

Climate Services for Water Resources – the Australian experience

Louise Wilson, Chantal Donnelly, Pandora Hope,
Elisabeth Vogel, Wendy Sharples , Justin Peter,
Ulrike Bende-Michl, Margot Turner, Julien Lerat ,
Robert Pipunic

Bureau of Meteorology, Australia

Outline

1. Australian context – a unique hydroclimate and the existing service landscape
2. The need for new services
3. Designing new services:
The UCD process
4. New services: short-term and seasonal forecasts, projections
5. Towards seamless information



*Supports many
human & ecological needs:*

Extinguishes fires

Supports ecosystems

Supports recreation, tourism

Supports energy systems – cooling water

Supports agriculture – dryland & irrigated

Supports people –
urban & rural drinking water supply

Supports resources extraction

Supports industries

Supports life!



Australia's Hydroclimate

Driest inhabited continent

Water Availability

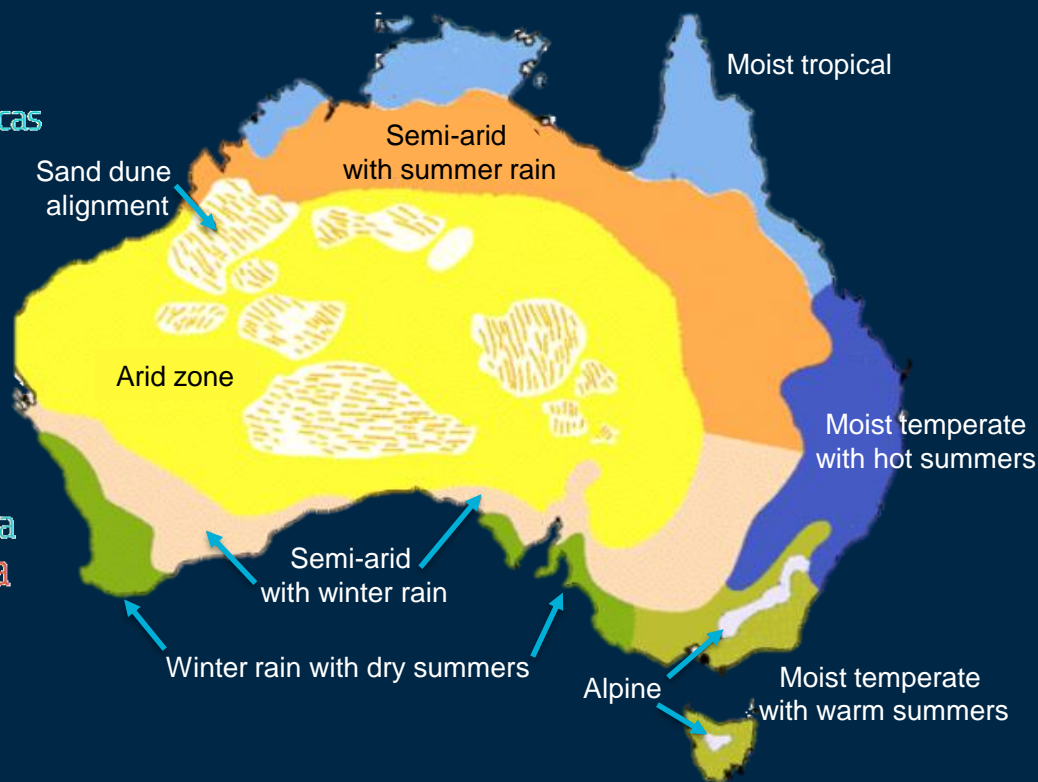
Annual streamflow per km²



High water use per capita

Water Use

Daily consumption per capita





Australian Context – Current Offerings

Fragmented Landscape



- Multiple services available across many organisations
- No funding for ongoing service provision
- National climate service does not extend to water impacts sufficiently
- Need for better coordination between Federal and States
- Methods for assessing impacts on water resources vary considerably
- Confusing for users



Customer needs

UCD Phase – 8 months

- Interviews with 56 potential customers from 20 organisations
- 33 potential uses across 7 different sectors

"I want to be able to understand best practice for performing climate assessments."

DIRDAC

"The 100 year history, is becoming less and less of a good comparison. We're starting to look at since the 1997 drought."

ABARES

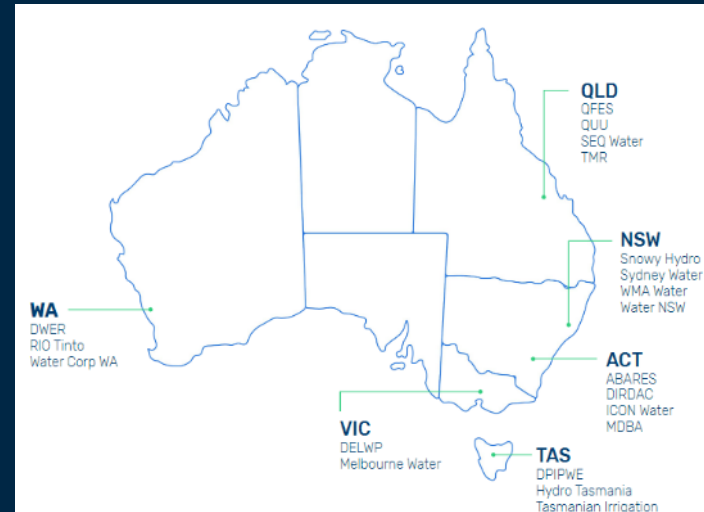
"I would like to see comparisons between basins"

MDBA

"I would like a broad 'coverage' of advice and information across multiple impacts, areas, variables..."

DELWP

Users	Product	Use Cases
Asset and infrastructure	Gridded, transient timeseries	Reassess Millennium Drought Bulk water storage
Water utilities	Changes in catchment yields	Water security Water production
Energy and resources	Combining hydro projections with other climate information	Pumped hydropower strategic design
Emergency services	High-res projection data for compound event analysis	Disaster management plans and risk assessment

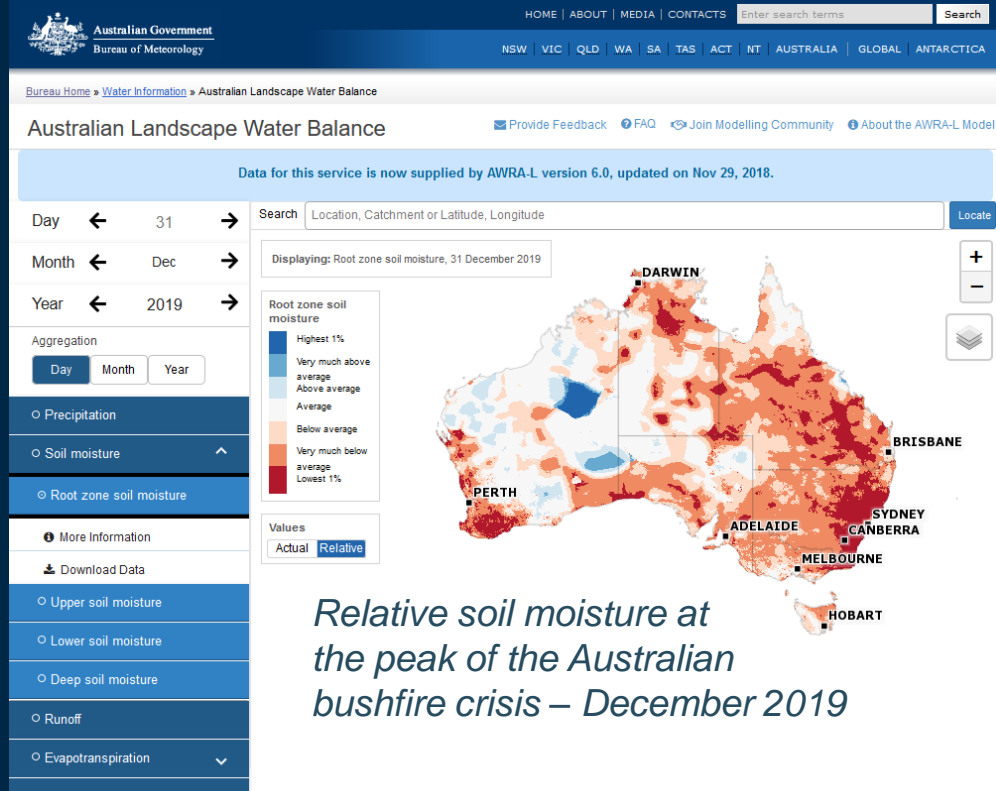




Existing National Hydrologic Operational Service

The Australian Landscape Water Balance

- Near real time water balance variables daily from 1910 until 'yesterday'
- Used across water, agriculture, government, research, insurance, and other sectors



Relative soil moisture at the peak of the Australian bushfire crisis – December 2019



Enhanced Australian Landscape Water Balance service



Expected release:
late 2020

1-10 day
forecast

Seasonal
forecast

Future
projections

Gridded output for all of Australia

- Uses the existing AWRA-L model
- Daily output at 5x5 km

Included variables:

- Soil moisture
- ET, PET
- Runoff

Information to assist you with decision making:

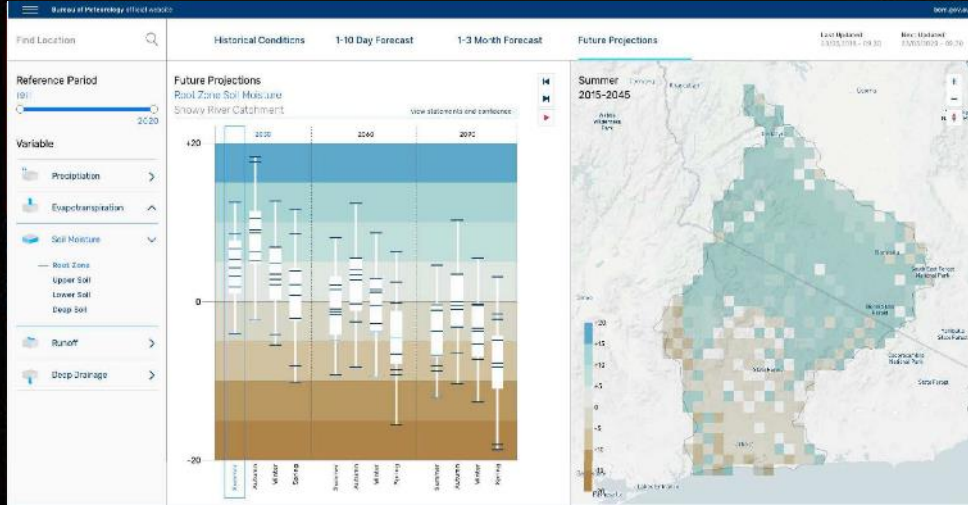
- For gauged and ungauged catchments
- Long term strategic planning
- Assessing climate risk



Service Specifications

1-10 day
forecast

Seasonal
forecast



Parameters include:

- Soil moisture (output from AWRA-L)
- Runoff (gridded) (output from AWRA-L)
- PET (output from AWRA-L)

Short-term forecast:

- Daily, 5x5 km for 10 days, released daily
- 99-member ensemble

Seasonal forecast:

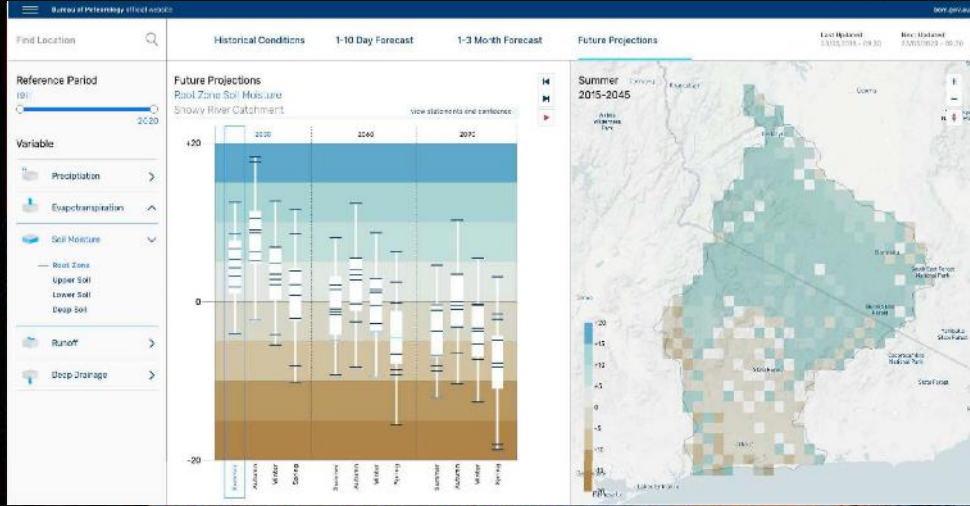
- Out to 6 months, released monthly
- 99-member ensemble

*in some regions



Service Specifications

Future projections



Parameters include:

- Rainfall
- Tmax
- Tmin
- Solar Radiation
- Surface wind
- Soil moisture (output from AWRA-L)
- Runoff (gridded) (output from AWRA-L)
- PET (output from AWRA-L)

Ensemble members:

- Daily, 5x5 km for period 1960 – 2100
- Multiple scenarios: RCP45, RCP85
- Multiple BC methods
- Multiple HMs*
*in some regions



Towards seamless information

1911 - Yesterday

**Australian
Landscape
Water Balance**

Today to 10 days

**Short-term
Landscape
Forecasts**

1 to 6 months

**Seasonal
Landscape
Forecasts**

Decades to 2100

**Hydrological
Projections**

AWRA-L Hydrological Model calibrated using AWAP Forcing

AWAP Reference
Forcing Data



SCC Ens
processed NWP

Quantile Mapped
Seasonal CM Ens

Bias-corrected
Projection CM Ens

AWAP Reference
Forcing Data

0-10 day NWP
Forecast(Det)

Seasonal CM
Forecast (Ens)

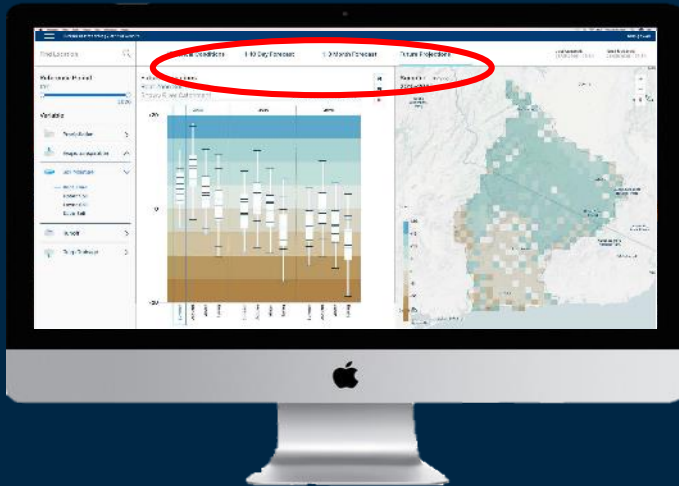
GCM/RCM/SDM
Projections(Ens)



Towards seamless information

Landscape data service:

- > Includes historical, forecast and projections
- > One web interface
- > One landscape model
- > Common verification datasets



Why?

- Branding – customers know and trust a product and would like to use on multiple time-scales, *from the same place, in the same format*
- Forecasts and projections that can be related to historical data – no biases
- Address the discontinuity between short-term NWP forecast and seasonal forecast from a climate model
- Bridge the gaps between seasonal forecasts and future projections

Thanks for your interest

Questions?

More information?

Want to collaborate?

Please contact:

water@bom.gov.au