



Climate services that facilitate the development, delivery and uptake of regional climate projections

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Outline

- CSIRO's climate research capabilities
- Australian climate projections
- Uptake of information

2018 IPCC
WORKSHOP

Commonwealth Scientific and Industrial Research Organisation (CSIRO)

Australia's
national science
agency, formed
in 1926

People ~5000

Sites 55

Budget \$1.2B



CSIRO Research Areas



AGRICULTURE



BIOSECURITY



DATA61



ENERGY



FOOD AND NUTRITION



LAND AND WATER



MANUFACTURING



MINERAL RESOURCES



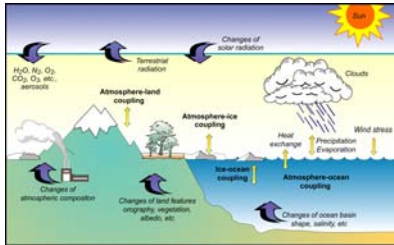
OCEANS AND ATMOSPHERE

CSIRO climate research capabilities

- Developed, delivered and supported the uptake of Australian climate change projections for 29 years, in collaboration with the Australian Bureau of Meteorology (BoM) for the past ten years.
- Over the past six years, CSIRO and the BoM have also created and supported climate projections for 15 countries the western tropical Pacific.
- Projections for a few countries in southeast Asia have also been produced.



CSIRO climate research capabilities



- Analysis of big datasets from many global climate models (e.g. CMIP5) and regional climate models (e.g. CCAM & WRF)
 - Assessment of model reliability
 - Development of regional climate projections for the 21st century for different greenhouse gas emission scenarios, years and climate variables
 - Focus on extreme events
 - Presentation of confidence ratings for projections
- Using current and projected hazard and exposure data to assess impacts in various sectors, e.g. food, health, energy, water, infrastructure, biodiversity, coasts, cities
- Integration of biophysical, social and economic research to assess adaptation options
- Co-production of knowledge between scientists and end users, e.g. universities, government, NGOs, industry, consultants

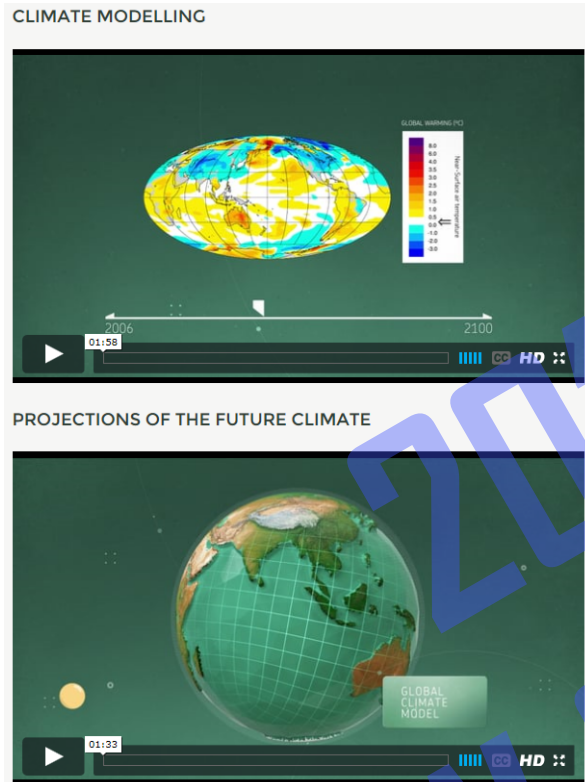
Australian climate projections



- A\$8.3 million research and outreach program¹ from 2012-2016
- Design of program was based on lessons learnt in Australia and the UK
- Early meetings between stakeholders, project leaders, key scientists, data managers and the communication manager established a mutual understanding of needs and research capabilities
- Wide variety of needs from basic to advanced
- A User Panel was formed to provide feedback on the projections during development

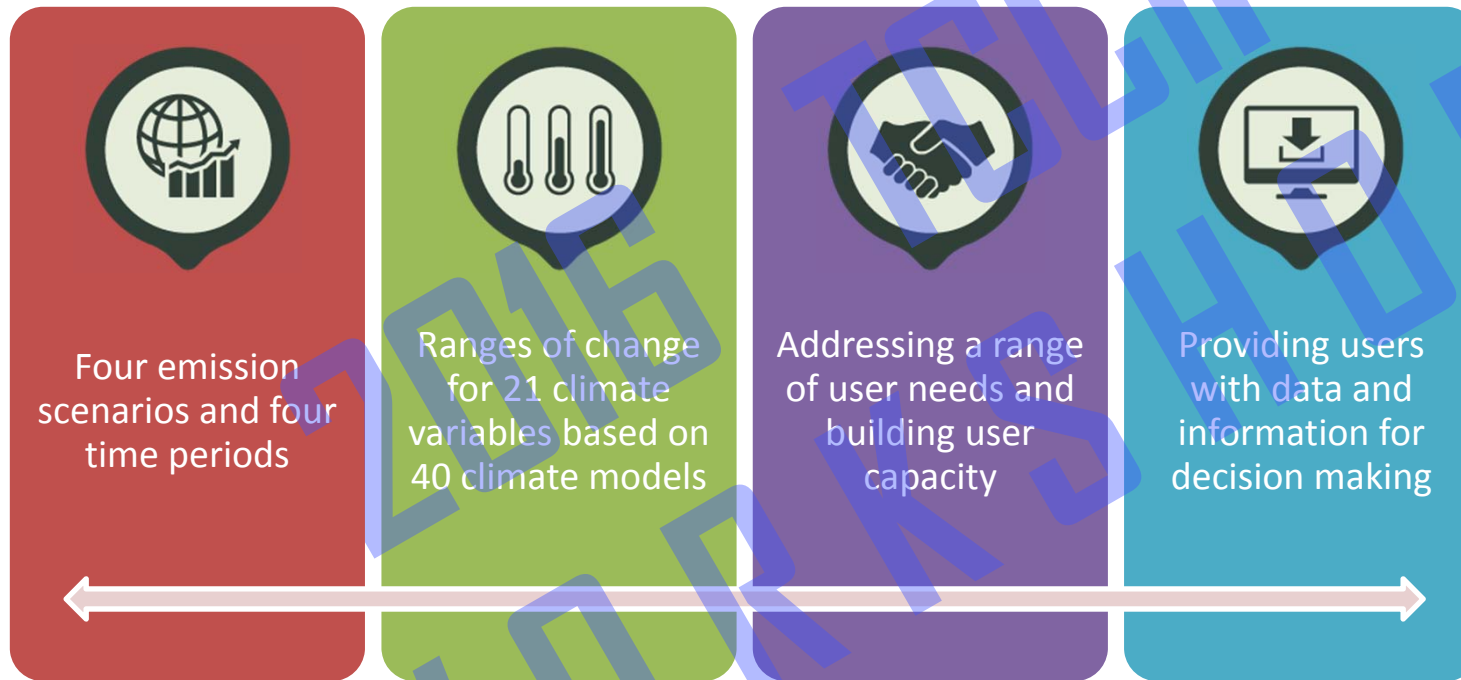
¹ Supported by the Commonwealth Government's Regional Natural Resource Management (NRM) Planning for Climate Change Fund administered by the Dep't of Environment, with co-funding from CSIRO and the Bureau of Meteorology

Australian climate projections

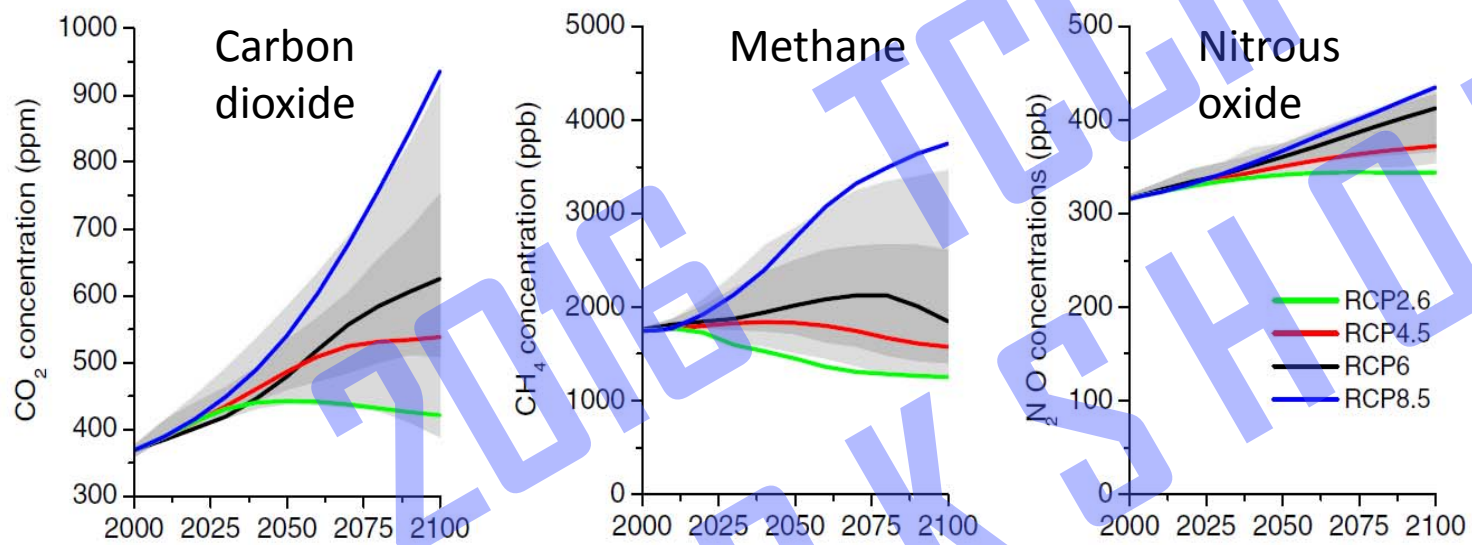


- A year before the projections were launched, workshops were co-designed by researchers and participants to develop the stakeholders' capacity to understand climate science
- Printed, web-based and technical products were prepared for different target audiences, including brochures, reports, web-tools, guidance material, online training, animations, slides and posters. The User Panel provided feedback
- About two months before the launch, briefings were provided for key stakeholders in government departments, as part of a "no surprises" strategy

Australian climate projections

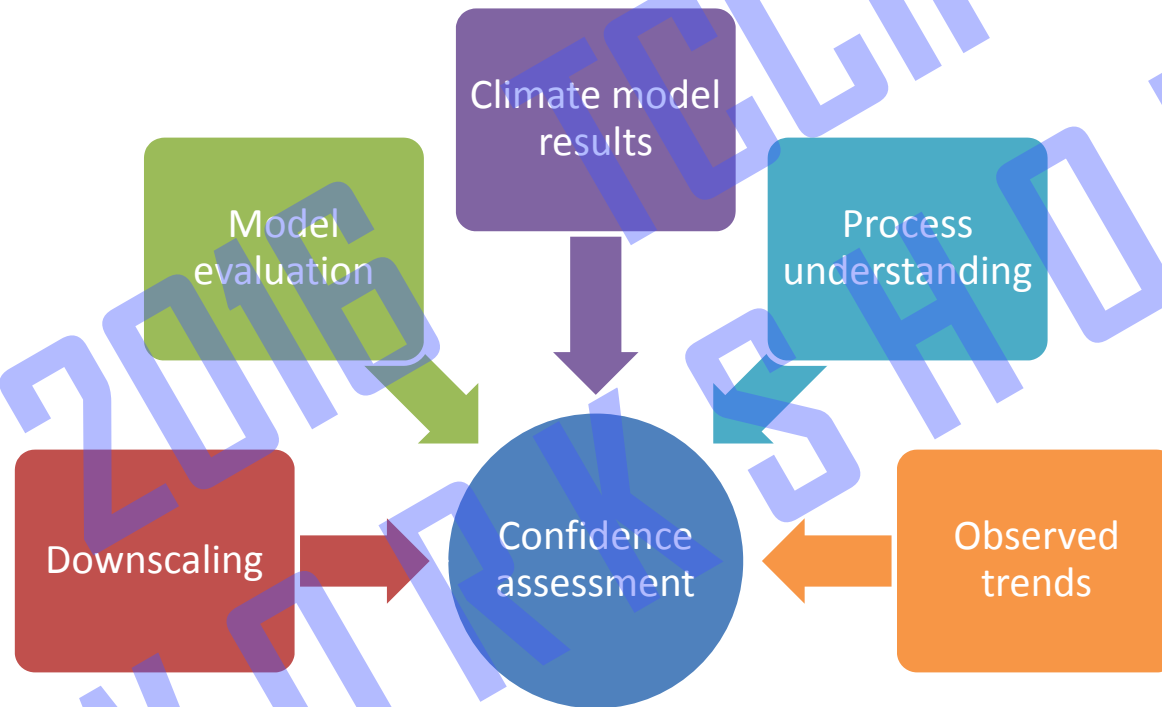


Greenhouse gas scenarios



Van Vuuren et al (2011)

Assessing confidence in projections





Temperature

There is *very high confidence* in continued increases of mean, daily minimum and daily maximum temperatures throughout this century for all regions in Australia

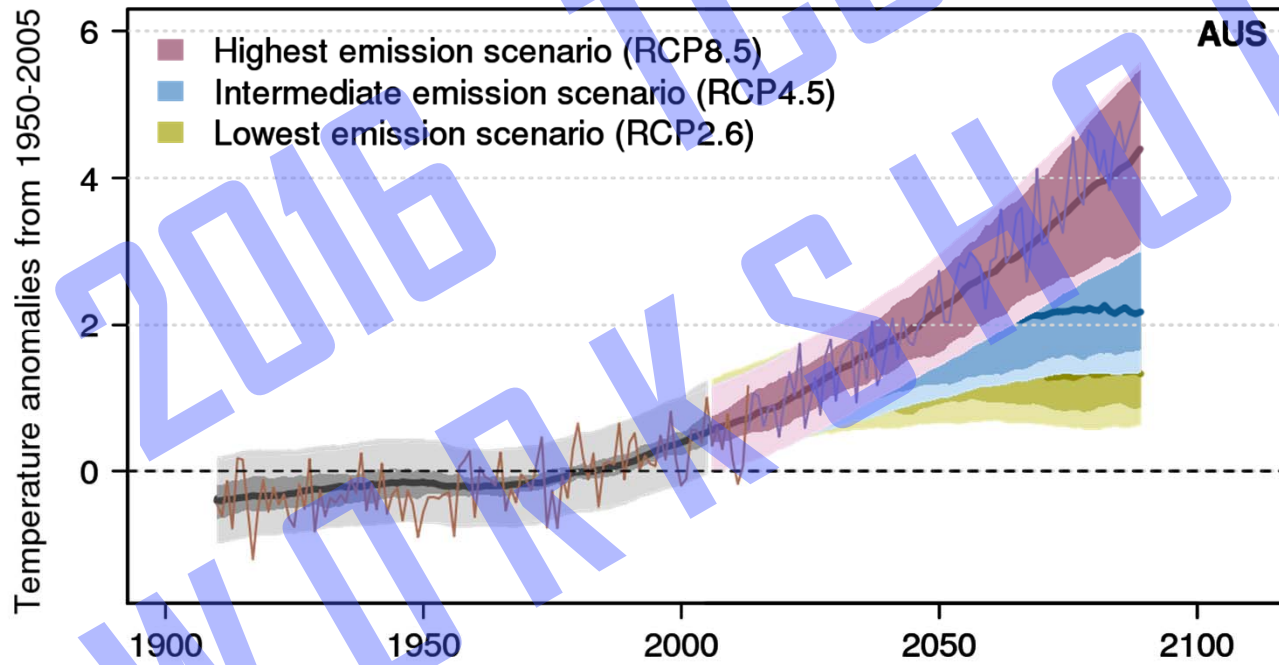
Warming will be large compared to natural variability in the near future (2030) (*high confidence*) and very large compared to natural variability late in the century (2090) under high emissions (*very high confidence*)

More frequent and hotter hot days (*very high confidence*)

Fewer frost days are projected (*high confidence*)



Temperature





HOT DAYS
DAYS OVER 35 °C
2090 / RCP4.5

DARWIN
+ 100 days

CAIRNS
+ 8 days

ALICE SPRINGS
+ 39 days

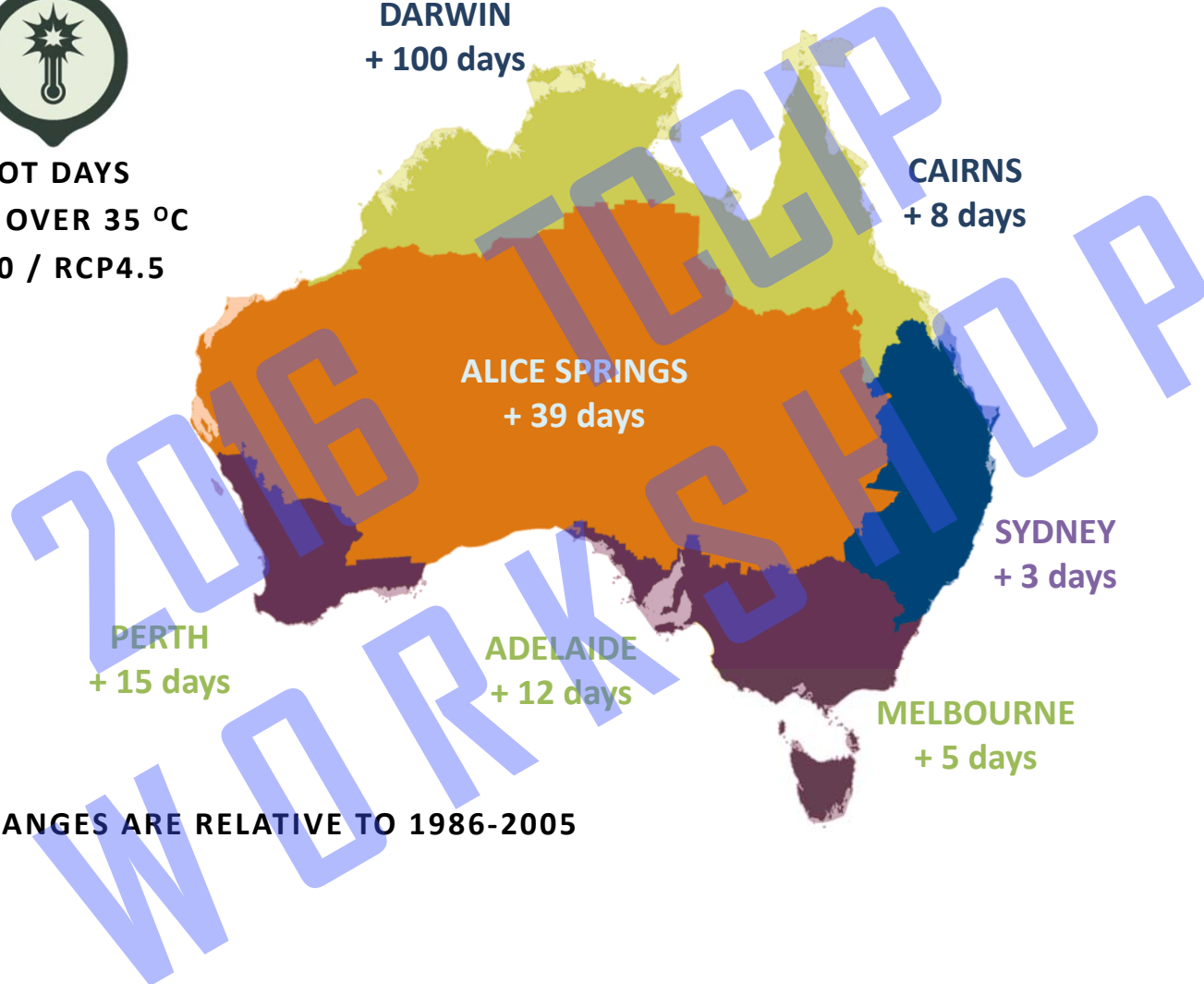
SYDNEY
+ 3 days

PERTH
+ 15 days

ADELAIDE
+ 12 days

MELBOURNE
+ 5 days

CHANGES ARE RELATIVE TO 1986-2005

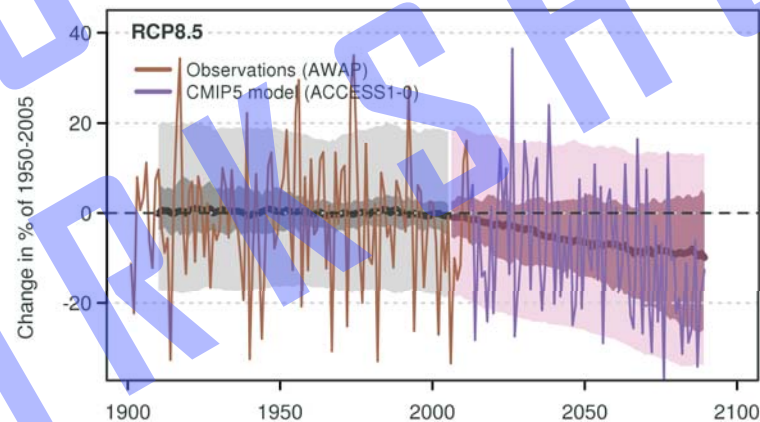
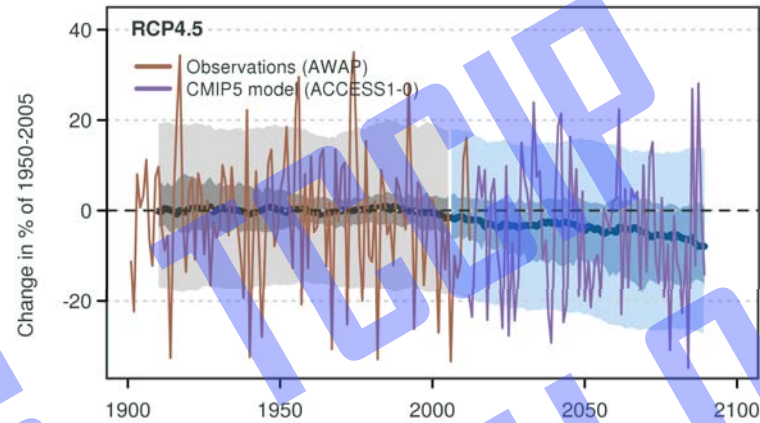




RAINFALL

Large variability from year to year, superimposed on a climate change trend

SOUTHERN AUSTRALIA





SOUTHERN AUSTRALIA

Winter and spring rainfall is projected to decrease (*high confidence*), though increases are projected for Tasmania in winter (*medium confidence*).

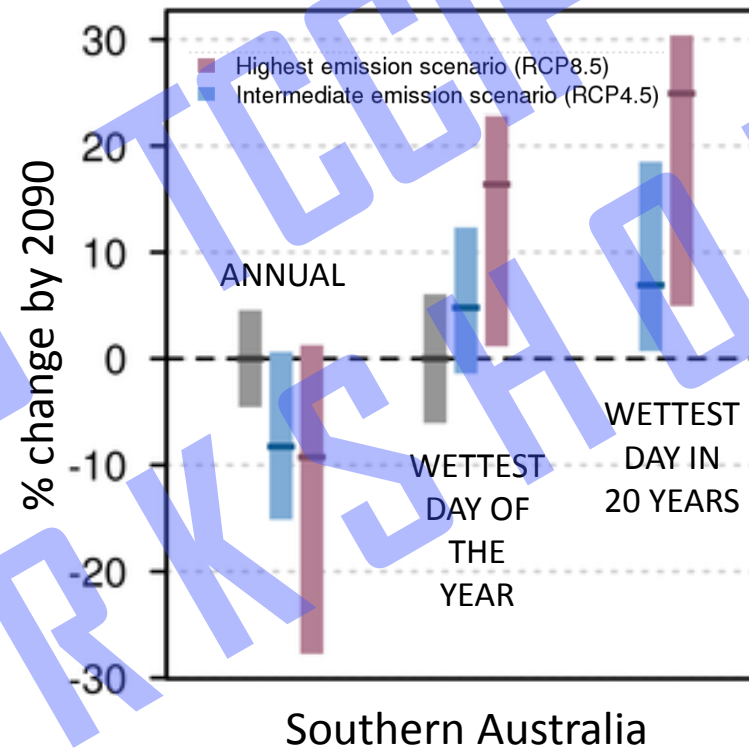
The direction of change in summer and autumn rainfall in southern Australia cannot be reliably projected, but there is *medium confidence* in a decrease in south-western Victoria in autumn and in western Tasmania in summer.

Range of change in % for 2090	Summer	Autumn	Winter	Spring
RCP4.5	-13 to +8	-19 to +9	-19 to +2	-23 to 0
RCP8.5	-13 to +16	-25 to +13	-32 to -2	-44 to -3



Extreme rainfall

Extreme rainfall events (wettest day of the year and wettest day in 20 years) are projected to increase in intensity (*high confidence*)



Launching the projections: part 1

- Basic website in January 2015
- Technical Report
 - The underpinning science behind all projections
- 8 Regional Reports
 - Focus on regional areas with distinct future climates
- 8 Regional Brochures
 - Key messages about regional climate change
- Supported by a media release
- Scientists with good communication skills available for interviews
- Webinars
- Help Desk
- Good uptake of information



Launching the projections: part 2

- Enhanced website in April 2015
- Data delivery brochure
- Selected cities brochure
- USBs with pdfs of all reports and brochures
- Powerpoint presentations
- Animations
- Images as jpg files



MELBOURNE
PROJECTED CHANGES RELATIVE TO 20 YEARS CENTERED ON 1995

Variable	Season	2030 RCP4.5	2090 RCP4.5	2090 RCP8.5
Temperature (°C)	Annual	0.6 (0.5 to 0.9)	1.5 (1.1 to 1.9)	3 (2.4 to 3.8)
	Summer	0.7 (0.4 to 1.2)	1.5 (1 to 2.3)	3.4 (2.3 to 4.6)
	Autumn	0.7 (0.4 to 0.9)	1.4 (1.1 to 1.9)	3.1 (2.4 to 4)
	Winter	0.6 (0.4 to 0.8)	1.3 (1 to 1.7)	2.8 (2.2 to 3.4)
	Spring	0.7 (0.3 to 0.9)	1.5 (1 to 1.9)	3 (2.4 to 3.8)
Rainfall (%)	Annual	-2 (-8 to +3)	-7 (-15 to +3)	-9 (-27 to +4)
	Summer	-2 (-20 to +16)	-3 (-24 to +10)	-5 (-28 to +17)
	Autumn	0 (-20 to +14)	-4 (-17 to +14)	-5 (-30 to +15)
	Winter	-3 (-10 to +7)	-4 (-14 to +7)	-10 (-25 to +6)
	Spring	-5 (-14 to +6)	-10 (-24 to -3)	-19 (-43 to -5)
Evapotranspiration (%)	Annual	2.7 (1.8 to 4.8)	6.5 (3.7 to 9.9)	12.5 (9.2 to 21.4)
Wind speed (%)	Annual	-0.2 (-3.3 to +1)	-1.1 (-5.2 to +0.9)	-1.7 (-5.9 to +1.7)
Solar radiation (%)	Annual	0.8 (0.1 to 2.3)	2 (0.2 to 3.6)	3.1 (0.9 to 7)
Relative humidity (%) (absolute)	Annual	-0.4 (-1.1 to +0.5)	-0.9 (-2.2 to +0.1)	-1.8 (-3.8 to -0.6)
Sea level rise (m)* (Stony Point)	Annual average	0.11 (0.07-0.16)	0.44 (0.27-0.62)	0.59 (0.38-0.81)

MELBOURNE

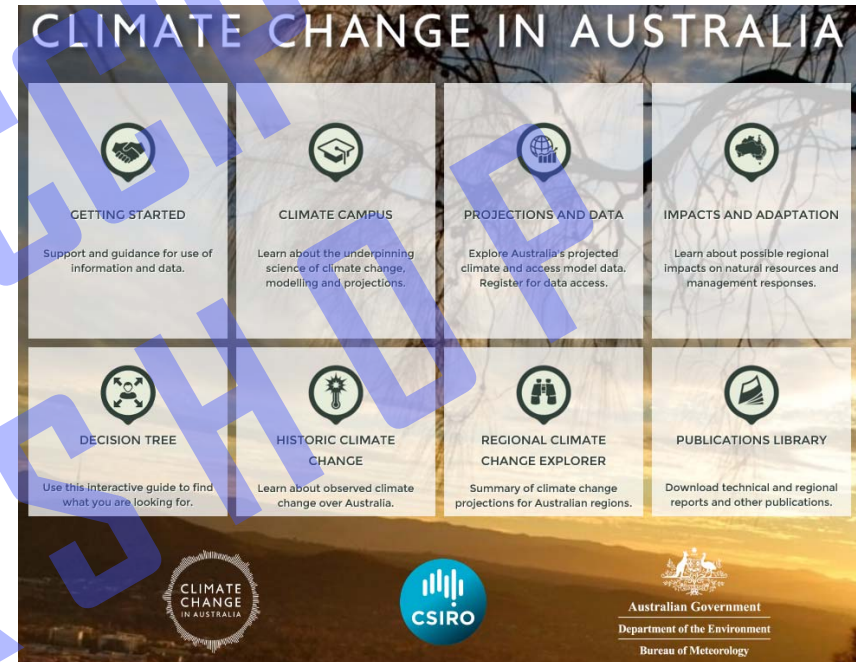
Current average (1981–2010) annual number of days above 35 °C and below 2 °C (frosts). Projections are also shown for 30-year periods centred on 2030 (RCP4.5) and 2090 (RCP4.5 and RCP8.5).

Threshold	Current	2030 RCP4.5	2090 RCP4.5	2090 RCP8.5
Over 35 °C	11	13 (12 to 15)	16 (15 to 20)	24 (19 to 32)
Below 2 °C	0.9	0.6 (0.8 to 0.4)	0.2 (0.3 to 0.1)	0.0 (0.0 to 0.0)



Website

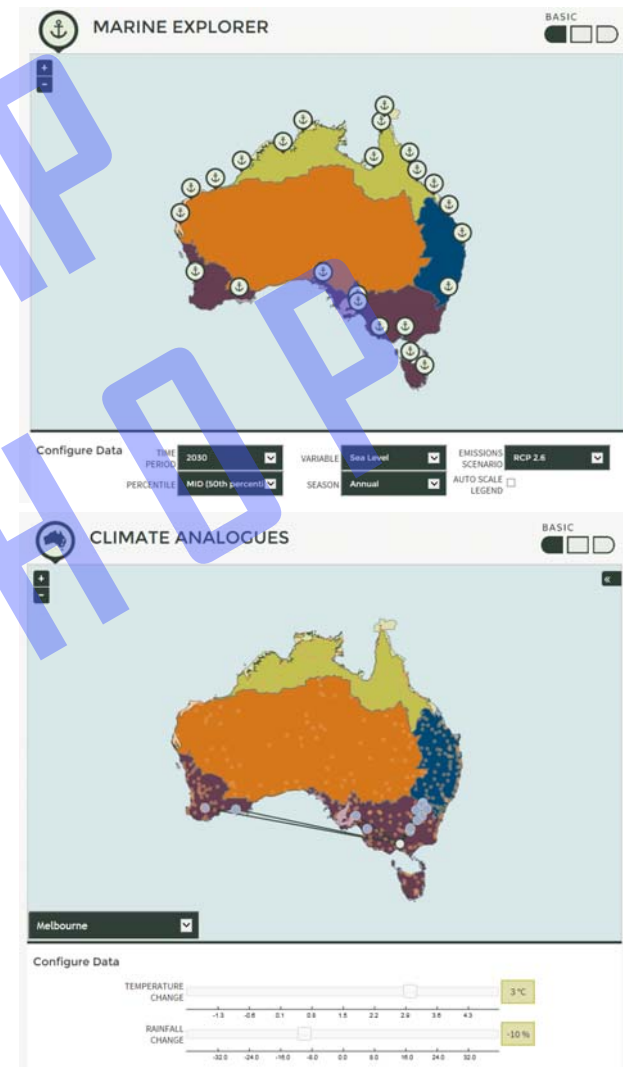
- Getting Started includes a Decision Tree to help people find what they want
- Climate Campus with guidance material including information about climate science and using projections in impact assessments
- Historic climate change information
- Projections and data
 - Climate change data (relative to 1986-2005)
 - Application-ready data (where projected changes have been combined with observed data)
 - 9 tools including the Analogues tool, Temperature Extremes Calculator, Marine Explorer & Map Explorer
- Information about impacts and adaptation



www.climatechangeinaustralia.gov.au

Uptake of information

- Website has received over 120,000 unique visitors and has almost 800 registered users
- Climate services provide ongoing outreach and support for stakeholders to facilitate widespread uptake of information
- Outreach activities include presentations, workshops and training courses to facilitate capacity-building and application of projections
- The Help Desk has handled over 100 requests for information tailored for specific applications
- Good examples of applications will be documented in case studies



Uptake of information

- Support can be technical (e.g. providing data, explaining methods, demonstrating tools), and often involves targeted communication and knowledge-brokering
- It is also important to undertake continuous monitoring and evaluation to assess uptake and impact
- User surveys are helping us evaluate the utility of products and services, consistent with the Global Framework for Climate Services



Thank you

2016 TCCIP
WORKSHOP