Water Accounting and Water Management Modelling

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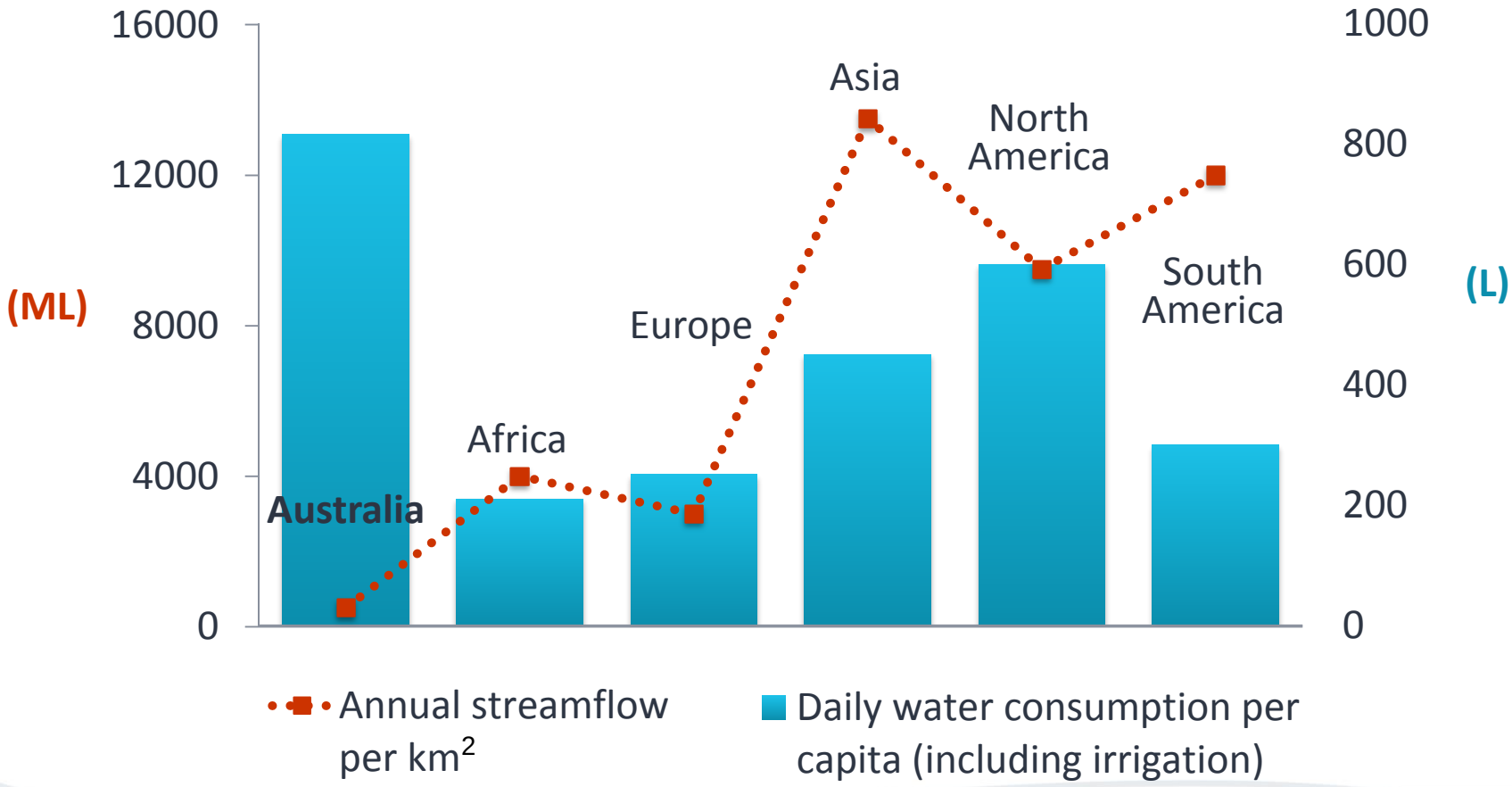
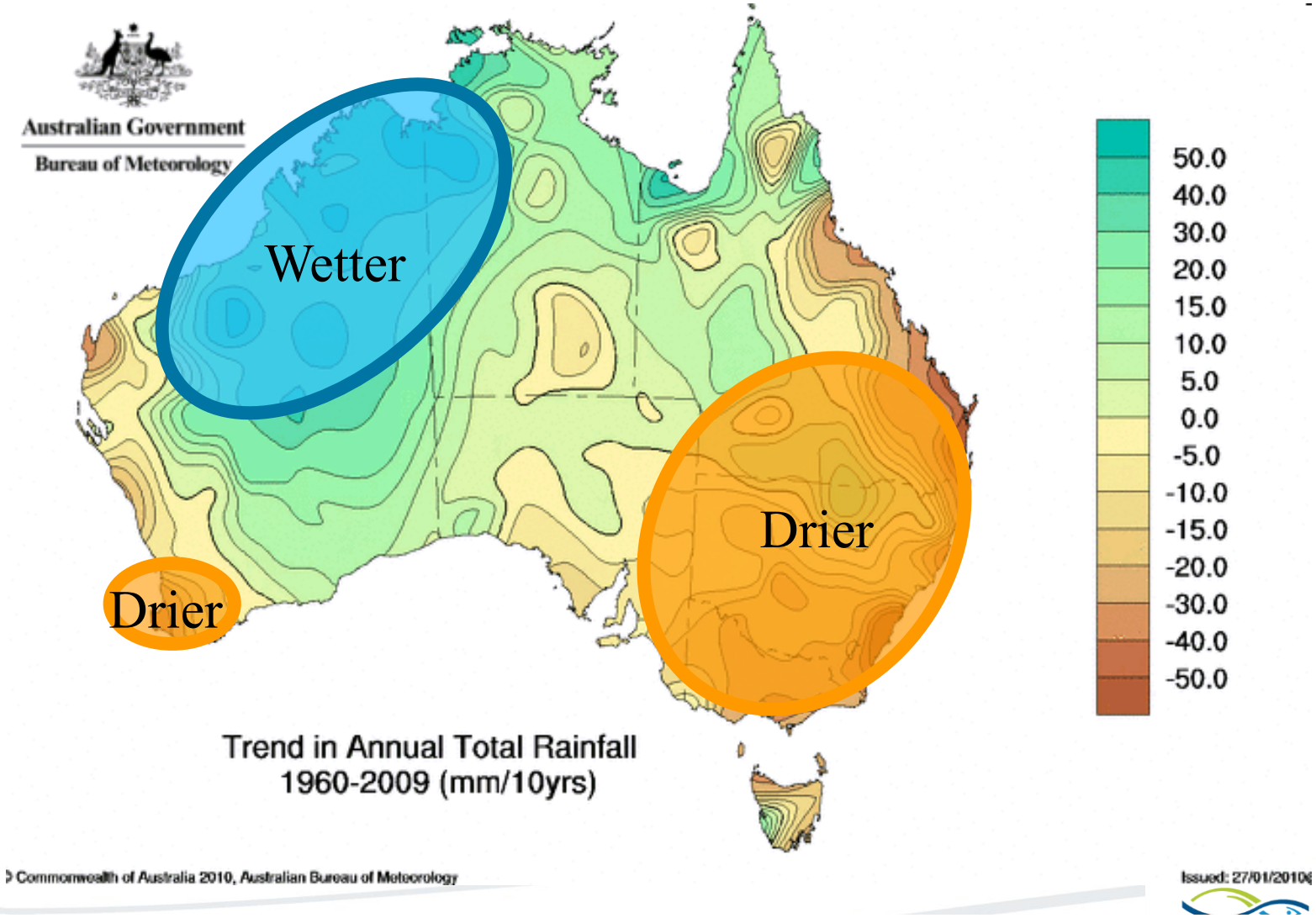
Australia – the driest inhabited continent
– with the highest per capita water use

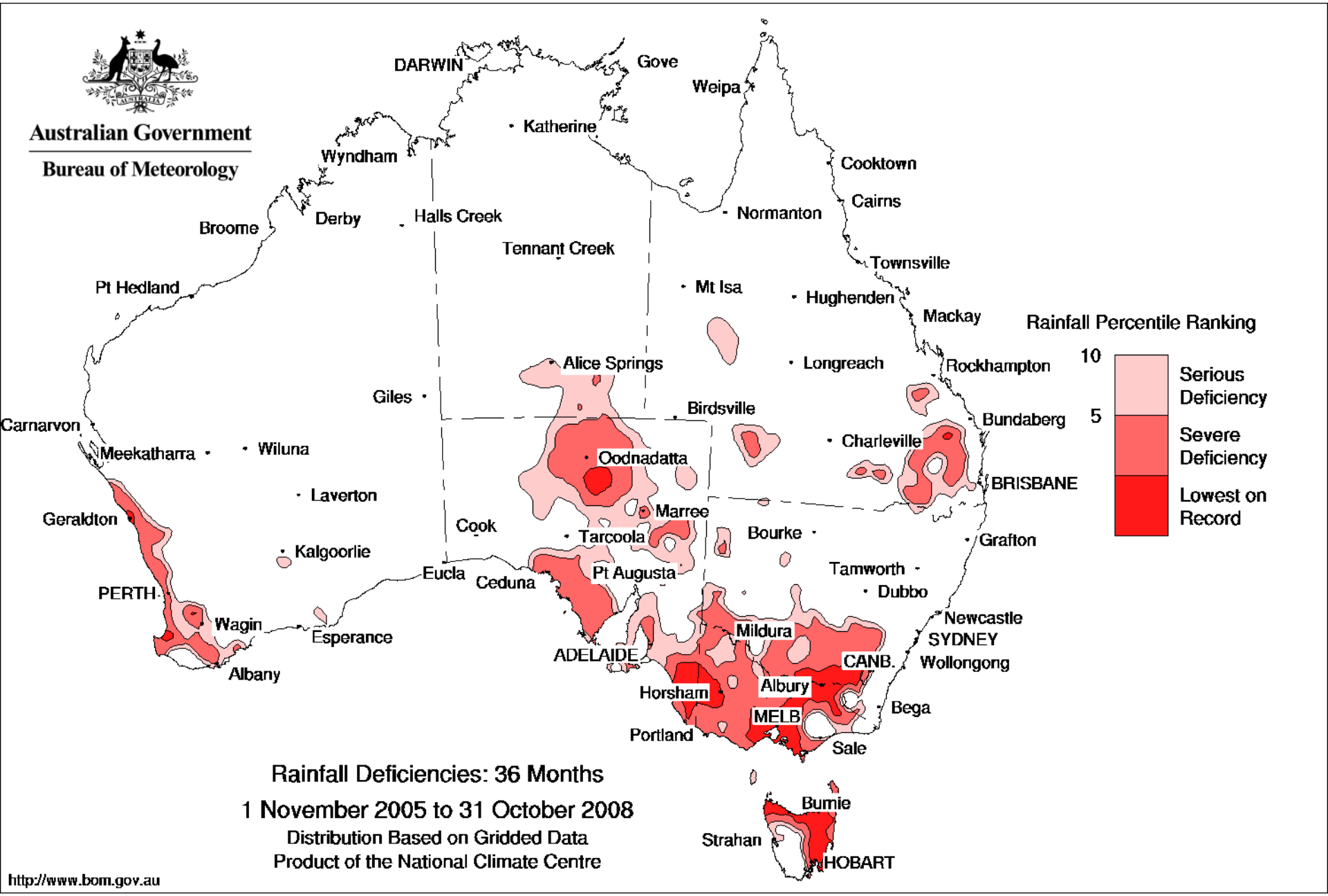


Climate Shift is already affecting Australian Rainfall

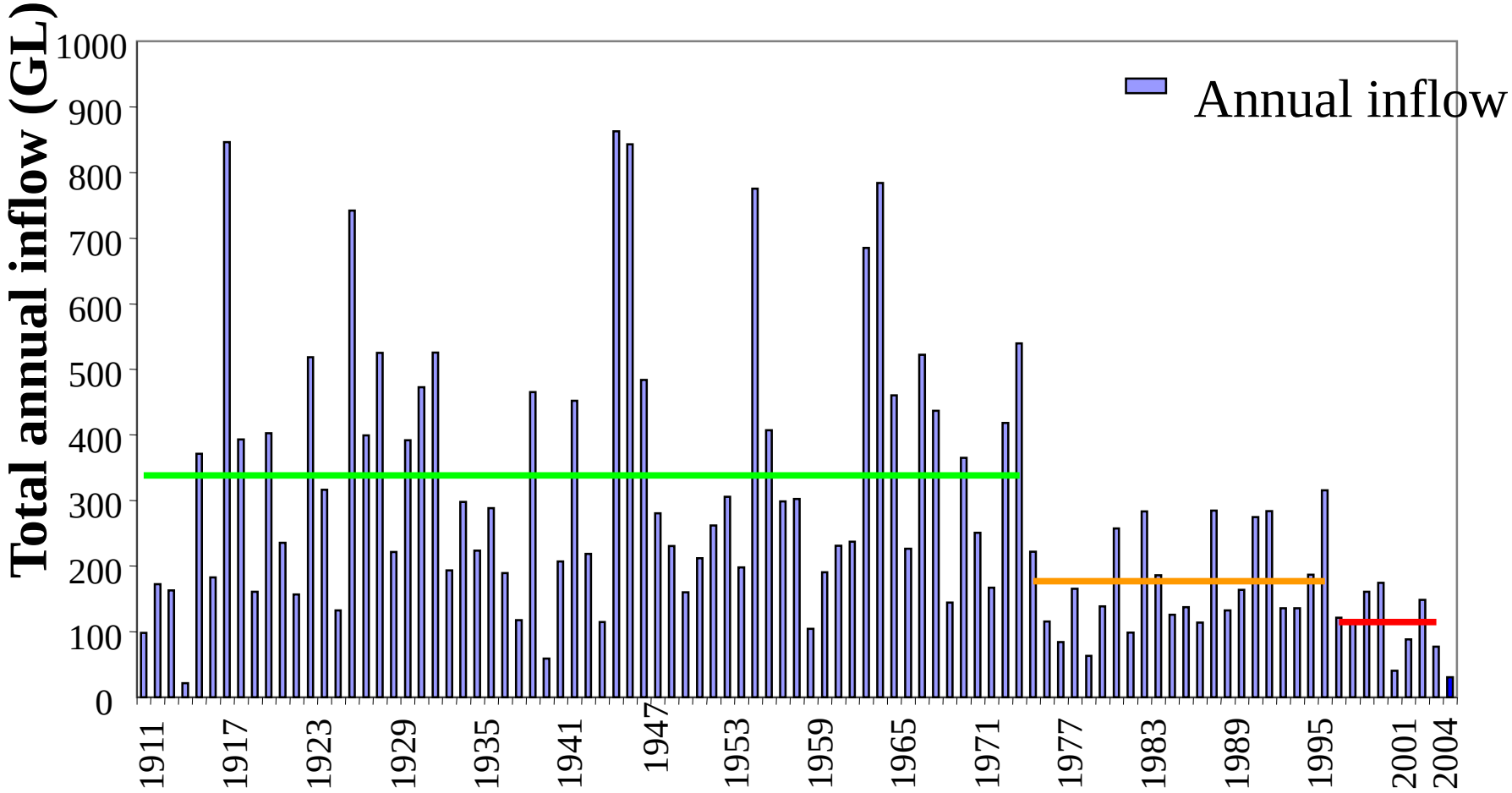


- Substantial increases in many parts of northern and central Australia
- Substantial decreases across much of southern and eastern Australia

The Millenium Drought – worst on record



Annual inflows to Perth dams have declined



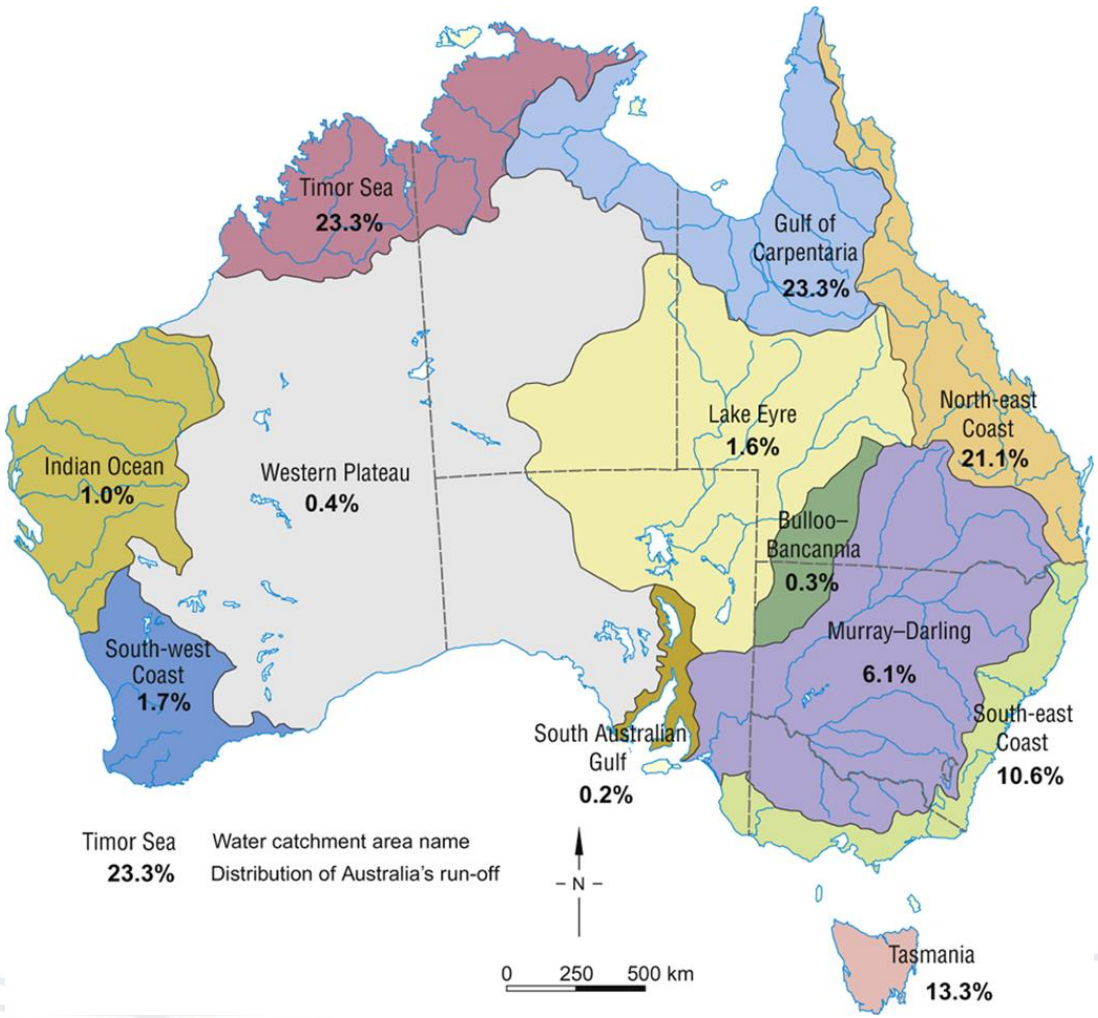
1911–1974 (**338 GL**) 1975–1996 (**177 GL**) 1997–2004 (**115 GL**)

Source: WA Water Corporation.

Floods January 2011, 2012, February 2013

Toowoomba, QLD on January 10, 2011

Australian Water Policy Coordination

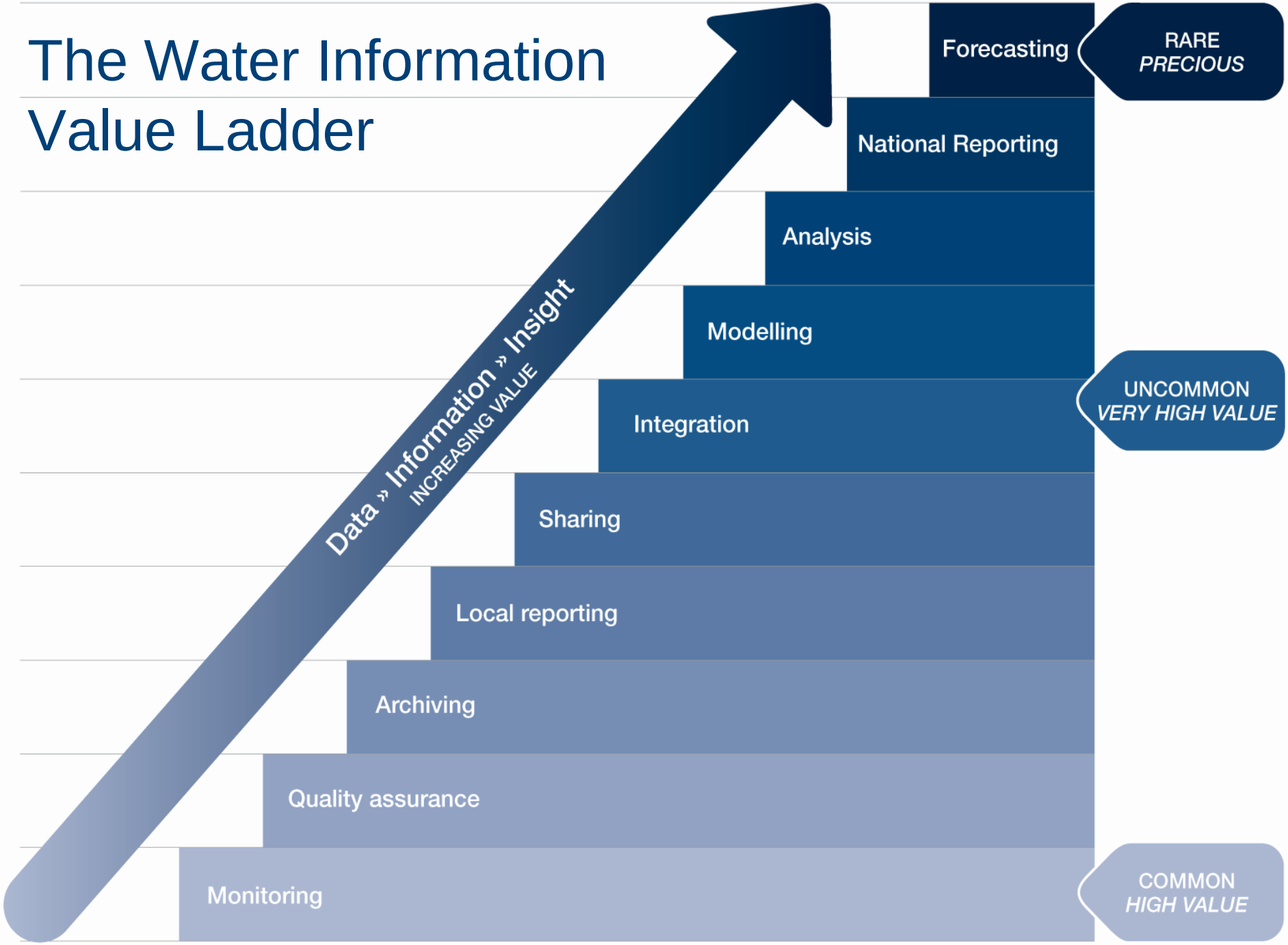


- Each State responsible for management of its natural resources eg land and water
- All governments recognise the need to work together
- Federal Government involved in coordination, funding

Models and Data to support decisions

- **Driving Philosophy:** You can't manage what you can't describe and measure
- Must move from **perceptions to fact**
- **Sufficient certainty** enables the hard questions and tradeoffs to be tackled.
- It is better to be **approximately right** than definitely wrong

The Water Information Value Ladder



By early 2000's a realisation that earlier generation tools would struggle to support water management complexity

- Increased Water Policy and Governance Expectations
- Focus on water use efficiency (eg. tradeable rights, environmental water)
- Ecological outcomes and Climate uncertainty

Released in 2012, eWater Source establishes a nationally consistent forecasting and planning capability, integrating:

- Balancing human and environmental needs
- Conjunctive surface and groundwater use
- Rural and urban supply
- Water use and reuse
- Planning and operational requirements
- Integration of Policy with water balance
- Managing Water Accounting and Sharing

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eWater CRC - 35 Industry & 11 Research Partners

PUBLIC INDUSTRY

New South Wales Government
Department of
Environment, Climate Change and Water

New South Wales Government
Department of Water and Energy

Victoria
The Place To Be

Department of Sustainability and Environment
Department of Primary Industries
Environmental Protection Agency (EPA)
Victorian Catchment Management Authorities

Queensland Government

Department of Environment and Resource Management Queensland Primary Industries and Fisheries – Department of Employment, Economic Development and Innovation

MURRAY–DARLING BASIN AUTHORITY

DEPARTMENT OF THE ENVIRONMENT, CLIMATE CHANGE, ENERGY AND WATER

Government of South Australia
Department of Water, Land and Biodiversity Conservation

BRISBANE CITY

SYDNEY CATCHMENT AUTHORITY

EPA South Australia

CORPORATE INDUSTRY

State water

LOWER MURRAY WATER

Melbourne Water

SA Water

SunWater

SKM

BMT WBM

ACTEW CORPORATION

SOUTHERN Rural Water

GOULBURN-MURRAY WATER

RESEARCH

LA TROBE UNIVERSITY

Griffith UNIVERSITY

MONASH University

THE UNIVERSITY OF ADELAIDE AUSTRALIA

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

THE UNIVERSITY OF QUEENSLAND

Australian Government
Bureau of Meteorology

SARDI
SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE

THE UNIVERSITY OF MELBOURNE

UC

CSIRO

Source MODELLING COMMUNITY

eWater Solutions

eWater
Not-for-profit Australian Government-owned company

MURRAY–DARLING BASIN AUTHORITY

State Government Victoria — Department of Environment and Primary Industries

Government of South Australia — Department of Environment, Water and Natural Resources

NSW GOVERNMENT — Department of Primary Industries Office of Water

Queensland Government — Natural Resources and Mines

We provide software development, capacity building and adoption services

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Entitlements and Allocations – Water as an Asset

- A Water entitlement is a right to a share of the water available in the river system each year as a maximum volume of water that can be taken.
- Water has different levels of reliability depending on whether it is held in dams or dependent on local rainfall etc. These are generally divided into High Reliability (>90%) and Low Reliability (<90%)
- Users have different water 'products' that they can access depending on the type of needs (irrigators, cities etc).
- Each year, depending on the seasonal conditions, an annual allocation is made to each license holder as a percentage of the entitlement

Adaptive Water Market
3 main Transfer Instruments

- Permanent Transfer of a water entitlement
- A limited time transfer of water entitlement (effectively a lease or rental).
- A temporary trade of Allocation. For example a license holder may choose to decide to use all of their seasonal allocation or transfer part (or all) to another user.

Water Accounting and Sharing Policies

Water Accounting is the process by which water use is counted as debits and credits against an account like a financial system and are part of a “Water P&L/Balance Sheet” for the reporting region. Water Accounting reports give decisions makers information in a form which is familiar to asset managers.

Water Sharing is the policy by which water is divided amongst users and informs the water accounts. Sharing can be in accordance with many kinds of rules:

- Based on flow thresholds and time of year (flood, drought)
- Can share throughout the system based on priorities defined by different methods (e.g. laws, agreements or court rulings)
- The intrinsic value of water is reflected in the various agreements embedded in the water sharing plans

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Water Accounting

A general purpose water accounting report shall provide information useful to users of that report for making and evaluating decisions about the allocation of resources.

Decisions about the allocation of resources may include:

- decisions about the management or trade of water and water rights or obligations over time
- the provision of water-related services
- whether there is a need to build additional infrastructure to store the water of a water report entity.

The elements of a general purpose water accounting report are:

- water assets;
- water liabilities;
- net water assets;
- changes in water assets; and
- changes in water liabilities

link to example

National Water Account

www.bom.gov.au/water/nwa

Published online

Input from many jurisdictional agencies

Water Information | Regulations | News and events | About

NWA ▸ Context | Statements | Notes | Accountability Statement | References | Select a Water Region

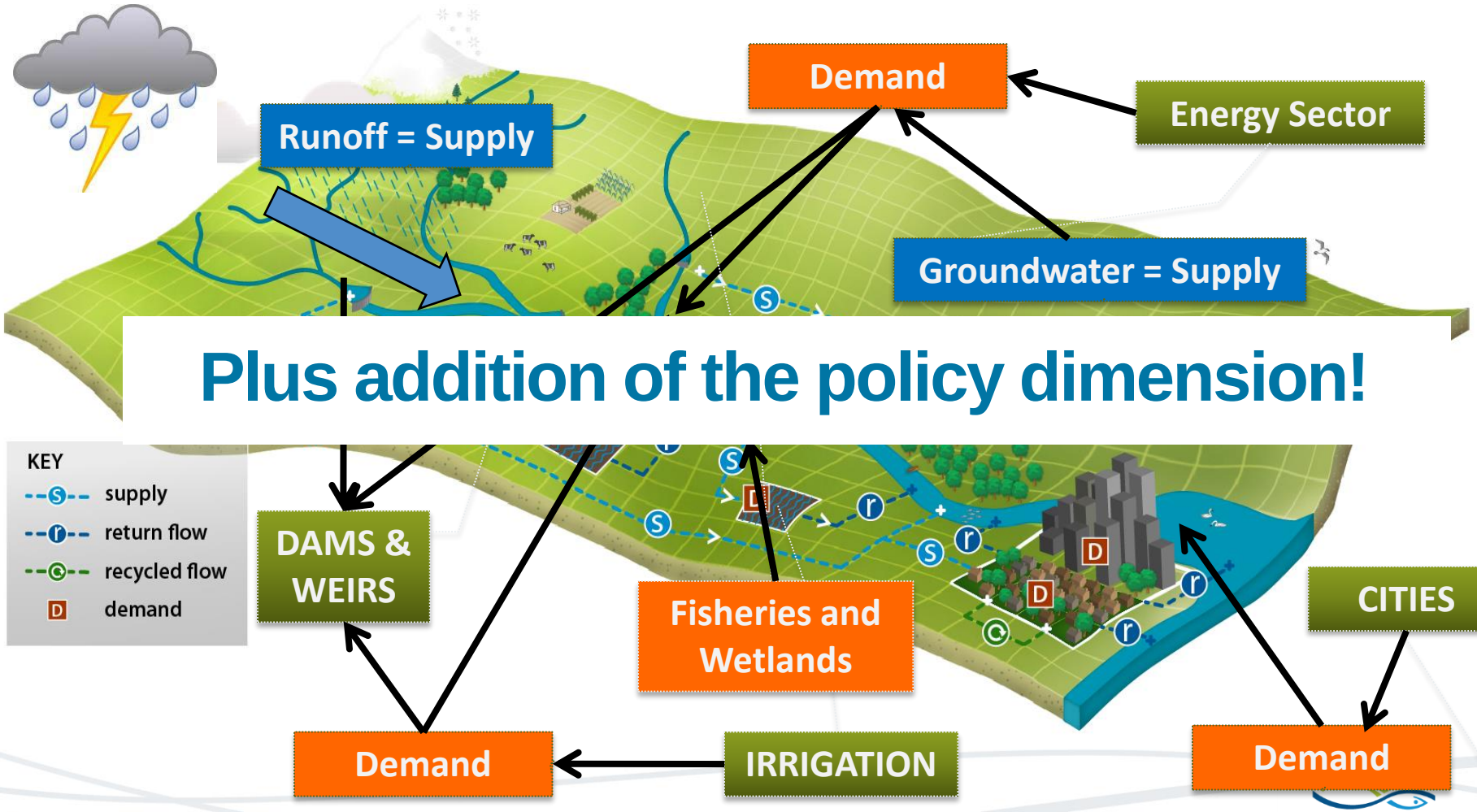
Water Assets and Water Liabilities | Changes in Water Assets and Water Liabilities | Physical Water Flow

Murray-Darling Basin

Physical Water Flow

	Data Type	2010 ML
WATER INFLOWS		
Connected Surface Water Inflows		47,122,027
Groundwater Inflows		
15.1 Groundwater inflow from outside region		
15.1.1 Regional groundwater inflow	Estimated	2,578
15.1.2 Sea water intrusion into aquifers	Estimated	57
15.1.3 Other lumped groundwater inflow from outside region	Modelled	10,400
15.2 Groundwater recharge		
15.2.1 Diffuse groundwater recharge from landscape water	Modelled	1,753,711
15.2.2 Groundwater recharge from connected surface water	Modelled	204,390
15.2.6 Managed aquifer recharge	Measured	5,037
TOTAL Groundwater Inflows		1,976,173
TOTAL WATER INFLOWS		49,098,200
WATER OUTFLOWS		
Connected Surface Water Outflows		43,517,124
Groundwater Outflows		891,050
TOTAL WATER OUTFLOWS		44,408,174
Unaccounted-for difference		1,085,123
CHANGE IN WATER STORAGE		3,604,903
TOTAL WATER INFLOWS		49,098,200

eWater Source – IWRM supply and demand of water quantity and quality - local to basin scale



Plus addition of the policy dimension!

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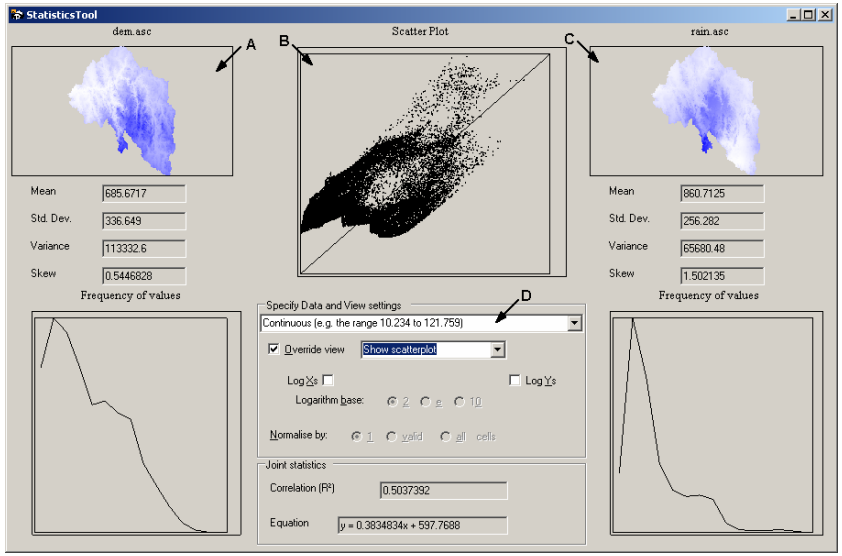
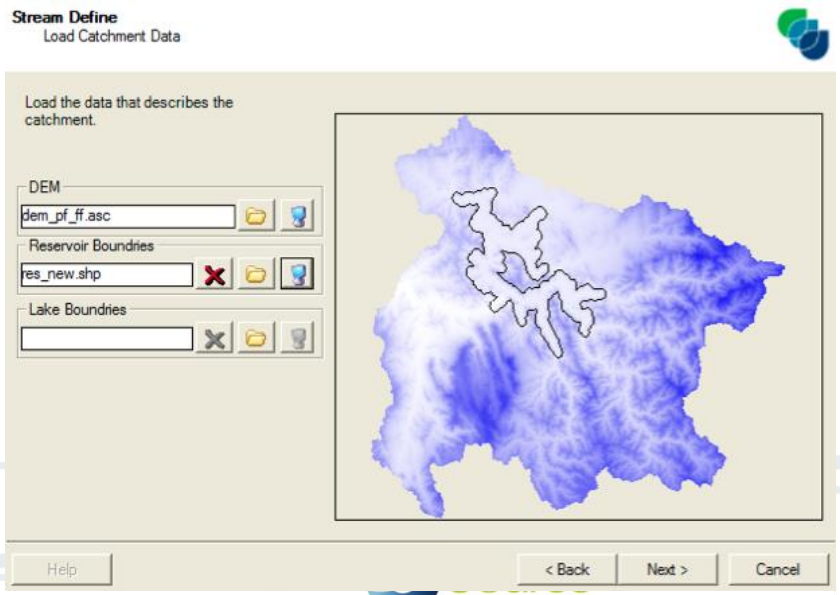
Built upon TIME – a general purpose modelling system

- A software framework for developing eco-hydrological models based upon the Microsoft .NET framework.
- Designed to support the creation, testing and end-user delivery of environmental simulation models.
- Supports the management, manipulation and presentation of a variety of data types, as well as support for testing, integrating and calibrating simulation models.
- Underpins a range of spatial and temporal modelling systems including the toolkit models (www.toolkit.net.au)



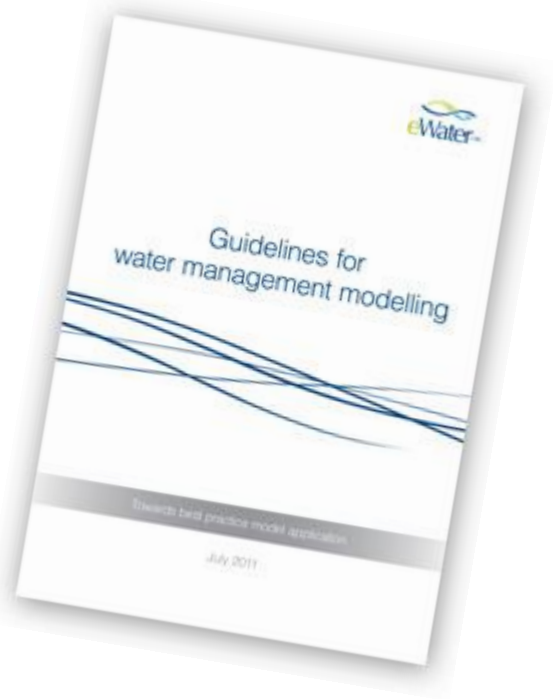


Best Practice Guidelines

High level guide released in September 2011

More specific guidelines at various stages of development

- Runoff generation (published)
- GW-SW Interactions (published)
- Water sharing rules (published)
- Uncertainty analysis (in review)
- Storages and wetlands (draft)
- Environmental demands (draft)
- River operations (draft)
- River Losses (draft)



http://ewater.com.au/publications/guidelines-for-water-management-modelling/

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Applications

eWater Source combines IWRM water balance with governance/legal structures

- Varying hydrologic regimes as basis for analysis (captures variability)
- Tracking of water through the system based on legal boundaries or other jurisdictions
- Resource assessment methods to allocate water between different competing uses within a jurisdiction
- Model represents the combination of IWRM and arrangements or agreements
- Ability to create a water budget both by source and as a 'water accounting' asset class according to use and legal agreements.

Australia's 'DSS' - The Scientific foundation of adaptive water management policy

1. Build & Calibrate hydrological base with local data and knowledge so that it matches stakeholder experience.
2. Consistency of platform to reduce technical issues and focus on comparison and policy
3. Test and refine policies in all kinds of hydrologic conditions including flood and drought to build resilience.
4. Use as a stakeholder engagement tool and knowledge product – demonstrate relative impacts and implications of proposals as a scientific basis for decisions.
5. Use as planning and operational tool
6. Compliance Tool – update with new data and check annually
7. Adjust policy and reflect in model as new situations arise
8. Repeat….. (the process is continuous)

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