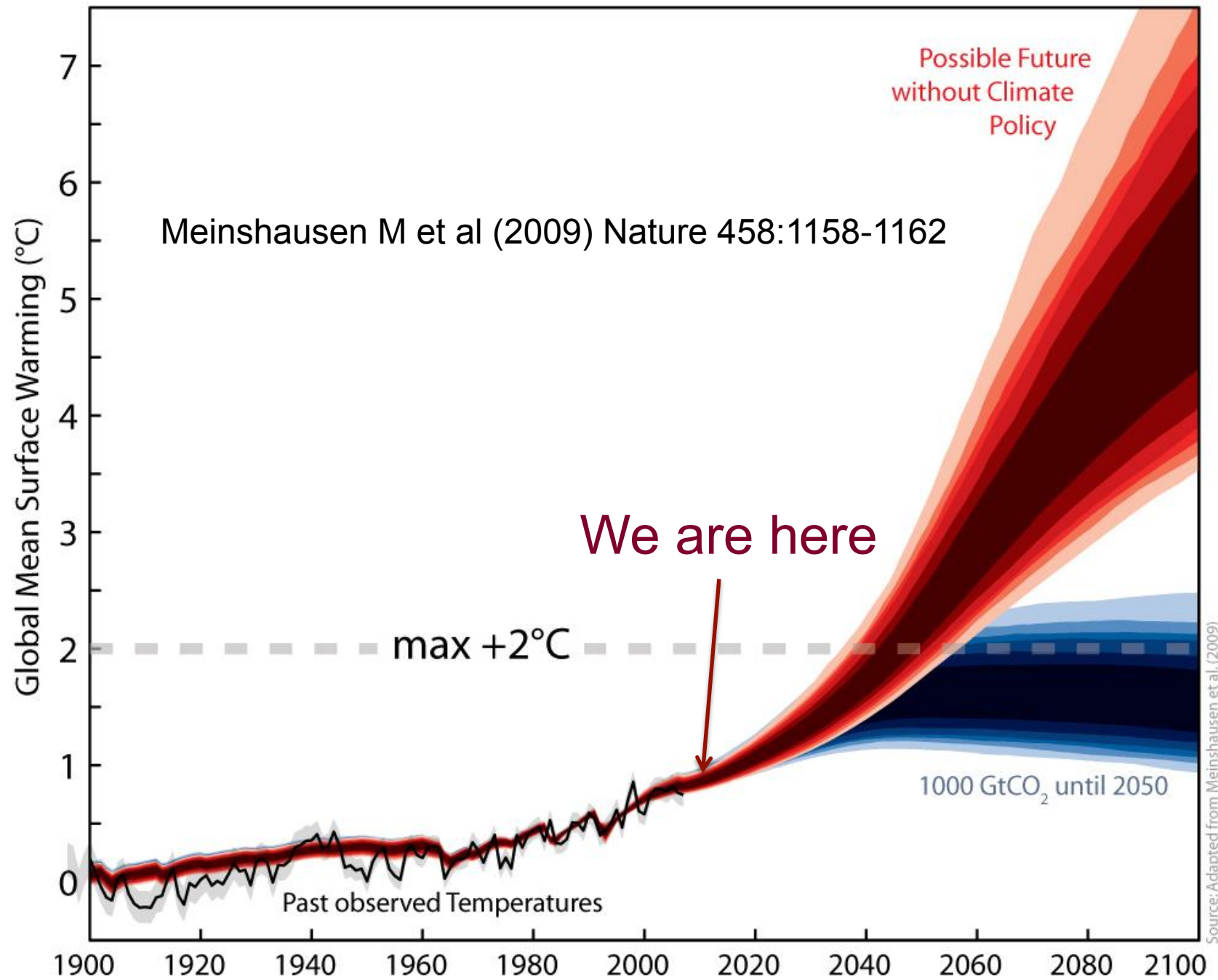
April-September

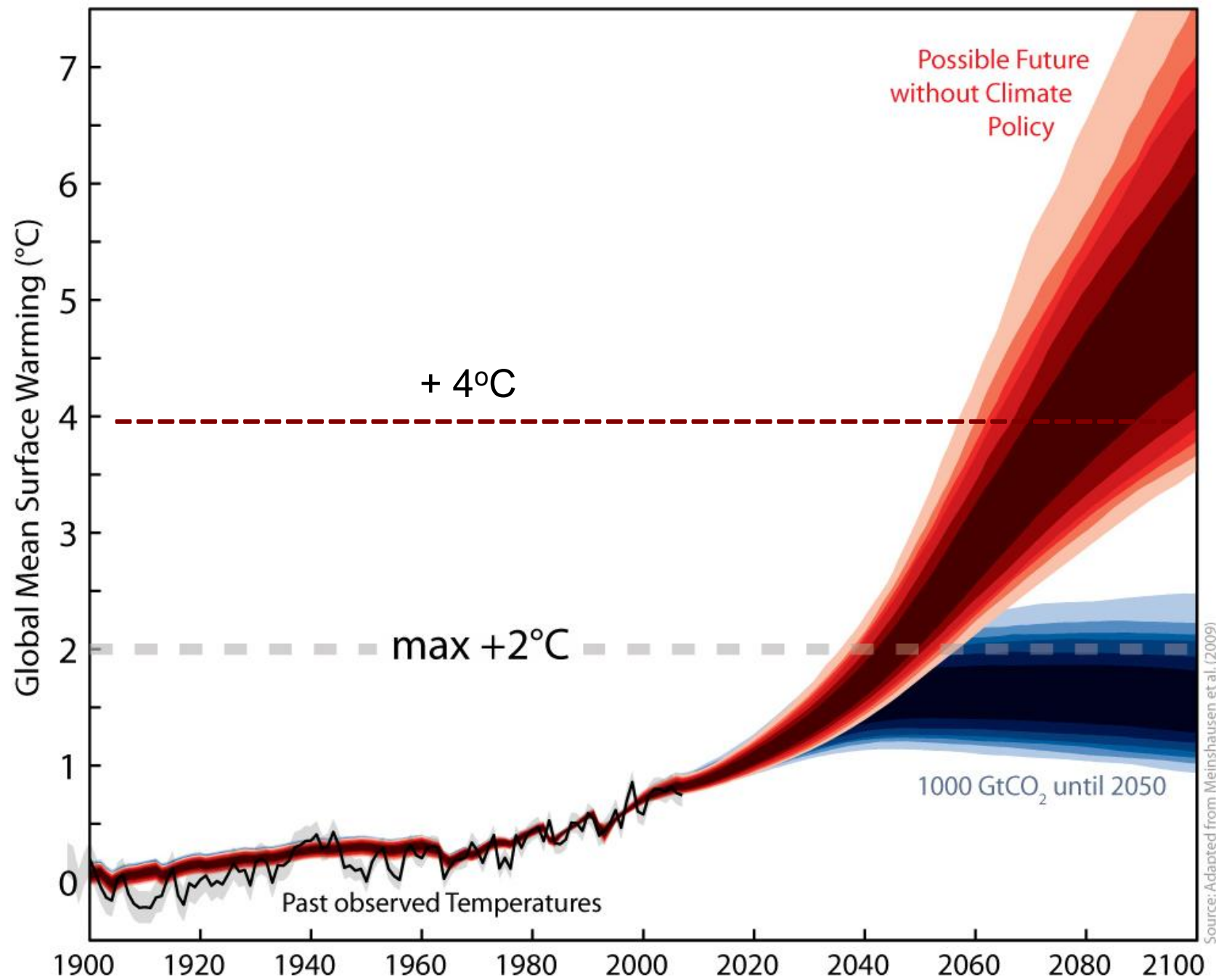
Observed trends in FFDI (1973-2010)





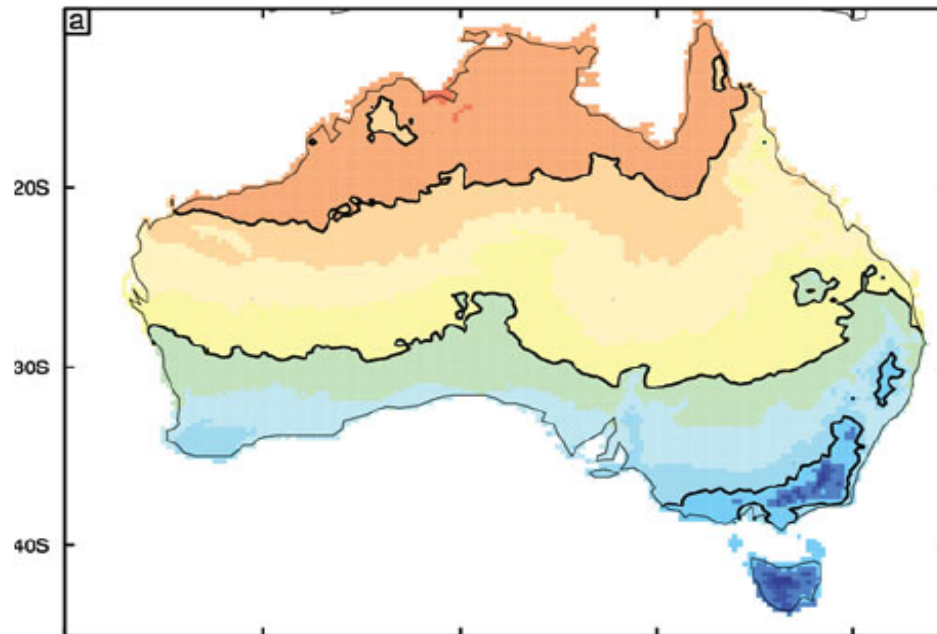
Weather conditions on 7th February, 2009 would have meant a Code Red designation over most of state (CFA 2009)



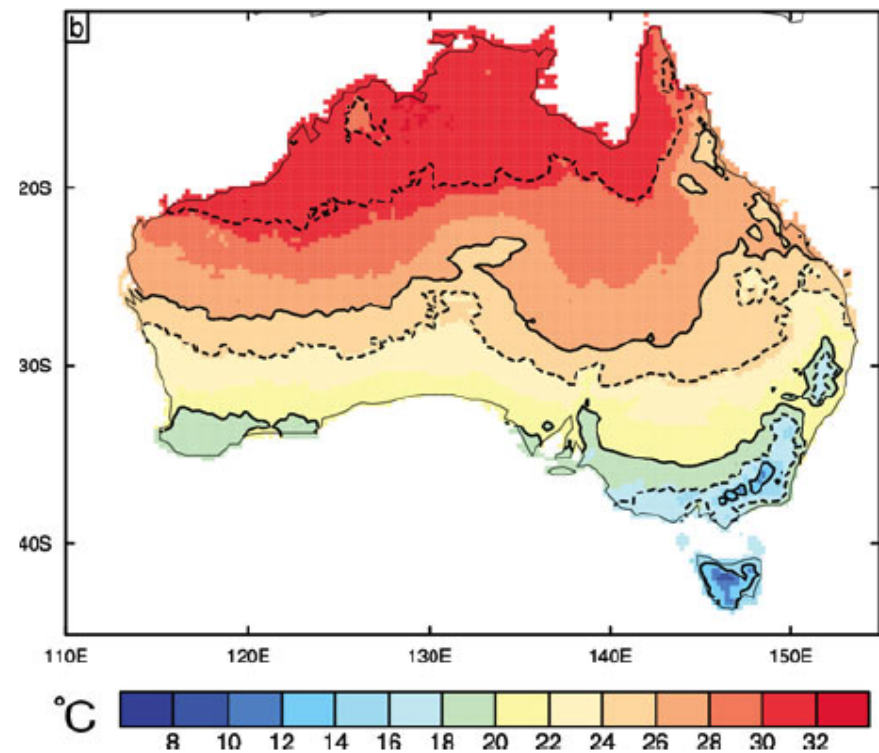


Projected temperatures (high emissions scenario)

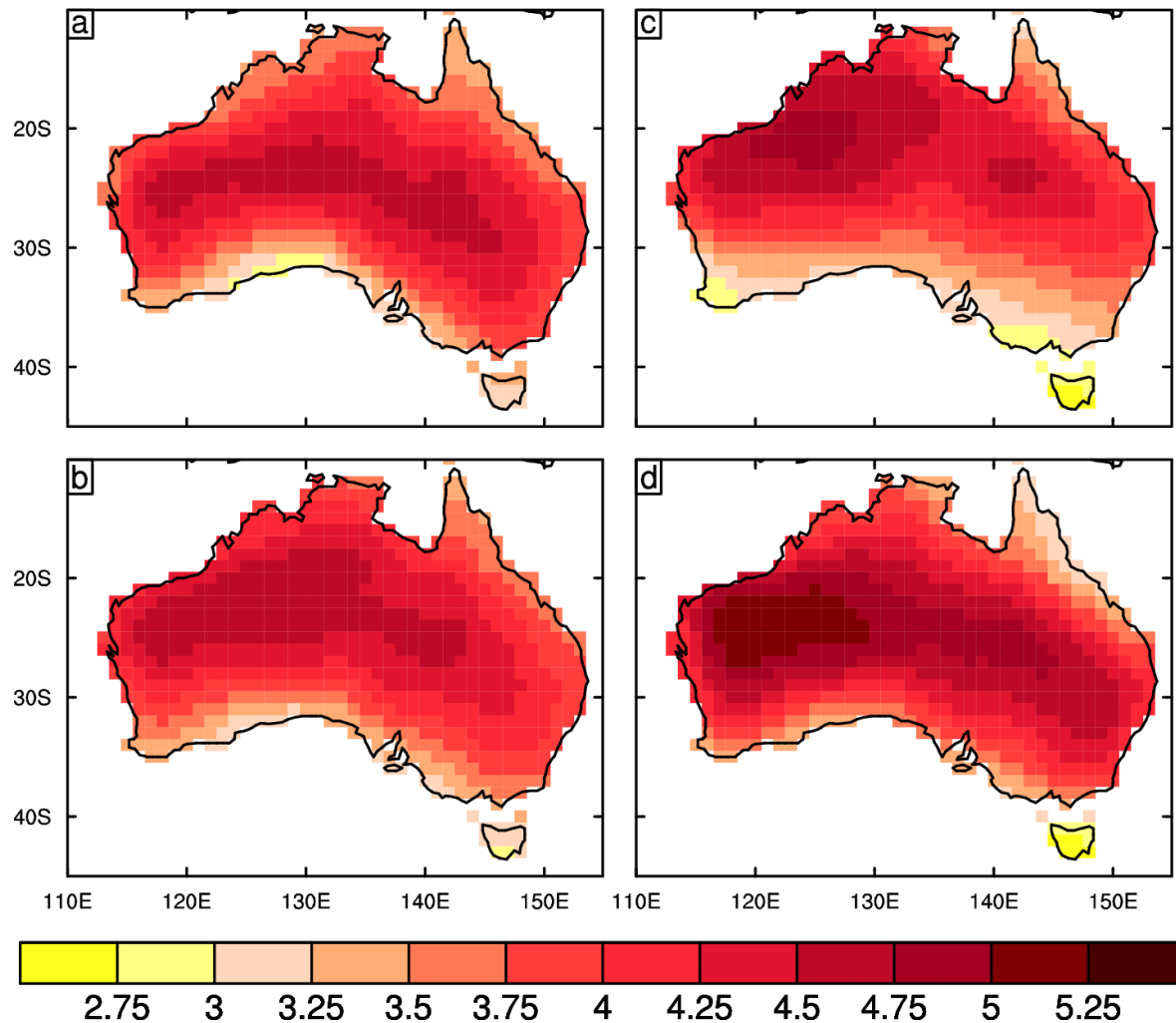
Current climate



Late 21st century



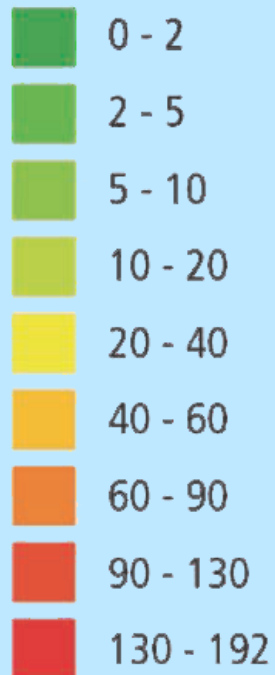
Projected temperatures (2080-2099 compared to 1986-2005, high emissions scenario)



<http://www.climatechangeinaustralia.gov.au/en/>

Potential heat exposure

Days per year > 40C°



2090

Projected average temperatures

- Average temperature will continue to increase in all seasons (very high confidence)
- 2030: 0.5-1.2°C above 1986-2005
- 2090: 1.2-2.1°C (medium scenario)
- 2090: 2.7-4.2°C (high scenario)

Rainfall

- Continuation of rainfall decrease in winter & spring **~15% to 2030** (high confidence)
- Trends in summer and autumn less clear
- Until 2030, natural variability expected to dominate trends due to GHGs
- By later in century, mid-range emissions scenario, projected **decrease in winter rainfall up to 20%**

<http://www.climatechangeinaustralia.gov.au/en/>

No. days >35°C

	1995	2030 Medium	2090 Medium	2090 High
Melbourne	11	13	16	24
Mildura	33	42	52	73

No. frost days

	1995	2030 Medium	2090 Medium	2090 High
Melbourne	0.9	0.6	0.2	0

Snow depth

	1980-99	2040-2059 Low	2040-2059 Medium	2040-2059 High
Mt Buffalo	60	10-30	5025	0-20



<http://www.climatechangeinaustralia.gov.au/en/>

Projected extremes

- More extreme hot days, fewer frosts (high confidence)
- Increased rainfall intensity
- Increased time spent in droughts (high confidence)
- Harsher fire weather (high confidence)
- Increased evapotranspiration (high confidence)

It's the extremes that matter

Future habitats

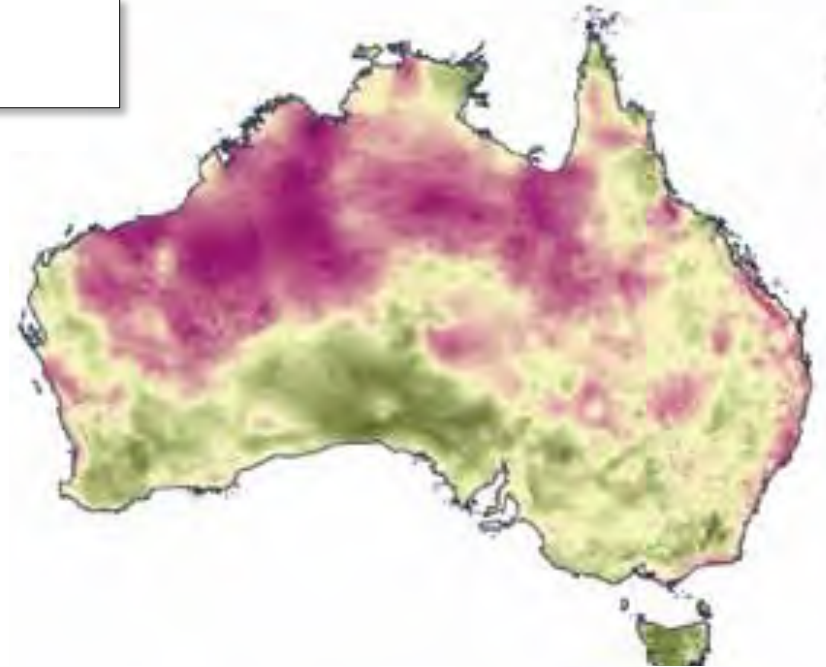
2030



Environment similar



Environment different



2070

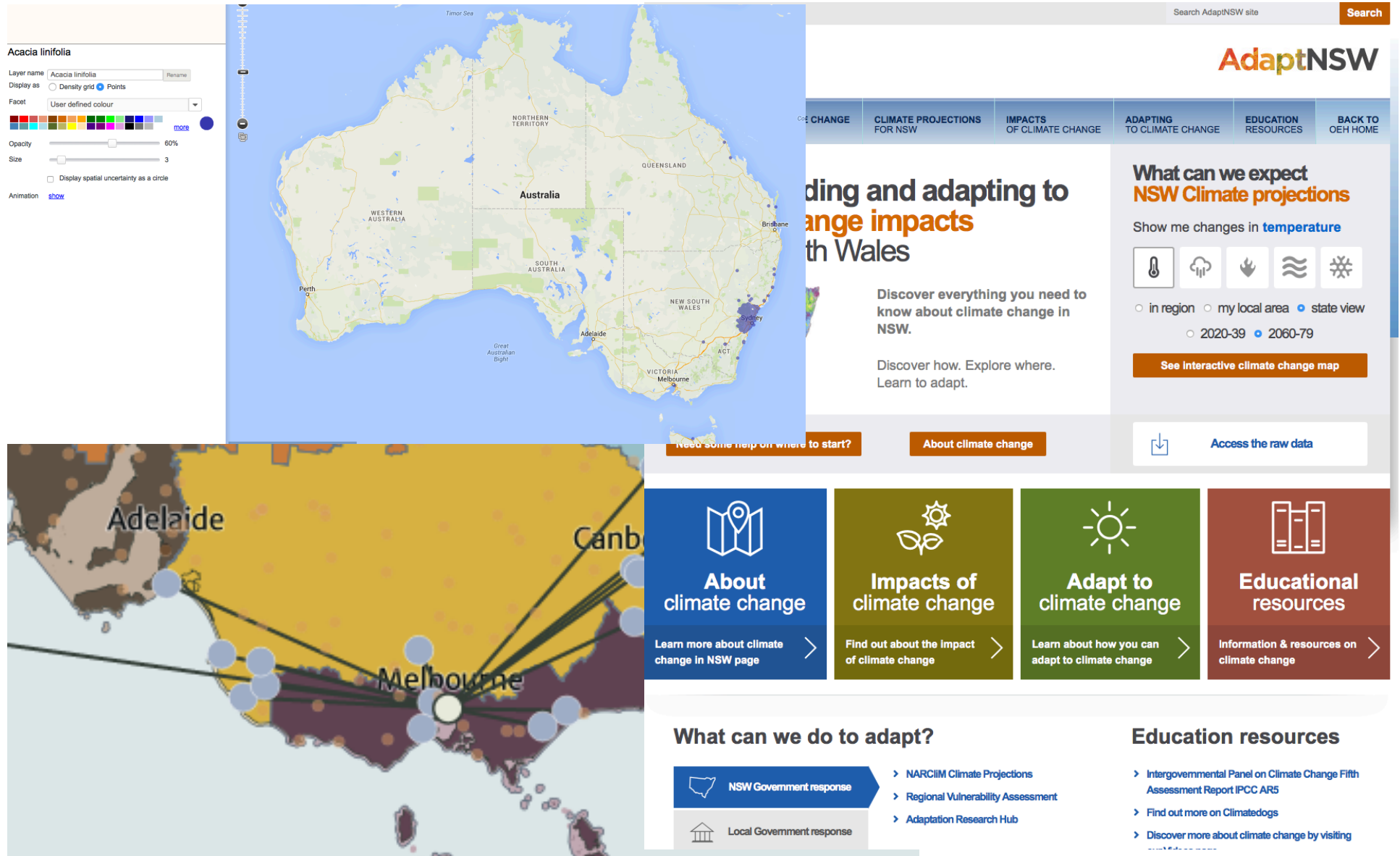


The implications of climate change for biodiversity conservation and the National Reserve System: Final synthesis

Michael Dunlop, David W. Hilbert, Simon Ferrier, Alan House, Adam Liedloff, Suzanne M. Prober, Anita Smyth, Tara C. Martin, Tom Harwood, Kristen J. Williams, Cameron Fletcher, and Helen Murphy.

SEPTEMBER 2012

Tools for planning

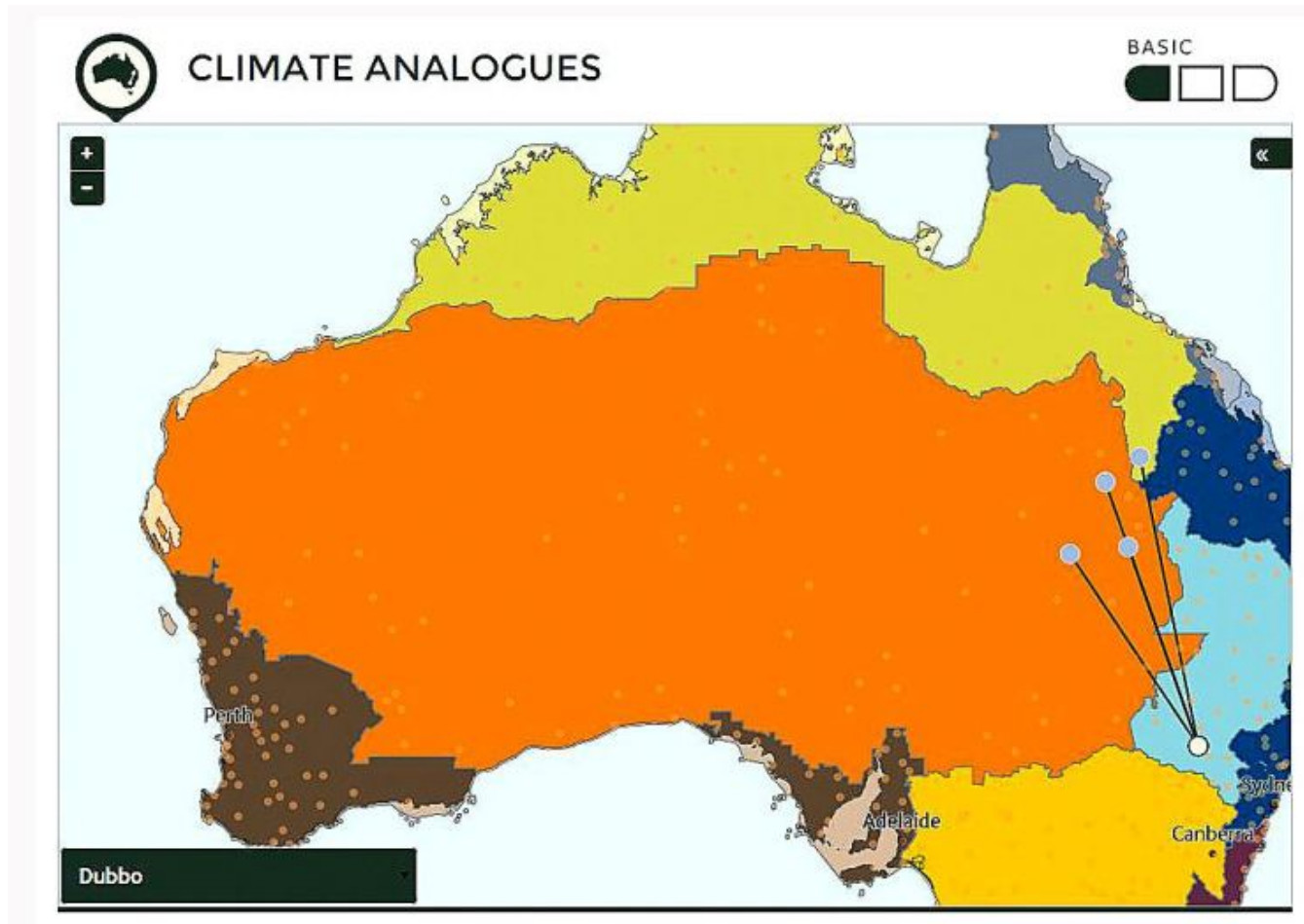


CSIRO/BoM



<http://www.climatechangeinaustralia.gov.au/en/>

Climate analogue tool



<http://www.climatechangeinaustralia.gov.au/en/climate-projections/climate-analogues/analogues-explorer/>

Climate analogue tool

Matches the proposed future climate of a location of interest with the current climate experienced in another location using annual average rainfall and maximum temperature.

- Choose town
- Choose low (RCP 2.6), medium (RCP 4.5) or high (RCP 8.5) emissions scenario
- Choose preset climate or choose temperature and rainfall

Emissions scenarios

RCP = Representative Concentration Pathways

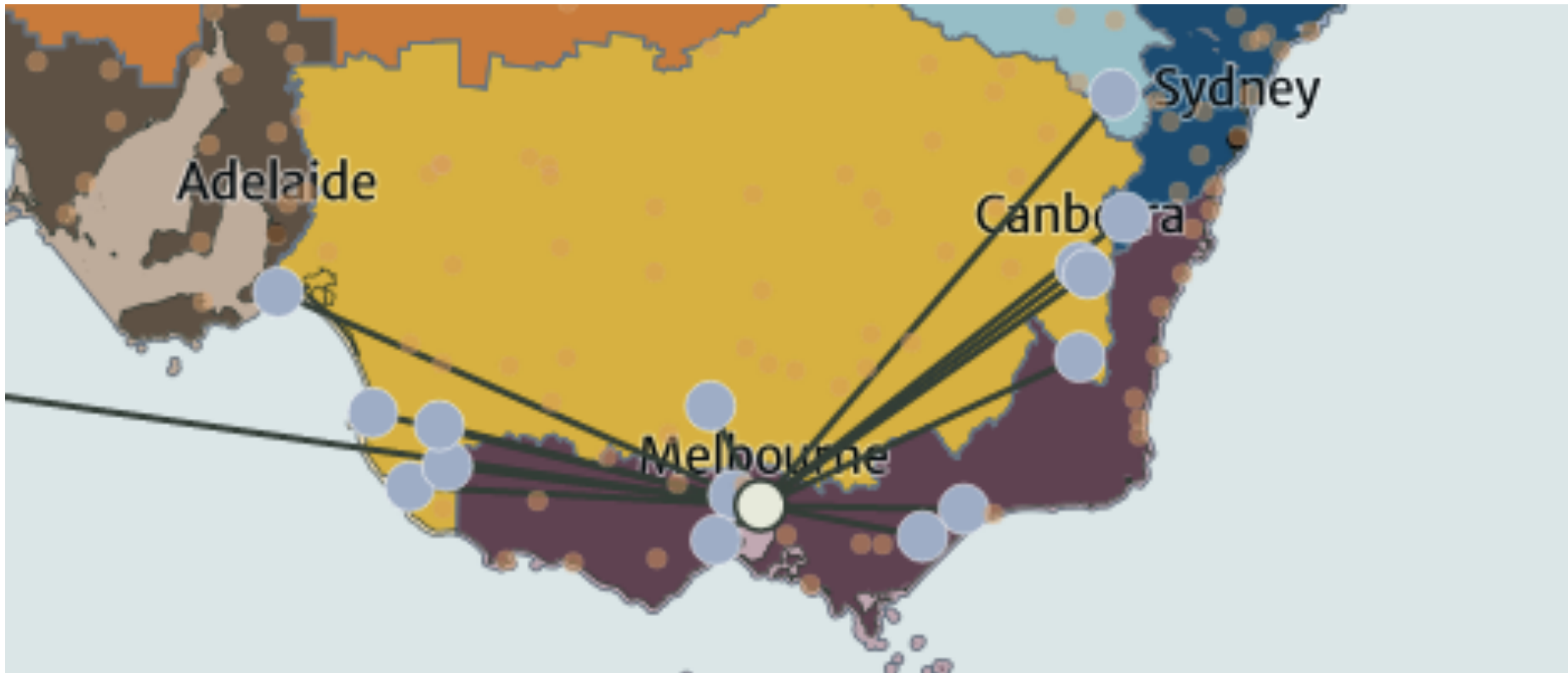
- GHG trajectories adopted as basis for modelling in the IPCC AR5
- 4 possible climate futures

RCP 2.6: “Low”

RCP 4.5: “Medium”

RCP 8.5: “High”

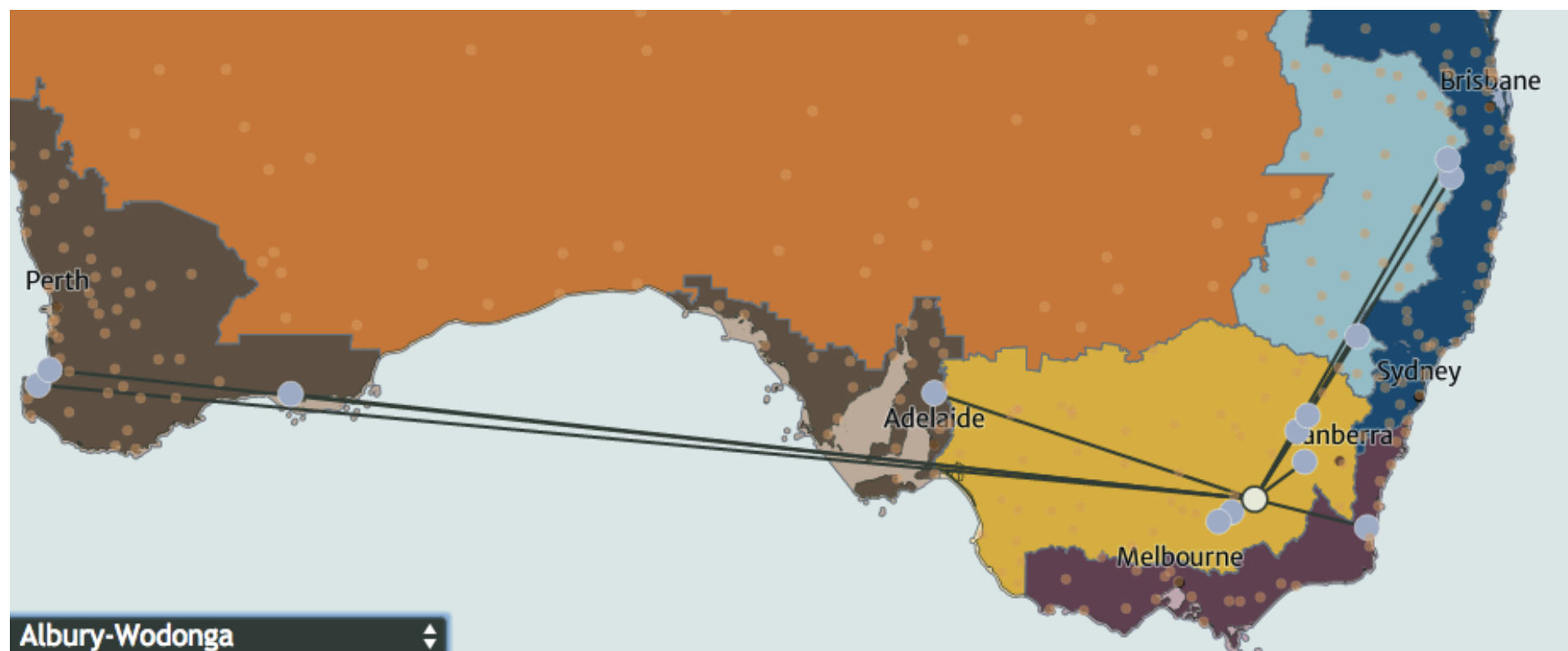
Climate analogue tool



Melbourne in 2050: High emissions scenario

Analogue towns: Melton, Millicent, Victor Harbor, Penola, Goulburn, Canberra, Bairnsdale, Queanbeyan, Naracoorte, Kingston S.E., Bathurst, Mount Barker, Sale, Bendigo, Geelong, Cooma

Climate analogue tool



Albury-Wodonga in 2050: High emissions scenario

Analogue towns: Cootamundra, Wangaratta, Bega, Clare, Tenterfield, Busselton, Bunbury, Esperance, Benalla, Tumut, Mudgee, Young, Stanthorpe,

Other tools

Victoria

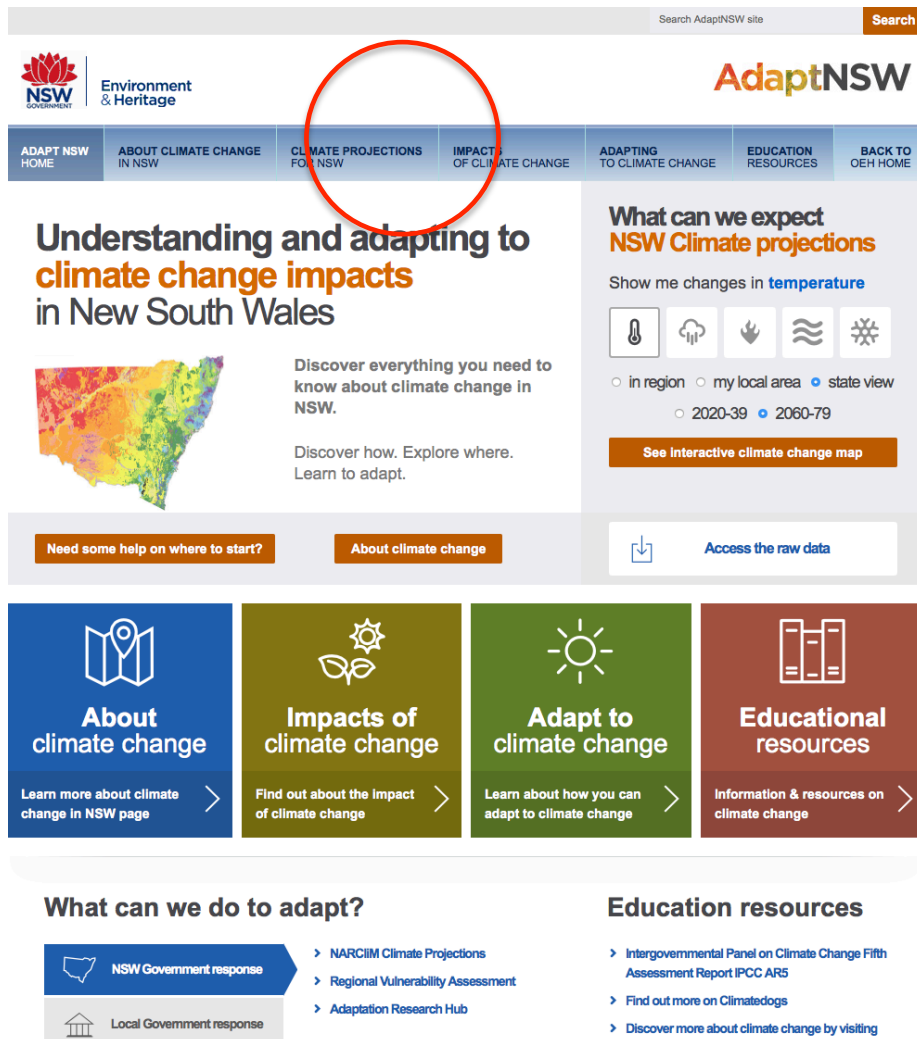
Climate change adaptation navigator: web-based tool to assist the local government

<http://adaptation-navigator.org.au/>

Climatedogs: explanations using animations of the drivers that influence Victoria's climate

<http://www.depi.vic.gov.au/agriculture-and-food/farm-management/weather-and-climate/understanding-weather-and-climate/the-climatedogs-the-four-drivers-that-influence-victoriaas-climate>


NARCIIM website



Near future 2030
Far future 2070
VS
1990 -2009

<http://www.climatechange.environment.nsw.gov.au>

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 The Atlas Of Living Australia

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A spatial portal for investigating species occurrences within specified locations and the environmental impacts.

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Contributed by Australia's academic, scientific, environmental communities and you.

[Get involved](#)




Blog & News Updates

World Parks Congress BioBlitz in Sydney's Olympic Park

Bringing south-east Arnhem Land stories to south-east Australia mob

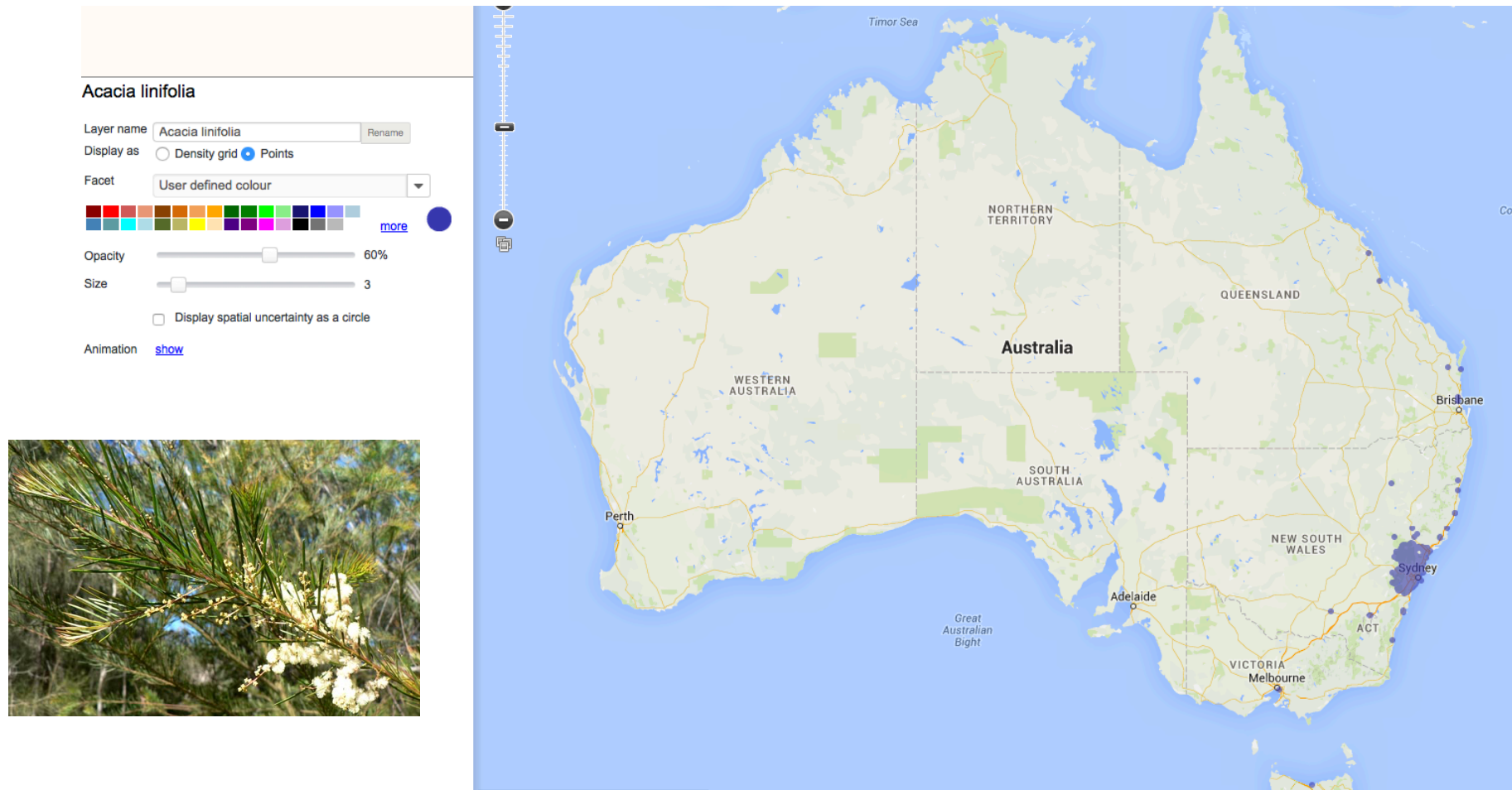
New to the Atlas: PhyloLink Phylogenetic tool released

Connect with us



Atlas of Living Australia (ALA)

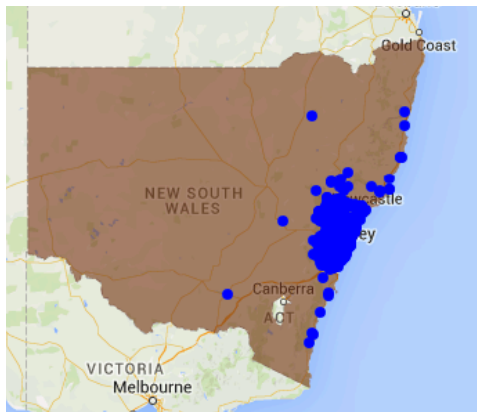
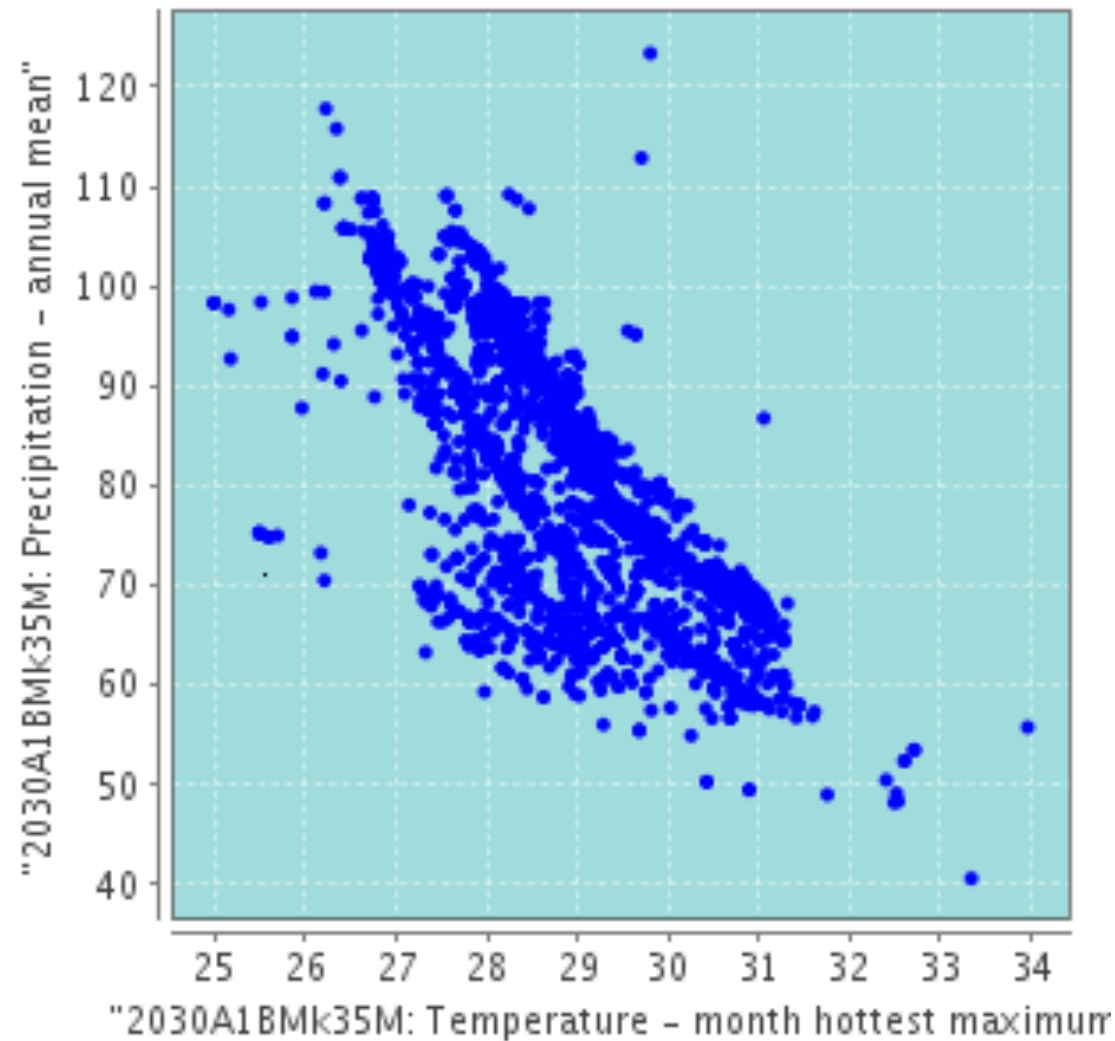
Acacia linifolia



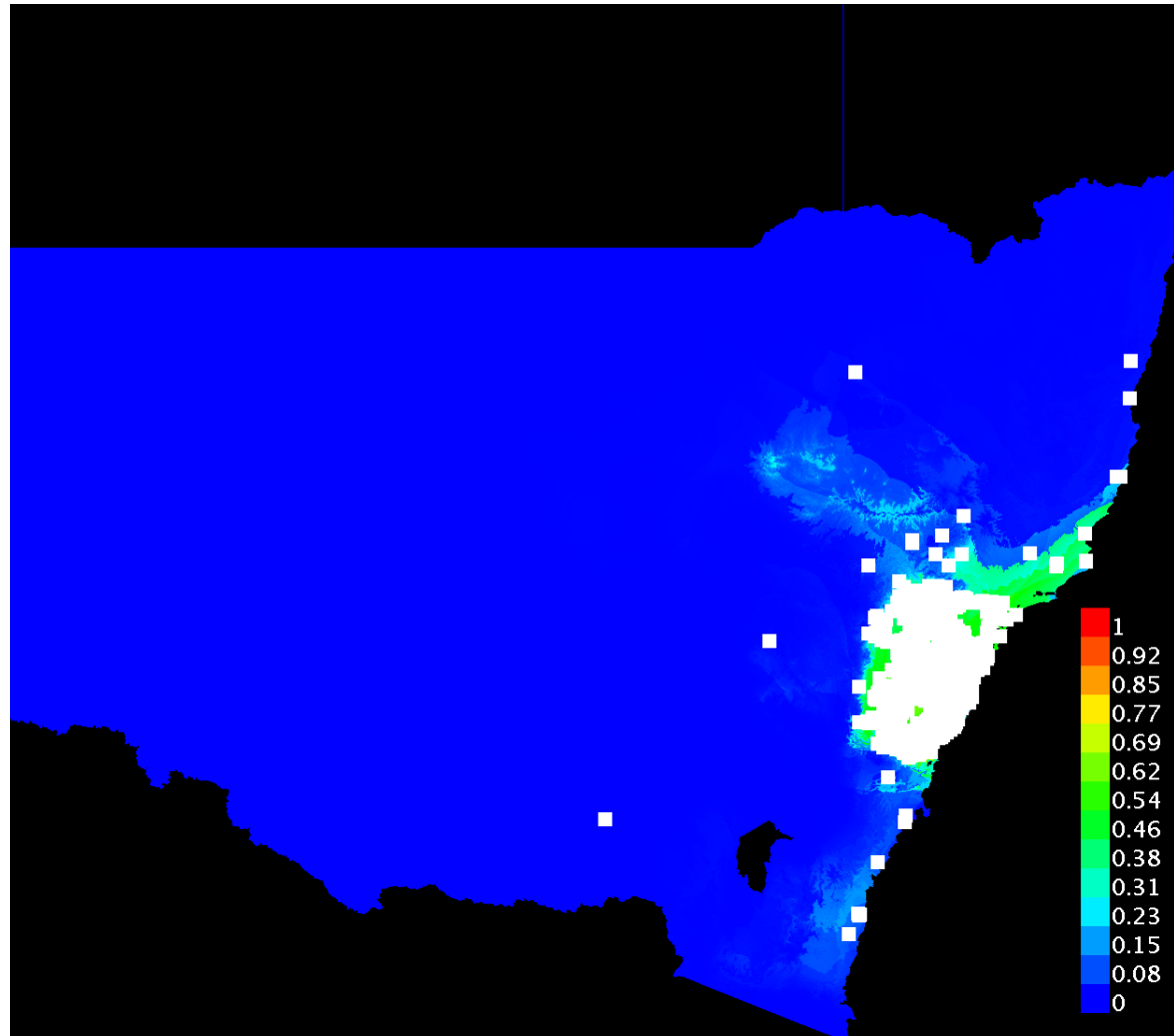
Method described in: Booth et al, 2012, *EMR*, 13, (3), 274-281

Current climate envelope vs future

Acacia linifolia



Predicted future distribution



weedfutures.net

WEED FUTURES

DETERMINING CURRENT AND FUTURE WEED THREATS IN AUSTRALIA


- Home
- Overview
- Search by Region
- Search by Species
- Search by Classification
- Methods
- Screening Tools
- Glossary
- Downloads
- Links
- Contributors
- Feedback

This website is a decision-support tool that provides users with the ability to interrogate individual profiles for over 500 non-native naturalised and invasive plant species within Australia and assess weed threats for regions of interest under current and predicted future climates.

The integration of modelling, spatial analysis and species' trait information provides a comprehensive assessment and information source for these plant species under both current and future climates [\[read more\]](#)


Search by region

Explore at various regional levels with our interactive maps




Search by species

Browse our database of 541 naturalised and invasive plant species



Search by classification

Investigate species listed under various weed legislation or classifications



MACQUARIE UNIVERSITY

NCCARF
National Climate Change Adaptation Research Facility

Search by Region

Currently viewing details for LGA: Ku-ring-gai • [Change region type](#) • [Return to map](#)

Click on a column heading to sort • Click on a species name to view its profile



Species Name ^[?]	% of Suitable Habitat in Region ^[?]			Rating (NSW) ^[?] / Climate Change Impact (AUS) ^[?]	
	Current ^[?]	RCP 8.5 2035 ^[?]	RCP 8.5 2065	Current	RCP 8.5 2065
Acetosa sagittata	100	100	100	Class 3	
Aeschynomene americana	100	100	100	16	16
Agapanthus praecox	100	100	100	30	30
Ageratina adenophora	100	100	100	Class 3	
Ageratina riparia	100	100	100	Class 3	
Agrostis gigantea	81	0	0	32	32
Agrostis stolonifera	72	0	0	38	34
Ailanthus altissima	100	100	100	Class 3	
Aira caryophyllea	100	100	100	34	34
Alopecurus geniculatus	100	0	0	32	32
Alternanthera pungens	100	100	100	Class 3	
Ambrosia artemisiifolia	100	100	100	Class 3	
Ambrosia psilostachya	100	100	100	Class 1	
Ambrosia tenuifolia	100	100	100	Class 3	
Anredera cordifolia	100	100	100	Class 3	
Anthoxanthum odoratum	100	81	18	36	34
Antigonon leptopus	100	100	100	20	22
Araujia sericifera	100	100	100	Class 3	
Argemone mexicana	100	100	100	Class 3	
Argemone ochroleuca	100	100	100	Class 3	
Arundo donax	100	100	100	Class 3	
Asparagus aethiopicus	100	100	100	Class 3	
Asparagus africanus	100	100	100	Class 3	
Asparagus asparagoides	100	100	100	Class 3	
Asparagus declinatus	0	0	18	Class 1	
Asparagus falcatus	100	100	100	32	30

= recorded occurrences in this region
 = available for purchase online in Australia (current as of May 2013)

Summary

- Climate change is already here and already having impacts
- Conservation and restoration strategies can no longer assume an equilibril world
- Need to be prepared for a hotter (probably) drier, more extreme environment
- We have some excellent tools for forward planning