

WATER RESOURCES OBSERVATION NETWORK



... transforming data to knowledge for water managers

wron.net.au

Water is becoming a scarce and vigorously contested resource. Efficient water resource management and informed decision making is currently hampered by a lack of accurate and timely water information. To improve water information in Australia, current barriers need to be overcome such as the cost of water monitoring, absence of nation-wide standards and lack of available technology. A national Water Resources Observation Network (WRON) will overcome these barriers, enabling a radical improvement in the utility of our water resources information. WRON technologies will provide the ability to integrate a diversity of water data maintained by many agencies across Australia. It will permit real-time assessments of water availability and quality in our rivers, groundwater systems and dam storages; and ready comparisons to historical and predicted conditions. It will revolutionise monitoring and forecasting of patterns of water demand and use across the country, assisting regulatory systems, water markets and environmental flow trusts to operate more effectively.

Background

It is widely accepted that water scarcity will remain a major challenge in the years ahead. With climate change dictating lower rainfall and runoff, reductions in water yield from our catchments is being seen through increased interception to support agriculture. At the same time we are seeking to return more runoff to rivers as environmental flows.

Major investment will be needed in water supply infrastructure reform, particularly as urban population grows and climate change becomes an increasingly significant threat.

Through the Australian Government Water Fund, \$2 billion has been directed to reform water planning, regulation and trading within an environmentally sustainable framework¹. Sound water resources information is critical in order to maximise the effectiveness of this investment and to withstand public scrutiny of decisions.

We need to be able to understand the status and trend of Australia's water resources at multiple spatial and temporal scales to achieve many of the reforms outlined in the National Water Initiative, and to ensure that future investments in water infrastructure will be optimal. To this end, development of a WRON has begun.

In 2007, the Prime Minister of Australia announced 'A National Plan for Water Security', committing \$10 billion over 10 years to improve water efficiency and address over-allocation of water in rural Australia. Under this plan, the Bureau of Meteorology has been charged with building and operating a national water resources information system, which will require the rapid uptake and operational realisation of the WRON vision and technologies.

What is the Water Resources Observation Network?

WRON will provide the technical framework and standards required to support water information management. It will link Australia's many water and related data assets, and harnesses new data streams from satellites and on-ground sensor networks. It couples these data to a new generation of web-based forecasting and reporting technologies, to provide reliable forecasts of the status of our water resources.

WRON will revolutionise our ability to monitor, forecast and manage water demand, supply, quality and use patterns in any part of the country, at any time. It will provide the transparency and rigour demanded by government, community and business, and will provide a robust scientific foundation to a transparent, credible and evidence-based water reform process.



Hydrometric data

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WRON will allow us to:

- better anticipate changes in water availability and demand
- better define adequate allocations for users and the environment
- shape demand and inform new infrastructure planning

WRON services will be made available via the Internet allowing applications to be deployed using a wide variety of web-based devices. This will provide the public, farmers, catchment management authorities, researchers, land and water managers better access to public data.

Countries such as the United States and the European Union are actively addressing similar problems, giving Australian science and industry the opportunity to lead the next generation of water resource management with global solutions.

Technology on tap

Through the *Water for a Healthy Country* Flagship, CSIRO is investing significantly on foundation research to ensure the success of WRON. Its applications will:

- enable water information interoperability
- improve the usability and availability of water data
- develop next generation modelling and forecasting tools
- develop improved reporting and visualisation tools

Case studies

WRON researchers are already delivering on some key projects, offering an insight into WRON's potential.

Examples are:

- the Australian Dam Levels Monitor
- next-generation sensor networks
- a report card framework for water quality

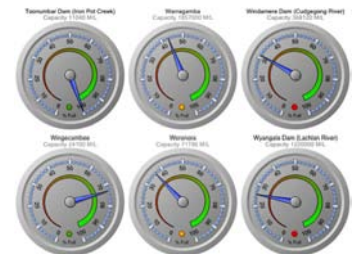
The Australian Dam Levels Monitor

The Australian Dam Levels Monitor is a prototype WRON application that, for the first time, enables us to ascertain dam levels across the country using just one site. It uses innovative 'web data harvesting technology' to take dam level data published by agencies on more than 40 websites, each with a different way of reporting the information, to deliver a cohesive and standardised national coverage. It currently shows more than 90% of Australia's stored water volume.

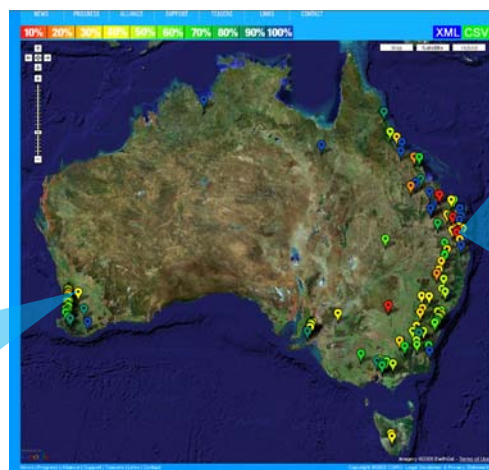
Information is delivered in map, graphical and tabular form and can be accessed by other websites and models through an XML interface. Data for specific dams can also be accessed at the site using desktop widgets. The project is developing data and communication standards to allow this information to be served directly from the field measurement point into the web.



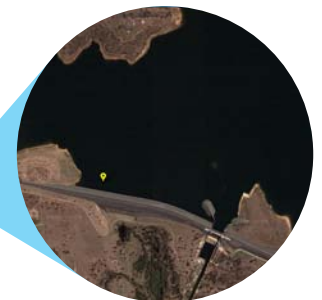
Widgets allow you to display current and historical level data for chosen dams on your desktop.



Dashboard-style gauges provide a quick view of current dam levels and the total capacity for each dam.



Our web map interface allows you to check dam levels at a glance across Australia.



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Next-generation Fleck sensor networks

Next-generation sensor networks provide an opportunity to access information in real time at a fraction of the cost of present day monitoring systems.

Flecks, developed by CSIRO, are low-cost network modules delivering self-powered, ad hoc network-enabling capability to farmland and waterways in Queensland's Burdekin region. While providing enhanced efficacy and reducing the cost of water resources monitoring, Flecks can be easily adapted for a number of uses. Sensors distributed around water bores monitor how much water is being pumped out, and the effect this has on salinity levels and the water table. Information is fed through a distributed network directly to the office of the local water authority.

With very low standby current and a long radio range, Fleck is making possible the WRON vision of measuring and monitoring our environment in real time.



The heart of Fleck, the technology that will enable WRON to deliver a step-change in natural resources management.

Representation of next generation sensor network.



Fleck sensors distributed in situ feed real-time data to the WRON network.

Report card for water quality

WRON technology will allow us to rapidly provide reports and models of both water quantity and quality online. CSIRO is providing underpinning science and a framework to support the development of an integrated Water Quality Report Card for North Queensland's Marine and Tropical Research Science Facility (MTRSF). Management issues in the Great Barrier Reef include:

- changing catchment run-off and loads resulting from changed land and water use
- impacts from climate change ranging from bleaching and acidification to changing ocean circulation
- the sustainable use and enjoyment of marine resources

The report card will provide a framework for the assessment and reporting facilities of MTRSF so it can evaluate outcomes of management interventions. It will draw on a range of data types collected and held by

multiple State and Commonwealth agencies and research bodies; and will develop a framework to facilitate reporting.

The technology developed for the report card will be a readily accessible feature of WRON, allowing Australia's water resource managers to quickly produce accurate reports and models online.



WRON will make reporting on water quality and environmental conditions timely and cost effective.

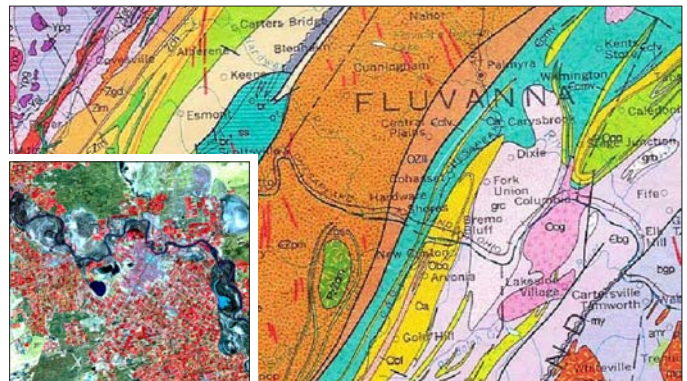
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Capability of WRON

WRON aims to transform Australia's disparate water resources data into a nationally accessible, consistent and timely information system that will meet demand for improved management, reporting and forecasting of water resources.

Over a ten-year timeframe, the challenge for the WRON Alliance is to build the technical capacity in Australia's water industry by:

- developing and adopting industry standards for water information sharing
- implementing ways to manage the coverage, accessibility, accuracy and security of water data
- developing and implementing the next generation of forecasting and reporting tools
- deploying next-generation sensor networks to accurately measure water resources



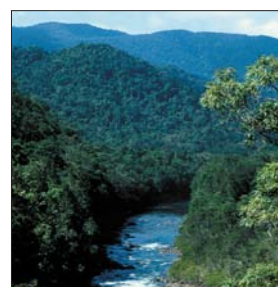
Geospatial data.

Partners in science and knowledge delivery

The WRON Alliance, initiated by CSIRO, is a collaboration between State and Federal government agencies and public and private sector organisations. The Alliance is working together in order to realise the WRON vision and is well supported by an increasing number of organisations including:

- CSIRO
- Bureau of Meteorology
- eWater CRC
- Bureau of Rural Sciences
- Geoscience Australia
- Murray-Darling Basin Commission
- National Land and Water Resources Audit
- Australian Bureau of Statistics
- Sinclair Knight Merz
- Kisters Pty Ltd
- NGIS

The WRON Alliance has recently developed the specification of the Australian Water Resources Information System (AWRIS) as part of the National Water Commission's Australian Water Resources 2005 project. AWRIS is to be developed over the next two years and operationalised by the Bureau of Meteorology.



Collecting water quality samples.
WRON will reduce much local effort in water monitoring.



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