Victoria's Climate Futures: The context for strategy

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MACQUARIE University

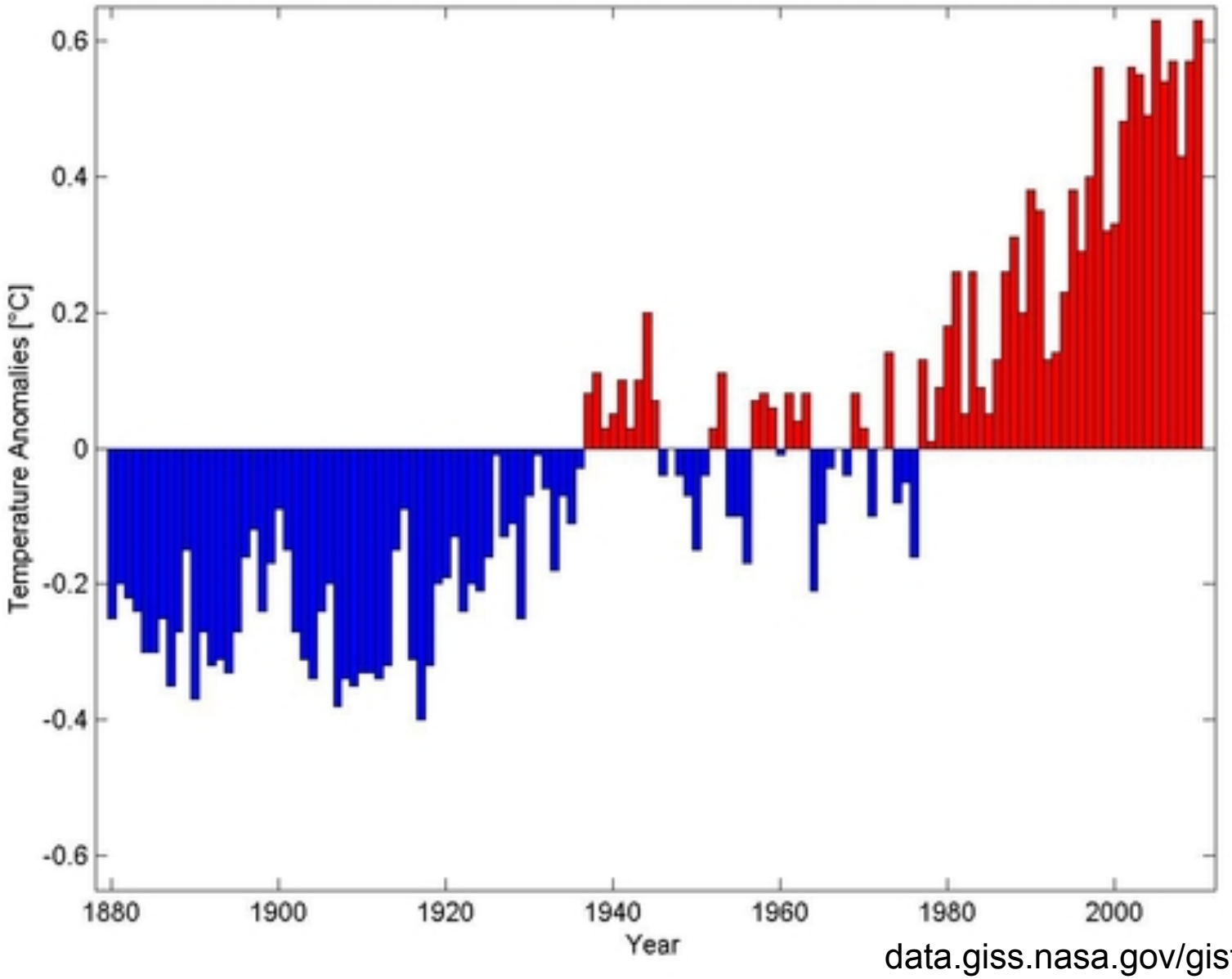
CLIMATE COUNCIL

Outline

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

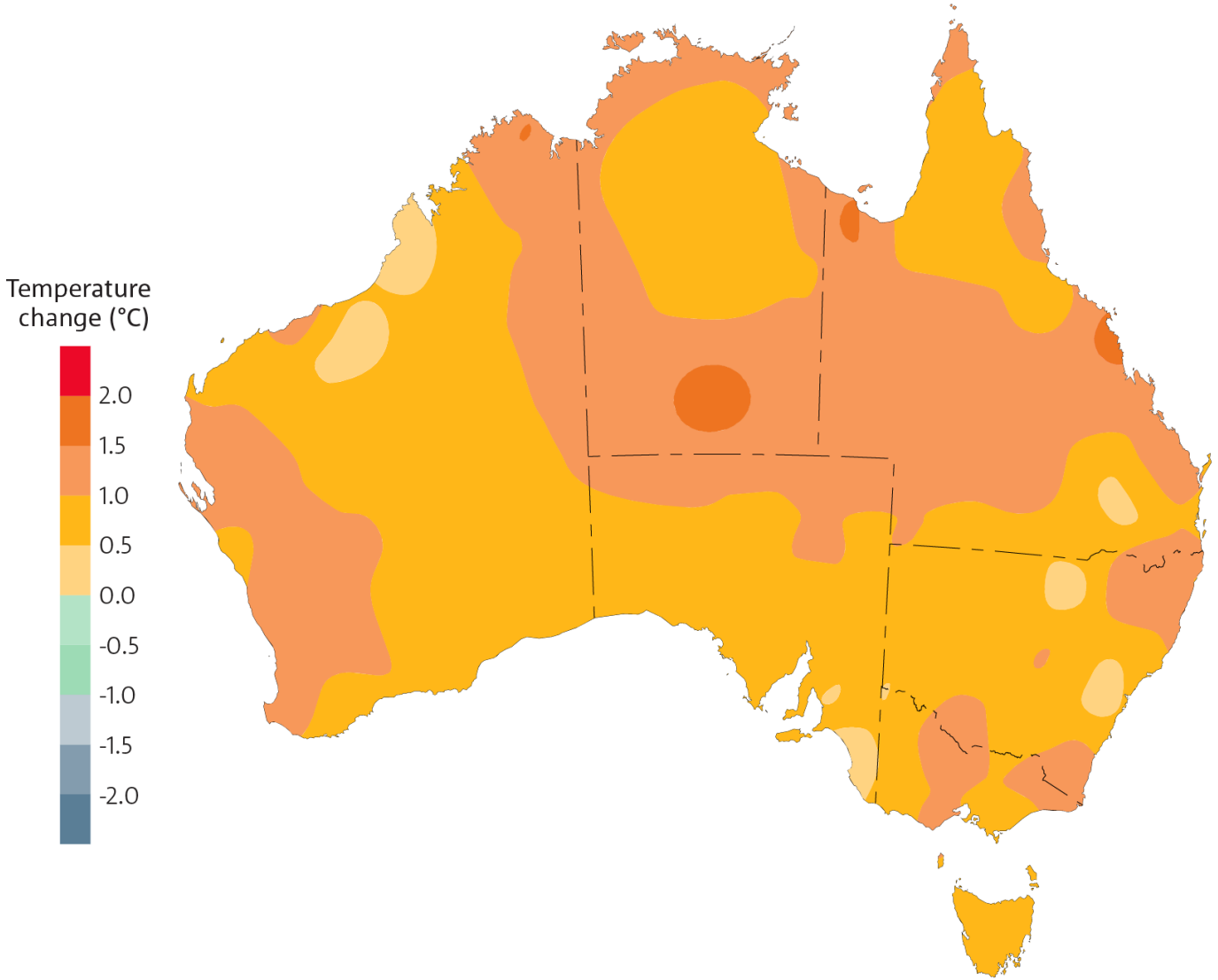


Observed temperatures: global



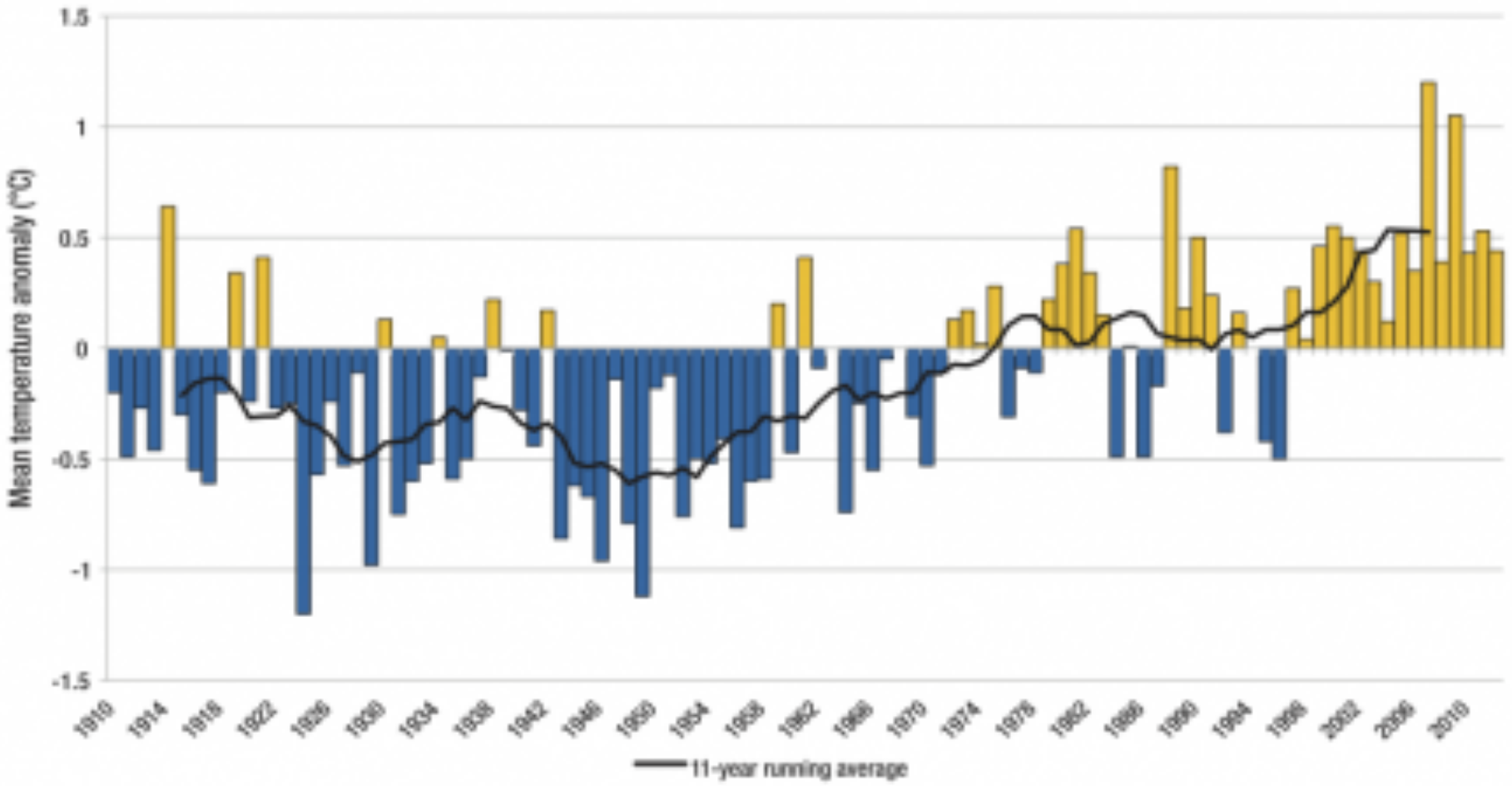
data.giss.nasa.gov/gistemp

Observed temperatures: Australia (1910-2013)



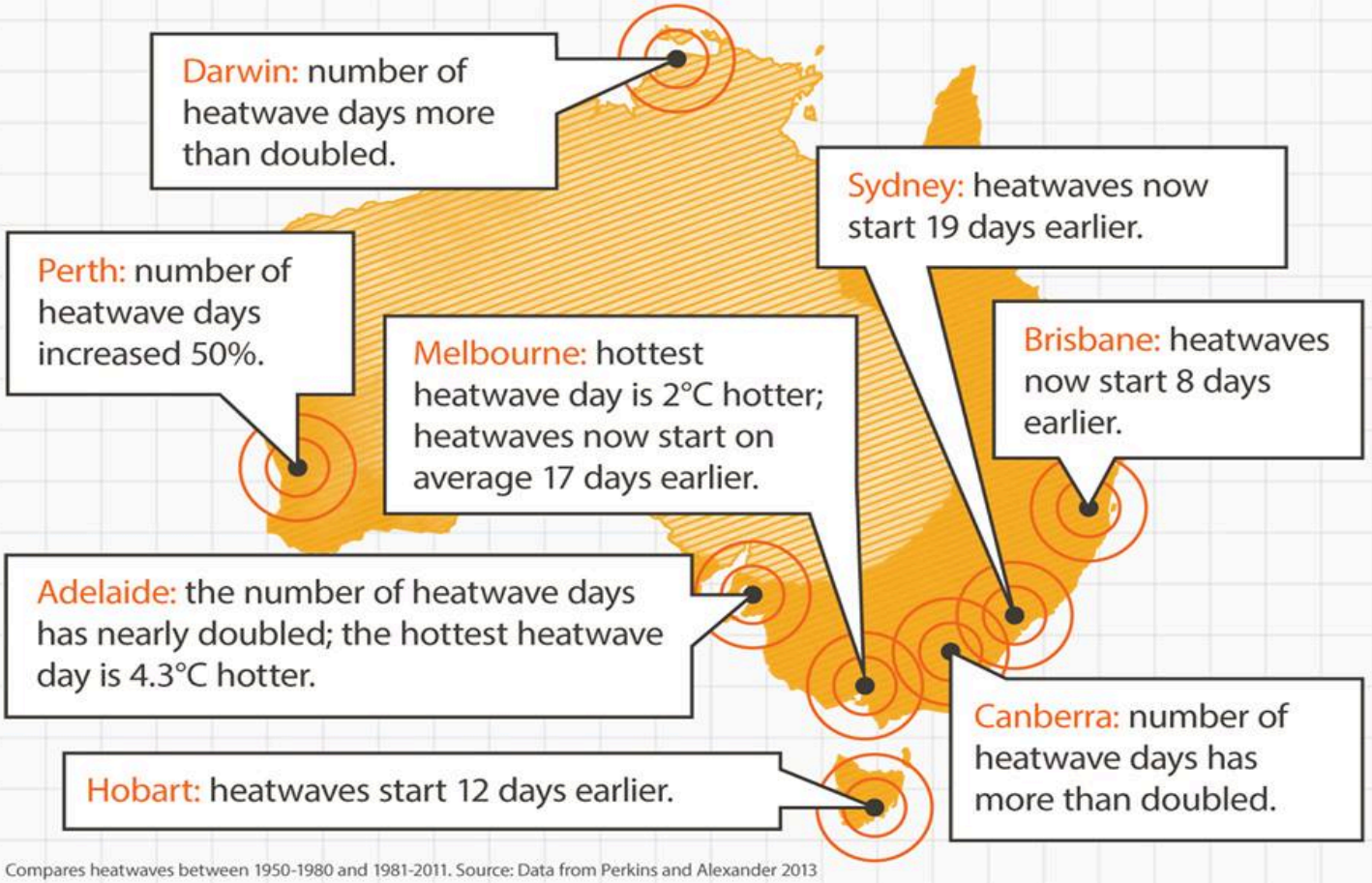
BoM 2014 http://www.bom.gov.au/state-of-the-climate/

Observed temperatures: Victoria



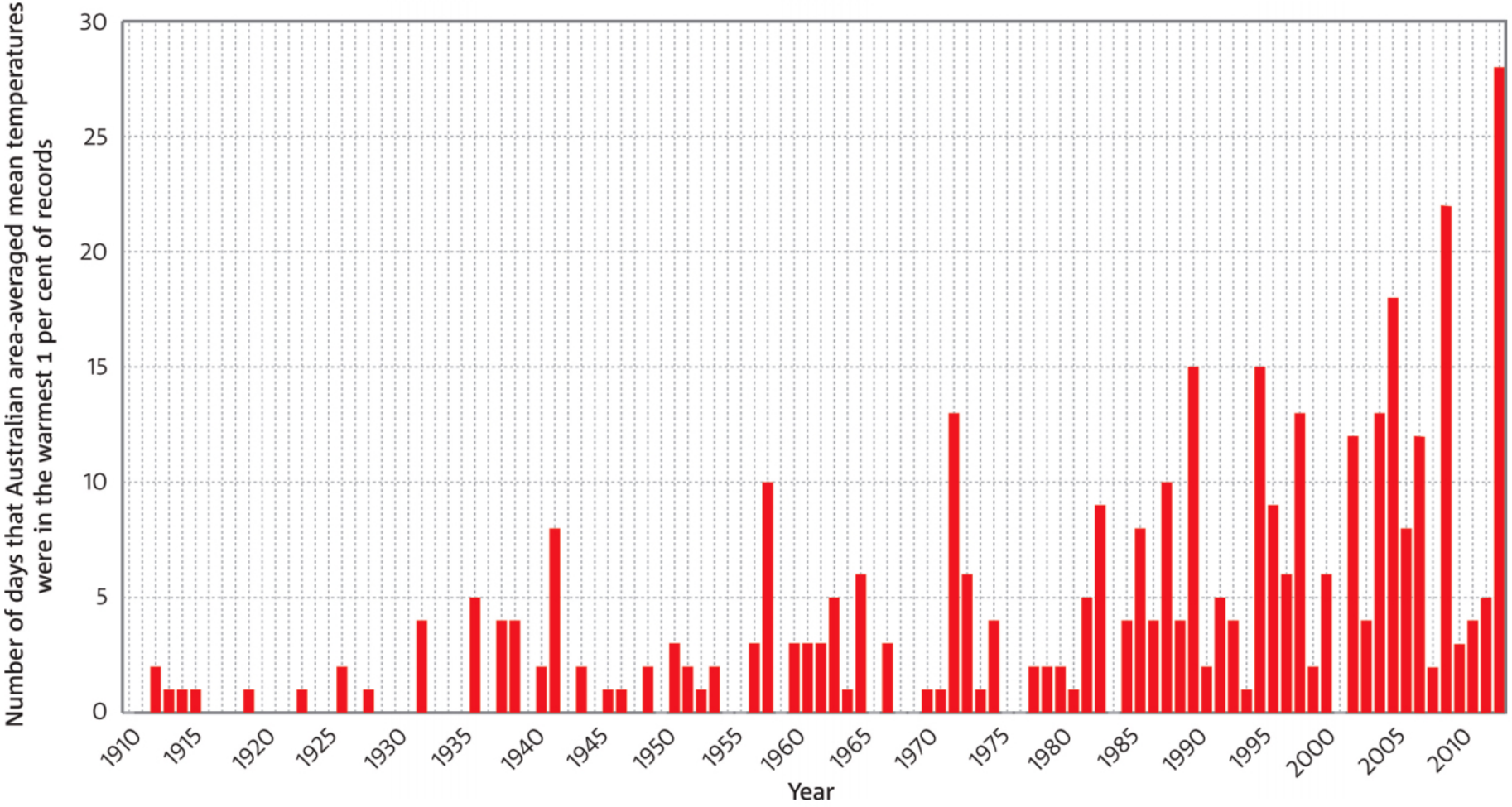
https://www.ces.vic.gov.au

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



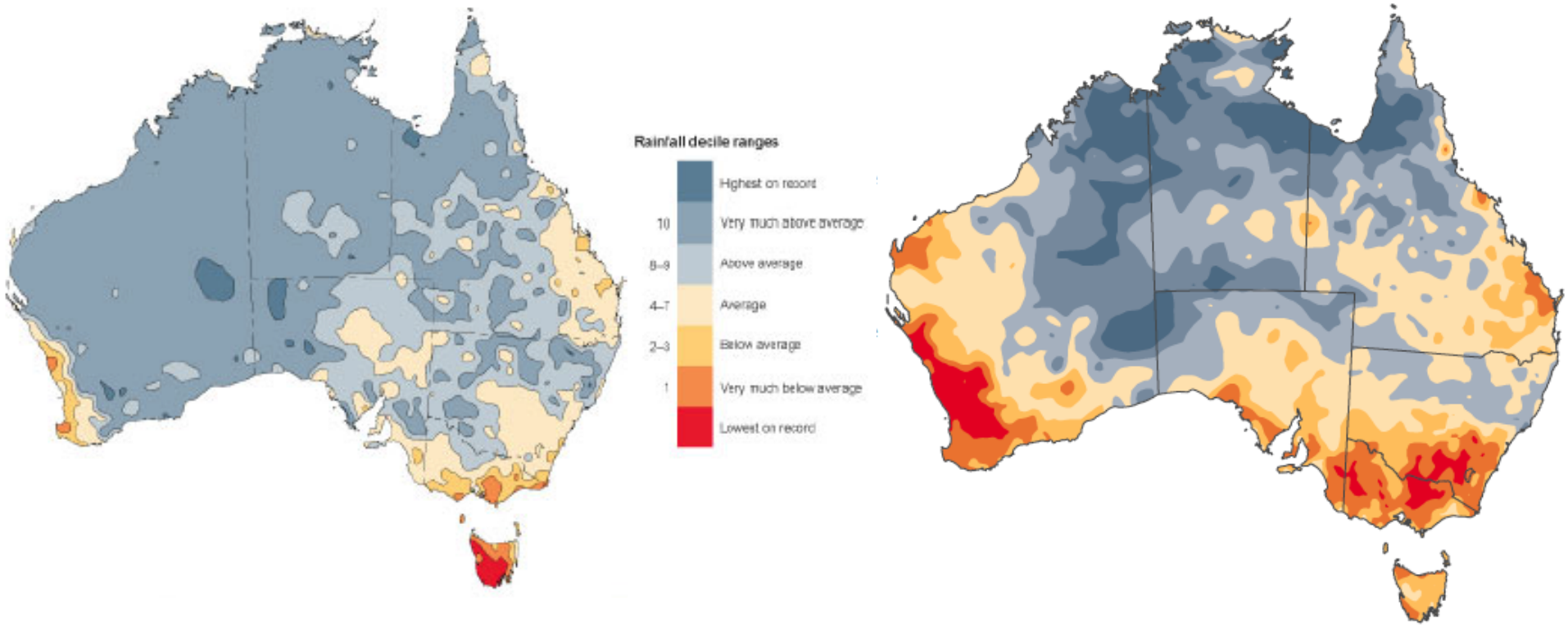
Compares heatwaves between 1950-1980 and 1981-2011. Source: Data from Perkins and Alexander 2013

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)

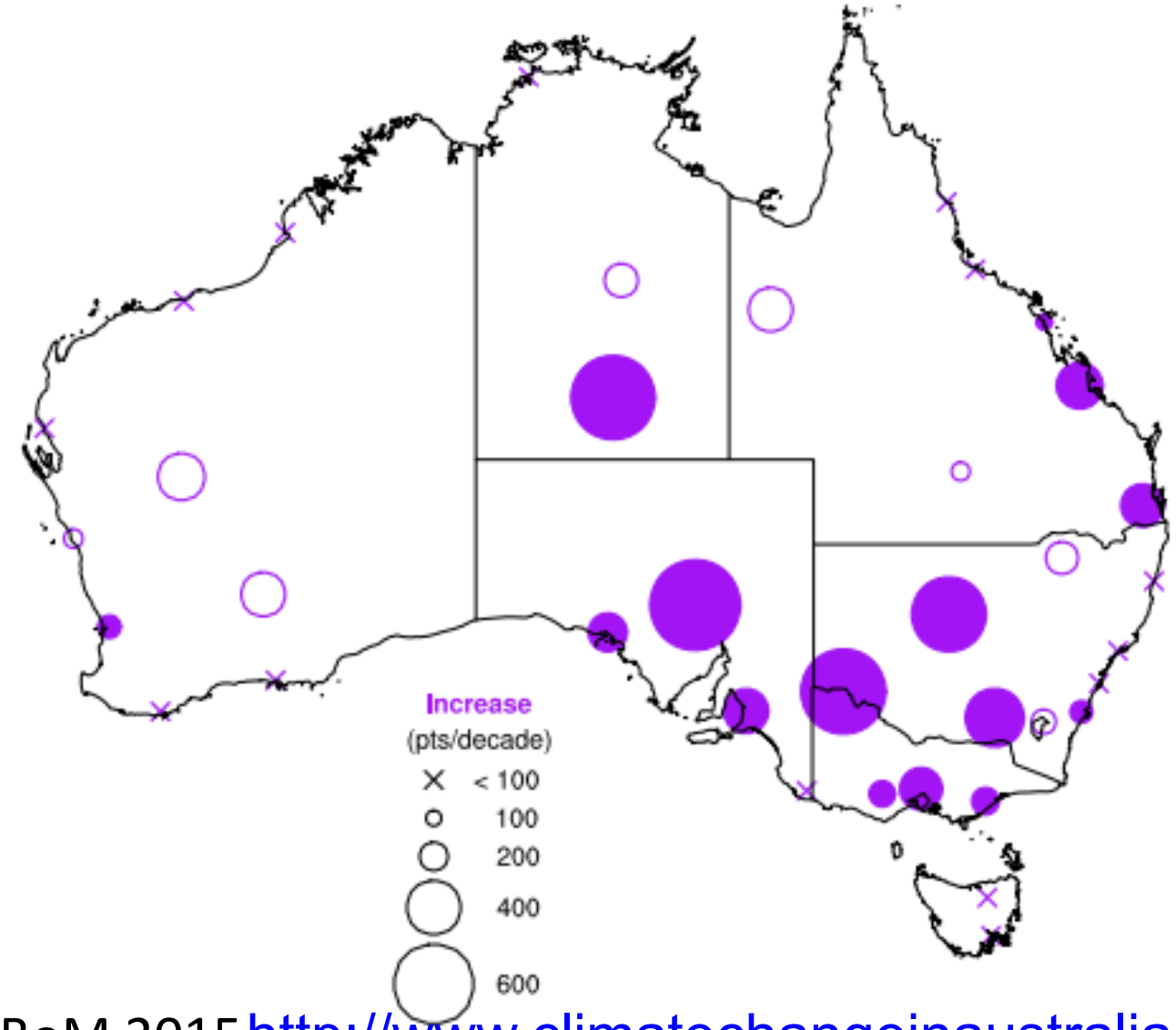


October-April

April-September

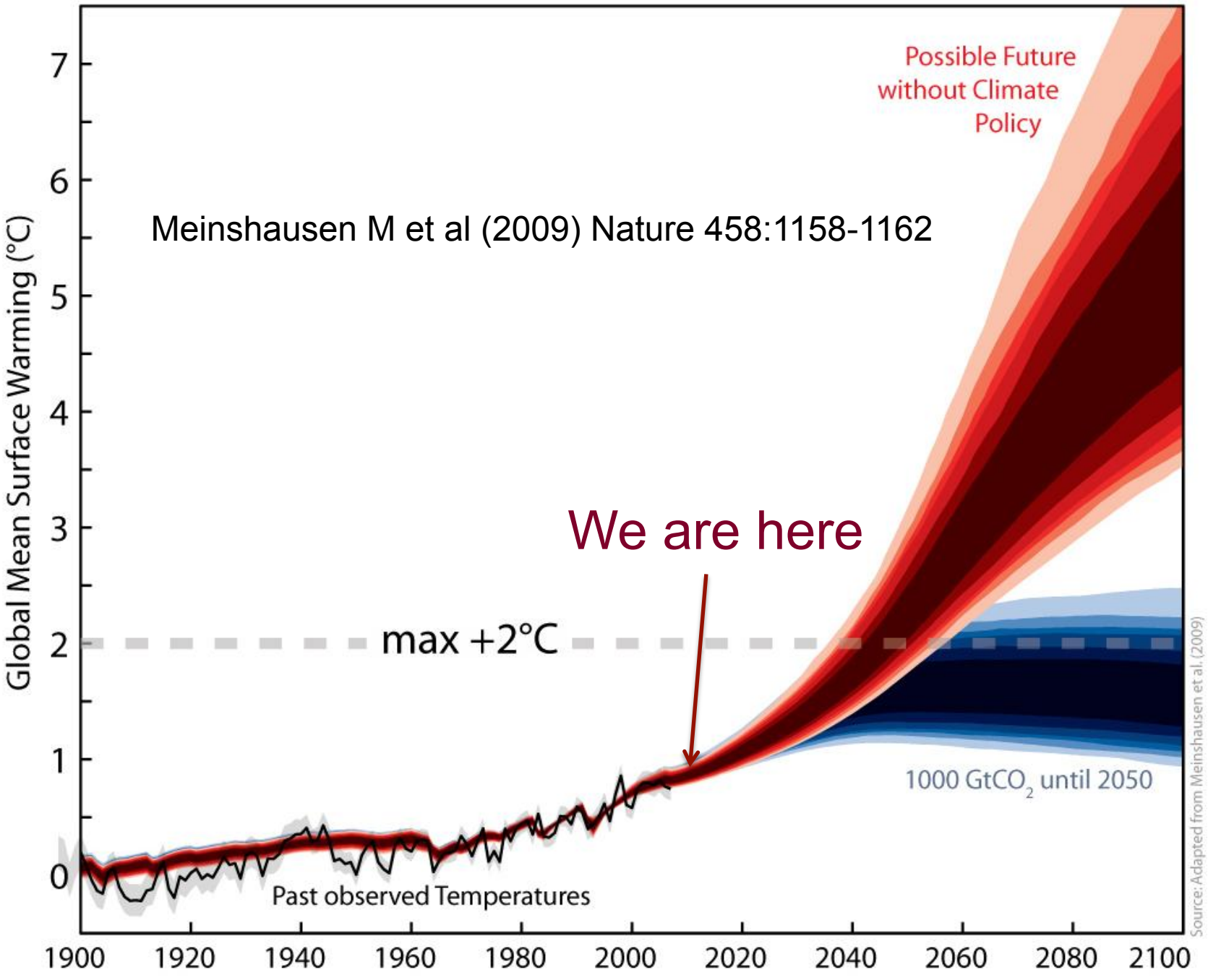
BoM 2014 http://www.bom.gov.au/state-of-the-climate/

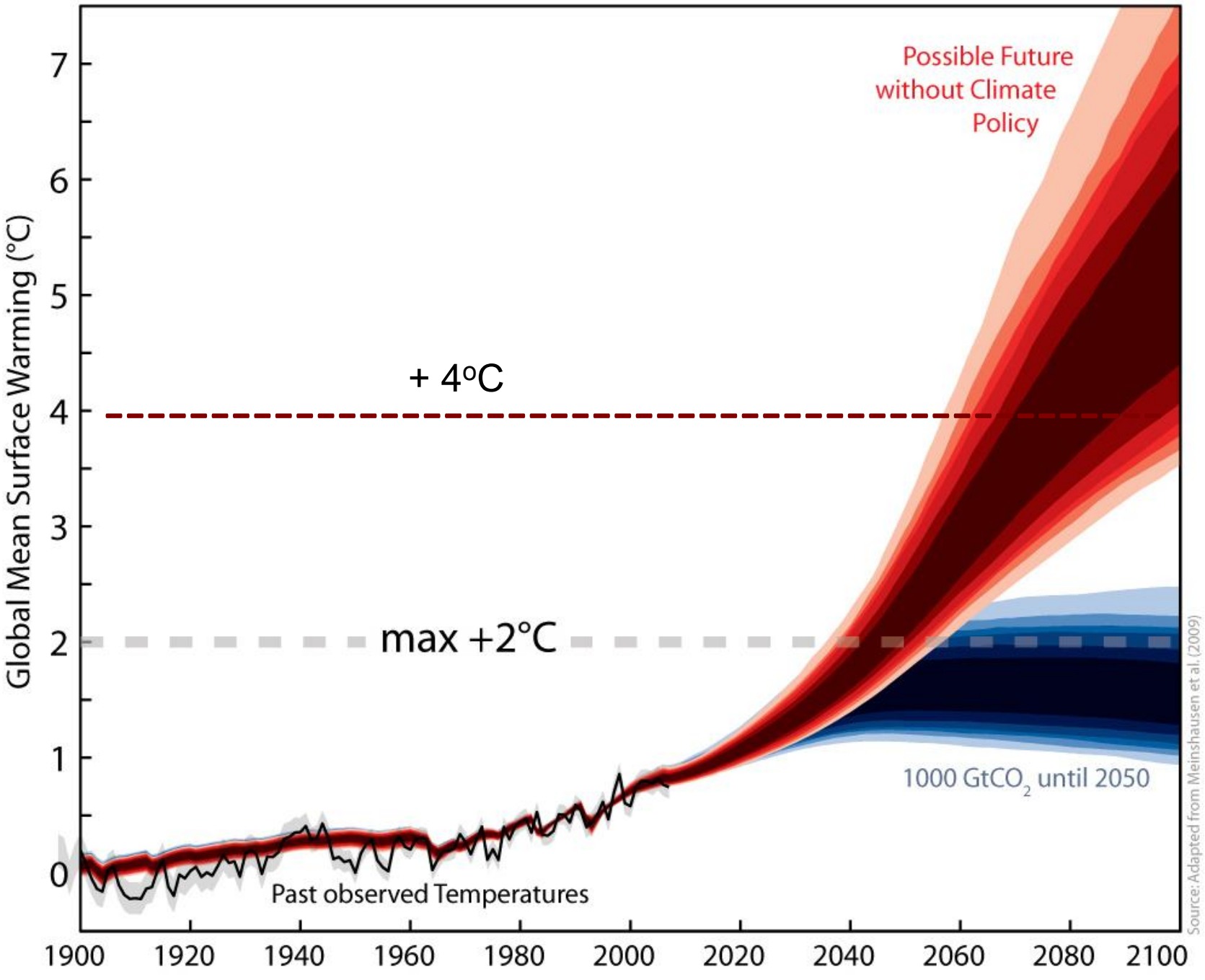
Observed trends in FFDI (1973-2010)



CSIRO & BoM 2015 http://www.climatechangeinaustralia.gov.au/en/

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


Meinshausen M et al (2009) Nature 458:1158-1162
Possible Future without Climate Policy
We are here
max +2°C
1000 GtCO2 until 2050
Past observed Temperatures
Global Mean Surface Warming (°C)
0
1
2
3
4
5
6
7
1900
1920
1940
1960
1980
2000
2020
2040
2060
2080
2100
Source: Adapted from Meinshausen et al. (2009)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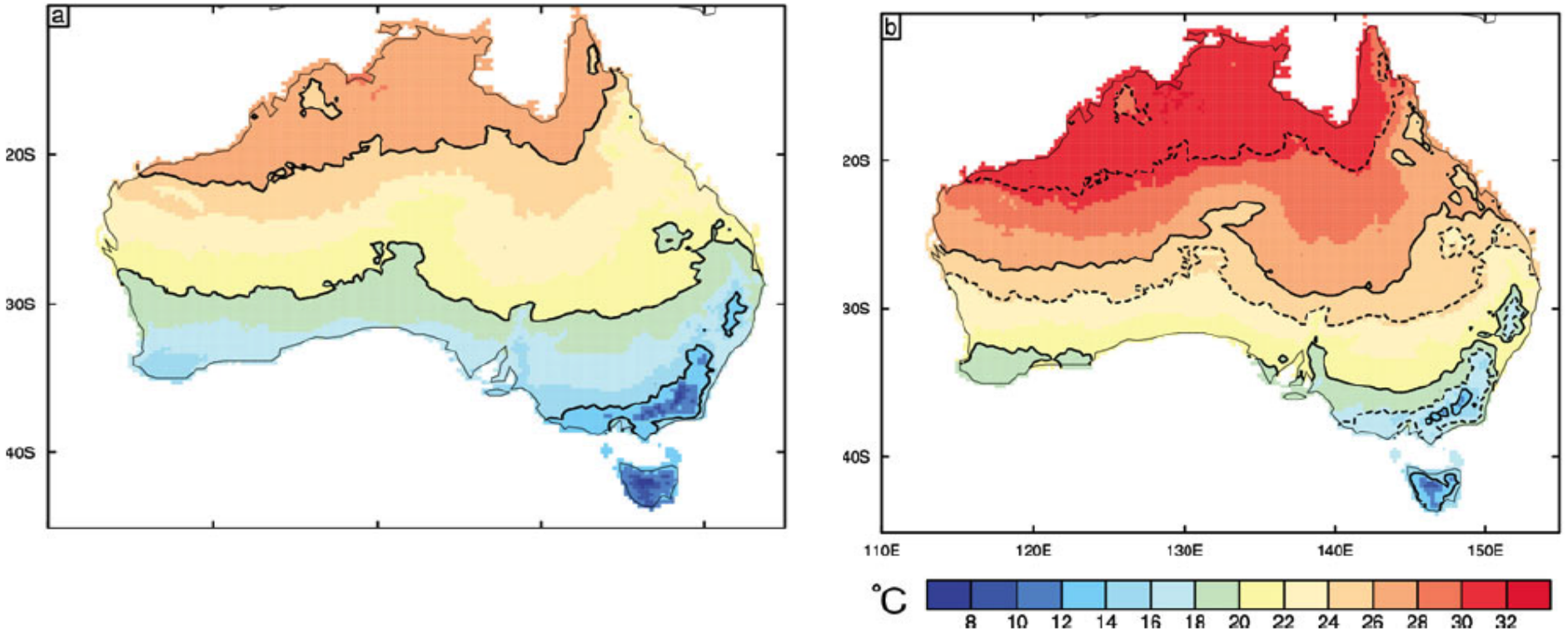
Source: Adapted from Meinshausen et al. (2009)

Projected temperatures
(high emissions scenario)

Current climate

Late 21st century

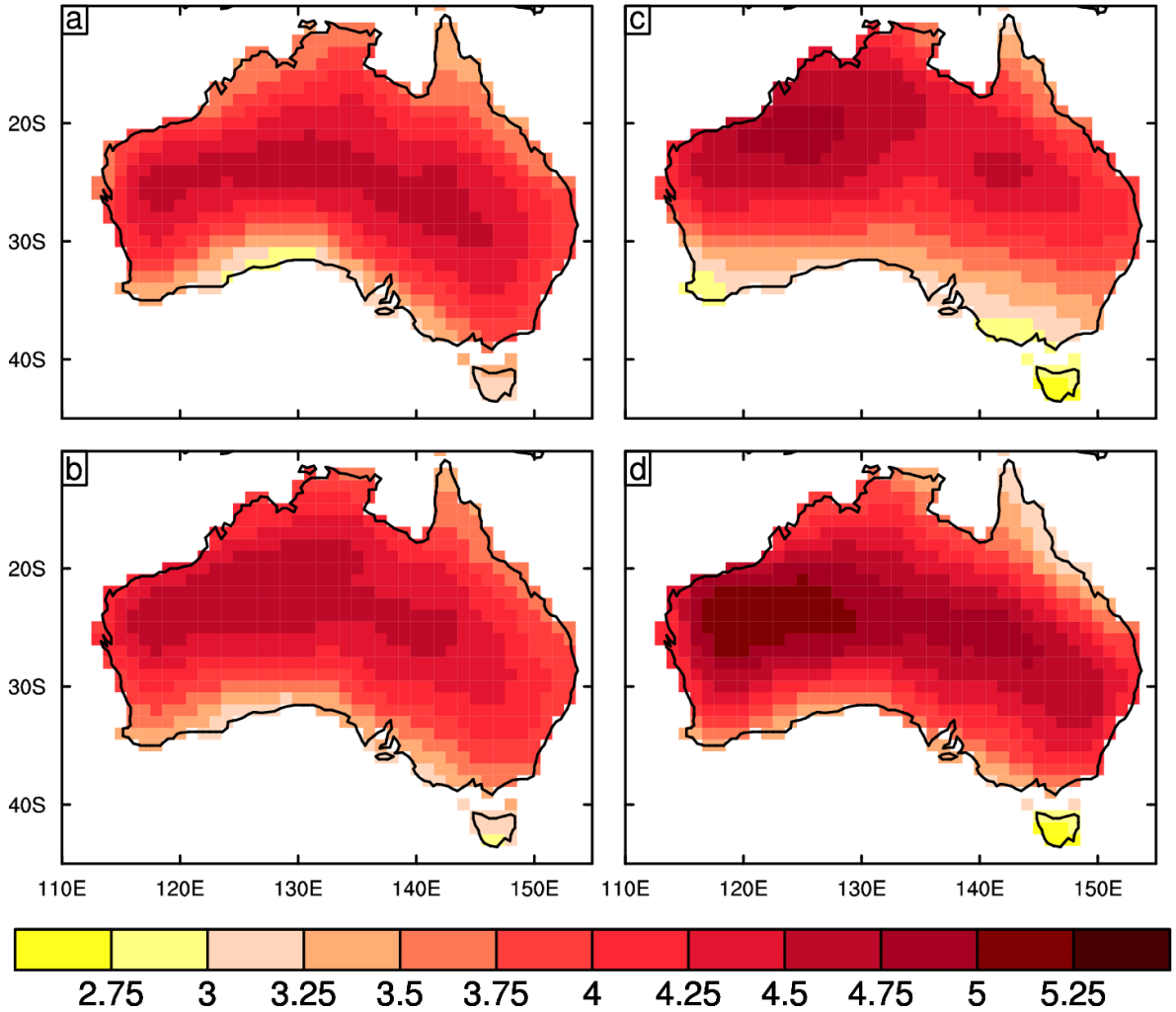


CSIRO & BoM 2015

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

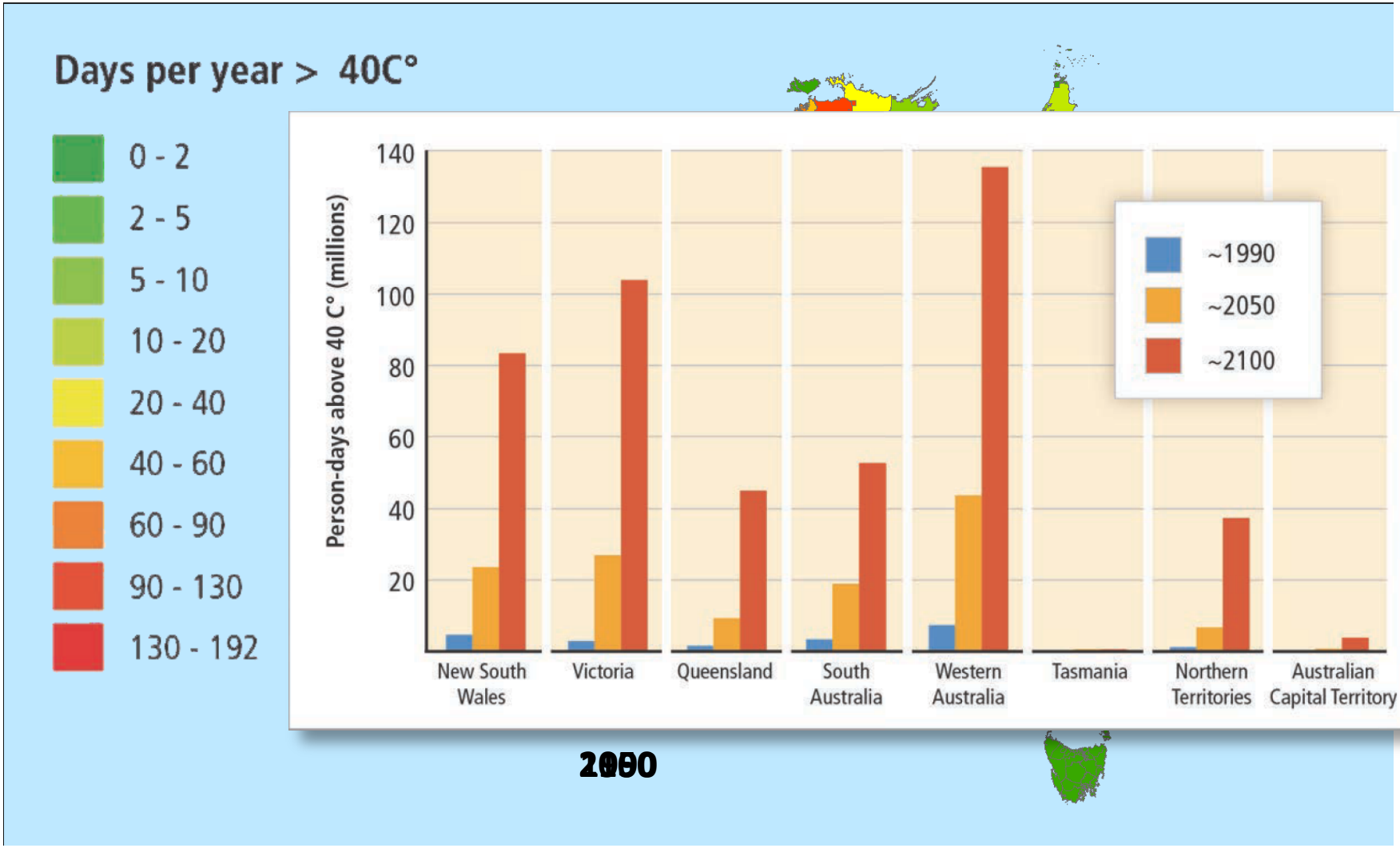
Projected temperatures

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



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

Potential heat exposure



IPCC 2014, Chapt 25

Projected average temperatures

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

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

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

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

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)

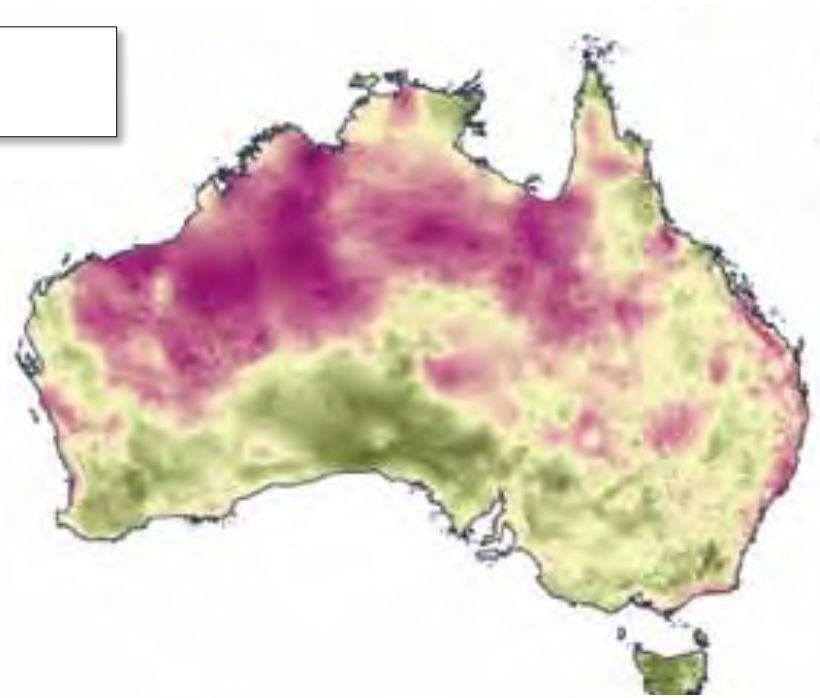
It's the extremes that matter

Future habitats

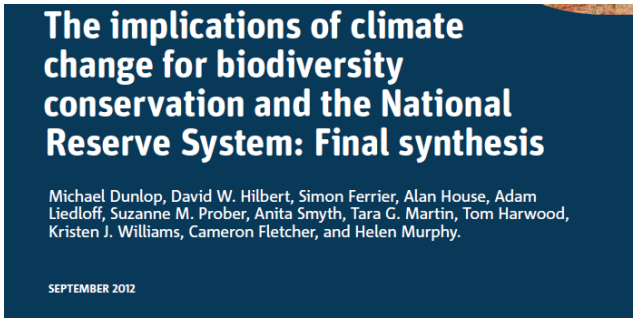
2030

Environment similar

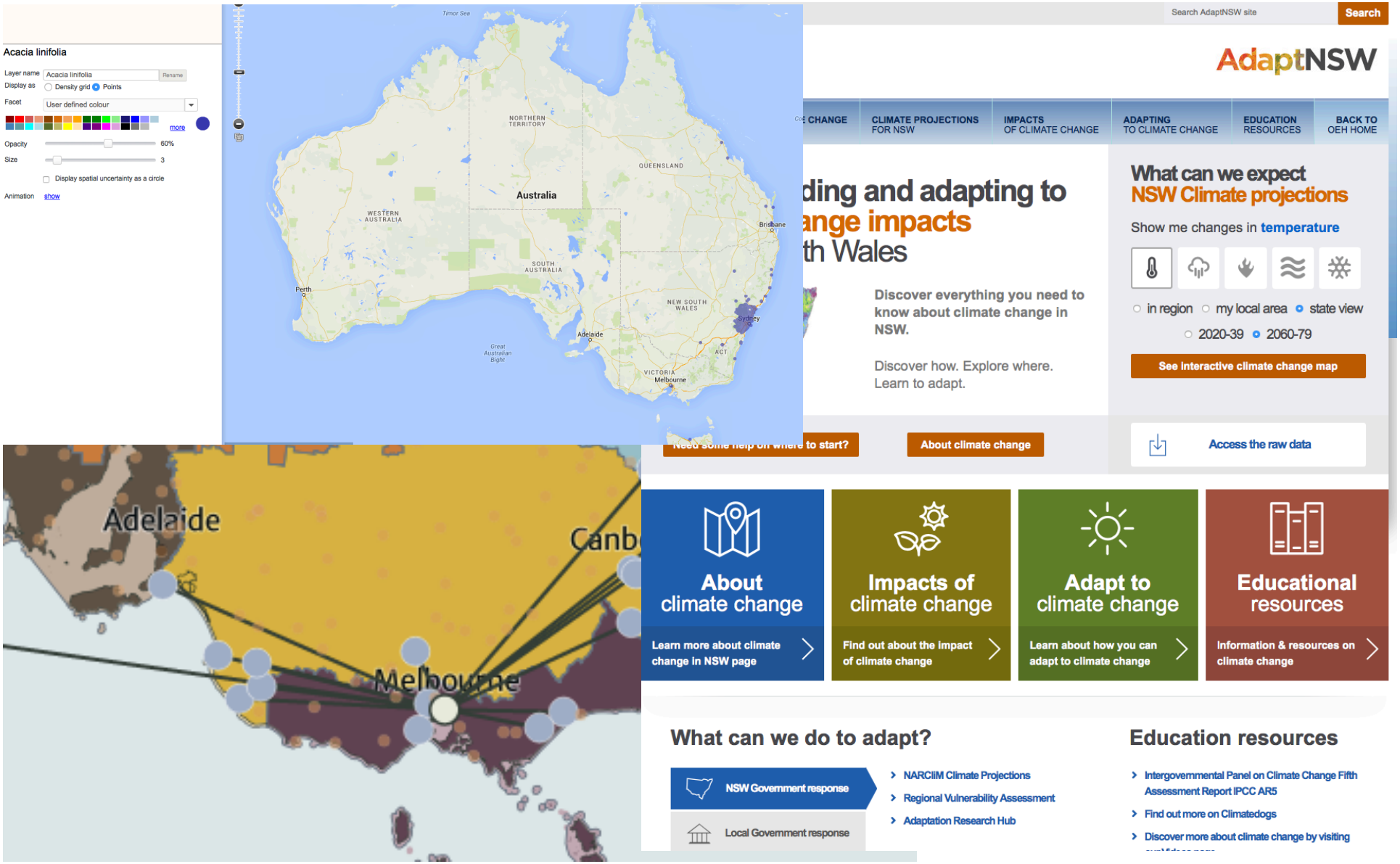
Environment different



2070



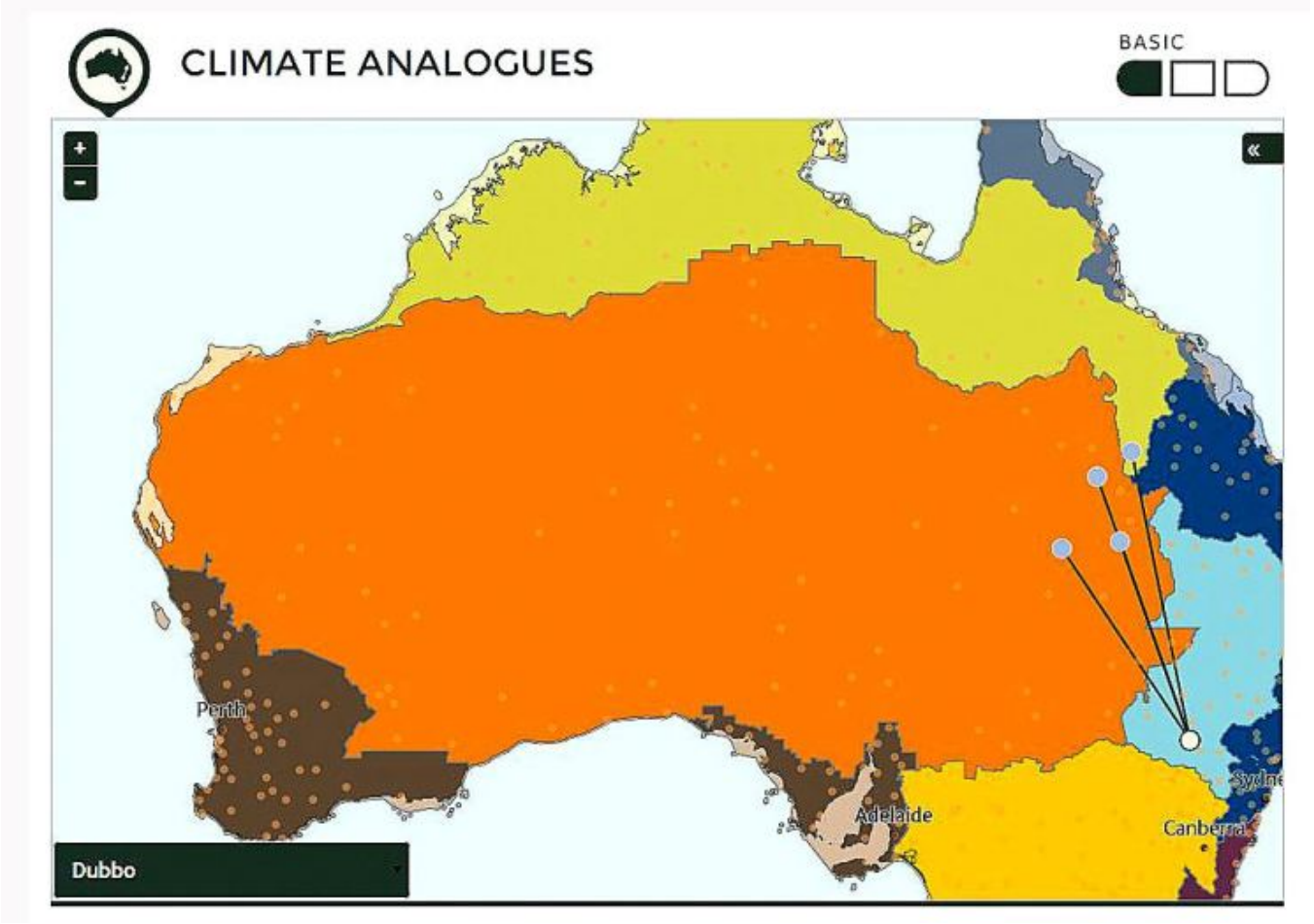
Tools for planning



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

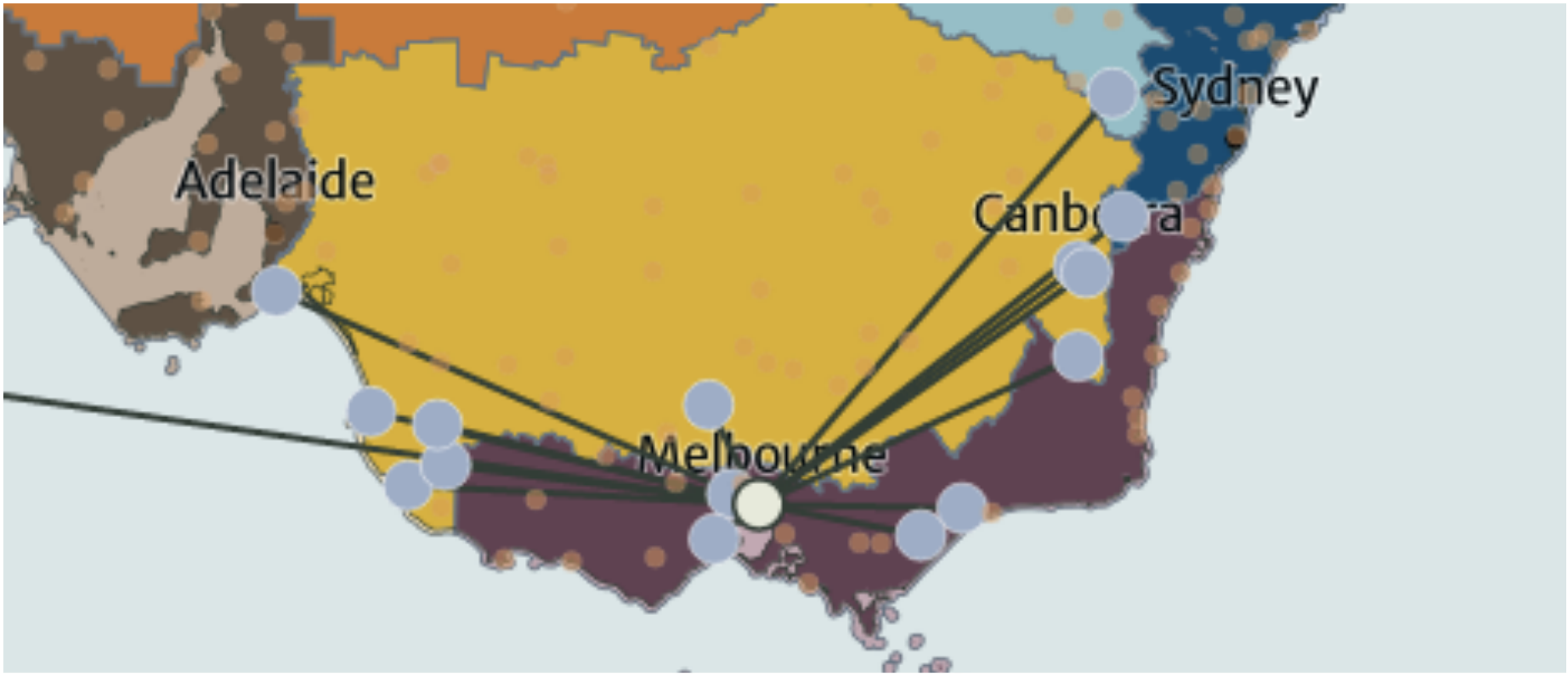
- GHG trajectories adopted as basis for modelling in the IPCC AR5
- 4 possible climate futures

RCP 2.6: “Low”

RCP 4.5: “Medium”

RCP 8.5: “High”

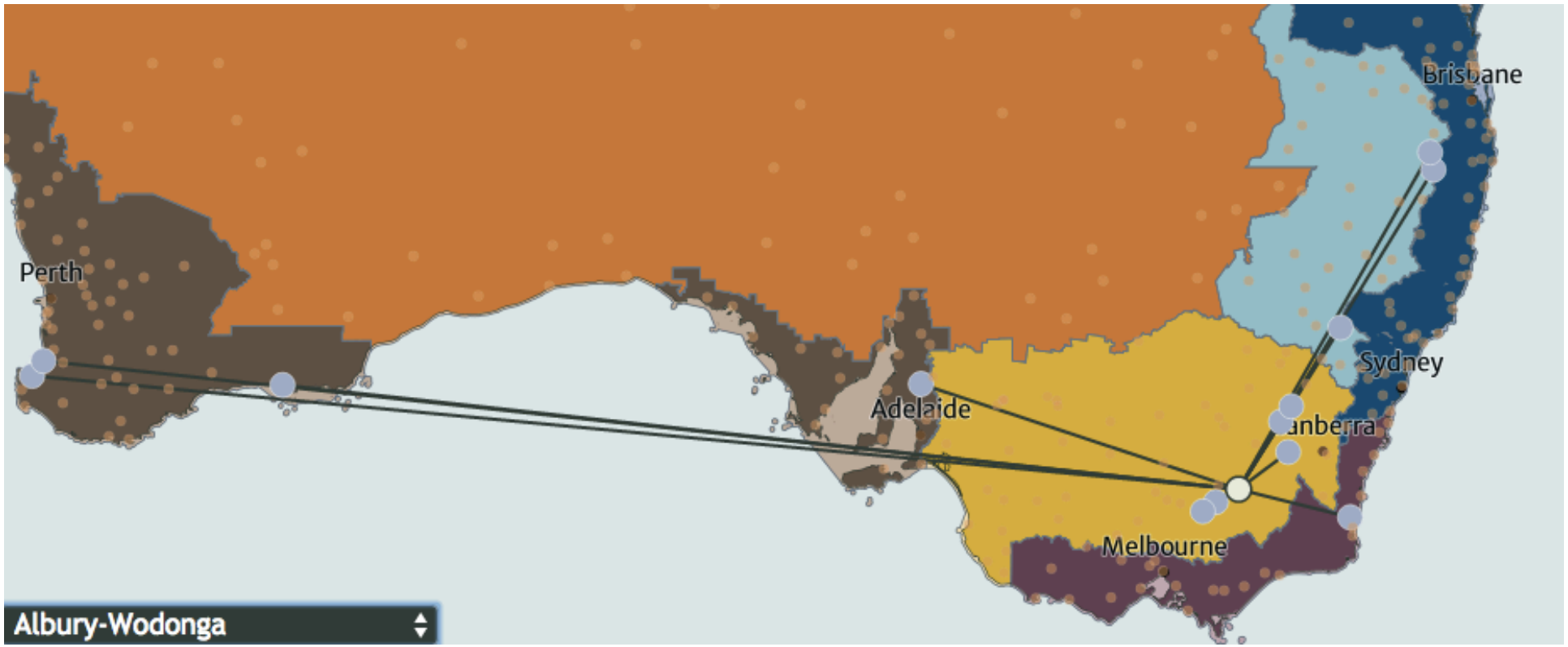
Climate analogue tool



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

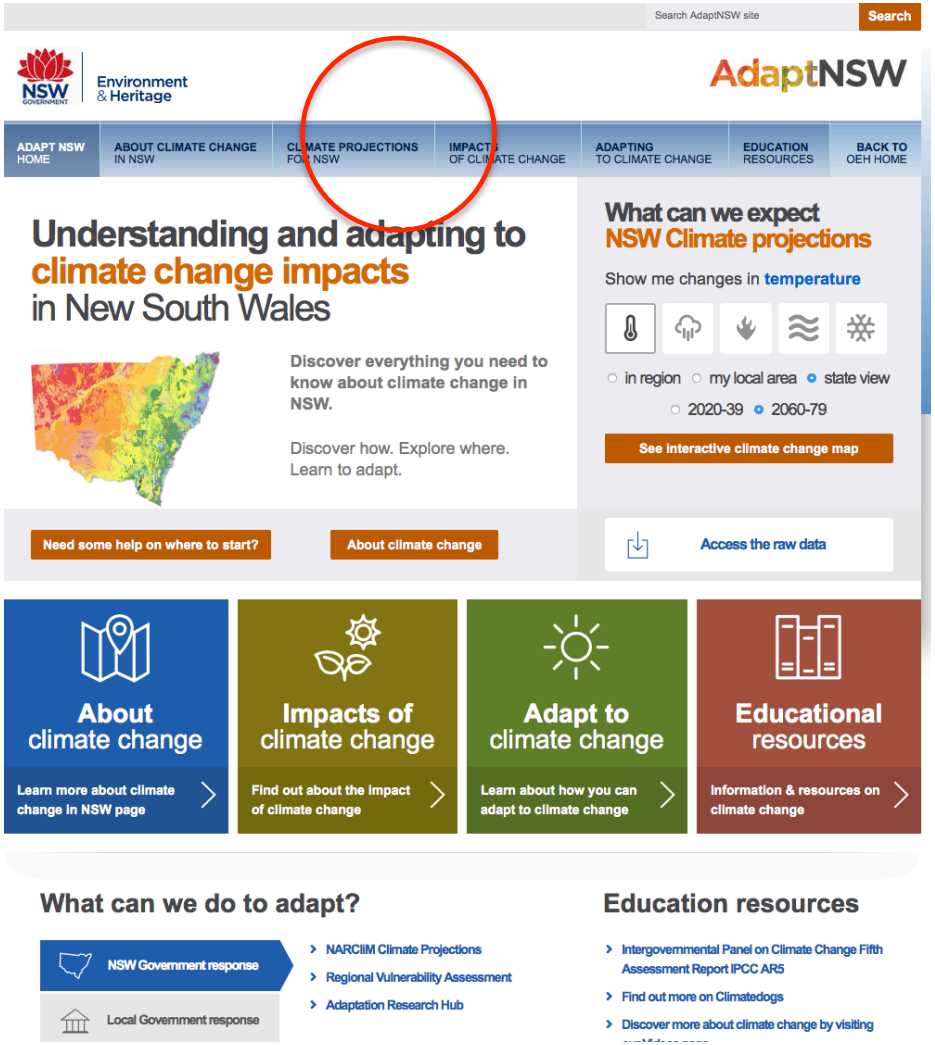
Victoria

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

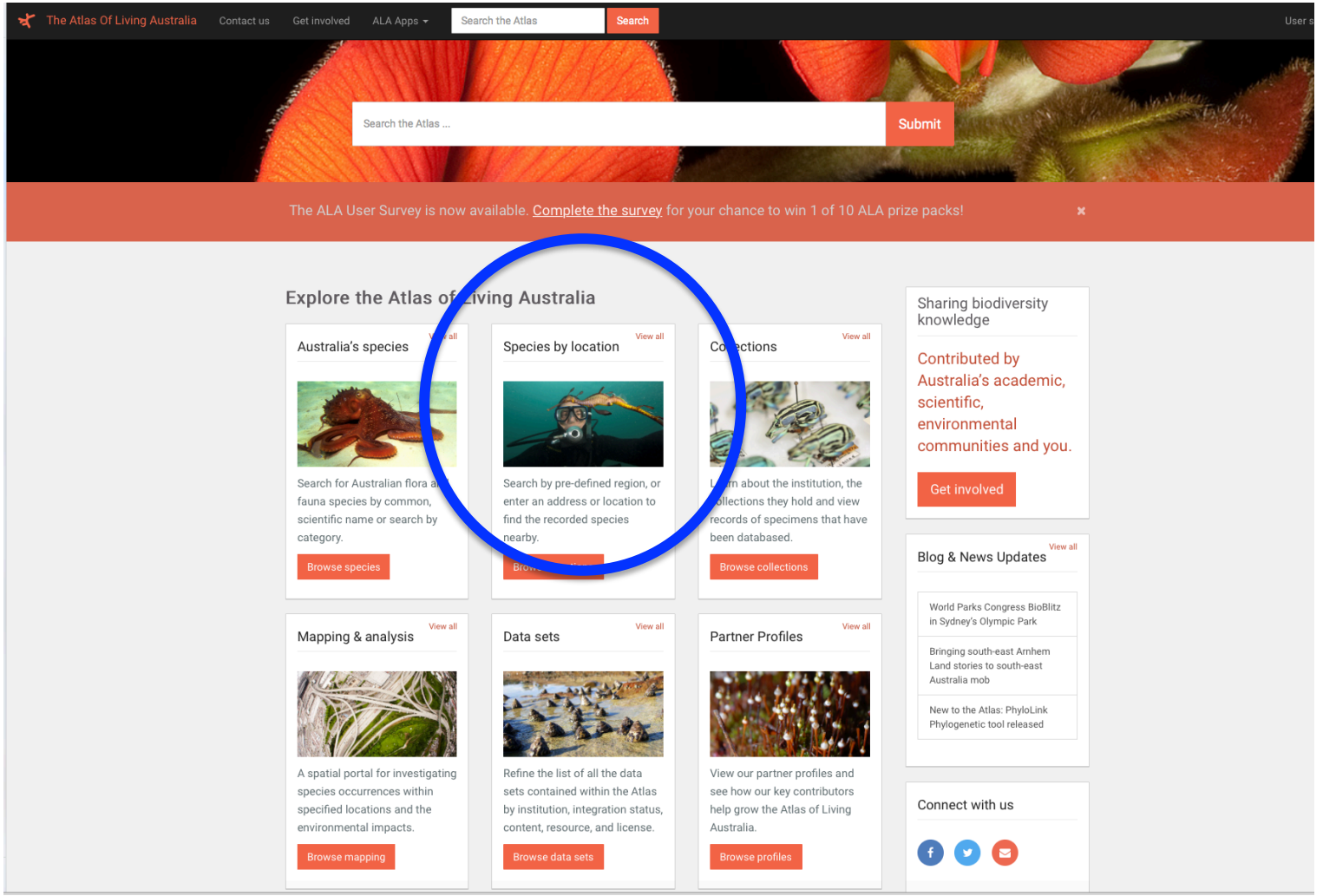
NARCliM website



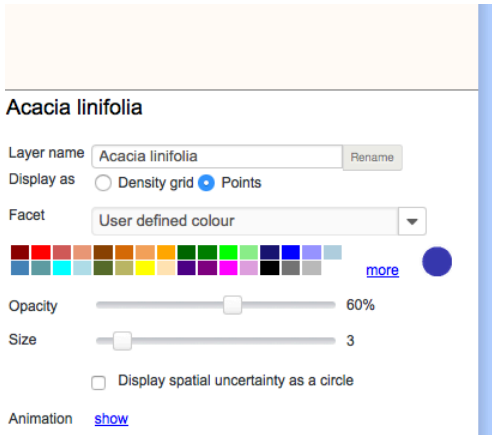
Near future 2030
Far future 2070
vs
1990 -2009

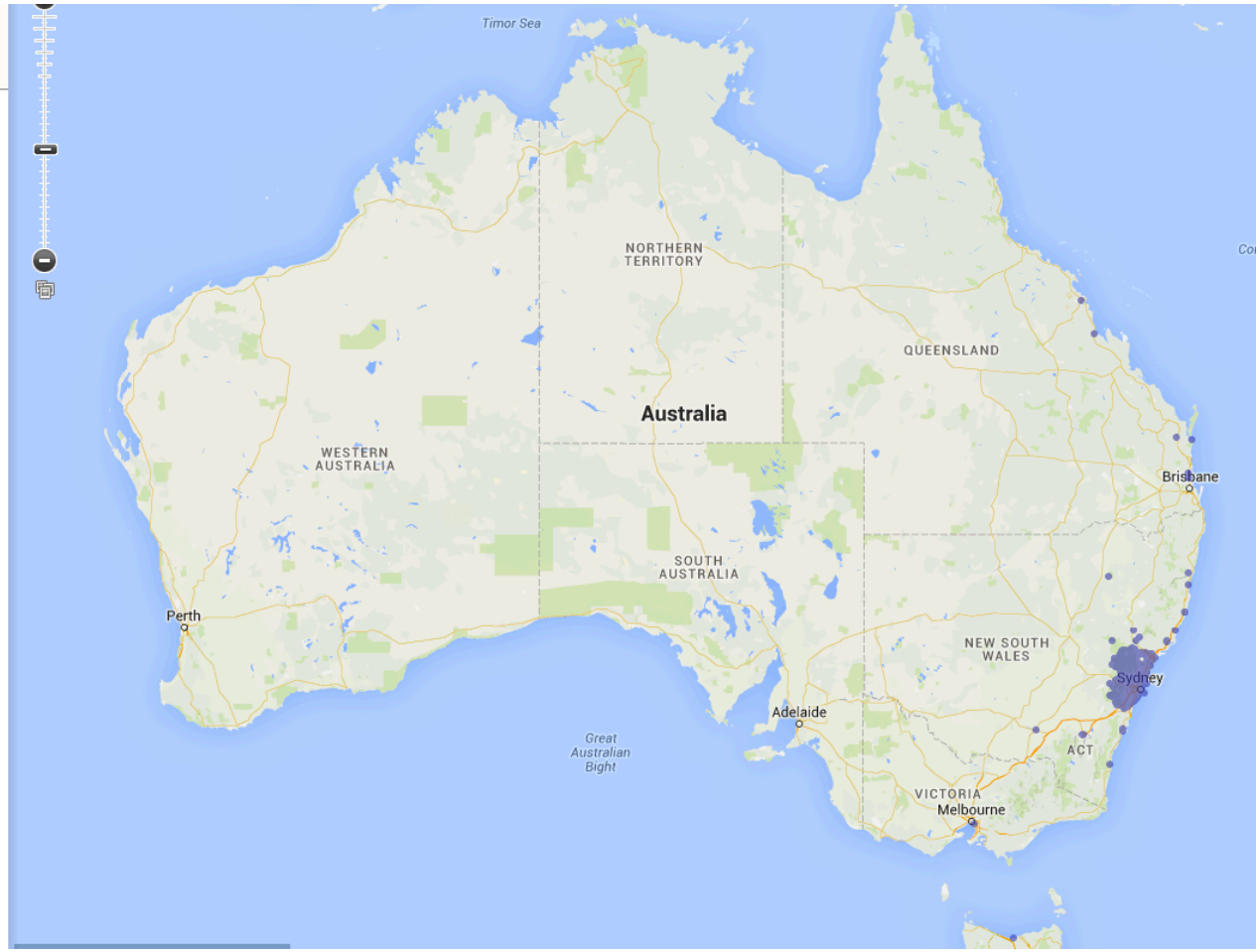
http://www.climatechange.environment.nsw.gov.au

Atlas of Living Australia



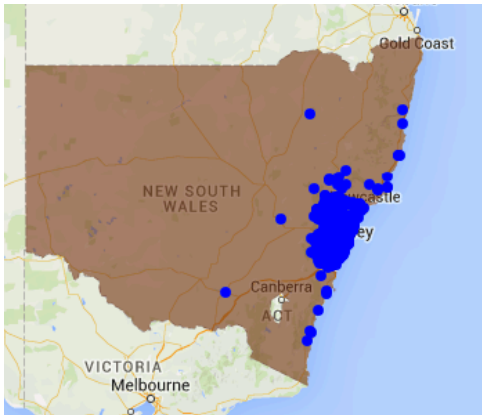
Atlas of Living Australia (ALA)
Acacia linifolia

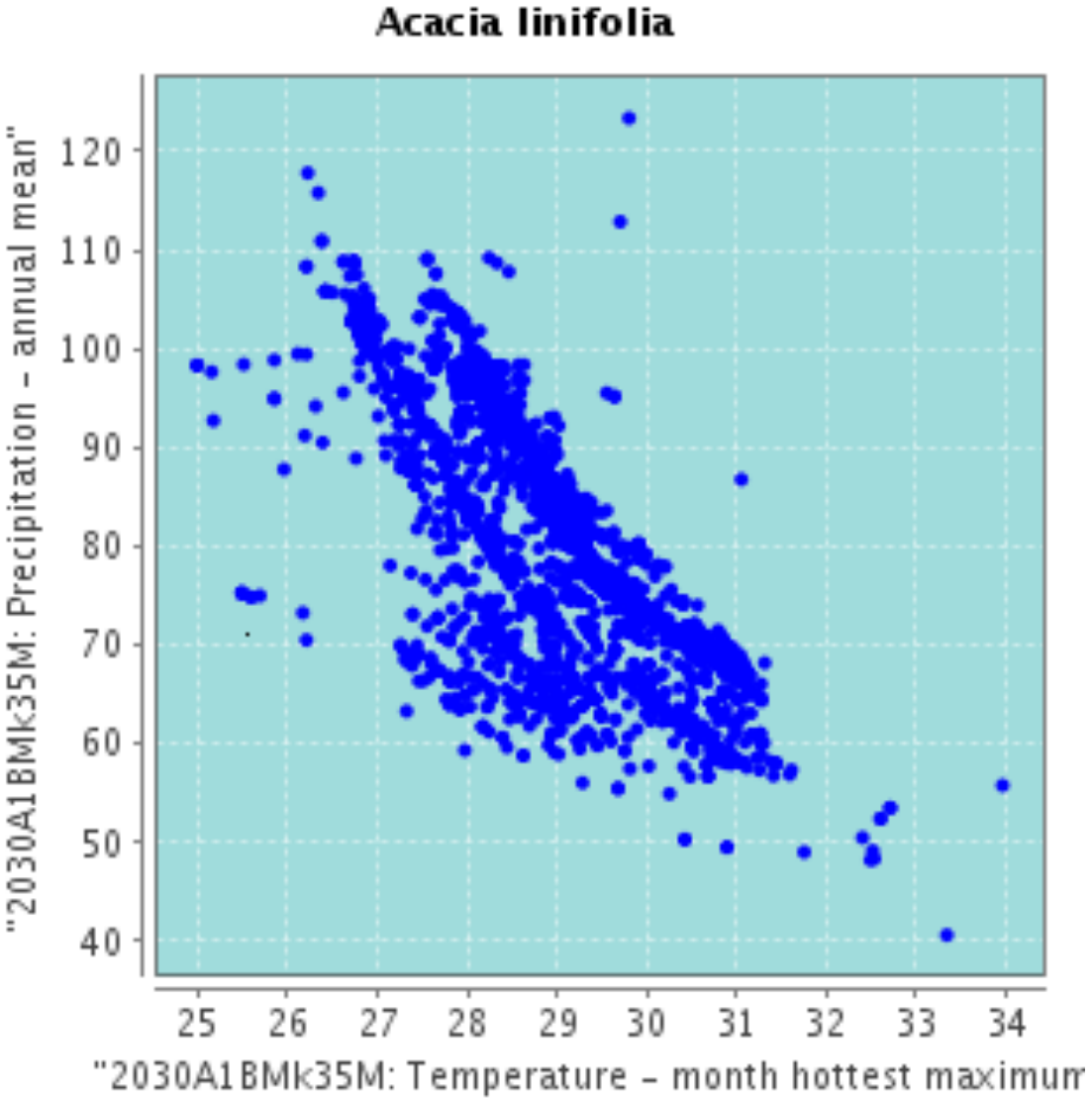




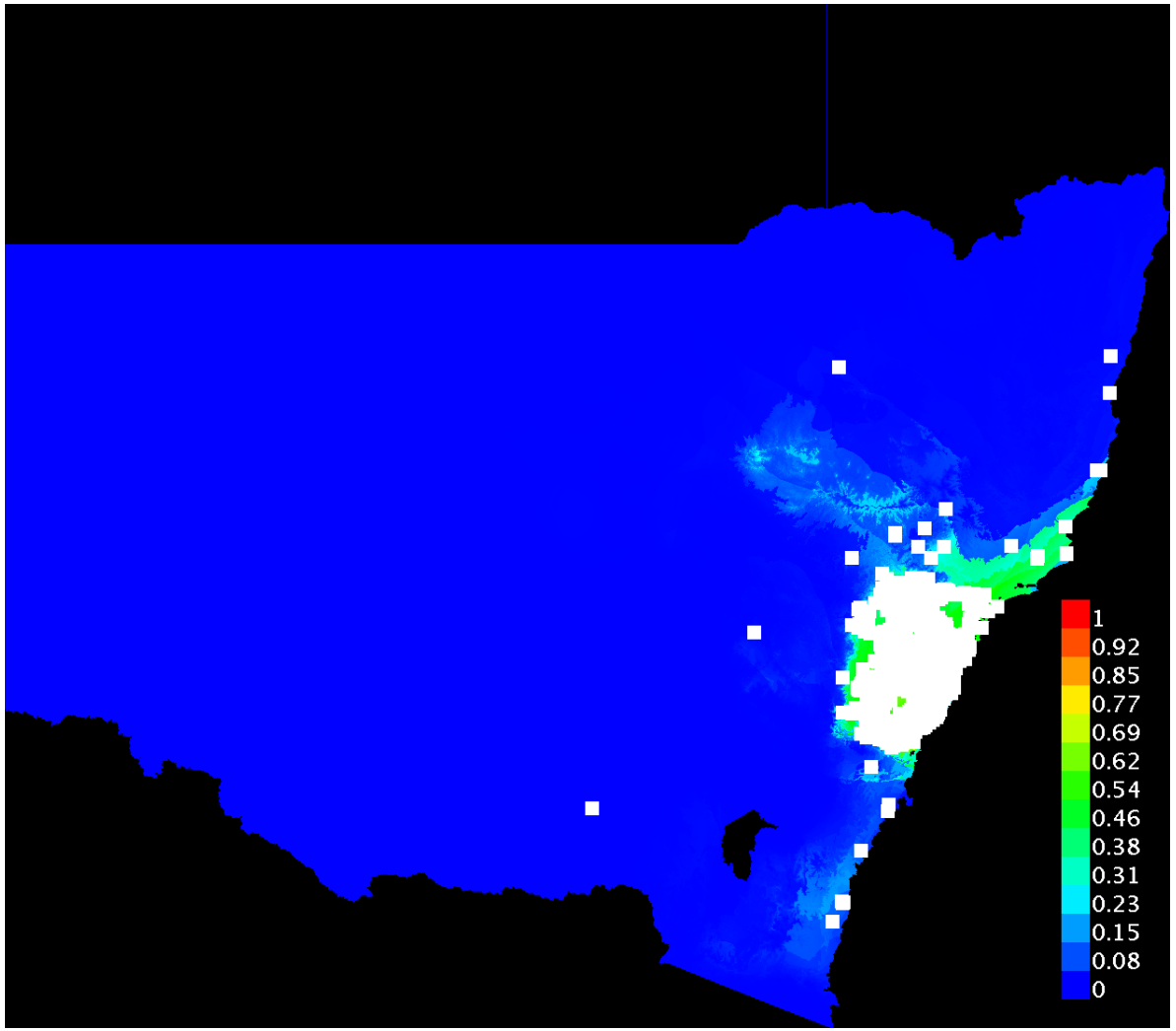
Method described in: Booth et al, 2012, *EMR*, 13, (3), 274-281

Current climate envelope vs future





Predicted future distribution



weedfutures.net

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

HELP

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 equilibrial world
- Need to be prepared for a hotter (probably) drier, more extreme environment
- We have some excellent tools for forward planning