

ARTICLE

The global water crisis

The state of this precious resource in Australia



Most of us in Australia have been fortunate enough to not have to worry about water adequacy or reliability. But what if all that is about to change as experts predict that Australia is on the brink of a water crisis?

Escalating pressures on our water resources continue to be fuelled by climate change, pollution, and rapid population growth. Globally, water use, storage and distribution are responsible for around 10% of global greenhouse gas (GHG) emissions.¹ Consequently, we're seeing declines not only in water availability but also quality.

How can we do more with less? By using the already available technologies that enable increased carbon neutrality and decreased water waste.

What's driving changes in water quality and availability

The United Nations predicts that up to 5.7 billion people globally will experience water scarcity at least one month per year by 2050.²

What's impacting the safety and security of our precious water resources in Australia? Bushfires, drought, floods, climate change, increased urban development, and rapid population growth.

In the past 20 years Australia has experienced the two worst droughts in recorded history, requiring us to build rainfall-independent water security options like recycling and desalination. These are very energy-intensive systems.

According to the CSIRO's July 2022 report "Our Future World: seven global megatrends", rainfall levels in Australia vary by nature, but there's been a noticeable shift towards lower rainfall in the southwest and above-average rainfall in the north. They note, "these rainfall patterns are expected to lead to an increase in flash flooding in northern Australia and drought conditions in southern and eastern Australia."³

The report advises that a way to overcome water scarcity whilst proceeding with sustainable development is to look at advances in water management.

State of the industry in Australia

In Australia, the water industry has an estimated annual revenue of \$22.68 billion, adding \$11.38 billion to the Australian economy in 2019-20. But these water services also produce around 5-8% of global methane emissions.⁴

In Victoria alone, the water sector emits more greenhouse gas emissions than any other sector. According to the Department of Environment, Land, Water and Planning (DELWP), Victoria's 18 water corporations released almost one million tonnes of carbon dioxide equivalent greenhouse gases in the 2019/20 financial year. That's more than Victoria's public hospitals, schools, or train network or equivalent to 215,469 gasoline-powered passenger vehicles driven for one year.

Households in urban areas are the industry's largest users of water in Australia as daily requirements for the resource increase due to population growth and as a result of more people working from home due to the COVID-19 pandemic and some reductions in economic activity (Figure 1.).

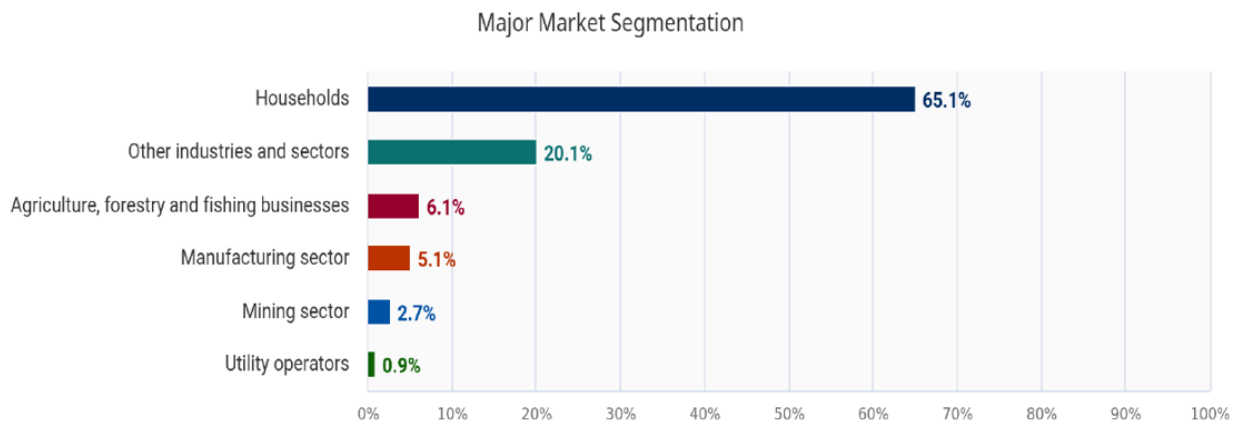
Globally, The United Nations predicts that up to **5.7 billion people** globally will experience **water scarcity at least one per month** year by 2050.

bushfires, drought, floods, climate change, increased urban development and rapid population growth are impacting the safety and security of our precious water resources in Australia

research shows the availability of water in Australia has dropped by 3.5% whilst the population has grown by 1.1%

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Figure 1: Major Market Segmentation
Of water supply in Australia. Source: IBISWorld



2022 INDUSTRY REVENUE

\$14.9bn

Water Supply
Source: IBISWorld

The agricultural sector is the largest user of water from the mains system and from natural sources supplied by the water industry. The consumption of water supplied by water utilities, through the mains system and from natural sources, such as rivers, is dominated by agriculture, at more than 50% of total water volumes in the current year. Another major water-using industry includes the manufacturing sector especially food and beverage, metal products, and petroleum refining.

Water treatment plants, utilities, and energy consumption

Water treatment plants and utilities are large consumers of energy. Sydney Water, for example, uses the same amount of electricity each year to the equivalent of powering over 72,000 homes. This is because of the amount of energy needed to treat and pump water for residential and commercial use. Consider that NSW is the most populous state in Australia and roughly 64% of the state's population live in Sydney.

Being able to accommodate increased supply demands in the most efficient way whilst decreasing long-term asset management and maintenance costs will be largely supported by

the adoption of technologies that enable system efficiency, energy efficiency and improved operability for the entire water treatment, supply, and distribution process.

In February 2022 IBISWorld published the industry report "Water Supply in Australia" which included analysis of major utilities including Sydney Water, Water Corporation, Seqwater and Melbourne in areas of water supply for residential, commercial, industrial, and agricultural sectors (Figure 2).⁵

Their analysis signified the availability of water in Australia has dropped by 3.5% whilst the population has grown by 1.1%. Annual growth in profit has grown 2.4% since 2017 and industry revenue is expected to have increased at an annualised 2.1% over the five years through to 2022, to \$14.9 billion.

Key trends affecting this figure have been identified as investment in water infrastructure and capacity expansion. Cost savings and efficiency improvements have also contributed to profitability for water utilities.

Looking to the future, the report reveals that the private sector will likely play a greater role in new

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Source: IBISWorld published industry report "Water Supply in Australia" (February 2022).

industry assets over the next five years and governments are projected to rationalise water company numbers to improve operating efficiencies. Concerns for the environment are forecast to continue to feature prominently when it comes to industry development and as such utilities have focused on efficiency improvements and cost cutting.

In an age when public-private funding partnerships become more frequent for infrastructure developments that include desalination facilities and major water treatment plants, it's more important than ever to focus the attention on technologies to support the preservation of water availability through efficient system operations that promote reduced energy consumption and parity in supply-demand, as environmental concerns are sure to persevere.

Figure 2: Water Supply in Australia
February 2022 industry report. Source: IBISWorld

Industry at a Glance

Key Statistics

\$14.9bn
Revenue

Annual Growth	Annual Growth	Annual Growth
2017-2022	2022-2027	2017-2027
2.1%	2.1%	

\$2.7bn
Profit

Annual Growth	Annual Growth
2017-2022	2017-2022
2.4%	

18.1%
Profit Margin

Annual Growth	Annual Growth
2017-2022	2017-2022

Key External Drivers

% = 2017-22 Annual Growth

-3.5% Availability of water	-2.4% Level of annual rainfall
0.5% Agriculture irrigation water use	9.4% Capital expenditure by state and local government
1.1% Population	

Industry Structure

POSITIVE IMPACT

Life Cycle Growth	Industry Assistance High / Steady
Concentration Low	Barriers to Entry High / Steady
Industry Globalization Low / Steady	Competition Low / Increasing

MIXED IMPACT

Revenue Volatility Medium	Technology Change Medium
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Looking beyond: Trends and success factor dependents

It is estimated that between 3.5 to 4% of the world's electrical energy is consumed by the water and wastewater segments. We've heard it cited many times over, that energy efficiency is the "first fuel" to making improvements that support Net Zero climate goals. Technology will continue to play a major part in improving water security and optimising sewerage treatment plants when it comes to reducing operating costs and improving treatment process efficiency to ensure deliverables related to high water quality are met.

According to the International Energy Agency (IEA), existing technologies when implemented can increase energy efficiency two-fold by 2040. Water use can be decreased when advanced technology is used in systems and procedures, the extent of water re-use, and management practices.

Using more energy efficient technology not only leads to reduced operating costs but offers benefits for society overall including keeping water services affordable. According to the IEA's Sustainable Development Scenario, energy efficiency represents more than 40% of the emissions abatement needed by 2040. They also note that energy consumption in the water sector could be reduced by 15% by 2040 if the right energy efficiency and energy recovery measures were adopted.

For example, upgrading to new pump designs can deliver energy savings of 3 to 7%. Pairing a variable speed drive (VSD) with a high-efficiency motor can additionally result in about 25 to 30% energy savings.

Digitalisation for decarbonisation

As the water industry looks to gain fuller transparency into operations, asset performance, data collection, and remote monitoring, digital

technologies have become a sought-after solution to increase energy efficiency, reduce energy costs, secure water supply, forecast behaviour of the water network, predict and locate leaks in the system, and move away from manual procedures overall.

Technology like the ABB Ability™ Smart Sensor provides a platform to identify opportunities for optimisation and savings potential to help operators avoid unnecessary energy consumption, water loss, and unnecessary maintenance issues. It converts traditional motors, pumps, and other applications into smart, wirelessly connected devices.

The Smart Sensor for motors enables users to monitor the health and performance of their motors and to plan maintenance in advance to avoid downtime. They have already helped numerous utilities to detect motor anomalies, signalling alarm states and have identified the exact moment when a water pump started to fail. Capturing this data from motors used in pumping applications can help plant operators to understand when they need servicing and how efficient they are or could be.

IE5 synchronous reluctance (SynRM) motor and drive packages helping to meet energy efficiency challenges

Network optimisation can reduce energy demand in systems and at sewerage treatment plants with the use of smart, variable controls and monitoring.⁶

Centrifugal pumps which are at the core of most operations in the water industry are driven by electric motors. These motors are responsible for over 90% of electricity use in water facilities. It makes sense then that because pumping systems are used throughout the water and wastewater process, they offer good opportunities for saving energy. It is estimated that upgrading to new pump designs can deliver energy savings of 3 to 7%.

Often, utilities run motors to the end of their working life. This means that older, less efficient units, such as IE1 and IE2 efficiency class motors, can be kept in place for decades. In the time since they were installed, technology has advanced and motors have become more efficient. Each new IE class motor reduces losses significantly over its predecessor — an IE4 motor, for example, has 20% lower losses than an IE3 motor.

Adding a VSD to a high-efficiency motor can additionally result in about 25 to 30% energy savings. When a motor is not controlled by a drive, it runs generally at full speed even when the load requirements are minimal. A VSD controls an electric motor to match its operation to the application. That means it adjusts the speed and torque to suit the exact requirements of the process. Because the electric motor only runs as fast as needed, significant energy savings are realised.

ABB's SynRM motors comply with the IE5 ultra-premium rating. This goes well beyond the new minimum standard, IE3, for International Efficiency (IE) classes for low-voltage motors, established and enforced by the EU Ecodesign Regulation in July 2021.

The exact savings made possible by this leap in energy efficiency depend on the application and conditions. However, when an IE3 induction motor is paired with a VSD energy bills are reduced typically by up to 25%. A further saving of around 3-4% is possible when an IE3 and VSD combination is replaced by an IE5 SynRM-Drive package.

Tangible examples of how these technologies are already making a difference

To understand how existing technology has already been used to reduce energy consumption, minimise carbon footprint, and increase energy efficiency in water applications, we can look at examples of projects cited by ABB Australia:



(L-R): Anthony Merrett from Remtron and Mitchell Palmer from AlburyCity Council, beside ABB's M2BAX IE3 high efficiency motor.

- ABB's drive and motor package gives AlburyCity Council water plant an energy efficiency upgrade and eliminates residential disturbances: The Council has succeeded in not only solving the problem of electrical lighting disturbances in nearby dwellings but also upgrading their aging infrastructure to enable their water supply system to operate more efficiently and cost-effectively thanks to the implementation of new technology [CASE STUDY](#)

- Queensland irrigation provider Lower Burdekin Water achieved cost savings, lower energy consumption in operations, and realise long-term operational efficiency with ABB's ACS880 ultra-low harmonic variable speed drives (VSDs). [CASE STUDY](#)

- About 80% of energy usage at Sydney Water's plants is attributed to the operation of motors for pumping. IE3 premium efficiency high motors along with medium voltage drives will form a part of their water pump station upgrades in the Prospect to MacArthur Project in Sydney's Southwest to accommodate a rapidly growing population. These motor-drive packages can deliver significant energy savings because they use less energy at the same power output, which concurrently lowers CO2 emissions. [PRESS RELEASE](#)

Generating energy from waste

As the water industry evolves so does the innovative thinking around energy sources. Yarra Valley Water's Wollert waste to energy facility in northern Melbourne is an Australian first. Launched in 2017 the facility processes commercial food waste into renewable energy to help power their adjacent Aurora sewage treatment plant while excess energy is exported to the electricity grid.

The food waste is considered "end of life" meaning it can't be used in any other form. Therefore, this becomes a beneficial way to repurpose the waste instead of it going to landfills where it will create greenhouse gas emissions and be significantly harmful to the environment.

Glenn Wilson, General Manager, Service Futures at Yarra Valley Water says, "the primary design of this application was to provide high quality and durable motors and drives - with the aim of producing gas, keeping the engines running and producing electricity. By reducing downtime, the facility benefits from better productivity, with more food waste being converted into renewable energy, rather than ending up in landfills.

We use variable speed drives for most drive requirements and to control our motors. This is largely because VSDs help to ensure a robust and reliable process, which ultimately leads to more energy efficient operations."

New inventive ideas like this which help to divert tonnes of waste away from landfill and instead cut

greenhouse gas emissions will be part of the future water system to reduce energy costs, and consumption, and keep water bills low for consumers and residents. Coupling them with the right technology for longevity and expected performance will also be essential.

Reworking the water system in the race to zero

The water industry has a pivotal role to play in reducing emissions to tackle climate change. Restructuring energy-intensive processes in the water and wastewater sector is an investment that not only helps the environment but is also commercially viable.

Reduced energy consumption not only means reduced carbon emissions but also overall improved plant productivity. Cost savings generated by water operators and suppliers ultimately then transfers through to customers' bills.

In an age when Australia is on the brink of a water crisis with a steep decline in water availability and population increases putting pressure on water supply, being part of the chain of change is inescapable. Every State and Territory government in Australia now has a 2050 net zero emissions target.

Let's do better to make a concerted effort to use available technologies together with new ideas and employ high-return, low-risk initiatives to help get us there.



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This article is part of ABB's 4 For Water campaign. For four weeks, we'll be releasing knowledge-based content all about the water industry addressing valuable topics like using technology to reduce the risk of issues associated with critical infrastructure, maintain system service and reliability, and increasing energy efficiency in supply, treatment, and distribution to meet the needs of a sustainable world. Come with us on this virtual journey and learn how to overcome major challenges currently facing Australia's water industry. [Discover more here.](#)

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