



# The Climate Science Information Base for Queensland

## Ken Day

Queensland Climate Change Centre of Excellence

Queensland's Climate Change Strategy



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Toward's Queensland

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# Introduction

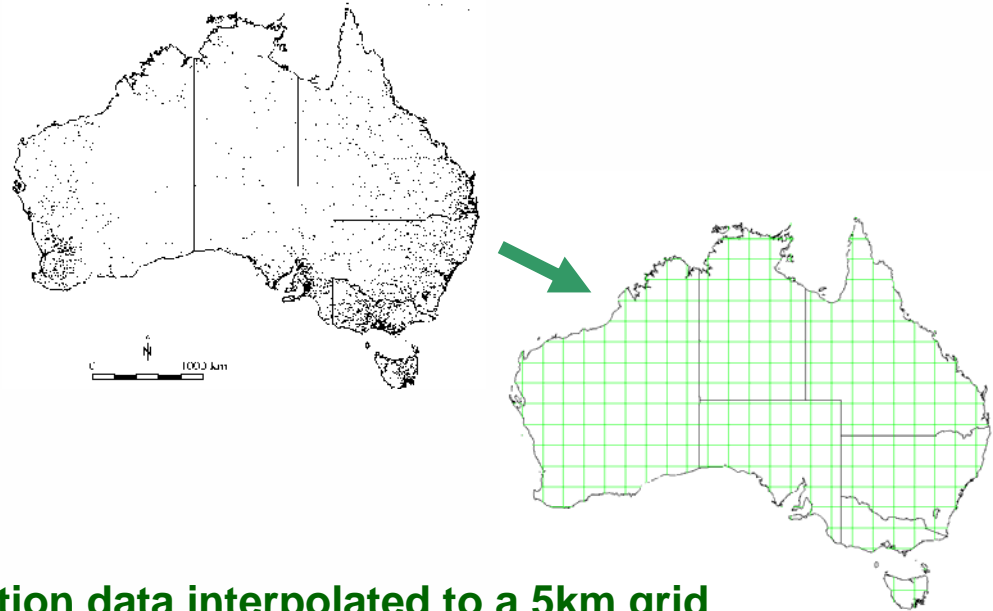
- Climate information for Queensland
  - SILO climate database
  - Climate change projections data for modellers
  - Advances in climate modelling
  - The Long Paddock website



# SILO: QCCCE's climate database

## Climate data in useful formats

- rainfall
- evaporation
- radiation
- temperature
- vapour pressure



## Station data interpolated to a 5km grid

- grids are spatially and temporally complete
- used to fill missing station data
- daily input to Centre's AussieGRASS model



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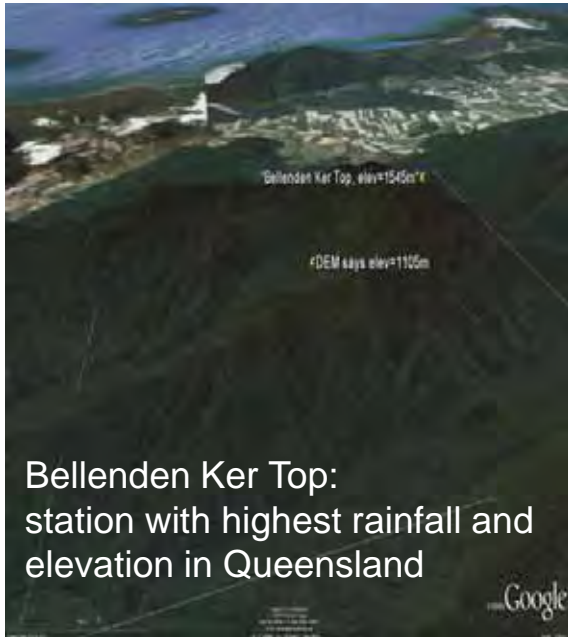


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# Working with users to improve data

Rainfall normalisation currently assumes stations are in the centre of each grid cell



← can lead to major  
variance in station  
elevation in hilly regions

particularly if station  
location is incorrect in  
BoM's station dictionary →



- Using actual station location improves rainfall normalisation and interpolated rainfall surfaces
- QCCCE error checking continually leading to improvement in BoM's station dictionary



# SILO: daily climate projections data

## Aim of Consistent Climate Scenario's Project:

For AR4 projections centred on 2030 and 2050 and 20th Century baseline:

- produce daily climate data sets suitable as input to biophysical models
- do so in a consistent manner across 10 projects under Australia's Farming Future: Climate Change Research Program
- develop ongoing national delivery mechanism through SILO



Australian Government

Department of Agriculture, Fisheries and Forestry

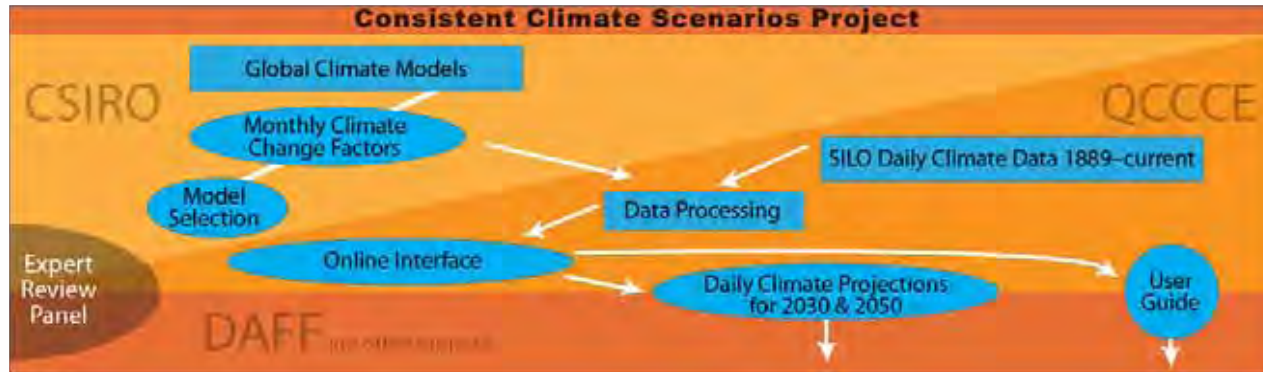
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# SILO: daily climate projections data



For years centred on 2030 and 2050:

- 15 AR4 GCMs (Expert Panel recommendation – but QCCCE will provide at least 17)
- 2 emissions scenarios (A1B, A1FI check)
- 3 climate sensitivities to global warming (low, medium, high)
- 2 statistical downscaling methods (OzClim 'change factors', M-Quantile regression)
- 2 output formats (APSIM, GRASP – in future SILO/AussieGRASS grids)



# Facilitating users: DAFF CCRP projects

## CSIRO

- Climate ready cereals; climate change resilient cropping and mixed cropping/grazing
- Agriculture transforming to adapt to climate change

## University of Melbourne

- Adaptation and wheat to elevated atmospheric CO<sub>2</sub> concentration
- Thermal stress impacts on animals (southern Australian dairy, beef and sheep industries)

## DEEDI Qld

- Relocation of intensive crop production systems-Northern Australia
- Managing climate variability and climate change within beef production across northern Australia

## GWRDC

- Adaptation and the wine industry

## MLA

- Adaptation and southern livestock industries

## DPI Vic

- Adaptation of fisheries and fisheries management – south-eastern Australia – a national case study

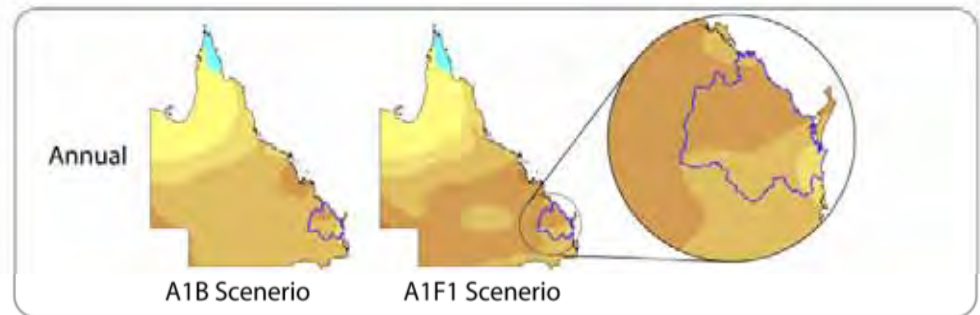


# Potential effects of climate change on water resources

Variable	GCM Model	Year	Scenario	January	February	M
Rainfall	CSIRO Mark 3.5	2050	A1B	3.5[2.1 - 5.7]	-1.8[-1.1 - -2.9]	
	MIROC 3.2 Hires	2050	A1B	3.9[2.3 - 6.2]	12.7[7.8 - 20.3]	
	NCAR CCSM 3.0	2050	A1B	5.9[3.6 - 9.5]	3.0[1.4 - 4.6]	
Potential Evaporation	CSIRO Mark 3.5	2050	A1B	6.8[3.9 - 10]		
	MIROC 3.2 Hires	2050	A1B			
	NCAR CCSM 3.0	2050	A1B			

- Three regional reports prepared by QCCCE
- Supporting State Regional Water Supply Strategies
- Wide-Bay Burnett, Mackay-Whitsunday, North Queensland

In future DERM will be able to download climate projections data directly from SILO



Rainfall (% change)





# DERM Water Planning Sciences

## OzClim vs dynamical downscaling for Wivenhoe

CSIRO through SEQ Urban Water Security Alliance funding  
June 2010 (completed)

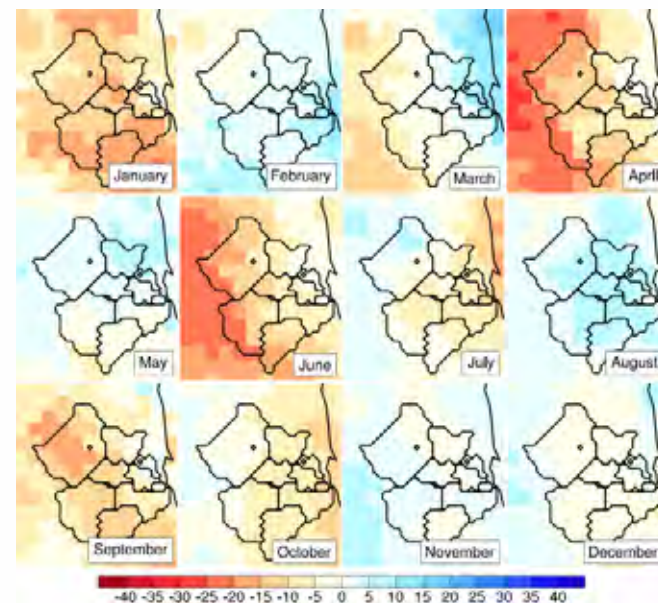
CSIRO-MK3.0 A1B  
CSIRO-MK3.0 A2  
CSIRO-MK3.5 A2  
GFDL CM2.1 A2  
MIROC3.2 MEDRES A2  
MPI/ECHAM5 A2

June 2011 (almost completed)

UKMO-Hadcm3 A2  
NCAR-CCSM3.0 A2  
UKMO-HadGEM1 A2

CSIRO through Smart State funding (almost completed)

NCAR-CCSM3.0 A1B  
INM-CM3.0 A2  
INM-CM3.0 A1B



Percent change in rainfall Wivenhoe catchment 2050  
(downscaled CSIRO-Mk3.5 A2 medium sensitivity)



# QCCCE CMIP5 modelling for IPCC AR5

3 year collaborative project with CSIRO:

- Phase 1: modelling (Years 1 and 2)
- Phase 2: data analysis (Year 3)
- Using the CSIRO climate model and QCCCE HPC and mass storage systems
- CSIRO Mk3.6 T63 coupled atmosphere/ocean model
- Spatial resolution: 192 (longitude) x 96 (latitude) – approx. ~180km x 180km
- Some results are being dynamically downscaled using CCAM C128



CCAM C128 ~20kms



# The Long Paddock

- QCCCE Monthly Climate Statement
- SOI updates still the most popular feature on LongPaddock



The screenshot shows the Long Paddock website interface. At the top, there's a navigation bar with 'Home', 'Seasonal climate outlook', 'Rainfall and pasture growth', 'Drought', 'DAP products', and 'About us'. The main content area is divided into several sections:

- Quick links:** Climate outlook, Southern Oscillation Index, Climate data, AusAGDRAIN environmental calculator, Climate change in Queensland.
- Long Paddock:** Downtime notice: Operators of some services may be affected during the period 29 January to 27 March 2011. [Read more](#). Below this, a paragraph explains that the website is provided by the Queensland Government to help users manage climate risks and opportunities, particularly those associated with the El Niño - Southern Oscillation (ENSO) phenomenon.
- Latest maps:** Rainfall and pasture growth maps, and a link to the 'See latest temperature situation'.
- Features:** Pasture degradation: The extended drought periods in each degradation episode have provided a test of the capacity of grazing systems (i.e. land, plants, animals, humans and social structures) to handle stress. Evidence that degradation was already occurring was identified prior to the extended drought episodes. [Read more](#).
- Latest Southern Oscillation Index (SOI) values:** Date: 22 March 2011. Average SOI for last 30 days: 18.7. Average SOI for last 90 days: 21.0. Daily contribution to SOI calculation: 10.5. [View SOI data](#). A table shows monthly average SOI values: December 26.4, January 18.1, February 22.6.

At the bottom, there are logos for 'silo', 'FORAGE', 'with LMS', and 'SPOTA-1'. The footer contains copyright information for the State of Queensland (Department of Economic and Financial Development) 2011.

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# The Long Paddock

From August 2010 the Centre's new Monthly Climate Statement discussed the increased probability of a wet summer season for Queensland

OFFICE OF **climatechange** Department of Environment and Resource Management

## Queensland Climate Change Centre of Excellence Monthly Climate Statement

### Key messages for the summer season

- High probability of above median rainfall
- Bureau of Meteorology expects higher than average number of cyclones in the Queensland region
- Above median rainfall already recorded during the early part of summer

### Findings for December 2010

The Queensland Climate Change Centre of Excellence (the Centre) considers that there is an increased probability of above-median rainfall throughout most of Queensland this summer.

The Centre's understanding is based on the current and projected state of the El Niño-Southern Oscillation (ENSO) phenomenon and on factors which modulate the impact of ENSO on Queensland rainfall (for example the Pacific Decadal Oscillation).

- Observed sea surface temperatures in the key [Niño 3.4 and Niño 4 regions](#) remain much cooler than normal – typical of a well-established La Niña pattern.
- Associated with this La Niña pattern, the sea surface temperature gradient (west to east) across the [South Pacific Convergence Zone](#) (i.e. between eastern Australia and the Central Pacific) was extremely positive leading into summer (e.g. +1.8°C in October). According to the Centre's experimental [SPOTA-1 scheme](#), a positive sea surface temperature gradient across this region, particularly in October, tends to be associated with above-median rainfall in Queensland during the following summer (November to March). November was extremely wet (rainfall between the 90<sup>th</sup> and 100<sup>th</sup> percentile) and December so far has also been extremely wet. Many regions have already received rainfall totals which exceed the long-term median for the entire summer (November to March).
- As reported in recent months, historical evidence suggests that the current La Niña pattern is highly likely to result towards a wet summer.



## Queensland's Climate Change Strategy

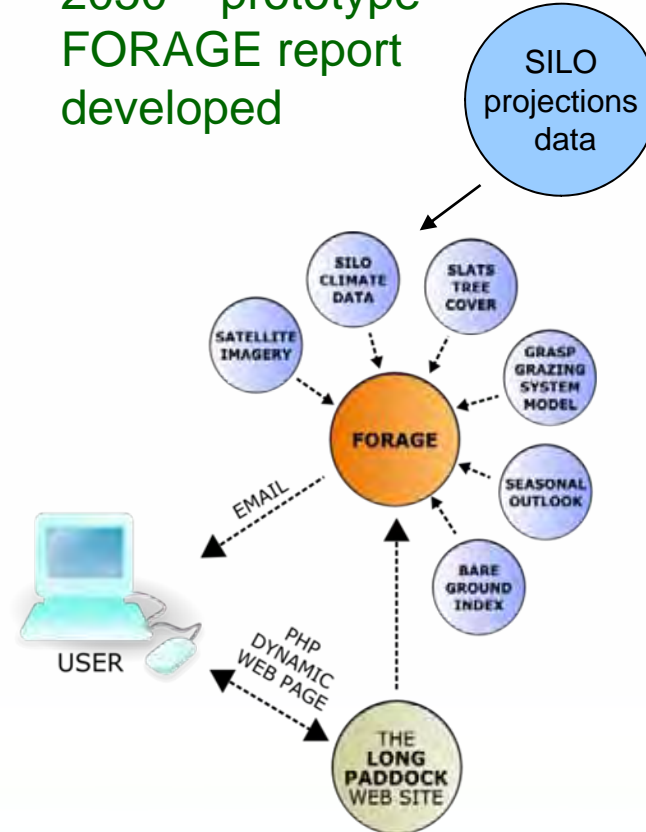
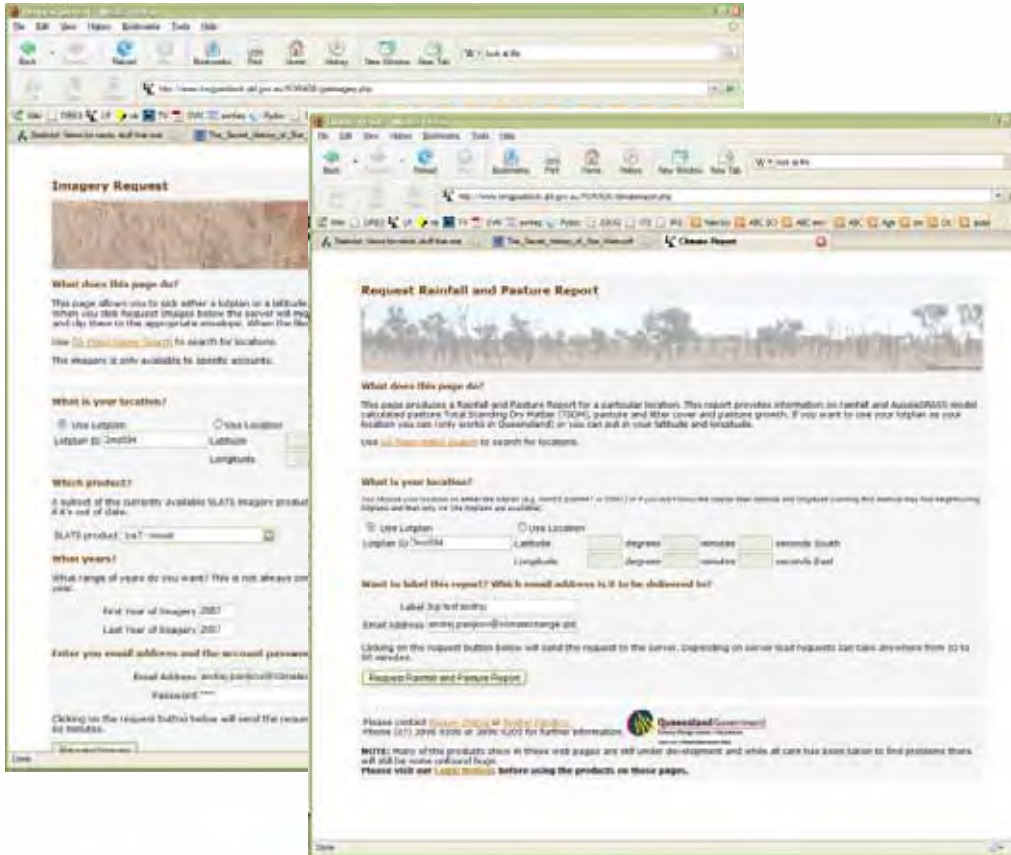


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# The Long Paddock

Pasture growth projections for 2030 and 2050 – prototype FORAGE report developed



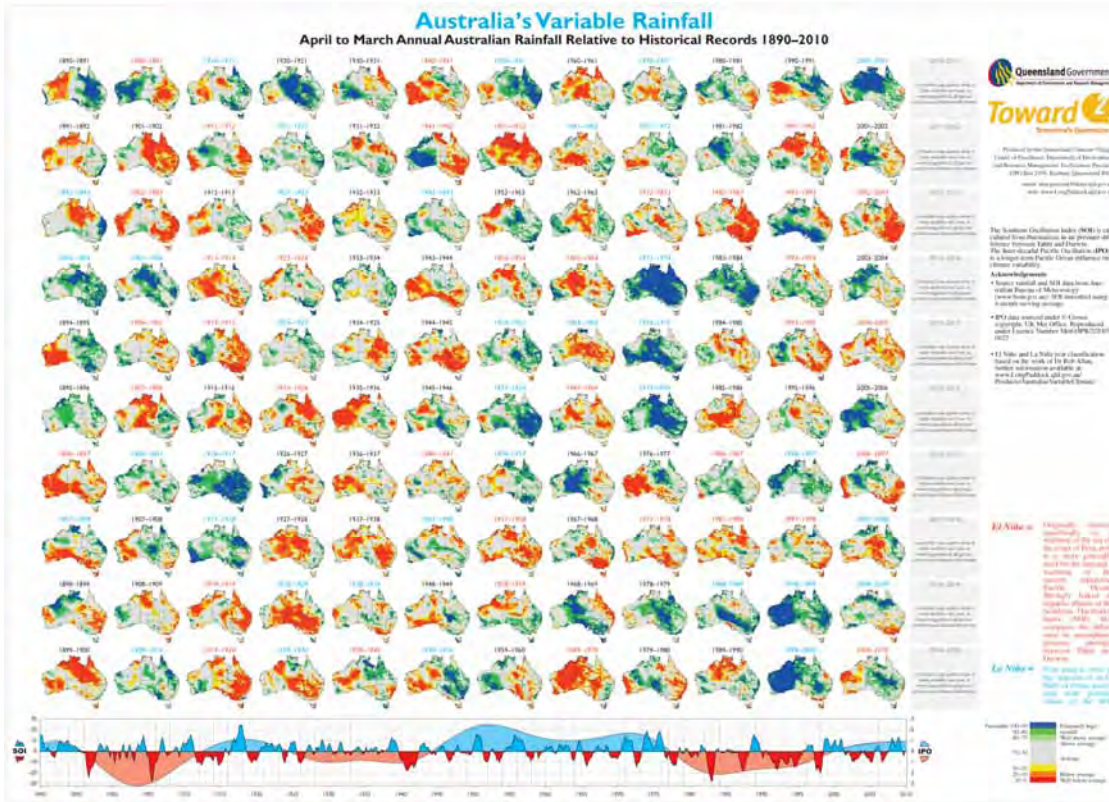
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# The Long Paddock



Sometimes the simplest communication tools are the best

The popular "Australia's Variable Rainfall" poster updated to 2009/10 now available for download from Long Paddock:

<http://www.longpaddock.qld.gov.au/>

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# Conclusions

- QCCCE in collaboration with national and international partners is rapidly improving the climate change information base for Queensland
- QCCCE is contributing modelling to support the IPCC 5AR and is developing ways to make this information available to users
- QCCCE has an important role in communicating the latest climate science to policy, industry and the Queensland public



# Thank you

# Questions?

