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Topic Insights

# Engineers: The Key to Sustainable Water Use

Neil Andrew

*Chair of Australia's Murray–Darling Basin Authority and Fellow of the Australian Academy of Technology and Engineering, Australia*

Although Australia is known for being the world's driest inhabited continent, water scarcity is hardly an issue that is isolated to just one country. In recent months, the prolonged drought in South Africa has led to a water crisis that prompted real and urgent warnings that Cape Town, the country's second-largest city, faced the possibility of running out of water. In India, the northern summer has brought on a repeat of acute water shortages, with reports of taps running dry in many areas and with one policy think-tank warning that around 600 million people in India are facing water stress.

The United Nations (UN) agency UN-Water says that water scarcity affects every continent; growing populations and higher water use over the past century are increasing the number of regions that are reaching the limit of sustainable water use. To quote Benjamin Franklin, the American inventor, statesman, and founding father, "When the well is dry, we know the worth of water."

Now, more than ever, the world is looking to its engineers, scientists, and policy makers to come up with new ways to manage river systems in order to ensure that the "well" does not run dry, and to make sure water is used efficiently and fairly.

In recent years, Australia has confronted its water issues head on. Our approach to ensure that water use can be sustained across multiple government boundaries could well become a template for other nations to follow. Although it is an arid continent, Australia is a major food producer and exporter. According to the latest official forecast by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), farm production in Australia will be worth 61 billion AUD to the economy over the coming year, and exports will be worth around 47 billion AUD. Much of this comes from the Murray–Darling Basin, a globally significant area that covers more than a million square kilometers and 23 river systems across four states of the Australian Southeast. The Murray–Darling Basin is home to more than two million people and is the nation's primary food bowl.

In 2007, following the worst drought on record, more than 50 years of increasing water extractions, growing evidence of environmental harm, and arguments between regions over water-sharing arrangements, it became clear that national leadership was required. The result was the new Murray–Darling Basin Plan, which became law in late 2012. The plan has a clear objective: to ensure long-term and sustainable use of water in order to safeguard the environment and balance the needs of irrigators and communities along the river systems. The Murray–Darling Basin Plan requires a reduction of around 20% in average annual water take from the Murray–Darling Basin's rivers, which is equivalent to 2750 GL.

The social and economic impact of this reduction is offset to some degree by a substantial government investment in purchasing water licenses from those willing to sell them, and by investment in more efficient irrigation infrastructure. More than 10 billion AUD has been allocated to these water-recovery efforts, which have currently yielded licenses representing more than 2100 GL on average. This water is being returned to the environment to improve its health.

A major objective of the plan was to separate the value of land from the value of water. Everyone in the Murray–Darling Basin now knows the real financial worth of water, and this shift in perspective drives a real change in how the water is used.

The Murray–Darling Basin Authority is the body charged with developing the plan, overseeing its implementation with state government agencies, and reviewing the plan at least once every decade. The work of the Murray–Darling Basin Authority is based on the best available science and evidence, and involves substantial consultation with impacted communities. On an international level, the Murray–Darling Basin Plan is at the frontier of sustainable water management that crosses multiple government boundaries. It is unique in its consideration of ecological needs alongside social and economic demands.

An initial five-year review has found that the plan is working well. The environment is benefiting from increased flows, water rights are being traded for higher value use, and all stakeholders along the river systems are aware of the true value of water. The results after five years show that there is more water in the rivers and in adjacent floodplain wetlands, and that irrigation that uses water more efficiently can maintain or enhance agricultural production. All of these changes have led to greater efficiencies and more flexible farming practices—and to a new focus on the engineering and agronomic solutions that are required to manage water in the 21st century.

The great civil engineering projects of the past 100 years built dams, weirs, barrages, and locks to help control the river, alleviate flood risks, and open up vast areas for irrigation and food production. Looking forward, more infrastructure projects and improvements are needed—and it is here that Australia can learn from the major civil engineering projects in China, such as the Huai River Basin Project. However, new kinds of engineering solutions are also needed.

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In 2018, Australia's farmers are hungry for the new technologies that help to drive efficiencies and production. Farming practices have changed significantly over the past century, and today's farmers are just as comfortable with a computer keyboard as they are in the cab of a tractor. Across the Murray–Darling Basin, many farmers now use total channel-control systems and smart meters to monitor and control the water supply to their crops. Soil moisture can be actively measured, with water being delivered to plants and crops when and where it is needed. GPS satellites guide farm equipment across the fields, and graziers can release water for livestock with the click of a computer mouse.

Thanks to engineering and technological advances, river authorities are now harnessing satellite technology to monitor environmental flows and catchment levels across the Murray–Darling Basin. Smart meters are also being used to measure water allocations. These are valuable new tools that have strengthened compliance and confidence in the water markets. Water management and irrigation are continuously evolving to become more efficient. A number of projects currently under development within the Murray–Darling Basin will further optimize the delivery of water for both human use and environmental outcomes, and will improve water use efficiency both on and off farms.

Nevertheless, more needs to be done to strengthen collaboration, improve data collection, and improve efficiencies over the next five years and beyond, in order to prepare the Murray–Darling Basin for a sustainable future in which the environment, industry, and community are all better off. Over the next five years, the tools needed to deliver a healthy working Murray–Darling Basin will be fully engaged. To ensure that the Murray–Darling Basin Plan succeeds, the Murray–Darling Basin Authority is committed to applying what we have learned through transparent and evidence-based decision-making, and to be guided by our responsibility to manage the Murray–Darling Basin's water resources in the national interest.