

# 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!*

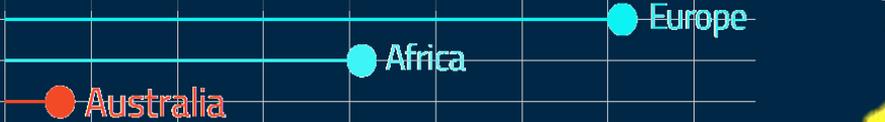


# Australia's Hydroclimate

## Driest inhabited continent

### Water Availability

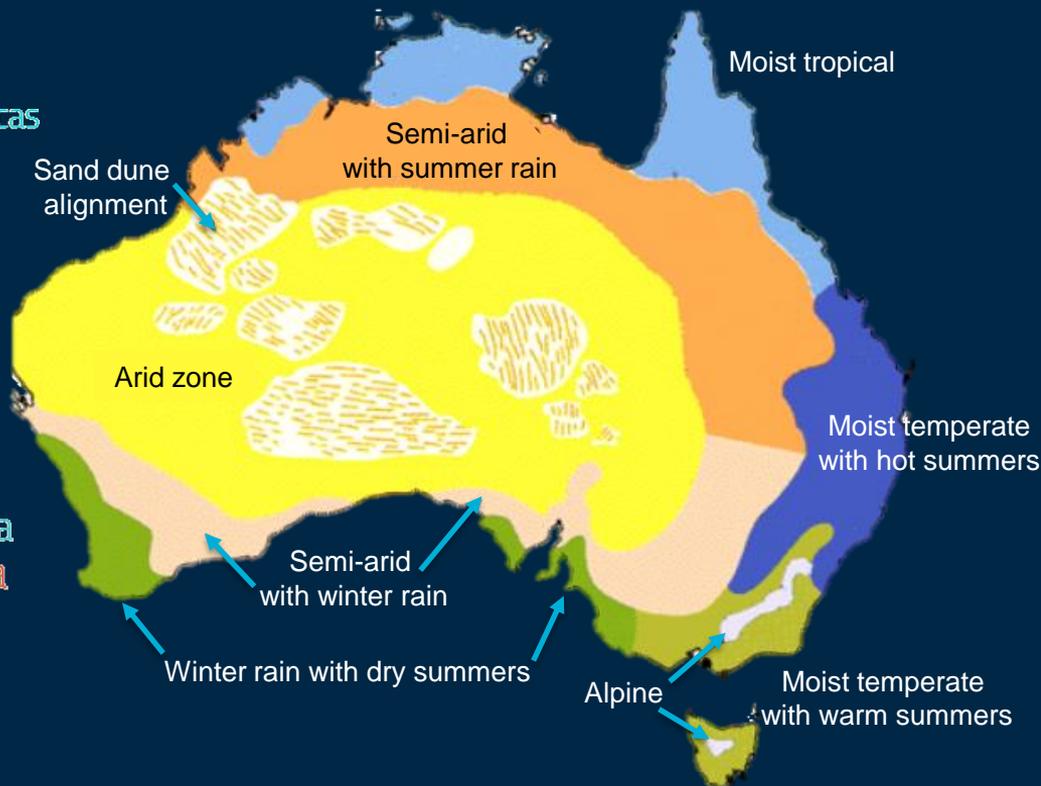
Annual streamflow per km<sup>2</sup>



## High water use per capita

### Water Use

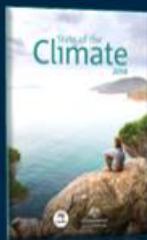
Daily consumption per capita





# 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



Bureau Home » Water Information » Australian Landscape Water Balance

### Australian Landscape Water Balance

Data for this service is now supplied by AWRA-L version 6.0, updated on Nov 29, 2018.

Day ← 31 → Search Location, Catchment or Latitude, Longitude

Month ← Dec →

Year ← 2019 →

Aggregation: Day | Month | Year

Precipitation

Soil moisture

Root zone soil moisture

More Information

Upper soil moisture

Lower soil moisture

Deep soil moisture

Runoff

Evapotranspiration

Displaying: Root zone soil moisture, 31 December 2019

Root zone soil moisture legend:

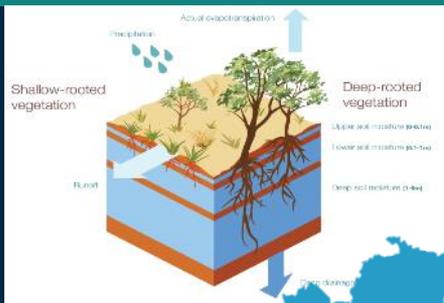
- Highest 1%
- Very much above average
- Above average
- Average
- Below average
- Very much below average
- Lowest 1%

Values: Actual | Relative

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:

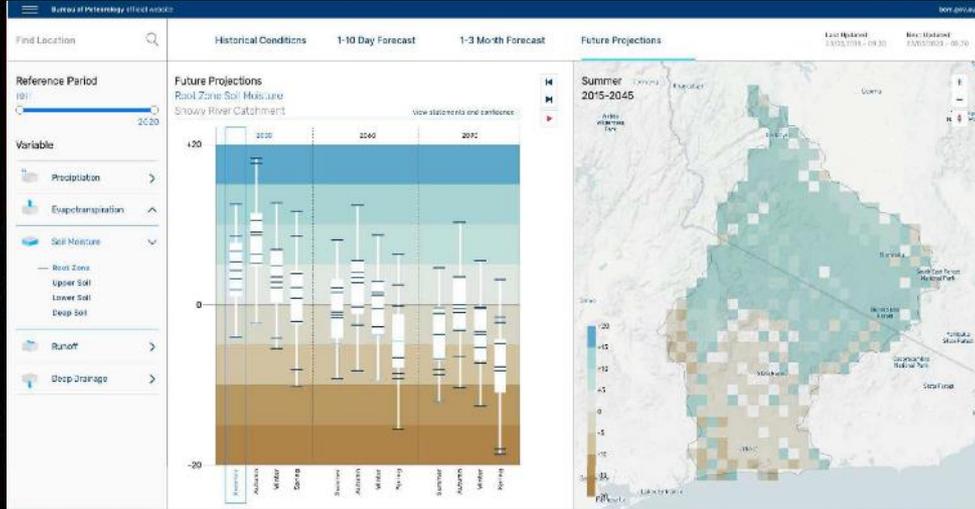
- For gauged and ungauged catchments
- Long term strategic planning
- Assessing climate risk



# 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:

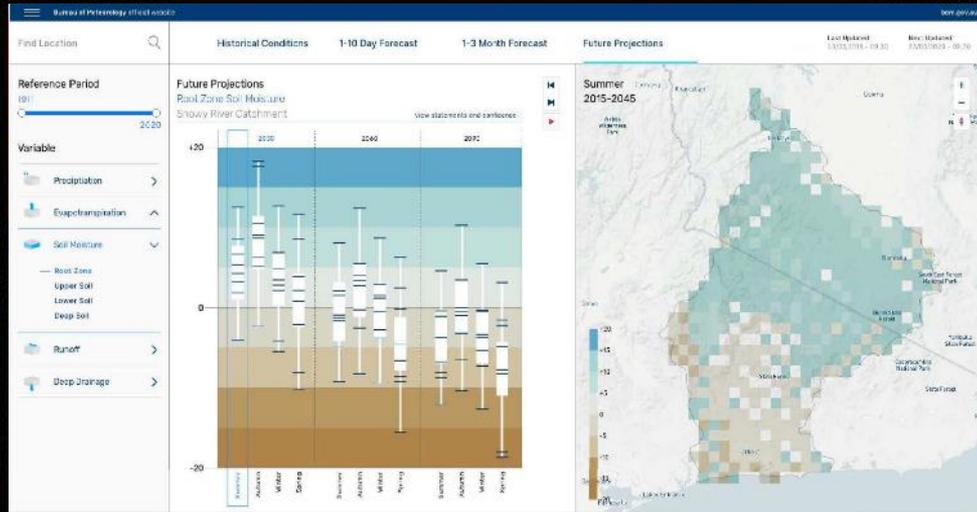
- Out to 6 months, released monthly
- 99-member ensemble

\*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)

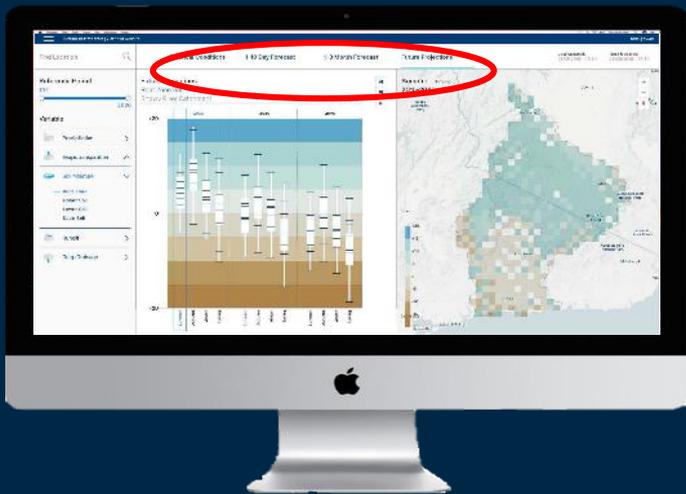
GCM/RCM/SDM  
Projections(Ens)



# 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](mailto:water@bom.gov.au)