



Curtin University

SECURING OUR WATER SUPPLY

WATER CAPABILITY STATEMENT

Make tomorrow better.

research.curtin.edu.au

ABOUT CURTIN UNIVERSITY

Curtin has become a leading institution for progressive research and collaboration.

As we build on our momentum, we aim to maintain a balance between demand-driven research, which solves defined problems for industry and society, and researcher-driven research, which is characterised by a desire to push the limits of understanding.

At the heart of our endeavours are strong academic and industry partnerships. We believe it is only through collaboration and research excellence that we can achieve impact and be ranked among the best in the world.

We are placed in the top one per cent of tertiary institutions worldwide in the 2020 Academic Ranking of World Universities, and the latest Excellence in Research Australia analysis ranked more than 95 per cent of our assessed research as world standard or above.

Partner with us on your next challenge and leverage our experience, networks, facilities and research expertise as we work together to find innovative solutions and explore new possibilities.



WATER FOR THE FUTURE



Water is a universal resource and access to it is a universal requirement for life, health, our environment, and our society. Water sources face competing demands from urban development, industry and agriculture, while also being needed to maintain broader environmental values. Demand from human activities is increasing, while supply is declining in many areas across Australia due to climate change and decreasing rainfall.

During the past decade, Curtin University has been building research capabilities to support sustainable water use, developing practical tools, products and processes to address issues of water quality, water quantity and related water supply challenges.

Our research expertise ranges from water quality at the molecular level to entire ecosystem interactions and impacts.

WATER SOURCES AND WATER QUANTITY

In a drying climate, securing and maintaining water sources for all users is a priority. Our researchers are increasing understanding of our natural water resources and their interconnectivity with the environment.

As aquifers are tapped to supplement domestic water supplies, research at the **Western Australian School of Mines: Minerals, Energy and Chemical Engineering (WASM-MECE)** is expanding knowledge of aquifer hydrogeology. For example, researchers are working with the WA Water Corporation to understand the connectivity and flow of water through the aquifer, the impacts of extracting water on local ecosystems, and how recycling water back into the aquifer affects the quality and volume of our groundwater. Detailed hydrogeological models of our surface water and groundwater systems are being continuously developed to monitor the health of these resources and inform management for water supply over decades.

Mining, mineral processing and related industries that drive the economy in Australia's arid interior are consistently challenged

by water demands. Cost, hyper-salinity and increasingly sensitive processing, such as in rare earth and battery minerals, are all driving a need for greater industrial fit-for-purpose water supplies and management. **WASM-MECE** researchers based at the Curtin Kalgoorlie campus are considering these water concerns in an industrial ecosystem context, and working with technologies to create value from wastewater streams including carbon mineralisation and metal recovery.

Considerations for monitoring and extracting groundwater are supported by expertise in **WASM-MECE** and the **Curtin University Oil and Gas Innovation Centre (CUOGIC)** in well logging and well field design.

To better manage our surface water reserves, Curtin's **School of Civil and Mechanical Engineering** is investigating how climate change and human activity are impacting on rainfall, run-off and streamflow in surface water catchments, and opportunities for better urban stormwater management. Technologies for water generation such as Fog Harvesting and Solar Distillation are being explored. These larger scale system models can help us better estimate future water availability.



WATER QUALITY

Climate change and expanding populations in Australia have resulted in scarcity of water in many urban and regional centres, particularly in some areas of Western Australia which have been in a drought pattern for more than twenty years. Scarcity of water has led to an increasing need for water utilities to rely on different, and sometimes lower quality, source waters for drinking water production. The **Curtin Water Quality Research Centre (CWQRC)** has 30 years of experience as a trusted partner to our water providers in assessing water quality and developing new treatment strategies to produce drinking water from a greater range of source waters.

Water quality assessment extends from understanding the natural components in source water, studying the removal of various chemicals in water treatment, monitoring the levels of disinfectant and other chemicals in drinking water distribution systems and understanding the formation of any unpleasant smells or tastes at the customer's tap. The CWQRC has developed new knowledge on the effect of high levels of bromide in source waters which has had significant industry impact. These high levels of bromide can be involved in unpleasant tastes and odours and formation of high concentrations of disinfection by-products, some of which are regulated in the Australian Drinking Water Guidelines.

Our researchers have a track record of developing and optimising water treatment processes to improve drinking water quality. Applying these technologies and optimising them at scale in

potable water treatment has led to minimisation of tastes, odours and disinfection by-products. As leaders in disinfection by-product research in Australia, we develop analytical methods for newly emerging disinfection by-products and study their presence in drinking water distribution systems.

The CWQRC is also exploring emerging treatment and disinfection technologies like continuous electrochlorination and advanced oxidation processes, as well as studying a number of aspects of desalination of seawater, to achieve high water quality from a range of different water sources.

WATER RECYCLING

Wastewater treatment is key to returning water safely to the environment or recycling it for further use. Through the CWQRC, our researchers are providing better understanding of the removal of organic contaminants and nutrients in both urban and rural wastewater treatment.

The CWQRC has been at the forefront of water recycling research nationally for the past 15 years. Its research has contributed to changing the way legislators, public utilities and the general public think about wastewater reuse. The centre's early research on chemical risks and emerging contaminants contributed substantially to the promotion of large-scale water recycling in WA by providing the information necessary to develop regulations for indirect potable reuse.

Subsequent research provided much of the science to enable a trial of groundwater replenishment of highly treated wastewater. CWQRC research helped optimise plant design to achieve water quality for aquifer recharge that consistently meets health and environmental guidelines. The centre also helped identify indicator chemicals to allow economical monitoring of process performance.

Demonstrating the deep impact of Curtin's water recycling research, the WA Government adopted groundwater replenishment in two full-scale plants to help secure Perth's dwindling water supply. The robust, rigorous and independent science provided by CWQRC and its collaborators gave confidence that concerns relating to chemical contamination in recycled water have been identified and addressed.

Curtin continues to guide industry and government on the performance of wastewater treatment and water recycling plants, in terms of removal of new emerging contaminants.

WATER DEMAND

Curtin brings together expertise in water planning, management, policy and sustainability to balance the constraints of demand and supply into the future.

The **Curtin University Sustainable Policy Institute (CUSP)** has an extensive track record of water monitoring and measurement projects to inform decisions around sustainable urban water use. By identifying water balances and usage patterns inside buildings, different technology can be harnessed to improve water efficiency. Together with industry and the community, Curtin University's **Legacy Living Laboratory** in East Fremantle is showcasing how smarter urban planning, design and management can contribute to the sustainable use of water and deliver a water-sensitive urban development.

CUSP is also championing the household use of alternative water sources such as rainwater and greywater in a range of 'lived in' demonstration programs using existing tools and technologies to make it easier for urban planners, builders and residents to minimise primary water use and improve urban water efficiency.

Agriculture is also a significant water user and **Curtin's Centre for Crop and Disease Management (CCDM)** is helping the industry gain a data-driven understanding of its water demand. By monitoring real-time on-farm water usage and combining this with weather, soil and crop-growing information, researchers are extrapolating water demand estimates across entire water catchments. A better understanding of water demand and usage is also being used to demonstrate and drive the uptake of existing water efficient technologies and tools. Working with industry, researchers are identifying the barriers and drivers to adoption to encourage behavioural change around water use efficiency.

Valuing water as a resource can drive sustainability and efficiency in its use, and both CUSP and CCDM are working with urban and agricultural communities to understand the return on investment from their water use. By creating planning tools encompassing land use and water demand forecasts in water balance models, researchers can identify the need for future water systems infrastructure and create business cases for sustainable water use practices. In conjunction with the **Curtin Institute of Computation**, data analytics, data visualisation and modelling capabilities can be used to map, understand and forecast complex systems of competing water demand into the future.



WATER GOVERNANCE, REGULATION AND ALLOCATION POLICY

In the context of decreasing supply but increasing demand, an evidence base of water availability and use, robust forecasting and scenario modelling tools can assist us to make informed decisions about water value and stewardship, supply infrastructure and allocation across a diverse range of stakeholders. In conjunction with other research groups at Curtin, the **Curtin Business School** supplies environmental and water accounting expertise, understanding of environmental law and water access legislation, stakeholder management, and governance and accountability strengths to mitigate water-related risks and consequently, improve overall water resource management and performance.

ACCESS OUR EXPERTISE

Curtin University welcomes opportunities to collaborate with organisations that are interested in securing water for our future in a drying climate.

Curtin also offers executive education, professional development and postgraduate courses that encourage lifelong learning and help organisations build expertise within their workforce.

Contact us today to discuss your business challenge or opportunity.

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