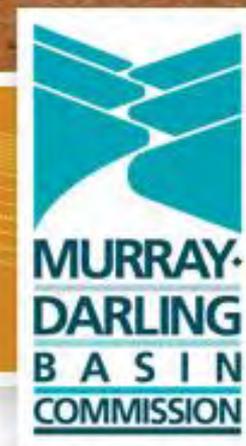




# SESSION 1. DROUGHT AND CLIMATE CHANGE

## South East Australian Climate Initiative Summary

Katrina Maguire (MDBC) 9 September 2008



# Overview

- Climate Change Program
  - Research and Investment Strategy
- South Eastern Australian Climate Initiative (SEACI)
  - Overview
  - Key findings

# Climate Change Program

# Climate Change Program



- Purpose
  - Climate change has been identified as the most significant of 6 key risks to the Basin's shared water resources.
  - Climate change program was established in 2007 to coordinate climate change issues and research and investment across the Commission

# Climate Change Program

- Currently responsible for 2 key areas
  - Developing a Research and Investment Strategy
  - Managing the current South Eastern Australian Climate Initiative (SEACI)

# Research and Investment

- Have consulted with other MDBC programs, key jurisdictional and federal government research and management agencies
- Clear that many other agencies are also currently defining their roles and interests in climate change issues.
- Scope of MDBC research and investment will be largely influenced by the requirements of the Water Act 2007 and NWI as well as a number of external programs

# Research and Investment

- Have identified 5 key areas for investment.
  - Climate science
  - Impacts
  - Adaptation
  - Mitigation
  - Communication / education
- Need to ensure our investment relates to our business.

**Murray-Darling Basin - Climate Variability Research and Investment Plan**

Possible Memorandum of Understanding?



**Climate Science**

- What influences climate in the MDB and how is it likely to change – seasonally and longer term?
- Essential that climate science underpins mitigation and adaptation measures

- Key Players**
- SEACI
  - BoM
  - CSIRO
  - QLD Climate change Centre of Excellence
  - State agencies (part. Vic. DSE)
  - DEWHA
  - DCC (ACCSP)
  - MCVP (LWA)

**Impacts**

- Impact on water resources (including availability and water quality).
- Impacts of changes in water availability/quality on associated:
  - ecosystems (e.g. native fish, wetlands and salinity)
  - social, economic and cultural conditions
- Implications for river operations
- Interface between climate science and hydrogeological modelling
- Impacts on other Risks to Shared Water Resources

- Key Players**
- COAG 5b project
  - MDBSY
  - State agencies
  - DEWHA
  - DCC
  - CSIRO
  - ABARE
  - DAFF
  - CCRISPI

**Adaptation**

- Design and implementation of strategies to address the effect of climate change on water resources:
  - consumptive and environmental allocations
  - assignment of risk
  - infrastructure and water delivery
- Effect of shifting practices on water resources
- Lessons of current drought
- Dealing with uncertainty and risk management

- Key Players**
- COAG Adaptation Strategy
  - COAG Adaptation Working Group
  - CSIRO Climate Adaptation Flagship
  - Climate Change Adaptation Research Facility (Water Plan and Network)
  - DEWHA
  - DCC
  - CCRISPI (LWA)
  - DAFF
  - NFF

**Mitigation**

- Role and effect of EMTS on water resources in the Basin
- Assess carbon sources and sinks
- Understanding international obligations
- Greenhouse impact assessment

- Key Players**
- DCC
  - Commonwealth Dept. Finance and Treasury
  - Garnaut Report

**Education and Communication**

- Providing information in a form that enables individuals, communities and industries to adapt

- Key Players**
- State agencies (particularly NSW DPI)
  - DEWHA
  - DCC
  - CSIRO

# **South Eastern Australian Climate Change Program (SEACI)**

# South Eastern Australian Climate Initiative (SEACI) Overview



- 3-year (commenced 2006), \$7M program: 3 scientific themes
- 4 “participants” (MDBBC, DCC, DSE VIC, MCVP) and 2 research providers (BoM and CSIRO): approx 50:50 co-investment
- MDBBC is the managing agency
- 2-tiered governance arrangement
  - Steering Committee
  - Technical Working Group
- Due to finish in December 2008
- Currently scoping out a SEACI Phase 2 program

# Theme 1: Characterisation & Attribution of Current Climate

- **Has our climate changed and major drivers affecting this change?**
  - **How (variability; extremes; shifts; trends)?**
  - **When (timing of any changes)?**
  - **Why (modes of climate variability; synoptic patterns; enhanced greenhouse)?**
- **What are the causes of the dry conditions affecting parts of the study area over the last decade?**
- **What is the current climate ‘baseline’?**
- **What is the short-term prognosis?**

# Theme 2: High-Resolution Climate Projections & Impacts



- How is climate likely to change over next 25-65 years?
  - Rainfall, temperature, evaporation
  - Means, variability, extremes
- What are the probabilities attached to these changes?
- How can methods for regional projections be improved so as to provide greater confidence for shareholders?

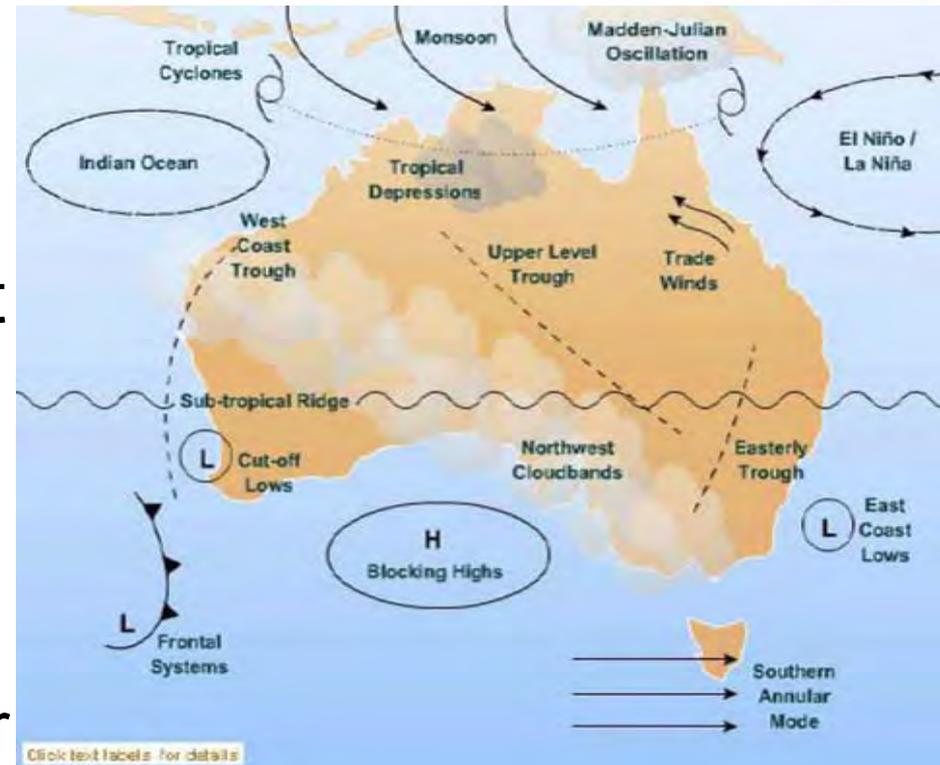
# Theme 3: Seasonal Forecasting

- **Can new, reliable methods for forecasting climate 3-12 months ahead be developed?**
- **Are the performances of these methods superior to those of existing methods?**
- **Can these methods be applied to forecast streamflow and crop yields?**

# SEACI Key Findings

# What controls rainfall in SE Australia?

- Number of large scale phenomena influencing the climate of south east Australia:
  - El Nino – Southern Oscillation (ENSO),
  - the Indian Ocean Dipole (IOD),
  - the Southern Annular Mode (SAM),
  - and the Sub-Tropical Ridge (STR) of the Hadley Circulation.



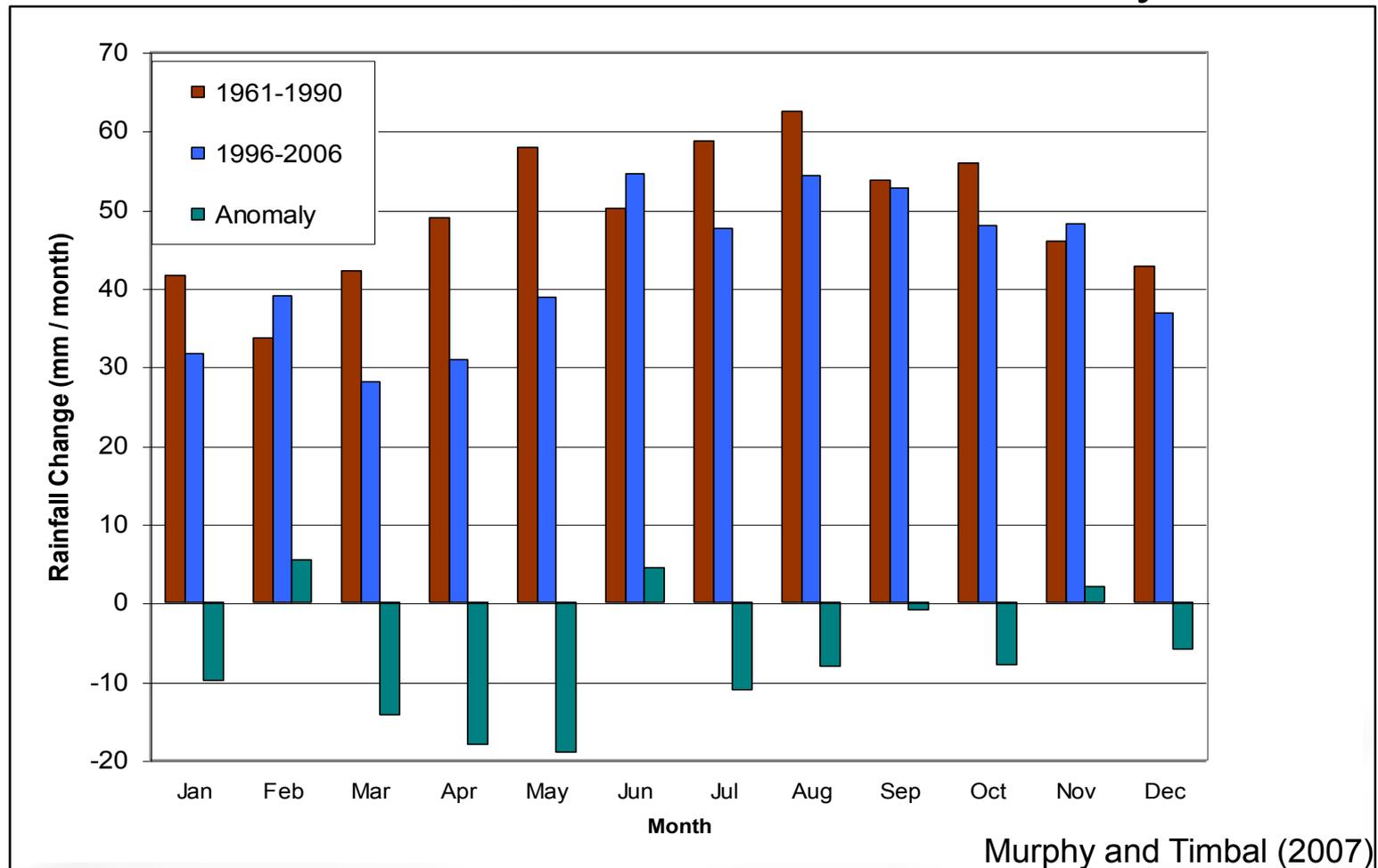
Large-scale factors that affect the climate of Australia; from BoM

# What controls rainfall in SE Australia?

- Impact of **ENSO** on rainfall and maximum temperature in spring is confirmed primarily in the Northern Basin (with warm dry conditions occurring during ENSO events)
- **IOD** affects the rainfall and maximum temperature in winter and spring, but there is no significant impact in summer and autumn
- **SAM** has a significant effect on rainfall and minimum temperature in all seasons except autumn, with the effects being opposite in winter and summer

# Drier Autumns

Monthly mean south eastern Australia rainfall, 1961-1990, 1996-2006 and anomaly

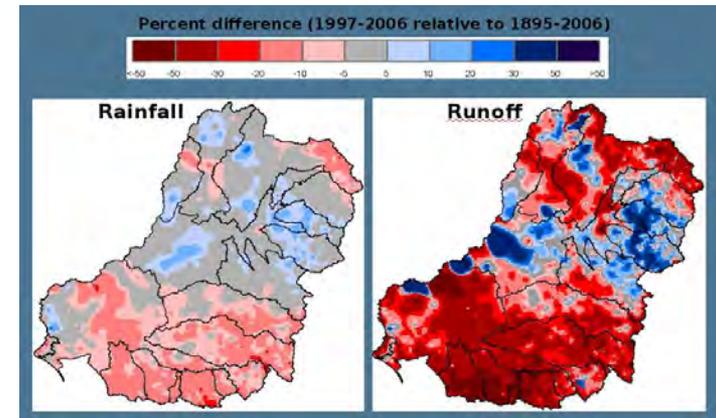


# Influence of the Sub-tropical Ridge

- While all those factors have some influence they did not appear to directly correlate with reductions in autumn rainfall
- Work in SEACI has now found a high correlation between the intensity of the sub-tropical ridge (STR) and SEA rainfall in autumn and winter
- The STR is a region of high surface pressure around 30° North and South in which rainfall is generally suppressed.
- The autumn rainfall in SEA has declined by about 34% since the early 1990s
- The intensity of the STR has been increasing over that period, and the statistical correlation between the STR and rainfall explains about 70% of the observed rainfall decline in SEA.
- Variations in the STR over the last century essentially track the changes in global surface temperature, which suggests that the STR is reflecting the effects of global warming.

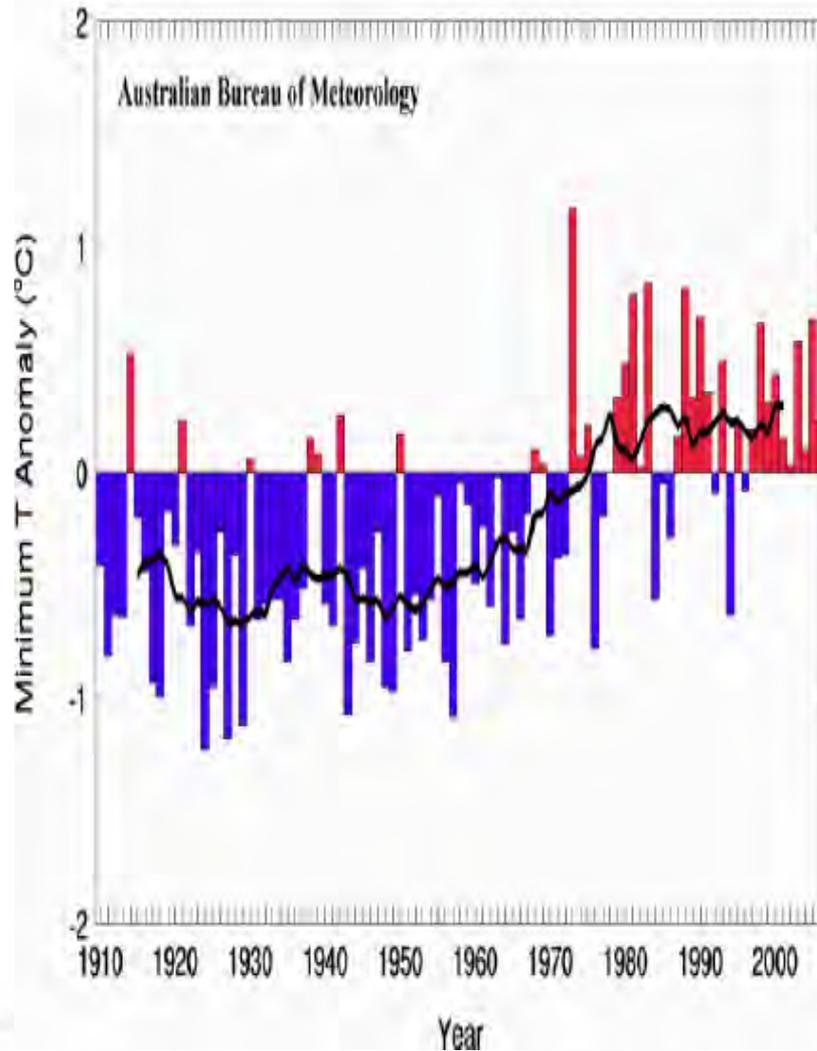
# Decreased Runoff

- During the 1940s drought a mean rainfall reduction of 14% was associated with a 22% run-off reduction.
- Over the last decade a mean rainfall reduction of 13% has led to a mean run-off reduction of 39%.
- Partly explained by a reduction in autumn rainfall over the last decade and increasing temperature

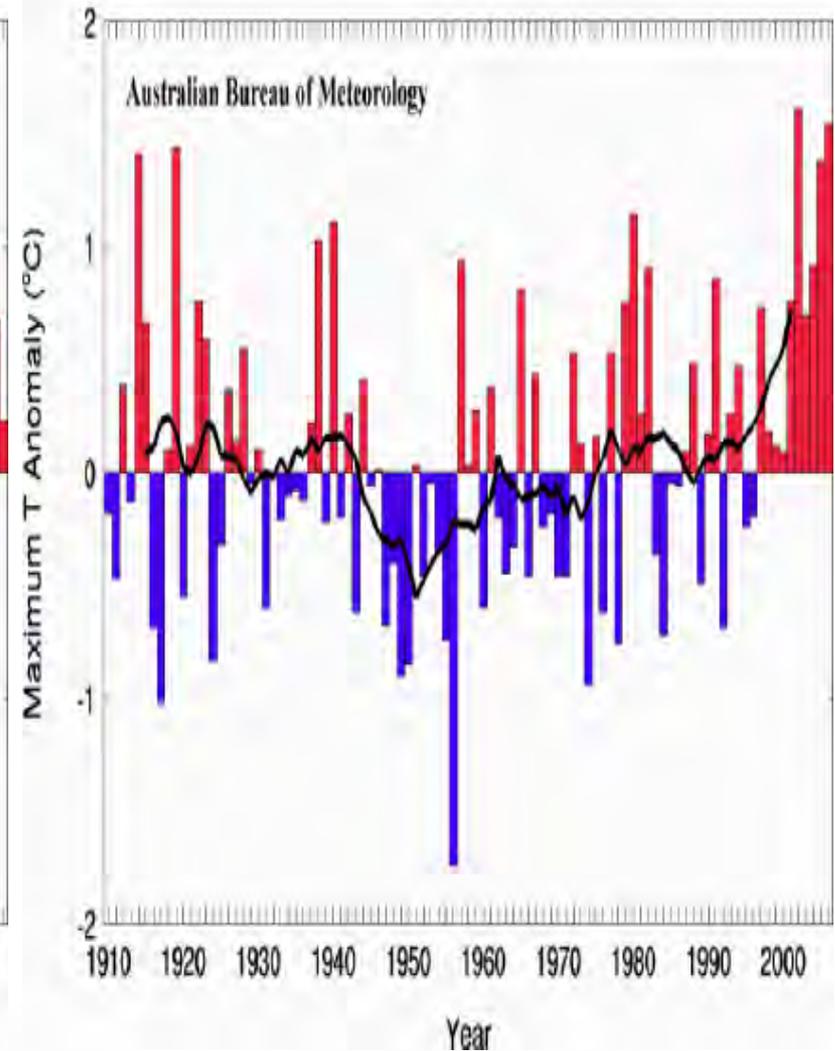


# Increased temperatures

Murray Darling Basin Annual Minimum T Anomaly (base 1961-90)



Murray Darling Basin Annual Maximum T Anomaly (base 1961-90)



# Future Projections

- Global emissions currently tracking on the higher IPCC scenarios (such as A1FI)
- Warmer drier conditions in the future under all global emission scenarios

# Future Projections

## SEACI Program - 2030 estimates relative to 1990

Global warming Scenarios	Average Run off change	
	MDB Region	SEACI Region
<b>A1B scenario (0.9°C)</b>		
Median estimates	0 - 20 % ↓	8 % ↓
Extreme estimates	30% ↓ - 30% ↑	20% ↓ - 6% ↑

## MDBSY Project - 2030 estimates relative to 1990

Global warming Scenarios	Average Surface Water availability change	
	MDB Region	Murray Region
<b>A1FI Highest (1.6°C)</b>		
Dry extreme	37 % ↓	41 % ↓
Wet extreme	7 % ↑	7 % ↑
<b>Medium (1.03°C)</b>	- 12% ↓	- 14 % ↓
<b>Recent climate</b> (1997-2006) current development	- 27% ↓	- 30 % ↓

Further information on SEACI can be  
found at  
[www.mdbc.gov.au/subs/seaci/](http://www.mdbc.gov.au/subs/seaci/)

**Thank you**