SDG 6 Clean Water and Sanitation

Overview

UQ demonstrates a strong commitment to SDG 6 through a comprehensive approach that spans campus operations, research and community engagement.

As part of its Sustainability Strategy 2021-2025, UQ has implemented efficient water saving initiatives and best practice water management practices to better understand and manage its water consumption and use across campuses.

Educational initiatives and partnerships extend UQ's impact beyond campus, offering training, research collaboration and practical solutions for water conservation.

The University also engages with local and international communities to improve water security, sanitation and environmental health. Through innovation, policy development, and outreach, UQ contributes to sustainable water management and fosters a culture of responsible water use, aligning its efforts with global sustainability targets.

Progress made in 2025 towards SDG 6 is reported here with reference to the following domains and enablers from UQ's Strategic Plan 2022-2025:

- learning and student experience
- research and innovation
- enriching our communities
- our global profile
- securing our future.

Related SDGs

- SDG 2 Zero hunger
- SDG 3 Good health and well-being
- SDG 7 Affordable and clean energy
- SDG 8 Decent work and economic growth
- SDG 13 Climate action
- SDG 14 Life below water.

Learning and student experience

UQ offers dedicated programs and courses in sustainability, as well as many more programs and courses featuring sustainability content and learning outcomes. UQ endeavours to educate future leaders, scholars and professionals to understand, address and solve sustainability challenges, including those involving securing and maintaining clean water and sanitation.

Curriculum

UQ offers a robust selection of programs focused on sustainable water management and planning, including undergraduate and postgraduate degrees in environmental management, engineering and urban planning.

The Master of Urban Water Engineering (Professional) is designed to develop students' technical expertise across the whole urban water cycle through advanced and postgraduate courses, while offering electives to complement their chosen discipline. This training is especially relevant in the context of the global trend towards urbanisation and associated water stress in modern cities, with urban centres becoming more densely populated. This postgraduate degree expertly prepares graduates with the necessary skills to solve complex engineering challenges in a changing world.

As part of the Bachelor of Engineering (Honours), UQ offers a Water and Marine Engineering Major. This major equips students to use innovative monitoring and modelling techniques to design efficient, adaptable and sustainable waterways, coastlines and resilient infrastructure. This includes designing and building renewable hydropower and ocean energy systems essential to reducing carbon emissions and managing climate change. Students in this major learn how to protect large areas of inland flood plains, beaches, estuarine zones and coral reefs, leading Australia's efforts in developing promising locations for water resources, hydro-power and tidal and wave energy.

UQ also provides a Graduate Certificate in Engineering Science, with an Urban Water Engineering Field of Study. This field of study provides engineers with the integrated knowledge and skills required to understand the urban water system from end to end. Graduates are equipped with the skills to design, optimise and manage the urban water infrastructure in the cities of the future.

Research Program

Coordinated by Student Enrichment and Success (SES) in conjunction with university research units, the UQ Research Experiences program provides motivated students with opportunities to engage in educational research activities. This initiative helps participants develop in-demand capabilities for the knowledge-based global economy, including critical thinking, reasoning, innovative idea development, data analysis and scientific communication. Within this framework, the Australian Centre for Water and Environmental Biotechnology (ACWEB) hosts targeted projects that address SDG 6. Through these projects, undergraduate including honours and postgraduate coursework students team up with the researchers to apply their degree-specific knowledge to real-world challenges, such as sustainable water management, contaminant control and advanced wastewater treatment.

Research and innovation

UQ seeks to deliver economic and social benefits to Queensland and Australia by leveraging its research expertise in a diverse range of fields, including those that contribute towards progress in SDG 6.

Water conservation and sanitation

UQ researchers partner with industry and government to develop novel methods and technologies that are supporting water sustainability, conservation and sanitation across the country to benefit people, the economy and the environment.

How we achieved this

- Researchers at UQ's Australian Institute for Bioengineering and Nanotechnology (AIBN) have developed an innovative magnetic resin that efficiently removes PFAS, known as 'forever chemicals', from contaminated water and biosolids. In 2025, Dr Cheng Zhang initiated a A$7 million project with a consortium of industry partners, led by ViridAU, to demonstrate the technology at wastewater treatment plants. The project aims to remove PFAS from wastewater and semi-solid effluent, making them safe to reuse as compost in agriculture and land rehabilitation. In a circular-economy approach, the recovered PFAS chemicals can also be repurposed into high-value battery materials, taking advantage of their unique fluorinated chemistry to enhance battery energy density, safety and cycling stability.
- In July 2025, researchers from UQ's Queensland Alliance for Environmental Health Sciences (QAEHS) published a study demonstrating that an average dishwasher-using household releases an estimated 33 million microplastic and nanoplastic particles into wastewater infrastructure annually. By testing plastic containers at 70 degrees Celsius, the research found that a single full load sheds roughly 920,000 particles, with polymers like polypropylene, polyethylene, and polystyrene contributing the highest volume. These findings highlight a previously unquantified source of micro-pollutants within municipal effluent. Because wastewater treatment byproducts, also called biosolids, are heavily utilised as agricultural fertiliser, tracking these household emissions is critical to preventing persistent plastic contaminants from accumulating in soil systems, entering food crops and degrading downstream aquatic ecosystems.
- In October 2025, researchers from UQ's Australian Centre for Water and Environmental Biotechnology (ACWEB) and School of Chemical Engineering, in collaboration with the University of Melbourne and Melbourne Water, published a study in *Nature Water* confirming that open-air sludge drying pans are a significant source of gaseous ammonia emissions. The research indicated that a single pan emitted an estimated 43 tonnes of ammonia over 2 years. This accounts for nearly 95 per cent of the pan's gas emissions and means 1/3 of its total nitrogen was lost into the air. While ammonia is not classified as a greenhouse gas, its release contributes to environmental risks like soil acidification and water eutrophication. To manage these impacts, the research highlights a long-term need for wastewater plants to investigate alternative methods like aerobic post-treatment units to remove ammonia.
- In October 2025, Dr Kaili Li from UQ was awarded the Queensland Student Water Prize by the Australian Water Association for pioneering research project,

Understanding and mitigating greenhouse gas emissions from wastewater systems in the data era. This work combines real-time full-scale monitoring with hybrid modelling to provide water utilities across Australia and New Zealand with actionable data tools. The resulting methodology supports municipal service providers in tracking operational outputs, improving reporting accuracy, and developing targeted mitigation pathways to progress toward net-zero emissions within urban wastewater networks.

Protecting and restoring water-related ecosystems

UQ researchers are making progress towards SDG 6 by helping to protect and restore water-related ecosystems in Queensland and Australia.

How we achieved this

- UQ researchers continued to enhance public understanding of the impacts of pesticide toxicity to reef environments through the Pesticide Reporting Portal and Pesticide Risk Metric Dashboard. Part of the Reef Catchments Science Partnership, this data-gathering collaboration with the Queensland Government provides freely available data to government and non-government stakeholders, landholders, managers and the general public to help collect, measure, monitor and analyse land-based pesticide runoff affecting coastal waters, supporting sustainable management and conservation efforts.
- Researchers at the Faculty of Science continued the Pesticide Projector project in collaboration with Farmacist, Queensland Government and Truii. The project aims to reduce pesticides in aquatic ecosystems. The web tool helps users select pesticide active ingredients that are less harmful to plants and animals in waterways, contributing to healthier and more resilient aquatic environments. The tool is available to all communities that recommend, purchase and apply pesticides to agricultural crops in Australia.
- Great Barrier Reef Catchment Loads Monitoring Program (GBRCLMP) tracks the annual loads of pollutants, specifically sediments, nutrients and pesticides, generated from terrestrial runoff entering the lagoon. Monitoring is conducted across 26 sites spanning 14 drainage basins, using automated samplers during heavy rainfall events alongside monthly manual ambient sampling. The collected data identify pollutant concentrations across seasonal changes and validate water quality models across 35 drainage basins, directly informing the annual Paddock to Reef report cards that measure progress toward established conservation targets. In May 2025, the Queensland Government established the Catchment Water Quality Alliance to support these ongoing assessments. Through this framework, researchers from UQ and James Cook University assist by delivering comprehensive technical training to Aboriginal and Torres Strait Islander groups, local landholders and Natural Resource Management (NRM) bodies.

Enriching our communities

UQ supports efforts in the broader community to address water management and usage. This includes providing educational opportunities for local communities to learn about sustainable water management, delivering practical off-campus water conservation support and promotion of conscious water usage.

Water management educational opportunities

The Centre for Water and Environmental Biotechnology (ACWEB) is a world leading centre in water research and an emerging leader in environmental biotechnology. ACWEB has broad collaborative links to more than 100 different utilities, businesses, industry groups, research institutions and educational facilities around Australia and the world. The Centre plays an active role in engaging with communities and professionals to address water management challenges. 2025 activities include:

- Short courses. The Centre offers a specialised microcredential in water treatment designed for engineers and professionals looking to advance their careers in urban water management. This industry specific qualification focuses on two critical areas: Wastewater Treatment (WATR6001M) and Drinking Water Treatment (WATR6002M). This flexible, fully remote program equips professionals with the advanced technical expertise required to manage complex treatment systems, ensure water quality and implement sustainable solutions for modern urban environments facing population growth and environmental changes. Furthermore, this formal microcredential provides academic credit applicable toward future UQ postgraduate programs.
- The Industry Water and Environment Series (IWES) Gold Coast. IWES is the largest and most successful continuing education program for professionals responsible for industry water, wastewater and environmental performance in Australia. Held from 21 to 25 July 2025, the IWES Gold Coast program featured 10 high-quality training sessions and workshops for industry professionals. The courses were delivered by leading industry practitioners and designed to keep busy professionals up to date with the latest trends, technologies and practices.

UQ Ventures Sustainability and Innovation Challenge Hackathon

In February 2025, UQ Ventures, the UQ Innovation and Entrepreneurship Society (UQIES) and Seqwater collaborated to deliver the Sustainability and Innovation Challenge (SIC) hackathon. As the first hackathon of the year, this high-energy educational initiative brought together university students, researchers and innovators to address critical water management challenges facing South East Queensland (SEQ). With over 3.7 million people relying on the SEQ Water Grid, which spans over 600 kilometres of pipelines, 25 dams, 32 conventional water treatment plants, 3 advanced water treatment plants and a desalination plant, the event focused on the critical need for a sustainable and resilient water supply.

During the program, participating multidisciplinary teams engaged in collaborative problem-solving to develop novel solutions for water conservation, ecosystem restoration and emission reduction. Individuals leveraged data, technology and engineering to address real-world resource problems while working directly alongside industry experts, mentors and Seqwater professionals to refine their concepts. Backed by a A$10,000 prize incentive and potential real-world implementation opportunities, the challenge aligned with a broader mission to invest in environmental stewards, support projects that benefit local communities and drive lasting improvements in regional water sustainability.

2025 International River Symposium

UQ was a Silver Sponsor of the 26th International River Symposium held in Brisbane under the theme River Revolution: Accelerating Solutions for Climate Resilience. The University also facilitated the Climate-Resilient Cities Design Challenge, an interactive capacity-building event where multidisciplinary teams engaged in scenario-driven exercises to design water-sensitive, energy-efficient city frameworks. Institutional involvement extended to executive representation and event adjudication, with UQ Chancellor Peter Varghese AO addressing the welcome reception on the intersections of education, research and policy in generating sustainable environmental outcomes. Furthermore, UQ Vice-Chancellor Professor Deborah Terry AC participated in the Gala Dinner and Thiess International River Prize Awards, where the university co-sponsored the evening proceedings celebrating global watershed restoration practices.

Facilities and services

Centre for Water and Environmental Biotechnology (ACWEB)

ACWEB offers a range of services and facilities to internal and external clients. These include:

- the analytical services laboratory, which offers routine services as well as adapts and develops new analytical methods around wastewater, surface water and drinking water to support researchers in their relevant research areas. Types of analytes include nutrients, sulphur species, anions, greenhouse gases, total organic carbon, and metals and metalloids.
- the environmental microbiology laboratory, which provides a fully equipped modern laboratory for molecular biology and the culturing of microorganisms, including facilities for manipulation and fingerprinting of DNA and various forms of enrichment and microbial culture techniques.
- methane potential and activity testing, which develops and conducts anaerobic biodegradability, activity and inhibition tests, offering independent testing to enable certainty in feasibility analysis. Ongoing testing of existing projects offers benchmarks to assess process efficiency and product quality.

Centre for Water in the Minerals Industry (CWiMI)

Part of the Sustainable Minerals Institute (SMI) at UQ, CWiMI focuses on the environmental management challenges of the mining and minerals industry through:

- delivering core technical work across hydrology, hydrogeology, soil hydrology, geochemistry, water resource engineering, spatial science, data science, climate science and aquatic ecology.
- operating a dedicated environmental field-scale facility at UQ Pinjarra Hills used for field-scale research and testing.
- developing participatory planning frameworks to help manage shared water infrastructure in water-scarce mining regions.

- providing technical guidelines to improve erosion and sediment control management in Great Barrier Reef catchments, alongside a water accounting framework developed with the Minerals Council of Australia to standardise industry water reporting.

School of the Environment

The School of the Environment also provides comprehensive infrastructure including the Centre for Geoanalytical Mass Spectrometry to support internal and external clients, highlighted by:

- utilising the environmental geochemistry laboratory as a core component of the Centre for Geoanalytical Mass Spectrometry, equipped with advanced instrumentation for the elemental analysis of materials, including environmental samples such as rocks, sediments and waters.
- maintaining the radiogenic isotope facility for precise isotope tracking that can be used to analyse a range of materials including low-salinity waters and seawater.
- equipping the stable isotope geochemistry laboratory with a full suite of infrastructure covering the complete cycle from preparation to analysis of the stable isotopes in geological and environmental samples.
- integrating the biosafety and sample preparation facilities with tools that can support multidisciplinary freshwater ecosystem research.

Our global profile

UQ seeks to have a positive impact not just locally and nationally, but also globally. Its research contributes towards maintaining safe, economically viable and environmentally sustainable water supplies and ecosystems in the Asia-Pacific and beyond as part of helping to advance the UN SDGs and leveraging UQ's development expertise to support capacity building.

How we achieved this

- In 2025, UQ, the Indian Institute of Technology Delhi (IITD) Research Academy and the CSIR National Institute of Oceanography (CSIR-NIO) secured a fellowship grant from the Coalition for Disaster Resilient Infrastructure (CDRI) for the 2025-2026 cycle. Led by PhD candidate Abhinav Dewangan alongside supervisors from UQ and IITD, the joint project, 'Digital Twin Framework for Coastal Infrastructure Resilience of Underground Infrastructures', integrates geospatial digital technology for real-time multihazard coastal resilience assessment, and aligns with SDG 6, SDG 9, SDG 11 and SDG 13.
- The 'Biofunctional spider silk and engineered living materials for sustainable waste stream treatment' project aims to create biohybrid membranes using recombinant spider silk functionalised with catalytic proteins, engineered microbial cells or peptides to remove contaminants like pharmaceuticals and industrial chemicals from wastewater and off-gas. It also focuses on recovering valuable resources such as rare earth metals, supporting the shift from wastewater treatment to resource recovery in a circular bioeconomy. By integrating expertise from UQ, TUM and the Bayreuth team, the project will deliver proof-of-concept membranes for pollutant degradation and

metal binding. It supports UN SDG 6 and SDG 12, with applications in water, mining, chemicals and environmental biotechnology sectors.

Securing our future

UQ recognises the deeply interconnected nature of water and sanitation, understanding that access to clean water and effective sanitation systems is not only essential for public health and wellbeing, but also plays a critical role in supporting sustainable development across environmental, social and economic dimensions.

UQ actively works to implement initiatives throughout its operations. Examples include water-sensitive urban design, such as native vegetation planting and stormwater capture systems, alongside the use of recycled water to enhance sustainability and reduce environmental impact across campus operations now and into the future.

Water usage and care

UQ aims to achieve best practice in efficient water management, piloting new technologies that demonstrate leadership in the sustainable and responsible use of resources. This commitment is reflected across University infrastructure, operational standards and ecological stewardship through:

- monitoring and optimising water consumption by sourcing potable water efficiently from local authorities while utilizing a comprehensive monitoring system, where over 500 water meters are reviewed monthly, to identify anomalies, detect leaks early, and drive continuous automation in efficiency tracking.
- implementing Design Standards across all campus construction projects to mandate water-efficient hydraulic infrastructure, explicitly integrating rainwater harvesting systems, high-efficiency fixtures, non-potable water storage tanks and advanced metering capabilities.
- promoting sustainable waste and water reduction on campus by installing widespread water refill stations, making it easy for students, staff and visitors to avoid single-use plastics and utilise reusable bottles.
- managing university grounds sustainably through seasonal planting practices that prioritise drought-tolerant, low-maintenance native species, while maximising the use of recycled water and harvested rainwater for landscape irrigation.
- restoring aquatic ecosystems through landmarks like the St Lucia campus lake renewal project, where an independent expert panel developed a self-sustaining natural system designed to support abundant aquatic flora and provide a thriving habitat for native fauna.

Water reuse

UQ actively reuses water to support sustainability across its campuses. Recycled water is used for irrigation, while harvested rainwater is used in isolated sites for both irrigation and toilet flushing, reducing demand on potable water supplies.