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Regional Water

Water for a Healthy Country Flagship

National Research
FLAGSHIPS
Water for a Healthy Country

CSIRO

To provide solutions that increase regional water security, while meeting social, environmental and critical human needs.

Australia's rural water resources face a major transformation in coming decades due to unprecedented pressures on our water systems from increasing climate variability and change, historical over-allocation of water, water trading from agriculture to urban and ecological uses, and inefficient irrigation practices.

Through partnerships with government, industry and communities, the Water for a Healthy Country Flagship's Regional Water research theme aims to provide solutions that increase regional water reliability and security, while meeting social, environmental, and critical human needs. Our researchers are developing tools and strategies to assess the availability and use of water in our river systems and catchments, and to support our partners to design a sustainable water future for all users.

This research will achieve greater certainty of water supply, improve water productivity, identify new water sources, and allow better planning.

> Researchers are developing methods to map the connectivity of our groundwater and surface water so we can better manage our water resources.

> Developing tools and measurement methods to estimate current and future water availiability across Australia.

Our research focuses on five key areas:

Water in a changing climate – Understanding climate and land use impacts on water availability and uses, and reducing the uncertainty in the quantification of streamflow in order to better adapt to these impacts.

Groundwater characterisation and management – Supporting national groundwater sharing plans through the development of new models and system tools to improve our understanding of groundwater impacts. This includes more accurate accounting for surface-groundwater interactions and the need to meet the water requirements of groundwater-dependent ecosystems,

Water in northern Australia – Providing robust, comprehensive assessments of water resource availability, as well as agricultural, industrial, and social requirements for water across northern Australia to ensure sustainable development of northern Australia's water resources. This includes integration of Indigenous water knowledge in northern Australia's water management.

Irrigation, Economics and Environment – Providing solutions to help industry, water managers and policy makers respond to challenges in managing water for irrigation and the environment. This includes conducting projects that assess options and quantify impacts on irrigation and environment, providing advice to governments, and ensuring the effectiveness of rural water management options.

River system modelling – Working with the National Hydrological Modelling Strategy and the eWater Cooperative Research Centre, this research stream aims to build the next generation of nationally-consistent river models that will support groundwater management, river operations and planning, and the water management industry into the future.

Delivering outcomes

Our research is developing the science to underpin estimations of the current and likely future water availability across Australia so we can:

- better understand the impacts of climate and land use change on water availability and on water users to enable better plans for the future and more equitable water sharing;
- improve our understanding of groundwater systems and their interactions with surface water systems so we can manage them closer to their sustainable limit;
- acquire a better systems understanding of the social, economic and ecological consequences of reduced water availability, water buybacks and infrastructure investments so that the effectiveness of various management options can be understood and maximised.

Achievements

Sustainable Yields

Decreased water availability in southern Australia due to climate change and water reforms means that demand for water for the environment and cities will increasingly compete with water for irrigation use, especially in the Murray-Darling Basin, one of Australia's most important and stressed, water resources.

A defining project of Regional Water research has been the Murray-Darling Basin Sustainable Yields (MDBSY) project. Commissioned by the Australian Government to quantify water availability in the Basin under different climate and land-use scenarios, the project highlighted the potential impact of climate change on reducing surface water in the southern part of the Basin.

This reduction has major implications for environmental health and the reliability of water supplies, and led to CSIRO delivering three more sustainable yield studies, covering northern Australia, south-west Western Australia and Tasmania.

More information is available at: http://www.csiro.au/partnerships/SYP.html

Identifying the cause of the big dry

CSIRO and partners are investigating the causes of climate change and climate variability.

The South-Eastern Australian Climate Initiative (SEACI) was a three-year, $7.5 million research program that investigated the causes and impacts of climate change and climate variability across south-eastern Australia.

SEACI research has significantly improved our understanding of projections and forecasts for south-eastern Australia. Based on projections from global climate models, south-eastern Australia is likely to be warmer and drier in future decades, especially in winter.

Outcomes of the research are being used by governments to develop and provide a scientific basis for future water resource planning and policy decisions.

More information is available at: http://www.seaci.org/

Measuring surface-groundwater interaction

Researchers have developed a new way of quantifying water movement between surface rivers and underlying groundwater systems.

Using a radioactive gas, radon-222, researchers can now track changes in radon along a river to see the location and magnitude of groundwater inflow. When the groundwater discharges to the rivers, the radon decays and is lost in the atmosphere.

This improved measurement of water resources is a vital tool in the future management of sustainable water supplies for Australia.

More information is available at: http://www.csiro.au/science/GroundwaterSurfacewaterInteractions.html

More benefits with less water

Faced with a future with less water, flagship researchers have developed a quantitative approach to maximise Australia's irrigation potential while improving local environments.

Using spatial analysis, researchers have devised a tool that can help water managers to identify which parts of an irrigation district would provide the best public investment in future irrigation infrastructure and which parts, if retired, would lead to avoidance of high salinity impacts and degradation of ecologically-valuable water courses.

With partner Goulburn-Murray Water, researchers undertook a pilot study evaluating opportunities to reconfigure land, water, and infrastructure in the Kerang Irrigation district in Victoria.

The research identified and estimated the costs and benefits of a range of land and water management options under changed water allocation regimes. Researchers are working on implementing this approach with a range of local institutions, including governments, industry, and communities.

More information is available at: http://www.csiro.au/science/more-benefits-less-water.html

> The Murray-Darling Basin is Australia's 'food bowl' and one of the country's most important areas for irrigated agriculture.

> Scientists are developing computer modelling tools to help fight the environmental impacts of rising salinity in WA's Avon and Blackwood River Basins.

Fighting the impact of rising salinity

Research to tackle dryland salinity in Western Australia has implications for land management across Australian landscapes.

Flagship scientists have developed computer modelling tools to predict how different drainage schemes help fight the environmental impacts of rising salinity.

The collaboration between CSIRO, and the WA departments of Water, and Agriculture and Food, found that different drainage systems have varying impacts on salt and groundwater levels in salinity-effected agricultural land.

The project evaluated drainage and other water management strategies for WA's Avon and Blackwood River Basins using the LASCAM (Large Scale Catchment Model) hydrological model. Studies were also undertaken on the impacts of a drying climate on water flows and river salinities in the ecologically and socially-important Blackwood River.

The work, part of the WA Government's Engineering Evaluation Initiative, has application in dryland catchments around Australia to help predict the impacts of different sub catchment and regional scale drainage management strategies.

Understanding how Indigenous people value rivers

In the first Australian study of its kind, scientists are recording Indigenous knowledge relating to water and quantifying the economic benefit to Indigenous people from water-dependent resources.

As part of the Tropical Rivers and Coastal Knowledge (TRaCK) program in northern Australia, our researchers are examining the effect of different water levels, or flow regimes, on the patterns of resource use by Indigenous people in three tropical catchments in Western Australia, the Northern Territory and Queensland.

This work will help water planners and managers consider Indigenous water needs in water allocation decisions. Quantifying Indigenous water requirements is a national water policy objective and this research will enable Indigenous people to have their water requirements factored into planning.

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New tool allows better water delivery from reservoirs to multiple users

Regional water researchers together with government and industry partners are developing a new river system modelling suite that provides a flexible way of managing the complex water rules that share water resources to multiple users throughout Australia.

The tool takes account of differing rules in each river system to track and manage differently owned parcels of water as they are stored and moved through river systems. It provides a way to track environmental water independently to water used by communities and industries, and allows water managers to explore a range of new river management options.

Trials, using different river water management systems, are underway in Queensland, New South Wales, and Victoria and the tool will be available to water industry users across Australia.

More information is available at: http://www.csiro.au/science/new-water-modelling-tools.html

> Researchers are examining how different water flow regimes in tropical catchments affect patterns of resource use by Indigenous people. © Skyscans.

Partnerships

By collaborating with industry, government, other research agencies, and the managers of our river basins and aquifers, CSIRO's Regional Water theme can help to ensure certainty for Australia's future water supply.

Complementing the skills of CSIRO scientists, we draw on the expertise and advice of our partners including:

- Murray-Darling Basin Authority
- Australian Bureau of Meteorology
- National Water Commission
- Australian and State Governments
- Australian universities
- Irrigation industry

We work in partnership with research groups such as:

- South Eastern Australian Climate Initiative
- Cooperative Research Centre for Irrigation Futures
- eWater Cooperative Research Centre
- Tropical Rivers and Coastal Knowledge program
- Northern Australian Water Futures Assessment
- National Centre for Groundwater Research & Training

Research Capacity

Our research brings together CSIRO's best scientific research capabilities from around Australia, and research leaders from across a range of disciplines within CSIRO, including climate science, economics, forestry, geophysics, hydrology, sociology, statistics, software development, and systems analysis.

These multidisciplinary teams provide opportunities for greater innovation and broader analysis of research towards strategic science outcomes.

In 2010-2011, the Regional Water theme is investing up to $30 million in research, with more than 250 CSIRO researchers working from more than seven locations across Australia.

> Regional Water brings together our best scientific research capabilities from across Australia to investigate our rural water challenges.

About the Water for a Healthy Country Flagship

Regional Water is one of four research themes within the Water for a Healthy Country Flagship, along with:

- Urban Water
- Integrated Water Information Systems
- Healthy Water Ecosystems

The Water for a Healthy Country Flagship is a research partnership between CSIRO, State and Australian governments, private and public industry and other research providers. The Flagship is addressing one of Australia's most pressing natural resource issues, the sustainable management of our water resources.

The Flagship aims to provide Australia with solutions for water resources management while protecting or restoring our major water ecosystems.

About the National Research Flagship Program

Water for a Healthy Country is one of ten National Research Flagships established by the CSIRO since 2003 as part of the National Research Flagship Initiative. Flagships are partnerships of leading Australian scientists, research institutes, commercial companies, and international partners.

Their scale, long time-frames, and clear focus on delivery and adoption of research outputs are designed to maximise their impact in key areas of economic and community need. Flagships address the major national challenges; health, energy, light metals, oceans, food, climate, manufacturing, minerals exploration, agriculture and water.

For further information:

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CSIRO and the Flagships program

Australia is founding its future on science and innovation. Its national science agency, CSIRO is a powerhouse of ideas, technologies and skills. CSIRO initiated the National Research Flagships to address Australia's major research challenges and opportunities. They apply large scale, long term, multidisciplinary science and aim for widespread adoption of solutions.