The University Of Queensland
AUSTRALIA

CREATE CHANGE

UQ Dow Centre for Sustainable Engineering Innovation

Annual Report 2025


UQ DOW CEN

Contents

Message from the Chair of the Advisory Board

For more than a decade, the UQ Dow Centre for Sustainable Engineering Innovation has combined research excellence with strong partnerships to drive engineering innovations for decarbonisation and the energy transition.

In 2025, the Centre entered a purposeful new phase, evolving into a platform for technology translation and talent development, with a sharper focus on delivering real-world impact through deeper engagement with industry, government, and the community – as well as UQ's commercialisation company, UniQuest.

The Centre continued to advance research across four core themes in 2025 – green chemical production, carbon dioxide utilisation, socio-techno-economic analysis, and electromobility – while evolving its priorities to meet emerging national and global decarbonisation challenges.

A key milestone in technology translation this year was the licensing of green hydrogen peroxide technology to Brisbane-based startup Evimien Energy. The technology is being developed for deployment across wastewater treatment facilities, mining operations and agricultural industries. The Centre also made important progress this year with the development of a novel ion-separation technology that integrates carbon dioxide capture with in-situ electricity generation – effectively reducing energy demand while moving toward scalable, carbon-negative solutions.

The Centre's ongoing contributions to Net Zero Australia (a collaborative initiative led by UQ, the University of Melbourne, and Princeton University) demonstrates the vital role universities play in providing independent analysis and advice on Australia's transition to a net-zero future. Building on its successful first phase, the project continues to provide practical guidance to government and industry partners on infrastructure, investment, and policy pathways.

Significant progress has also been made in electromobility since the launch of the first Tritium Fellowship in E-Mobility in 2020, supported by expanding charging infrastructure and strengthened government policy frameworks. We acknowledge the generous donation of Trevor and Judith St Baker, whose continued engagement has enabled the evolution of the St Baker and Tritium Fellowships into a unified St Baker Fellowship, expanding its scope to support high-quality research aligned with broader decarbonisation goals.

Looking to the future, the Centre will launch the 'Accelerating Future Decarbonisation Technologies Seed Grants' in 2026. This initiative is designed to encourage greater cross-disciplinary research at UQ – especially amongst early- and mid-career researchers – with a focus on the translation of decarbonisation technologies into real-world applications.

I extend my thanks to all members of the Advisory Board and would like to especially acknowledge the contributions of long-standing Board members Karen Dobson and Professor Alan Rowan, who both stepped down in 2025.

I also want to sincerely thank the UQ Dow Centre's leaders, researchers, staff, students, and partners for the way that they continue to advance decarbonisation efforts and meaningfully contribute to the transition to a low-emissions future.

Professor Deborah Terry AC

Vice-Chancellor and President, The University of Queensland

Chair of the UQ Dow Centre Advisory Board

Director's Message

2025 has been a year of purposeful transition for the UQ Dow Centre for Sustainable Engineering Innovation. As the urgency of global decarbonisation continues to grow, the Centre has sharpened its focus on translating high-quality research into practical solutions that deliver environmental, economic, and societal impact.

Building on more than a decade of achievement, our work this year has been shaped by a clear strategic intent: to accelerate the pathways that translate sustainable engineering innovations from discovery to deployment. This has required us to evolve how we collaborate, how we invest, and how we support our people, while remaining firmly grounded in scientific excellence.

A central focus in 2025 has been technology translation. Across the Centre, we made meaningful progress in advancing technologies beyond the laboratory through closer engagement with industry, UniQuest, and government partners. We progressed several translation-focused initiatives, most notably the execution of an IP licensing agreement for green hydrogen peroxide synthesis. This technology holds significant potential across various sectors, including energy storage, disinfection, mining. These milestones reflect a growing maturity in our ability to move innovation beyond proof-of-concept and toward commercial relevance.

Our research portfolio continues to address critical challenges in decarbonisation. Advanced materials and membrane technologies remain a core enabling capability, with major projects progressing next-generation membranes for separations, electrolysers, and energy storage, including scale-up-focused initiatives supported by new infrastructure investment.

The Centre has also continued to contribute to nationally significant initiatives, particularly Net Zero Australia, which progressed into Phase Two, building on updated modelling into actionable, policy-relevant recommendations to accelerate Australia's energy transition while balancing social and environmental priorities.

International engagement has featured strongly in throughout the year. We strengthened partnerships with leading institutions in Japan, China, Europe, and North America, including reciprocal visits with the University of Tokyo's Research Center for Advanced Science and Technology (RCAST). These engagements deepened research collaboration and created new opportunities for industry and government partnerships across regions facing shared decarbonisation challenges.

Our people remain fundamental to the Centre's success. In 2025, we continue to invest in our students, postdoctoral researchers, and early- and mid-career researchers through fellowships, training, and targeted engagement activities. Workshops focused on research translation and industry engagement, supporting capability development and reinforcing a culture of impact-oriented research.

Looking ahead to 2026, the Centre is well positioned to build on this momentum. Our priorities include strengthening industry engagement, supporting large-scale collaborative bids, investing in translation-enabling infrastructure, and continuing a strategic review of our research themes to ensure alignment with emerging national and global priorities.

I sincerely thank our Advisory Board members for their guidance and support: UQ Vice-Chancellor and President, Professor Deborah Terry VC (Chair), Ms Karen Dobson (Managing Director, Dow Australia and New Zealand), Dr Julia Woertink (Chief Technology Officer, Dow Asia Pacific), Mr Noel Williams (Specialist Manufacturing Advisor and UQ Alumni Representative), and UQ colleagues: Professor Sue Harrison, Professor Justin Cooper-White and Professor Alan Rowan. I take this opportunity to express my gratitude to Karen, who stepped down from the Advisory Board in July, for her longstanding commitment and contributions to the UQ Dow Centre. I also extend my sincere thanks to Professor Rowan for his support, insight, and engagement with the Centre over many years, and wish him every success in his new role at the University of Wollongong.

Finally, I extend my appreciation to our affiliates, partners, staff, and students. Your commitment and hard work underpin everything the Centre has achieved this year. Together, we are shaping a future defined by sustainable innovation and meaningful impact.

Professor Xiwang Zhang, FTSE

Endowed Dow Chair in Sustainable Engineering Innovation

Director of the UQ Dow Centre

People

Advisory Board Members

Professor Deborah Terry AC

Vice Chancellor and President, UQ, and Chair of the UQ Dow Centre Advisory Board

Professor Deborah Terry AC is a highly experienced leader in the Australian university sector – and an internationally recognised scholar in psychology.

Since August 2020, Professor Terry has served as Vice-Chancellor and President of The University of Queensland (UQ). Prior to this, she was Vice-Chancellor of Curtin University in Western Australia, from 2014 to 2020.

Having grown up in Perth and Canberra, Professor Terry completed her PhD in Social Psychology at the Australian National University in Canberra. She moved to Brisbane in 1990 to begin her academic career in UQ's School of Psychology. Between 1990 and 2014, Professor Terry progressed through a range of academic positions at UQ before moving into senior university leadership roles, up to Senior Deputy Vice-Chancellor.

Professor Terry is the current Chair of the Group of Eight (Go8), comprising Australia's 8 leading research-intensive universities. She is also a Fellow and past President of the Academy of Social Sciences in Australia, an appointed member of the Australian Research Council Advisory Council. She currently serves on the Boards of AARNET and Westpac Scholars, and is a member of the Universitas 21 Executive Committee.

She was appointed a Companion of the Order of Australia (AC) in January 2024 for "eminent service to tertiary education as an institutional leader and academic, to the strengthening of higher education through collaboration and innovation, and to the community."

Ms Karen Dobson

Managing Director
Dow Australia and New Zealand

Karen Dobson served as Managing Director of Dow Australia and New Zealand until August 2025. A graduate chemical engineer from the University of Melbourne, she joined Dow's Australian manufacturing operations at the outset of her career and accumulated more than 35 years' experience with the company.

Over this time, Karen held a variety of technical, marketing and business management roles in that time, including global roles in Dow's water treatment technologies and mining chemicals businesses, based over the years in Hong Kong, the United States and China.

Karen is widely recognised as a leading advocate for advanced manufacturing in Australia. Through her roles at Dow and extensive advisory work, she has influenced collaboration between industry, government and universities to address challenges including water scarcity, climate change and the circular economy.

She was appointed a Fellow of the Australian Academy of Technological Sciences and Engineering in 2024. She stepped down from the advisory board in August 2025.

Professor Sue Harrison

Deputy Vice-Chancellor (Research and Innovation), UQ

Professor Sue Harrison was appointed as Deputy Vice-Chancellor (Research and Innovation) in 2025. Prior to this role, she was the Executive Dean of the Faculty of Engineering, Architecture and Information Technology (EAIT) at The University of Queensland, where she focused on the delivery of leading educational programs, and research addressing global challenges and delivering transformational excellence.

Before joining UQ, Sue served as Deputy Vice-Chancellor (Research and Internationalisation) at the University of Cape Town, where her portfolio included research, innovation, postgraduate studies, and internationalisation with a strong focus on embedding social responsiveness into research.

Sue has a long, varied track record in management and leadership in the academic arena, built up through a 30-year academic career in the field of bioprocess engineering and its application to the circular economy, green technologies for the resource sectors, and improved health care and wellbeing.

Dr Julia Woertink

Chief Technology Officer
Dow Asia Pacific

Dr Julia Woertink is the chief technology officer (CTO) for Dow's Asia Pacific region, based in Singapore. She oversees R&D in the region, focusing on innovation strategy, technology roadmaps, customer engagement, talent strategy, growth platforms, and external partnerships. Previously, she was the R&D Director for Growth Innovation, R&D Recruitment and External Technologies at Dow, managing disruptive research, technical partnerships, new business development and recruitment strategy.

Julia joined Dow in 2010, where she led semiconductor packaging product development and served as site implementation leader for Dow's Women's Innovation Network. She later became R&D Strategy Leader, then associate R&D director for M&A Integration responsible for the R&D integration activities related to the DowDuPont merger. In 2017, she directed global departments in Dow's Packaging & Specialty Plastics business.

Julia holds a Ph.D. in Chemistry from Stanford University and a B.S. in Chemistry from the California Institute of Technology. She has eight patents and over twenty publications.

Mr Noel Williams

Specialist Manufacturing Advisor
UQ Alumni Representative

After a career with Dow spanning 36 years as a chemical engineer and later as a senior executive, Mr Noel Williams now works in consultancy as a Specialist Manufacturing Advisor and on charitable not-for-profit boards. Most recently in his career at Dow, Mr Williams was appointed as Vice President to lead Dow's Business Development efforts in Asia Pacific, while previously he had been President of Dow in South East Asia, Australia and New Zealand, all based in Singapore.

Mr Williams is a past Chairman of the Board of the Institution of Chemical Engineers (IChemE) in Australia, and was a Governor and Treasurer of the American Chamber of Commerce in Singapore. He is a past President and Director of the Australian Plastics and Chemicals Industry Association (now Chemistry Australia). Mr Williams also serves as chairman on the UQ School of Chemical Engineering Advisory Board.

Professor Liesl Folks

Executive Dean, Faculty of Engineering, Architecture and Information Technology

Professor Liesl Folks is a globally respected scholar and higher education leader, known for her commitment to advancing research, education, and equity. She holds a BSc (Hons) and a PhD in Physics from The University of Western Australia, and an MBA from Cornell University.

Before joining UQ, Liesl held senior leadership roles in the United States, including serving as Provost at the University of Arizona (UA), where she led initiatives to improve student outcomes - particularly for Indigenous and rural communities - and also as UA's Vice President for Semiconductor Strategy, guiding the university's response to national industry needs through strategic partnerships. Prior to joining UA, she served as Dean of the School of Engineering and Applied Sciences at the University at Buffalo (UB), delivering significant growth in student success and research activity. Earlier in her career, she worked in Silicon Valley doing R&D on nanostructured materials and spin-electronic devices for data storage.

Professor Justin Cooper-White

Head of School
School of Chemical Engineering, UQ

Professor Justin Cooper-White is a global leader in using engineering to solve problems in biology. In addition to holding the position of Head of School and Professor of Bioengineering in the School of Chemical Engineering, he also holds the position of Affiliate Professor in the AIBN, UQ. Professor Cooper-White is a past Director of the Australian National Fabrication Facility-Queensland Node, Research Director of the Herston Biofabrication Institute (a partnership between UQ and MNHHS), and co-Director of the Australian Organoid Facility at UQ.

He has been the President of both the Australasian Society for Biomaterials and Tissue Engineering and the Australian Society of Rheology and held the position of CSIRO Office of the Chief Executive (OCE) Science Leader. He is the Australian representative and Past President of the Asian Biomaterials Federation; an elected Fellow of and past Australian representative on the International Union of Societies for Biomaterials Science and Engineering (IUSBE), an elected Fellow of the Tissue Engineering and Regenerative Medicine International Society, and an elected Fellow and past vice President of the Queensland Academy of Arts and Sciences.

Professor Alan Rowan

Executive Institute Director, Australian Institute for Bioengineering and Nanotechnology

Professor Alan Rowan was the Director of the Australian Institute for Bioengineering and Nanotechnology (AIBN) for a decade, leading the institute through a period of transformative growth. During his tenure, AIBN expanded from around 250 to almost 600 researchers and professional staff, strengthening its reputation as a collaborative, inclusive and globally connected research institute.

A globally recognised leader in bioengineering and nanotechnology, Professor Rowan's research spans chemistry, biology and materials science, with more than 400 publications and the mentorship of over 80 PhD students. As Director, he championed research translation, spin-outs and industry partnerships, helping move discovery from the laboratory to real-world impact. He also established major capabilities including the UQ Biosustainability Hub, the National Indigenous Science Translation Centre and the PM1 Facility.

In 2026, Professor Rowan stepped into the role of Deputy Vice-Chancellor (Research and Innovation) at the University of Wollongong, bringing his people-first leadership and passion for impact-driven research to the whole-of-university level.


THE UNIVERSITY OF QUEENSLAND
AUSTRALIA
CREATE CHANGE
UQ Dow Centre for Sustainable Engineering Innovation
Empowering Sustainable Futures
Dow Centre Transition (VC strategic funding under consideration)
Focus: Technology translation
10 Translation Seed Grants/ year
• Develop prototypes and validate new technologies – advance them to higher TRLs
• Conduct preliminary LCA, TEA, or ESG studies on newly developed technologies
• Support teams to secure competitive funding from programs such as ARC LP, LP, ITRP, CRC-P, AEA Ignite and AEA Innovate
2 Industry Engagement Workshops/ year
To establish research partnerships with key industry players
• Topics include key challenges in decarbonisation
• Seminar or forum featuring renowned experts
• Targeted, small group meetings to address specific topics
• Build and extend relationships with external stakeholders
2 Training Workshops/ year
To equip PhD students and EMCRs with critical skills to translate research into practical applications
• Topics include IP protection, business case development, market analysis, LCA, TEA, ESG
• Interactive sessions such as group discussions, and case studies to apply learnings in practical scenarios
• Professional networking opportunities
Talking: UQ
9:46 AM
19/06/2025

Management

Professor Xiwang Zhang

Endowed Dow Chair in Sustainable Engineering Innovation at the University of Queensland

Director of the UQ Dow Centre

Professor Xiwang Zhang is the Endowed Dow Chair in Sustainable Engineering Innovation at The University of Queensland (UQ), Director of the UQ Dow Centre, and Director of the ARC Centre of Excellence for Green Electrochemical Transformation of Carbon Dioxide ($GETCO_2$). He is also a Professor and ARC Future Fellow within the School of Chemical Engineering at UQ. An internationally renowned expert in membrane science, Professor Zhang has dedicated his career to advancing membrane technologies that address critical sustainability challenges at the nexus of energy, water, and the environment.

Prior to joining UQ in 2022, he held leadership roles at Monash University, including Founding Director of the ARC Industry Transformation Research Hub for Energy-efficient Separation (EESep) and Deputy Director of the Monash Centre for Membrane Innovation (MCMI). He has more than 15 years of R&D experience across academia and industry, with a strong track record in technology development and translation.

Professor Zhang's research focuses on nanochannel membrane design, energy-efficient separation, resource recovery, green chemical synthesis, carbon dioxide conversion, and renewable energy generation. In recognition of his impact, Professor Zhang was elected a Fellow of the Australian Academy of Technological Sciences and Engineering (ATSE) in 2024.

Associate Professor Simon Smart

Deputy Director of the UQ Dow Centre

Associate Professor, School of Chemical Engineering, UQ

Associate Professor Simon Smart is the Deputy Director of the UQ Dow Centre for Sustainable Engineering Innovation. He is the UQ Director of the Net Zero Australia study and a Chief Investigator in $GETCO_2$. Simon completed his BE/BSc and PhD degrees in Chemical Engineering at The University of Queensland in 2003 and 2008, respectively.

From 2008 until 2012, Simon was a research fellow in the Films and Inorganic Membrane Laboratory Group of Emeritus Professor Joe Diniz da Costa, where he led inorganic membrane research into hydrogen production, carbon dioxide capture, oxygen production, desalination, and membrane reactor technologies. He pioneered metal, metal oxide silica and organosilica membranes, and was amongst the first researchers globally to apply Rapid Thermal Processing (RTP) to inorganic membranes. In 2016, he received the prestigious UQ Foundation Research Excellence Award for his work on low-carbon iron and petrochemicals production.

Simon has been working with the UQ Dow Centre since its inception in 2014. His research focuses on molten metals and molten salts as liquid catalysts for low carbon hydrogen production via methane pyrolysis, as well as CO_2 utilisation through dry reforming to produce syngas, and broader energy system modelling and decarbonisation pathways, exemplified in projects with the Future Fuels CRC, Net Zero Australia study and $GETCO_2$.

Affiliates

Professor Lianzhou Wang

Honorary Professor and ARC Australian Laureate Fellow, School of Chemical Engineering, UQ

Professor Lianzhou Wang is an Honorary Professor and former ARC Australian Laureate Fellow at the University of Queensland's School of Chemical Engineering and AIBN. He earned his PhD from the Shanghai Institute of Ceramics in 1999, followed by five years as a research fellow at Japan's NIMS and AIST. Since joining UQ in 2004, he has held several prestigious roles, including ARC Queen Elizabeth II Fellow, ARC Future Fellow, and ARC Laureate Fellow.

A global leader in semiconductor nanomaterials, his team set a certified world record for quantum dot solar cell efficiency in 2018. He is a Fellow of the Australian Academy of Science, the Australian Academy of Technological Sciences & Engineering, the Royal Society of Chemistry, and Academia Europaea. He also serves as President of the Australian Materials Research Society.

Professor Wang left UQ in June 2025 to join The Hong Kong Polytechnic University as the Chair Professor of Energy Materials.

Professor Liu Ye

Professor, School of Chemical Engineering, UQ

Professor Liu Ye's research focuses on sustainable environmental engineering, dedicated to innovative solutions for net-zero emissions, climate resilience, and sustainability. She has established national and international leadership in achieving net-zero emissions within urban wastewater systems. Currently, she serves as the Deputy Director of External Engagement (International) in the School of Chemical Engineering and is the Program Leader for Greenhouse Gas Research in Urban Water Engineering.

Professor Ye has secured over $10 million in competitive research funding, maintaining extensive collaborations across academia and the water industry. She has partnered with more than 15 global water utilities, government bodies, and technology firms like Jacobs, Suez, and Veolia. Her work has earned over eight scientific awards, including the Research Innovation Award from the Australian Water Association. She is a Fellow of the Royal Society of Chemistry and an elected member of the International Water Association Strategic Council.

Professor Mark Hickman

Professor and Chair of Transport Engineering, School of Civil Engineering, UQ

Deputy Head of School of Civil Engineering

Professor Mark Hickman is the Transport Academic Partnership (TAP) Chair and Professor of Transport Engineering within the School of Civil Engineering at The University of Queensland. Professor Hickman has taught courses and performed research in public transit planning and operations, travel demand modelling, and traffic engineering. His areas of research interest and expertise include public transit planning and operations, urban transportation planning, and the application of remote sensing technology for traffic management. His recent work also explores sustainable transport innovations, including electric vehicle (EV) infrastructure siting and the customer impacts of Mobility as a Service (MaaS) trial.

Professor Tapan Saha

Professor, School of Information Technology and Electrical Engineering, UQ

Professor Tapan Saha received his PhD from UQ in 1994. He joined UQ in 1996 and has been a Professor of Electrical Engineering since 2005. He is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and the Institution of Engineers Australia. He is also a Chartered Professional Engineer (CPEng) of Engineers Australia and a Registered Professional Engineer of the State of Queensland (RPEQ).

Professor Saha is the founding director of the Australasian Transformer Innovation Centre and leads a number of programs across UQ, such as UQ Solar, Power, Energy and Control Engineering Discipline and the Industry 4.0 UQ Energy TestLab. His current research projects are in the fields of renewable energy integration to the electricity grid and smart condition monitoring for transformers and other ageing assets.

Associate Professor Jingwei Hou

Associate Professor and ARC Future Research Fellow, School of Chemical Engineering, UQ

Centre Director, NanoMaterials Centre, UQ

Associate Professor Jingwei Hou earned his PhD from the University of New South Wales in 2015, followed by research roles at the UNESCO Centre for Membrane Science and Technology and the University of Cambridge. He joined UQ's School of Chemical Engineering in 2019 as an ARC DECRA Fellow and has since secured an ARC Future Fellowship, an NHMRC Emerging Leadership 2 Fellow, and an ARC Mid-Career Industry Fellow.

Currently, Associate Professor Hou leads the Functional Materials Engineering (FME) Lab, managing a team of over 15 researchers. His research focuses on the physical properties of microporous materials, developing advanced technologies for membrane separation, optics, energy storage, and catalysis.

Professor Tom Rufford

Professor, School of Chemical Engineering, UQ

Professor Tom Rufford is a Professor in the School of Chemical Engineering and a Chief Investigator in the GETCO$_2$. Tom completed his BE and PhD degrees in Chemical Engineering at UQ in 2000 and 2009, respectively. From 2001 to 2005 he worked as a process engineer and technologist on crude distillation columns, naphtha reformers, and hydrogen purification plants at Shell's Geelong Oil Refinery. From 2010 to late 2012, Tom was a research fellow at the University of Western Australia working on natural gas processing and LNG production research projects with UWA's Chevron Chair in Gas Process Engineering, Prof. Eric May. He returned to UQ as a teaching and research academic in December 2012.

He is also a Chartered Member of the Institution of Chemical Engineers (IChemE) and Engineers Australia.

Professor Shihu Hu

Professor and ARC Mid-Career Industry Fellow, Australian Centre for Water and Environmental Biotechnology, UQ

Professor Shihu Hu is an ARC Mid-Career Industry Fellow at ACWEB. An environmental scientist and engineer, he bridges ground-breaking research with practical solutions. His work, published in journals like Nature, established vital links between global carbon, nitrogen, and metal cycles, specifically regarding methane emissions.

Since 2014, Professor Hu has played a significant role in the joint establishment and management of the Urban Utilities Innovation Centre, collaborating with industry to develop novel technologies. He has managed numerous Australian and international projects with budgets exceeding $20 million, focusing on sulfide control and the recovery of carbon and nutrients in wastewater.

Dr Hong Peng

Amplify Senior Lecturer, School of Chemical Engineering, UQ

Dr Hong (Marco) Peng is an Amplify Senior Lecturer in the School of Chemical Engineering at UQ, where he also earned his PhD. He holds degrees in Minerals Engineering and Microbiology from Central South University and gained extensive industry experience as a chemical engineer at BHP Billiton's Olympic Dam and Newcastle Technology Centre.

His research specialises in nucleation and crystallisation, focusing on transforming waste into functional materials for carbon capture and critical metals. Dr Peng is a Chief Investigator for the ARC Research Hub for Photovoltaic Solar Panel Recycling and Sustainability and the ARC Training Centre for the Global Hydrogen Economy. He is also a recipient of both Early- and Mid-Career Advance Queensland Industry Research Fellowships.

Associate Professor Muxina Konarova

Director of Research, School of Chemical Engineering, UQ

Associate Professor Muxina Konarova is the Director of Research in the School of Chemical Engineering at UQ. She earned her PhD and Master's degrees from the Tokyo Institute of Technology and has a proven track record of leading major industry-academia collaborations, securing over $15 million in research funding.

Her research focuses on developing sustainable chemical processes and selective solid catalysts to address climate change and waste utilisation. A recipient of both Early and Mid-Career Advance Queensland Industry Research Fellowships, Muxina serves as a Chief Investigator for the ARC Research Hub for Value-Added Processing of Underutilised Carbon Wastes and the ARC Research Hub for Carbon Utilisation and Recycling.

Research Fellows

Dr Kai Li Lim

St Baker Fellow in Electromobility, School of Chemical Engineering, UQ

Dr Kai Li Lim is the inaugural St Baker Fellow in Electromobility at the UQ Dow Centre for Sustainable Engineering Innovation. As a trained computer engineer with more than nine years of experience developing mobility and navigation frameworks, his early research focused on him designing navigational algorithms for mobile robots and indoor pedestrians. More recently, his applications have employed techniques relating to data engineering, the Internet of Things (IoT), cloud computing, computer vision and deep learning.

Dr Lim received a BEng (Hons) degree in Electronic and Computer Engineering from the University of Nottingham in 2012, a MSc degree in Computer Science from Lancaster University in 2014 and a PhD degree from the University of Western Australia in 2020, where he was fully supported by the Australian Government under the Research Training Program.

Dr Haijiao Lu

ARC DECRA Fellow, School of Chemical Engineering, UQ

Dr Haijiao Lu obtained dual bachelor's degrees from Nankai University and Tianjin University in 2014, followed by a PhD from Tianjin University in 2019 under the supervision of Prof. Jingkang Wang. During her doctoral studies, she served as a visiting scholar at the University of Cambridge. Following a postdoctoral fellowship at The Australian National University (2019–2021), she joined UQ to collaborate with Professor Lianzhou Wang.

In January 2023, she commenced as an ARC Discovery Early Career Researcher Award (DECRA) Research Fellow, focussing on catalyst design for converting carbon dioxide into valuable chemicals. Her research is characterised by its interdisciplinary nature, bridging materials science, photo(electro) catalysis, and chemical engineering.

Dr Mike Tebyetekerwa

ARC DECRA Fellow, School of Chemical Engineering, UQ

Dr Mike Tebyetekerwa is an ARC DECRA Research Fellow and Sub-Group Leader at the UQ Dow Centre for Sustainable Engineering Innovation and investigator at GETCO$_2$. His current main research interests at the School of Chemical Engineering focus on water and electrochemical systems such as electrochemical CO_2 capture and conversion to valuable chemicals and the electrochemical production of hydrogen peroxide and/or hydrogen.

He is deeply interested in designing scalable and industry-relevant chemical cells and generators. He completed his PhD at The Australian National University (ANU), where his research focused on optical spectroscopy and advanced characterisation of semiconducting materials and their devices under supervision.

Dr Xiangkang Zeng

ARC DECRA Fellow, School of Chemical Engineering, UQ

Dr Xiangkang Zeng is a UQ Amplify Lecturer and ARC DECRA Research Fellow. He earned his PhD in Chemical Engineering from Monash University, Australia in 2017. Prior to that, he obtained a Master's in Fermentation Engineering and a bachelor's degree in Biological Engineering in 2012 and 2010, respectively at Jiangnan University. He previously held research positions at the Hong Kong University of Science and Technology (HKUST) and Monash University before joining UQ.

His research is centred around the development of advanced functional materials, such as 2D functional catalysts, metal-organic frameworks (MOFs), and covalent-organic frameworks (COFs) for applications in renewable energy to chemical energy conversion, water treatment, and antibacterial purposes.

Dr Rijia Lin

ARC DECRA Fellow, School of Chemical Engineering, UQ

Dr Rijia Lin obtained his PhD from the School of Chemical Engineering at The University of Queensland in 2016. His main research interests include metal-organic frameworks (MOFs), membrane gas separation, and the design and engineering of new and porous glass materials. He has published over 65 articles in high-impact journals.

He was awarded the ARC DECRA fellowship in 2022 and commenced his fellowship in 2023. The fellowship focuses on glassy MOF membranes for CO_2 separation and conversion.

Dr Saphira Rekker

ARC DECRA Fellow, School of Business, UQ

Dr Saphira Rekker is a Senior Lecturer (Assistant Professor) in Sustainable Finance and an ARC DECRA Fellow at UQ Business School. She holds a PhD in Finance and is internationally recognised for her work on corporate climate performance measurement and the development of science-based emissions reduction methodologies.

Her research develops rigorous tools and carbon-budget frameworks to assess the credibility of corporate decarbonisation commitments. She also leads the Carbon Budget Tracker, a collaborative platform linking researchers across the world to assess corporate and portfolio alignment with the Paris Agreement.

Dr Zhe Yang

Honorary Senior Fellow (Formally ARC DECRA Fellow), School of Chemical Engineering, UQ

Dr Zhe Yang joined the School of Chemical Engineering at UQ in Dec 2023 as an ARC DECRA fellow. He obtained his PhD from The University of Hong Kong (HKU) in 2018 and served as a research assistant at HKU, subsequently promoted to postdoctoral fellow and Assistant Professor. Dr Yang has over 10 years of experience in membrane technology for resource recovery, desalination, water reuse, and water/wastewater treatment. His research in UQ focuses on sustainable lithium extraction and critical mineral recovery.

Dr Yang left UQ in late 2025 to join The Hong Kong University of Science and Technology (HKUST) as an Assistant Professor in the Department of Civil and Environmental Engineering.

Dr Zhiliang Wang

ARC Future Fellow, School of Chemical Engineering, UQ

Dr Zhiliang Wang is an ARC Future Fellow at The University of Queensland. He focuses on renewable energy conversion processes, including water splitting, carbon dioxide fixation, and methane conversion. He has accumulated rich experience in the design of photocatalysts and photoelectrodes and achieved over 120 publications in highly ranked journals with over 7000 citations.

Dr Wang has received multiple awards, including the ARC DECRA award, the J G Russell Award from the Australian Academy of Science, the UQ Foundation Research Excellence Award (FREA), and the EAIT ECR Research Award at UQ.

Dr Chao Xing

Advance Queensland Industry Research Fellow, School of Chemical Engineering, UQ

Dr Chao Xing commenced with the UQ Dow Centre in March 2023. He was awarded his Bachelor degree of Science from Griffith University in 2019 and a bachelor's degree in Pharmaceutical Engineering from the Dalian University of Technology in 2016. He subsequently undertook his PhD in Chemical Engineering at Griffith University (2019- 2022), studying the application of two-dimensional (2D) material membranes in water purification and energy storage.

As an Advance Queensland Industry Research Fellow, his postdoctoral work involves the development of membrane-related equipment and the application of 2D material membranes in the fields of clean energy and protein separation.

Dr Zhuyuan Wang

Postdoctoral Research Fellow, School of Chemical Engineering, UQ

Dr Zhuyuan Wang commenced in Jan 2023. He is an active researcher in the field of membrane separation with over 10 years of experience. Previously, he worked at a listed membrane manufacturing company in China (2016-2019), focusing on developing Polyamide Thin Film Composite (PA-TFC) for water treatment. He then completed his PhD at Monash University under the supervision of Professor Xiwang Zhang and Professor Huanting Wang (2019-2023).

Through GETCO$_2$, Zhuyuan is currently developing ion-exchange membranes, especially proton exchange membranes, and in their application around electrolysers for green hydrogen production and CO_2 electrochemical reduction.

Dr Mengyang Dong

Postdoctoral Research Fellow, School of Chemical Engineering, UQ

Dr Mengyang Dong is an electrochemist and materials scientist at The University of Queensland. He obtained his PhD from Griffith University and held prior research positions at the University of Glasgow. His current research focuses on vanadium redox flow batteries (VRFBs) and large-scale renewable energy storage, using advanced operando spectroscopy and ANSTO synchrotron techniques to probe reaction mechanisms.

With over 30 high-impact publications in journals such as Advanced Materials, his work bridges the gap between fundamental discovery and the industrial deployment of sustainable energy solutions.

Dr Jindi Yang

Postdoctoral Research Fellow, School of Chemical Engineering, UQ

Dr Jindi Yang completed his PhD in Chemical Engineering from The University of Queensland in 2025. During his PhD, he worked on 2D materials-based photocatalysts for sustainable hydrogen peroxide production and energy-efficient 2D nanocomposite membranes for separation processes.

Currently, Dr Yang's research focuses on the development of advanced ion-exchange membranes for green chemical synthesis and renewable energy generation, as well as photocatalysts and bipolar membranes for sustainable production.

Dr Kaige Sun

Postdoctoral Research Fellow, School of Chemical Engineering, UQ

Dr Kaige Sun received his PhD in Chemical Engineering from UQ in 2025. His PhD research focused on electrochemical ion separation and selectivity.

As a postdoctoral research fellow at GETCO_2 and UQ Dow Centre, Dr Sun's current research interests are green electrochemical techniques for energy and environmental applications, such as electrochemical CO_2 capture and conversion, electrochemical deionisation, and the development of advanced biomass-derived electroactive materials.

Dr Ming Yong

Postdoctoral Research Fellow, School of Chemical Engineering, UQ

Dr Ming Yong obtained his PhD in Chemical Engineering from Monash University (2021–2025). He also holds a master's degree from Tianjin University (2019) and a bachelor's degree from China University of Petroleum (Beijing) (2016).

With extensive expertise in membrane technology, Dr Yong specialises in desalination, wastewater treatment, resource recovery, crude oil fractionation, and protein separation. His current work focusses on sustainable membrane processes for lithium extraction and magnesium utilisation from salt lake brines.

Dr Mark McConnachie

Postdoctoral Research Fellow, School of Chemical Engineering, UQ

Dr Mark McConnachie received his PhD in Chemical Engineering from UQ in 2025. His PhD research investigated methane pyrolysis as a low-emissions method for producing hydrogen and solid carbon using molten salt slurry catalysts. It identified MoS_2-based systems and optimal salt combinations that improved hydrogen yield and catalyst stability.

His current research interests include optimising a molten catalyst methane pyrolysis technology by developing a second generation catalyst to increase hydrogen yield, improve stability, and enable better management of carbon byproducts.

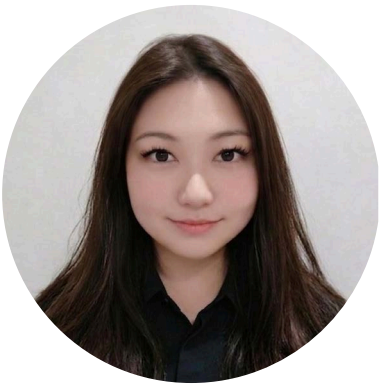
Professional Staff

Dr Hui Ying Hoh

Centre Manager, UQ Dow Centre for Sustainable Engineering Innovation

Dr Hui Ying Hoh is passionate about supporting researchers in tackling real-world challenges through the translation of technologies and fostering engagement with non-academic partners. She contributes to the Centre's mission to drive solutions in energy and materials by supporting strategic initiatives and building relationships with key stakeholders.

Hui Ying holds a PhD in Chemistry from the National University of Singapore. Throughout her career, she has held roles across research, teaching, and administration at institutions including The University of Queensland, Griffith University, and Monash University. Her work continues to centre on connecting people, ideas, and resources to foster impactful research and innovation.

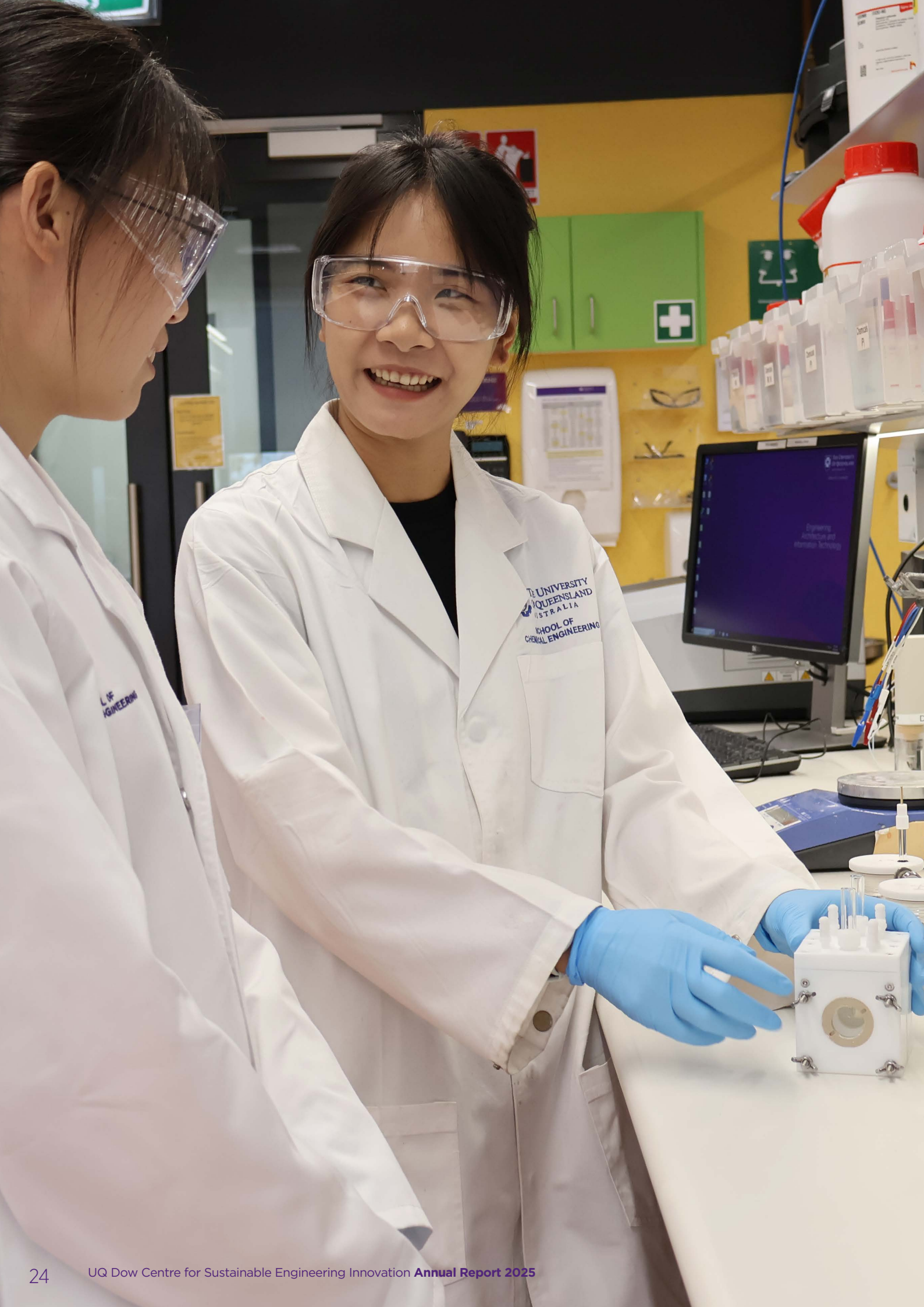


Ms Elyanna Fong

Executive Assistant, UQ Dow Centre for Sustainable Engineering Innovation

Elyanna Fong commenced with the Centre in July 2025. She has worked at UQ for 10 years and has developed a broad skillset across multiple departments within the University.

With a background in information technology, she brings a high level of organisation, efficiency, and attention to detail to her role as Executive Assistant.


THE UNIVERSITY OF QUEENSLAND
AUSTRALIA
SCHOOL OF CHEMICAL ENGINEERING

HDR Students

Mr Fengrui Yang
Project/Research interests:
Application of advanced membranes in precise separation

Mr Fangjun Wang
(Visiting student from Southeast University, China)
Project/Research interests:
Catalysts for electrocatalytic CO_2 reduction to chemicals and fuels

Mr Guangxiao Zhang
Project/Research interests:
Fabrication of robust ceramic membranes with application in harsh environment

Mr Hao Zhang
(PhD completed in 2025)
Project/Research interests:
Functionalised two-dimensional membranes for subnanometer-scale separations

Ms Hongxia Zhang
Project/Research interests:
Utilising co-products of water electrolysis in wastewater treatment

Ms Jie Yang
Project/Research interests:
Mixed matrix membranes for CO_2 gas separation

Ms Jinmeng Chen
Project/Research interests:
Preparation and properties of perfluorinated acid-based proton exchange membranes for advanced redox flow batteries

Mr Junyang Zhang
Project/Research interests:
Development of photocatalytic-photothermal-membrane separation systems

Mr Kaijie Xu
Project/Research interests:
Modifying perfluorinated sulfonic acid-based proton exchange membranes for advanced redox flow batteries

Mr Kwong Soon Chan
Project/Research interests:
Optimising low emission technology for clean energy transition

Ms Lijun Guo
(visiting student from Sichuan University, China)
Project/Research interests:
Development of biomass materials for water purification

Ms Rachel Mugumo
Project/Research interests:
Materials for electrochemical CO_2 capture

Mr Rizal Evans
Project/Research interests:
Engineering and design of industry-relevant hydrogen peroxide electrolyser and generator

Mr Ryota Okajima
Project/Research interests:
Integrating hydrogen from methane pyrolysis into the iron and steel industry

Ms Sophie Muheiti
Project/Research interests:
Pore engineering of chromatography membranes for bioseparation

Mr Umer Javed
Project/Research interests:
2D transition metal phosphide nanomaterials for H_2 production

Mr Wenming Zhao
Project/Research interests:
COFs-based ion-exchange membranes for energy storage and green chemical synthesis

Mr Xin Sun
Project/Research interests:
Development of advanced polymer-based catalysts for efficient production of hydrogen peroxide from water, air, and sunlight.

Mr Yichun Ma
(Visiting student from Donghua University)
Project/Research interests:
Accelerating packaging sustainability: optimising waste streams and life cycle assessment (LCA) to meet Australia's 2030 national recycling targets

Mr Yuhui Ge
Project/Research interests:
Exploring catalysts for efficient electrocatalytic hydrogen peroxide generation

Ms Yun Sun
Project/Research interests:
3D-architectured membranes for emerging toxic contaminants removal

Mr Zhonghao Xu
(PhD completed in 2025)
Project/Research interests:
Integrating MOF nanosheets to advanced membranes for achieving energy-efficient separation

Dr Chao Xing

Advance Queensland Industry Research Fellow

Dr. Chao Xing is an Advance Queensland Industry Research Fellow and early-career researcher at the UQ Dow Centre for Sustainable Engineering Innovation. His research sits at the intersection of membrane materials, electrochemistry, and scalable energy technologies, focusing on practical solutions for long-duration energy storage. As renewable electricity becomes a larger part of the grid, the need for safe, durable, and cost-effective storage continues to grow; consequently, Chao's work targets the bottlenecks currently facing redox flow batteries and metal-battery systems. While these technologies offer long lifetimes and high safety profiles, they are often hindered by material costs and manufacturing inconsistencies.

At UQ, Chao works closely with industry to bridge the gap between laboratory demonstrations and deployable technologies. His projects encompass membrane engineering—aimed at improving ion selectivity and durability—and the development of process-monitoring tools designed to increase manufacturing reliability. Ultimately, Chao is motivated by research that connects fundamental transport mechanisms to real-world outcomes, such as lower-cost battery components and a stronger clean-energy capability for Queensland.

Tell us about your research at the UQ Dow Centre.

My main project is an Advance Queensland Industry Research Fellowship (2025–2027) with Energy Storage Industries – Asia Pacific (ESI-AP). The goal is to develop low-cost proton-exchange membranes for iron flow batteries using nanochannel engineering strategies and scalable polymer processing. In parallel, I lead a UQ Knowledge Exchange & Translation (Kx&T) project with Vecco Group to develop a real-time quality-control platform for vanadium electrolyte manufacturing using in-line UV–Vis spectroscopy and automated analysis. Together, these projects target two major barriers to flow battery scale-up: membrane cost and performance, and manufacturing consistency.

How have your previous experiences shaped the work you are doing now?

My PhD training gave me a strong foundation in membrane materials, electrochemical testing, and connecting structure to performance. After joining UQ, my work became more translational and industry-connected. This experience shaped how I approach research questions—thinking not only about "what works in the lab," but also about "what can be made reliably and scaled." It also strengthened my focus on reproducibility, clear reporting, and building prototypes that partners can evaluate with confidence.

What has driven the development of your research interests over time?

Two themes consistently drive my research: addressing decarbonisation challenges and building technologies that can be deployed. Flow batteries are exciting because they are safe and durable, and are well suited to long-duration storage. However, they still face practical barriers such as component cost, lifetime, and manufacturing quality control. That gap between technical potential and real-world adoption is what motivates my research direction.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SCHOOL OF
Chao Xing

Can you take us back to the moment or a series of moments that inspired you to pursue a career in research? What keeps that spark alive today?

I became interested in research when I realised that meaningful problems rarely have single-step answers—they require iteration, evidence, and persistence. During my PhD, I learned to enjoy the process of refining ideas through experiments and learning from unexpected results. Today, that spark is kept alive by translation: when a material or method becomes something an industry partner can test, improve, and potentially manufacture, it reinforces why the work matters.

What do you find most meaningful or rewarding about your work?

I find it rewarding to turn complexity into clarity—understanding why a material behaves the way it does, then using that insight to improve performance. I also value mentoring and supervision. Supporting students as they develop technical capability, scientific thinking, and confidence is one of the most meaningful parts of my role.

Every research journey has its challenges. What have been some of the toughest moments in your career so far, and how did you navigate them?

One challenge has been balancing ambitious targets with real-world constraints like reproducibility, scale-up feasibility, and partner timelines. Translational work also demands strong documentation, traceability, and consistency—sometimes more challenging than achieving a peak result once. I manage this by designing tight experimental loops, keeping detailed records, and maintaining regular communication with collaborators so expectations remain aligned.

Looking back over the last 12 months, what moments or achievements stand out to you?

A standout achievement has been delivering strong first-year progress in my AQ Fellowship, including reproducible baseline testing and the successful fabrication of membrane prototypes with improved conductivity and selectivity. Another highlight is the strength of industry engagement—regular technical meetings, reporting, and collaborative discussions that helped move the work toward pilot-scale planning.

Collaboration is often at the heart of great research. Can you share an example of a meaningful partnership and what made it work well?

The partnership with ESI-AP has been meaningful because it combines clear technical objectives with frequent feedback and a shared focus on translation. Regular meetings support fast decision-making and keep the research grounded in practical needs. Similarly, working with Vecco Group has been effective because the collaboration is highly complementary—UQ contributes analytical and modelling capability, while Vecco provides real production context and samples to ensure our tools are industry-relevant.

What potential do you see in sustainable battery materials, and how might your findings influence future energy storage technologies?

Sustainable battery materials can reduce dependence on scarce, expensive, or hard-to-import components while improving supply-chain resilience. My membrane research aims to show that high performance does not have to come with high cost. By tuning structure and transport pathways, we can improve selectivity and conductivity using scalable materials. If successful, this can reduce cost and accelerate adoption of flow batteries in applications where safety and long lifetime are essential.

What real-world impact do you envision your work having over the next decade, particularly in clean energy?

Over the next decade, I want my work to contribute to practical manufacturing pathways for long-duration energy storage—helping flow batteries become more cost-competitive, reliable, and scalable. This includes membranes that can be produced locally and quality-control tools that reduce waste and improve consistency. Ultimately, the goal is to enable more renewable energy on the grid without sacrificing stability.

If you could go back in time, what is one piece of advice you would give your younger self starting out in research?

Build systems, not just results. Reproducibility, documentation, and clear communication amplify impact. Also, collaborate earlier—many challenges become more manageable when you involve the right partners and expertise early in the process.

How do you see the next stage of your research journey evolving, and what goals or opportunities are you most excited to pursue?

I'm excited to move further into scale-up validation—A4-sized membrane fabrication, stack-level testing, and pilot-relevant evaluation. I also want to expand national-level translation through opportunities aligned with CRC-P, ARC Hub programs, and ARENA-related initiatives, building larger partnerships around long-duration storage and clean manufacturing. In parallel, I'm keen to strengthen my teaching and mentoring through Teaching@UQ and structured training activities within the School.

Engagement

Meaningful engagement remains central to advancing the strategic priorities of the UQ Dow Centre. In 2025, the Centre continued to strengthen its connections with affiliates and external stakeholders through a diverse program of seminars, workshops, and media engagement. With a growing emphasis on decarbonisation technologies, these activities fostered the exchange of cutting-edge insights and emerging solutions, enabling collaboration and supporting the effective dissemination of knowledge across research, industry, and policy communities.

Internal Engagement

In June, the Centre held a Decarbonisation Technologies Strategic Workshop focused on translating decarbonisation technologies into practical applications. The workshop brought together colleagues from across the University of Queensland, including representatives from the Energy Transition Network, Strategic Partnerships, UniQuest, the Research Office and the Centre for Policy Futures. Participants emphasised the importance of interdisciplinary collaboration in advancing technology translation and highlighted the need to engage external stakeholders through clearly defined challenges and outcomes to maximise impact.

In November, a Research Translation Workshop was delivered to support Early- and Mid-Career Researchers (EMCRs) in translating their research into real-world outcomes. The workshop featured a masterclass by Industry Professor Leigh Staines, followed by a panel discussion with representatives from industry (Low Emission Technology Australia, International Water Association) and UniQuest, providing practical guidance on commercialisation pathways, stakeholder engagement and strategies for enhancing research impact.

Decarbonisation Technologies Strategic Workshop

Panel session at the Research Translation Workshop

External Engagement

The Centre continued to expand its engagement with international collaborators, industry partners, government bodies and the broader community in 2025, strengthening its role in advancing decarbonisation and sustainable technology solutions.

In February, Professor Xiwang Zhang led a delegation with Professor Esteban Marcellin (UQ Biosustainability Hub) to the Research Center for Advanced Science and Technology (RCAST) at the University of Tokyo, building on a virtual workshop held in 2024. The visit strengthened collaborative ties with Professor Masakazu Sugiyama's team on shared decarbonisation priorities and included hosting an Australia-Japan Partnership Dinner attended by industry leaders and Trade and Investment Queensland (TIQ) representatives based in Tokyo. This collaboration was further reinforced in August when a delegation from RCAST, led by Professor Sugiyama, visited UQ. The RCAST visit included a seminar series, meetings with UQ researchers and guided tours of laboratories and facilities, with the visit again featuring an Australia-Japan Partnership Dinner attended by the Consul-General of Japan in Brisbane, government and industry representatives, and UQ colleagues.

In April, Professor Zhang delivered a platinum lecture on decarbonisation at Peking University (Shenzhen campus), followed by visits to Big Bay University and the Shenzhen University of Advanced Technology. This engagement was complemented by subsequent visits to collaborators and electrolyser testing facilities in the United States and Canada, including the Hydrogen Centre at the University of Delaware, providing valuable insights into emerging hydrogen technologies and strengthening global research connections.

In September and October, Professor Zhang further extended the Centre's international engagement through visits to Nanjing, Suzhou and Shanghai in China with CSL to meet research collaborators and membrane manufacturing facilities. He also attended the 10th International Water Association (IWA) ASPIRE Conference and the Water New Zealand Conference & Expo in Christchurch, delivered invited talks on decarbonisation in Hefei and Shanghai, and visited Lanzhou University and a CO_2 conversion demonstration site in Lanzhou.

Australia-Japan Partnership Dinner in The University of Queensland

Several Dow Centre researchers participated in the 12th International Membrane Science & Technology Conference (IMSTEC 2025), held on the Gold Coast in December. For a number of early-career researchers, this marked their first experience presenting their research to an external audience. The Centre hosted several international visitors throughout the year, showcasing our research and the infrastructure and facilities in the Andrew N. Liveris Building. In May, Professor Frank Döpper (University of Bayreuth and Fraunhofer Institute for Process Innovation) was hosted by Associate Professor Simon Smart. The visit included discussions of opportunities to strengthen collaboration and industry linkages between Queensland and Bavaria. A delegation including potential research collaborators and HDR students from Donghua University, China, visited in June. A HDR student among the delegation joined the Centre as a visiting research student in late 2025.

Industry engagement remained a key priority. Associate Professor Muxina Konarova hosted industry partner Mr Jim Snow (Executive Director, Oakley Greenwood; UQ Adjunct Professor). Dr Hui Ying Hoh visited Dow Chemical Pacific in Singapore, meeting with Chief Technology Officer and UQ Dow Centre advisory board member Dr Julia Woertink as well as leaders across multiple business units. The visit provided insights into Dow's Asia-Pacific operations and identified potential areas of alignment with the Centre's research priorities.

The Centre's researchers also continued to engage with the Queensland Decarbonisation Hub, an interdisciplinary collaboration involving the Queensland Government and seven Queensland public universities. The Hub supports the development and implementation of sector-specific emissions-reduction pathways aligned with Queensland's legislated net-zero targets.

Dr Julia Woertink and Dr Hui Ying Hoh at Dow Chemical Pacific (Singapore)

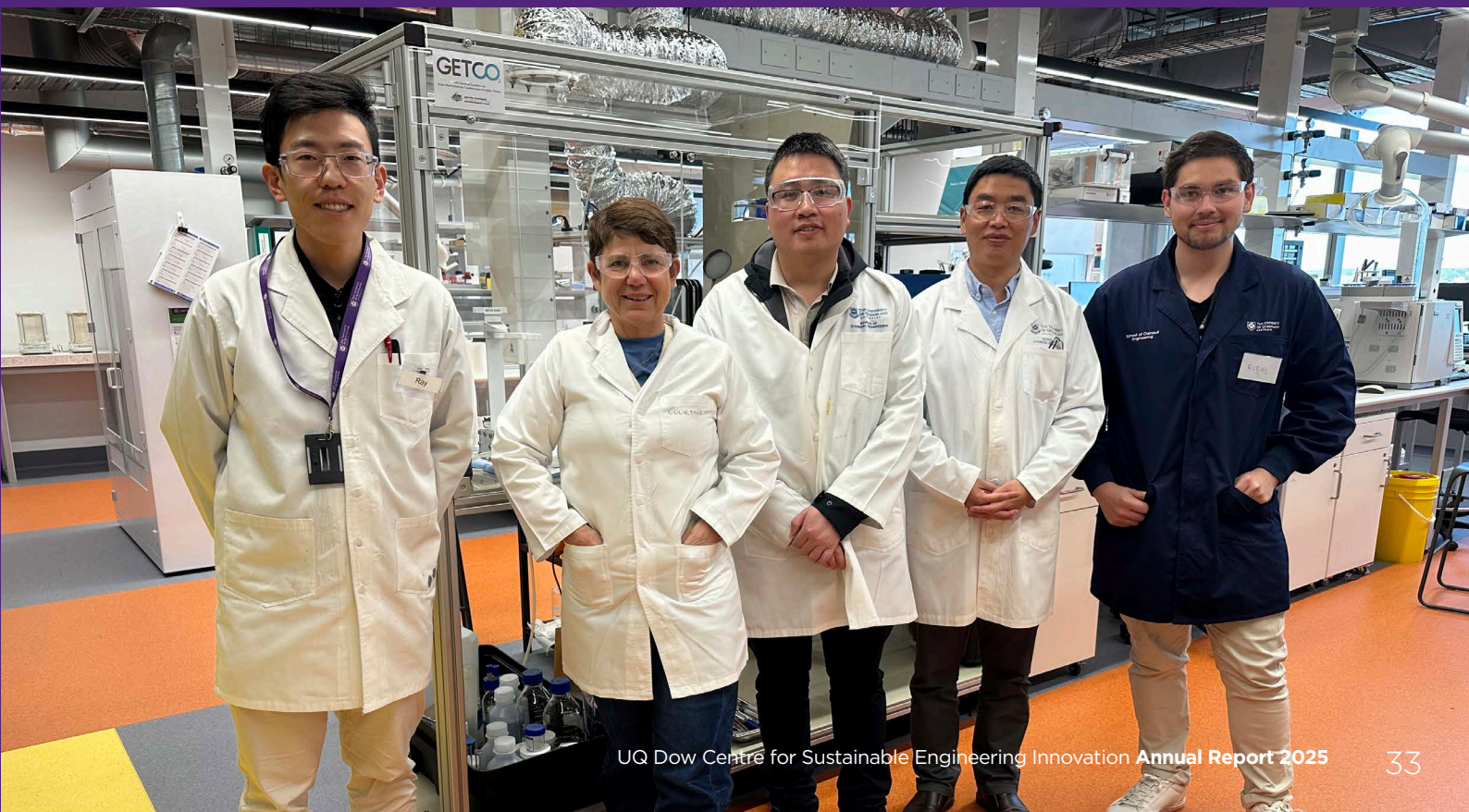
(left to right) Dr Zhuyuan Wang, Dr Jindi Yang, Professor Xiwang Zhang and Dr Ming Yong at IMSTEC 2025

Associate Professor Simon Smart contributed substantially through collaboration with Dr Liz Young and Professor Belinda Wade (UQ Business School) on the project Supporting Sectoral Emissions Reduction in Queensland, which brings together academic, industry and government expertise to analyse technology options, implementation barriers and enabling policy settings across sectors including energy, industry, transport, agriculture and the built environment.

The E-mobility team continued to actively engage with stakeholders through advisory roles, conferences, international collaborations and media contributions. Dr Kai Li Lim engaged with local industries and international partners, including collaboration through the UQ–IIT Delhi Research Academy. Contributions to media and outreach presence included guest lectures at the University of Virginia and IIT Delhi, and media coverage in ABC News on electric vehicle regulation and battery performance (May 2025)1. Dr Kai Li Lim also presented at the 20th Intelligent Transport Systems Asia Pacific Forum in Suwon, Korea.

Through these combined activities, the Centre enhanced the visibility and impact of its research, strengthened partnerships across sectors and regions, and contributed to evidence-based decision-making in the transition to a low-carbon future.

[Left ft to right] Dr Ray Bi, Dr Liz Young, Dr Xiangkang Zeng, Professor Xiwang Zhang, and HDR Rizal Evans



Research Success

Our researchers demonstrated strong research excellence in 2025, securing over $1.7 million in external funding. In addition, they achieved success across multiple internal UQ schemes, with awards exceeding $225,000. An overview of the awarded research grants is provided below.

Project focus	Investigators and partners	Grant value (AUD)
Australian Research Council (ARC) Linkage Project Sustainable scaled-up production of high-quality nanosheets	Xiwang Zhang, Zhuyuan Wang, Mike Tebyetekerwa, Darren Martin	$1.2M
Australia's Economic Accelerator (AEA) Ignite Innovative, ultra-efficient device for sustainable electricity harvesting from CO_2	Zhe Yang, Zhuyuan Wang, Xiwang Zhang, Low Emission Technology Australia (LETA)	$494K
UQ Global Partnerships grant Australia–Indonesia partnership in decarbonisation of industry and sustainable fuels	Tom Rufford and Simon Smart	$15K
UQ Research Infrastructure Investment Scheme (UQ RIIS) Multifunctional extrusion-calendaring platform to advance pilot-scale fabrication of membranes, electrodes, and films for electrochemical and photovoltaic technologies	Xiwang Zhang	$170K

Professor Xiwang Zhang and Professor Lianzhou Wang have been named Clarivate Highly Cited Researchers for 2025. This recognition places them among the top 1% of most cited researchers globally, in the Cross-Field and Materials Science respectively, reflecting the exceptional influence and interdisciplinary impact of their research.[1]

Professor Liu Ye and Associate Professor Jingwei Hou been appointed as members of the ARC College of Experts for 2026, joining Professor Lianzhou Wang and Professor Xiwang Zhang.[2] College members contribute their expertise to help ensure that ARC-supported research delivers significant impact and value to the broader community.

The Centre also celebrates the achievements of emerging researchers. Dr Zhe Yang received a 2025 Foundation Research Excellence Award during the 2025 Research and Innovation Week for “Novel Li-ultraselective nanofiltration membranes for highly efficient lithium extraction,” recognising innovation in sustainable resource technologies.[3]

Dr Kaige Sun and Dr Yang Zhe were named in the top 100, 000 scientists based on multiple citation metrics in Scopus or a percentile rank of 2% or above in their respective sub-fields (Mining & Metallurgy and Chemical Engineering; Chemical Engineering and Environmental Sciences, respectively).[4]

We congratulate Dr Hao Zhang, Dr Jindi Yang, Dr Kaige Sun, Dr Ming Yong and Dr Mark McConnachie on their doctoral awards in 2025. Collectively, these recognitions underscore the depth of talent within the Centre and reflect its strong culture of excellence, innovation, and impact in research.

1 https://clarivate.com/highly-cited-researchers/

2 https://www.arc.gov.au/about-arc/governance/arc-college-experts

3 https://vimeo.com/1115706978?fl=pl&fe=cm

4 Ioannidis, John P.A. (2025), “August 2025 data-update for "Updated science-wide author databases of standardized citation indicators"”, Elsevier Data Repository, V8, doi: 10.17632/btchxktzyw.8. Database of the 100,000 most-cited authors across all scientific fields based on their ranking of a composite indicator that considers six citation metrics in Scopus (https://www.scopus.com/).

Research Themes

Green Chemicals

Green hydrogen production plays an important role in the transition to a low-carbon energy economy, with applications spanning clean fuels, power generation and industrial processes. Produced via water electrolysis using renewable electricity, green hydrogen offers a zero-emissions alternative to fossil-based hydrogen pathways. While advances in electrolyser technologies have significantly improved efficiency and cost competitiveness, challenges related to large-scale production, storage and transport continue to limit widespread deployment. In response, research in the Centre increasingly focuses on hydrogen-derived green chemicals and carriers, including hydrogen peroxide, ammonia and formic acid, which offer safer, more practical and scalable routes for hydrogen storage, transport and utilisation across multiple sectors.

In hydrogen production systems, proton exchange membrane (PEM) electrolysers are a key enabling technology. PEM electrolysers use a solid polymer membrane to split water into hydrogen and oxygen using electricity, producing high-purity hydrogen and offering fast response to variable renewable power. However, their performance and durability are highly dependent on materials design, operating conditions and feedwater quality, motivating continued research to improve robustness and scalability for real-world deployment.

Among hydrogen-derived chemicals, hydrogen peroxide (H_2O_2) plays an increasingly important role in both sustainable energy and industrial systems, particularly in wastewater treatment and green chemical manufacturing. Conventionally produced via the anthraquinone process, hydrogen peroxide manufacturing is energy-intensive and reliant on petrochemical feedstocks. Research within the Centre focuses on more sustainable alternatives, including the direct electrochemical synthesis of H_2O_2 using advanced catalysts and membrane-based reactor designs, enabling lower-emissions, on-site and safer production pathways.

Sustainable Hydrogen Production from Used Water

This ARC Linkage Project, jointly delivered by the University of Queensland and Monash University, addresses the growing challenge of freshwater scarcity associated with large-scale hydrogen production by enabling the use of treated wastewater as the electrolysis feed. The project systematically examined how water impurities influence the performance, efficiency and long-term durability of proton exchange membrane (PEM) electrolysers, which are highly sensitive to contaminants.

Through controlled experimental studies, the research demonstrated that acidified treated wastewater could sustain stable electrolyser operation for more than 700 hours, achieving hydrogen production rates comparable to those obtained with deionised water while substantially reducing freshwater demand. In parallel, water chemistry analysis and mitigation strategies were developed to manage impurity-driven degradation mechanisms. Complementary techno-economic analysis indicates that this approach could reduce operating costs by approximately 15%. Together, these outcomes provide practical guidance for integrating hydrogen production with existing wastewater treatment infrastructure, supporting the scalable, resilient and resource-efficient deployment of green hydrogen systems.

Green Peroxide for Pollutants Removal

This completed research project was funded through the Queensland–Chinese Academy of Sciences Collaborative Science Fund and conducted in partnership with the Research Centre for Eco-Environmental Sciences, Chinese Academy of Sciences. The project addressed the growing challenge of

emerging micropollutants in water, including pharmaceuticals, endocrine-disrupting chemicals and per- and polyfluoroalkyl substances (PFAS), which pose significant risks to human health and aquatic ecosystems. Conventional hydrogen peroxide used in advanced water treatment is energy-intensive to manufacture and presents safety concerns during transport and storage.

This project developed a more sustainable alternative by integrating advanced oxidation processes with innovative electrochemical systems for on-site hydrogen peroxide generation. Key outcomes included the design of high-performance electrocatalysts, development of novel reactor systems, and successful laboratory validation demonstrating high pollutant removal efficiencies. The research progressed to pilot-scale prototype development and early industry engagement, including discussions with Evimien Energy Pty Ltd (https://evimienenergy.com/), establishing a strong foundation for future scale-up and deployment of sustainable water-treatment technologies.

Bioinspired Photocatalysts for Solar-Driven Hydrogen Peroxide Production

This ARC Discovery Early Career Researcher Award (DECRA) project led by Dr Xiangkang Zeng focuses on developing sustainable photocatalysts capable of producing hydrogen peroxide directly from water, air and sunlight. Drawing inspiration from natural photosynthetic systems, the project has centred on designing reaction-oriented, conjugated polymer-based photocatalysts with carefully engineered atomic and molecular nanostructures to improve efficiency and selectivity. It has delivered new insights into artificial photosynthesis, photocatalytic mechanisms and functional material design, while advancing environmentally friendly alternatives for hydrogen peroxide production used in chemical manufacturing and water treatment.

Key outcomes of this project include the synthesis of multiple high-performance catalyst systems, detailed characterisation and mechanistic studies through access to advanced characterisation facilities at Australian Nuclear Science and Technology Organisation (ANSTO), and successful laboratory validation of solar-driven hydrogen

peroxide generation. The project has also resulted in several high-quality publications and strong foundations for follow-on funding and future scale-up opportunities in solar-to-chemical energy conversion.

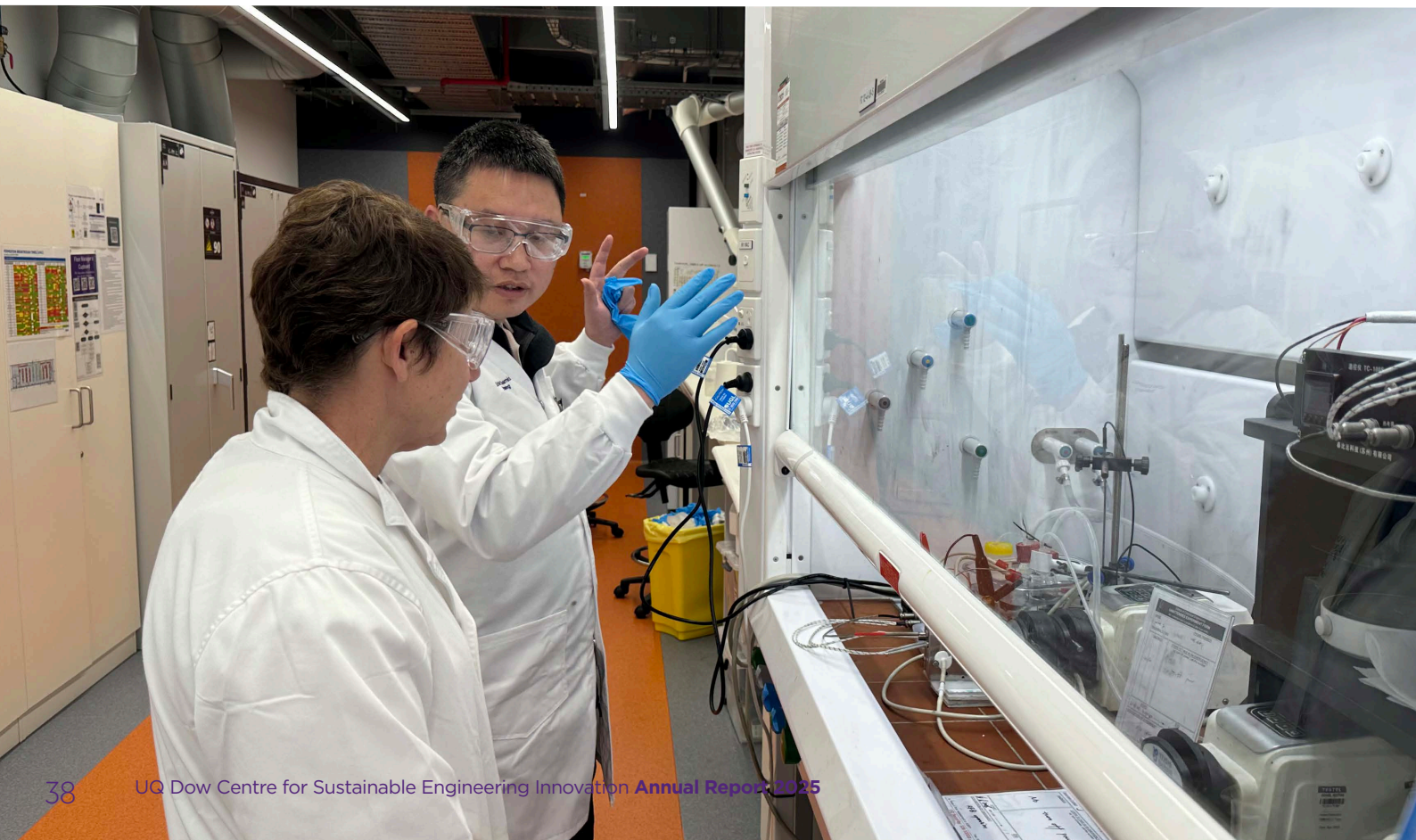
Catalytic Hydrogen Production via Pyrolysis (CHyPP)

This Australia's Economic Accelerator (AEA) Ignite project is led by the University of Adelaide, with UQ contributing under the leadership of Associate Professor Simon Smart. The project advances a low-emissions hydrogen production pathway based on methane pyrolysis, using pneumatically circulated molten catalysts to produce hydrogen and solid carbon rather than carbon dioxide. This approach addresses key limitations of conventional hydrogen production by significantly reducing direct carbon dioxide emissions while improving catalyst stability and enabling effective management of solid carbon by-products.

At UQ, research has focused on catalyst characterisation, reactor hydrodynamics and process optimisation to improve hydrogen yield, operational durability and scalability. As the project progresses, it aims to lift the technology readiness level and strengthen the techno-economic and commercial viability of catalytic methane pyrolysis, supporting pathways toward cleaner industrial hydrogen production and contributing to Australia's broader decarbonisation and hydrogen transition ambitions.

Integrated Solar to Chemical Production and Membrane Concentration System

This ARC Linkage Project led by Associate Professor Jingwei Hou aims to develop an integrated, solar-driven process for converting low-cost raw materials into high-value chemicals. The project combines advanced photocatalytic reactor design with membrane separation technologies to enable efficient photocatalytic water splitting and the production of ultrapure hydrogen and hydrogen peroxide. By coupling solar energy conversion with membrane concentration, the system addresses key challenges associated with the energy intensity and cost of conventional hydrogen peroxide manufacture, which is critical for industries such as semiconductor and solar panel fabrication. The project has delivered important advances in photocatalytic materials, reactor integration and membrane engineering, demonstrating a practical solar-to-chemical production pathway with strong potential to improve sustainability and economic viability in chemical manufacturing.



Membranes

Membrane technologies are central to water electrolysis, gas separation and purification, and the efficient production and utilisation of hydrogen carriers. They also play an important role in energy storage applications, including batteries and fuel cells, where they enable ion transport while maintaining separation of reactive species. In PEM electrolysers, membranes selectively transport protons while separating hydrogen and oxygen, enabling efficient hydrogen generation. More broadly, membranes enable the purification and selective separation of hydrogen from mixed gas streams and play a critical role in hydrogen carrier systems, such as ammonia synthesis and decomposition, by facilitating controlled hydrogen recovery. Through improved separation efficiency, durability and scalability, advanced membranes are key enablers of both green chemicals and energy storage technologies, supporting their economic viability and large-scale deployment.

Epitaxial Stacking of Nanoporous Nanosheets for Next-generation Membranes

This ARC Future Fellowship project led by Professor Xiwang Zhang, investigates the formation of vertically ordered nanochannels through epitaxial stacking of two-dimensional nanoporous nanosheets, enabling precise control over molecular transport and separation selectivity. With applications across pharmaceuticals, food processing and resource industries, the project contributes both fundamental insights into membrane structure–property relationships and practical foundations for industrially relevant, next-generation separation solutions.

Key outcomes included significant progress in nanosheet synthesis, surface functionalisation and membrane fabrication, including successful demonstrations in challenging applications such as low-temperature pervaporation dehydration. The developed membranes have shown high permeability, strong selectivity and excellent chemical stability, delivering notable reductions in energy consumption compared with conventional separation processes.

Pore Engineering of Chromatography Membranes for Bioseparation

This ARC Linkage Project, led by Professor Xiwang Zhang in collaboration with Monash University and CSL Behring, is developing next-generation affinity membranes to transform antibody purification for biopharmaceutical manufacturing. The project addresses the limitations of conventional column chromatography by engineering membrane pore structures and ligand distributions to enable fast, high-yield and scalable bioseparation. Significant progress has included the establishment of a complete design-to-module fabrication workflow and the creation of membrane systems achieving several-fold higher binding capacity than commercial alternatives while maintaining low pressure drop and high selectivity. These advances provide a strong foundation for continuous, cost-effective purification with clear industrial translation potential.

Novel Interlayered Membrane for Highly Efficient Separation Processes

This ARC DECRA project led by Dr Zhe Yang explored the development of advanced membrane architectures incorporating functionalised interlayers to dramatically enhance separation performance. By precisely tuning interlayer chemistry and structure, the project achieved substantial improvements in solvent permeance, and selectivity compared with conventional membranes, enabling more energy-efficient separations across a range of applications. Outcomes included new mechanistic insights into transport behaviour within interlayered membrane systems, contributing to Australia's broader capability in sustainable separation technologies. This project was relinquished in November 2025 following Dr Yang's career transition to The Hong Kong University of Science and Technology.

ARC Research Hub for Value-Added Processing of Underutilised Carbon Waste: Biomass-derived Materials for Advanced Vanadium Electrolyte

The ARC Research Hub for Value Added Processing of Underutilised Carbon Waste, led by Monash University, seeks to develop upcycling technologies to address the pressing impacts caused by accumulation of organic wastes.[1]

1 https://vapucw.org/

As part of the Hub, this project, led by Dr Xiangkang Zeng in partnership with Vecco Electric, focuses on developing biomass-derived additives to enhance the performance, stability and energy density of vanadium redox flow battery electrolytes. By valorising underutilised carbon resources, the project supports both circular-economy objectives and grid-scale energy storage needs. Progress to date includes completion of scheduled technical milestones, publication of a comprehensive review, and strong industry engagement. The outcomes provide a pathway to more cost-effective and durable flow battery systems while strengthening prospects for downstream commercial and research collaboration.

Advance Queensland Industry Research Fellowship: Nanochannel Engineering of Proton-exchange Membranes for Iron Flow Batteries

Long-duration energy storage technologies are critical for renewable-rich power systems, yet iron flow batteries are currently limited by membrane performance and cost. This Advance Queensland Industry Research Fellowship project led by Dr Chao Xing addresses this challenge by optimising commercially relevant polymer membranes through nanochannel engineering. Early membrane prototypes have demonstrated promising proton transport and ion selectivity, establishing a practical, industry-aligned foundation for durable, scalable and cost-effective energy storage solutions.

Dr Mike Tebyetekerwa describes the electrochemical production of hydrogen peroxide.


Hongxia Zhang

Carbon Dioxide Utilisation

Carbon dioxide (CO_2) utilisation is rapidly emerging as a critical pillar in the global transition to net zero, particularly as emissions continue to rise, reaching approximately 38 billion tonnes annually with only a small fraction currently captured or reused.[1] While existing carbon capture and utilisation (CCU) pathways already process around 230 million tonnes of CO_2 each year,[2] primarily in conventional applications, there is growing momentum toward transforming CO_2 into sustainable fuels, chemicals, and materials. In Australia, this shift is especially significant given the nation's industrial base and renewable energy potential, with CO_2 utilisation identified as a key strategy to decarbonise hard-to-abate sectors while creating new economic opportunities through low-emission products. Against this backdrop, this research theme continues to advance the vision of a circular carbon economy, where CO_2 is no longer treated as waste but as a valuable resource underpinning future clean energy and manufacturing systems.

The ARC Centre of Excellence for Green Electrochemical Transformation of Carbon Dioxide ($GETCO_2$) entered a high-impact growth phase in 2025, significantly increasing research output, engagement, and conference participation. One notable event held by the $GETCO_2$ team in 2025 is the Hackathon Competition 2025, a flagship initiative designed to foster interaction, collaboration, engagement, and science communication across stakeholders within and external to the $GETCO_2$ network. The competition centred on a challenge to identify high-impact innovations in materials and associated supply chains required to enable sustainable, gigawatt-scale Power-to-X CO_2 electrolysers, while considering long-term economic, environmental, and social sustainability factors, including technoeconomic analysis, life cycle assessment, circularity, and policy settings. Delivered through a structured program comprising launch and promotion, team formation, induction and Q&A sessions, mentor-guided concept development, and final project pitches and awards at the $GETCO_2$ National Conference in Sydney in November, the hackathon successfully fostered cross-node collaboration and new external partnerships. Participating teams developed innovative, sustainability-focused solutions and delivered clear, engaging pitches accessible to both expert and non-expert audiences, supported by strong team branding and well-defined value propositions.

Innovative, ultra-efficient device for sustainable electricity harvesting from CO_2

This Australia's Economic Accelerator (AEA) Ignite project, led by Dr Zhuyuan Wang (formerly Dr Zhe Yang), continued to progress strongly in 2025 toward advancing a novel ion-separation technology that integrates carbon dioxide (CO_2) capture with in-situ electricity generation. Addressing a critical limitation of conventional carbon capture and storage (CCS) systems, namely high energy demand and associated costs, the project aims to offset CO_2 adsorption energy requirements while enabling a carbon-negative pathway for energy recovery. Building on laboratory-scale validation (TRL4), the team has achieved measurable progress toward TRL6 through the development of larger prototype systems (~1 m^3) and demonstration of scalable voltage.

1 https://globalcarbonbudget.org/
2 https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage/co2-capture-and-utilisation

Socio-Techno-Economic Analysis

Socio-techno-economic analysis integrates technological performance with economic viability, policy settings and social considerations to support the development and scale-up of low-emissions technologies. This approach is essential for translating laboratory and pilot-scale advances into deployable, system-level solutions. By evaluating costs, infrastructure requirements, regulatory frameworks, environmental outcomes and social acceptance alongside technical maturity, socio-techno-economic analysis identifies risks and trade-offs early in the innovation cycle. Flagship initiatives such as Net Zero Australia apply this framework to inform credible pathways for hydrogen-based fuels, carbon utilisation and industrial decarbonisation at national and state scales.

Net Zero Australia

Australia's transition to net zero emissions presents complex technological, economic and social challenges that require integrated, evidence-based analysis. Net Zero Australia is a major, collaborative research initiative launched in 2021 to address the lack of comprehensive, non-partisan analysis on Australia's transition to net zero emissions. The project is jointly led by The University of Melbourne, The University of Queensland (UQ) and Princeton University's Andlinger Centre for Energy and the Environment, with strong engagement from industry and policy stakeholders. Its core aim is to rigorously assess the scale, cost, pace and impacts of achieving net zero emissions across Australia's energy system and economy.

Phase 1 of Net Zero Australia delivered Australia's first integrated, economy-wide modelling of pathways to net zero, highlighting the infrastructure, investment and policy challenges associated with different transition scenarios. Building on this foundation, Phase 2 focuses on translating modelling insights into practical, socially and environmentally responsible decarbonisation pathways. Key areas of analysis include the roles of renewable energy, storage, firming technologies such as natural gas and carbon capture and storage, and emerging options such as clean hydrogen.

A flagship output of Phase 2 is the Updated Net Zero Pathways for Australia[1] report released in September 2025, which examines technology build rates, system constraints, infrastructure requirements and the distribution of transition costs across households, industry and the broader economy. The second topical report, Australia's Progress to Net Zero by 2050,[2] was released in December 2025 at the Net Zero Australia Annual Conference. This report presents a unified national approach to decarbonisation, offering guidance for planning, governance and implementation of large-scale emissions-reduction initiatives. It highlights integrated strategies for managing biodiversity, land use and greenhouse gas emissions, balancing ecological protection with agricultural productivity and climate goals.

1 https://www.netzeroaustralia.net.au/wp-content/uploads/2025/09/NZAu-Topical-Report-1-Net-Zero-Pathways-24-Sep-2025.pdf
2 https://www.netzeroaustralia.net.au/wp-content/uploads/2026/02/NZAu-Topical-Report-2-Net-Zero-2050-Progress-Tracker.pdf


projected.
Maps
• New build electricity, hydrogen, CO_2 and water transmission connects major centres.
Costs and investment
• Decarbonisation tasks and costs vary widely across end-use sectors, with industry most impacted.
• Achieving net zero is capital intensive across supply-side and demand-


Panel discussion
TODAY'S PANEL
Michael Brear
Professor
The University of Melbourne
Simon Smart
Associate Professor
The University of Queensland
Meg McDonald
NZAu Advisory Group member
MODERATOR
Ben Potter
Energy Journalist
SUMMARY OF
Energy production, storage, and build
• Renewables dominate, with 5-10%+ annual growth for many technologies in the net zero Scenarios.
• Solar and battery storage are prioritised.
• Firming will mainly be provided by batteries and gas, with investment primarily in batteries.
• Many different energy systems achieve essentially the same GHG emissions and total transition costs.
• Net Zero Scenarios need ~2+ times existing electricity transmission, and new CO_2 and H_2 pipelines.
Energy use, emissions, and targets
• Emissions reduction is fastest in electricity; transport and heavy industry are slower.
• The agriculture and land sector is not expected to be a source of offsets for other sectors.
• CCS has an important role in all decarbonised futures.
• Commonwealth 2030 and 2035 targets are achieved in 2031+ and 2038+ respectively, depending on Scenario.
• Additional action is needed to achieve 82% renewables by 2030, with 2033+ projected.
Maps
• New build electricity, hydrogen, CO_2 and water transmission connects major centres.
Costs and investment
• Decarbonisation tasks and costs vary widely across end-use sectors, wi
most impacted.
• Achieving net zero
ntensive across supply-side and demand-
44

Electromobility

Background

The Electromobility (e-mobility) program at the UQ Dow Centre has driven research and innovation in sustainable transport, bringing together interdisciplinary expertise to accelerate the transition to low-emission, electric-powered mobility solutions. Central to this effort is the St Baker and Tritium e-Mobility Fellowship, established through a generous $1.5 million donation from the Trevor and Judith St Baker Family Foundation. Supported initially by UQ strategic funding and now sustained through an ongoing endowment, the Fellowship has enabled a cohort of leading researchers to deliver impactful work in electric vehicle adoption, encompassing studies on charging and mobility behaviours, charging infrastructure planning and management, and the decarbonisation of heavy vehicles. Collectively, their contributions have strengthened evidence-based decision-making and advanced national conversations on electromobility.

Fellows include:

- Dr Jake Whitehead (Tritium E-mobility Fellow)
- Dr Sohrab Nizami (Tritium E-mobility Fellow)
- Dr Dia Adhikari-Smith (Tritium E-mobility Fellow)
- Dr Kai Li Lim (St Baker Fellow in E-Mobility)

The Fellows are mentored by Professor Mark Hickman and Professor Tapan Saha. The e-mobility team is further supported by a broader network of staff and students, including Dr Ying Lu and Ms Thara Philip. Through strong cross-sector collaboration, the program also informed policy, investment, innovation, and community behaviour.

Over 2020-2025, the e-mobility team:

Engaged and collaborated with over **30** partners across government, industry, academic institutions and peak bodies, including:

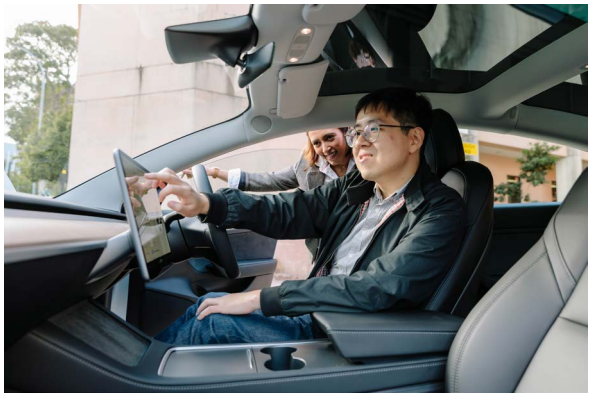
- Queensland Department of Transport and Main Roads
- Brisbane City Council
- Gold Coast City Council
- Queensland Fire and Emergency Services
- Lendlease
- Volvo Trucks
- Evie Networks
- iMOVE Cooperative Research Centre
- University of California, Davis
- Swinburne University of Technology
- Public Transport Association Australia New Zealand
- Energy Consumers Australia

Driving conversation. Sharing knowledge. Creating impact for a sustainable future.

Delivered over **150** external engagement and communication activities, including more than **110** media engagements (radio interviews, news coverage, and social media) and over **30** conference and seminar presentations.

Highlights include:

- The Conversation article on car emissions[1]
- Women Who Move Nations Podcast[2]
- ABC News article on electric trucks[3]
- Feature in The Project, Channel 10[4]
- Participation as Lead Author in Climate Change 2022, Mitigation of Climate Change, Technical Summary, Intergovernmental Panel on Climate Change (IPCC)[5]



1 https://theconversation.com/cars-in-australian-cities-are-emitting-less-but-in-the-regions-exhaust-emissions-are-growing-241017
2 Spotify: https://spoti.fi/3LEJSRY ; Apple: https://apple.co/46hC5mw
3 https://www.abc.net.au/news/2022-12-06/qld-ev-electric-vehicle-strategy-trucks-volvo-emissions/101665874
4 https://www.youtube.com/watch?v=VMhWI_ENFqM
5 https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_TechnicalSummary.pdf

2025 Update

Australia has experienced a significant acceleration in electric vehicle (EV) uptake in recent years, reflecting growing consumer demand and improved market availability. By June 2025, there were over 360,000 EVs on Australian roads, supported by a rapidly expanding charging network of more than 1,300 fast and ultra-fast charging sites nationwide.[6]

This growth has been further reinforced by increasing government support, including, the Australian Government's National Electric Vehicle Strategy, the introduction of the New Vehicle Efficiency Standard (NVES) effective from 1 January 2025, and complementary state-based initiatives such as Queensland's Electric Vehicle Charging Infrastructure Cofund Scheme and the Queensland Electric Super Highway[7] across multiple sectors.

6 Federal Chamber of Automotive Industries, VFACTS (various editions); Electric Vehicle Council sales data (various editions); Department of Climate Change, Energy, the Environment and Water, EVEnergi, National Electric Vehicle Charging Infrastructure Mapping Tool (2025), evciroadmap.evenergi.com/

7 www.dcceew.gov.au/energy/transport/national-electric-vehicle-strategy; www.infrastructure.gov.au/infrastructure-transport-vehicles/vehicles/new-vehicle-efficiency-standard; www.qrida.qld.gov.au/program/electric-vehicle-charging-infrastructure-scheme; www.tmr.qld.gov.au/community-and-environment/electric-vehicles/queenslands-electric-super-highway

The e-mobility team at UQ Awards for Excellence 2022

In response to this evolving landscape and the rapidly advancing EV ecosystem, discussions were undertaken with donor Mr Trevor St Baker AO to ensure the ongoing alignment of the e-mobility research program with emerging priorities. These discussions recognised the need for a more integrated and flexible approach to addressing the next phase of decarbonisation challenges.

As a result, the Tritium Fellowship and St Baker Fellowship in e-mobility have been merged into a single St Baker Fellowship, establishing a refreshed model aligned with the Dow Centre's broader decarbonisation program. The Fellowship will support interdisciplinary research with a focus on techno-economic analysis (TEA) and life cycle assessment (LCA), enabling the development of decision-support tools, policy insights, and industry-relevant outcomes

Mr Trevor St Baker AO (centre) with Dow Centre management team and Mr Weston Bruner from UQ EAIT Advancement (right).

2025 Publications

35

Publications in Quartile 1 journals and 2 reports

> 85%

Publications include an international author; collaborations with the United States, China, Denmark, Sweden and Singapore.

457

Citations, an average of **13.4** citations per paper (as of May 2026).

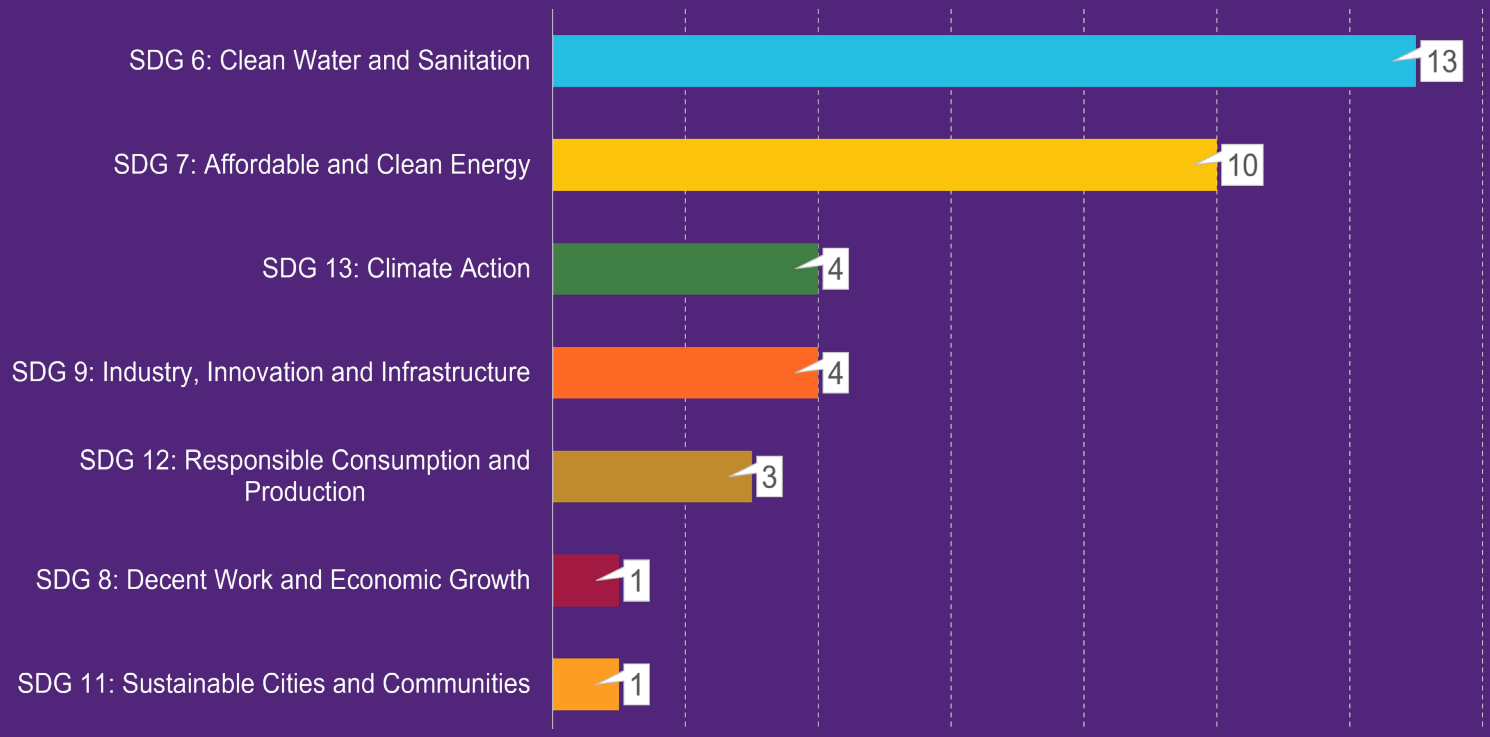
22

Publications contributing to 7 United Nations Sustainable Development Goals, with 13 mapped to SDG 6: Clean water and sanitation, and 10 contributing to SDG 7: Affordable and clean energy.

1

Hot paper (top 0.1%) in the Essential Science Indicator (ESI) Environment/Ecology (Web of Science, April 2026), and 2 Highly Cited papers (top 1%), one each in Materials Science and Environment/Ecology.

Number of publications contributing to the United Nations Sustainable Development Goals (SDGs)*



* Some publications are mapped to multiple SDGs.

2025 Publications

Journal Articles

1. Bie, C., Jiang, C., Yang, J., Sun, X., Zeng, X., Zhang, J. and Zhu, B., Side reactions in photocatalytic H_2 production by overall water splitting. *Journal of Materials Science & Technology*, 2025. **229**: p. 48-57.

2. Bie, C., Yang, J., Zeng, X., Wang, Z., Sun, X., Yang, Z., Yu, J. and Zhang, X., Nanoconfinement Effects in Electrocatalysis and Photocatalysis. *Small*, 2025. **21**(13).

3. Ge, Y., Yong, M., Zeng, X., Xing, C., Wang, Z., Yang, J., Luo, B. and Zhang, X., Biomass-derived Materials for Advanced Vanadium Redox Flow Batteries. *Materials Futures*, 2025. **4**(4).

4. Hu, J., Liu, Q., Ouyang, Y., Dong, M., Luo, B. and Zhang, X., Tailoring Membrane Surface Electrostatics to Regulate Zinc Deposition for Alkaline Zinc-Based Flow Battery. *ACS Energy Letters*, 2025. **10**: p. 6408-6414.

5. Hu, J., Zhang, P., Wang, P., Zhang, L. and Zhang, X., Covalent organic framework composite membrane for long lifespan alkaline zinc-based flow battery. *Chemical Engineering Journal*, 2025. **525**.

6. Hu, Y., Sarkar, P., Peng, L.E., Wang, F., Yang, Z. and Tang, C.Y., Design Ultrathin Polyamide Membranes against Funnel Effect: A Novel Zone-of-Influence-Based Approach. *Environmental Science and Technology*, 2025. **59**(21): p. 10600-10607.

7. Huang, L., Chen, B., Yang, J., Su, J., Zeng, W., Zhong, K., Huang, L., Wang, C., Zhang, H. and Ng, H.Y., Hierarchical N/Se dual-doped porous carbon drives four-electron oxygen reduction for superior efficiency and durability of microbial fuel cells. *Journal of Power Sources*, 2025. **655**.

8. Iqbal, S., Leuaa, P., Buchauer, F.L., Javed, U., Tebyetekerwa, M., Hardwick, L.J. and Chatzichristodoulou, C., Alkali Cation Interactions with Superoxide Intermediates during the Oxygen Evolution Reaction on $Ni_{1-x}Fe_xOOH$. *ACS Energy Letters*, 2025. **10**(7): p. 3395-3406.

9. Javed, U., Tebyetekerwa, M., Tang, C., Zeng, X., Wang, Z., Sun, K., Yang, J., Marriam, I., Guo, L., Sun, X., Sahu, A.K., Zhang, Y., Zamyadi, A., Du, A., Li, Q., Rufford, T.E. and Zhang, X., Water Oxidation to Hydrogen Peroxide Over a Super-Aerophilic Graphite Catalyst. *Advanced Materials*, 2025. **37**(35).

10. Klein, J.R.M., Biogas Purification by Methane and Acetate Manufacturing. *Global Change Biology Bioenergy*, 2025. **17**(1).

11. Long, L., Wu, C., Shao, S., Yang, Z., Sarkar, P. and Tang, C.Y., Assessment of permeance and selectivity of thin-film composite polyamide membranes for diverse applications. *Nature Water*, 2025. **3**(6): p. 668-682.

12. Lu, X., Wang, L., Peng, H., Zhu, X., Yang, Z., Wei, J. and Liu, B., Double Nanofoaming Enhanced Interfacial Polymerization toward Ultra-High-Performance Nanofiltration Membranes. *Environmental Science & Technology*, 2025. **59**(36): p. 19593-19603.

13. Moglia, M., Tapsuwan, S., Ghaderi, H., Nygaard, C.A., Dia, H. and Smith, D.A., Who doesn't like a battery electric truck? Heterogeneous motivations in the uptake of low-emissions trucks in Australia. *Transportation Research Part A: Policy and Practice*, 2025. **193**: p. 104396.

14. Pascale, A. C., Watson, J. E. M., Davis, D., Smart, S., Brear, M., Jones, R. and Greig, C., Negotiating risks to natural capital in net-zero transitions. *Nature Sustainability*, 2025. **8**(6): p. 619-628.

15. Qiu, L., Gong, S., Qiu, Q., Zhu, X., Xu, D., Kang, X., Wu, D., Wang, F., Yang, Z. and Cheng, X., Sodium citrate-modulated interfacial polymerization towards highly permeable NF membranes for simultaneously enhanced mineral/NOM selectivity and anti-fouling performance. *Desalination*, 2025. **601**: p. 118541.

16. Sahu, A.K., Rufford, T.E., Ali, S.H., Knibbe, R., Smart, S., Jiao, F., Bell, A.T. and Zhang, X., Material needs for power-to-X systems for CO_2 utilization require a life cycle approach. *Chemical Science*, 2025. **16**(14): p. 5819-5835.

17. Sun, Z., Yang, Y., Zhang, Z., Shan, Y., Hu, Z., Yang, J. and Ren, X., Enhancement of antifouling and separation properties of poly(m-phenylene isophthalamide) hybrid ultrafiltration membrane using highly crystalline poly(heptazine imide) nanosheets. *Journal of Membrane Science*, 2025. **713**: p. 123340.

18. Wang, D., Zeng, Y., Liang, Y., Chen, Y., Liu, C., Zhan, C., Chen, P., Sun, K., Song, S. and Jia, F., Pilot-scale, cost-effective waste resource recovery: Efficient reduction of trace Au(I) from industrial wastewater via an adsorption and electrodeposition coupling process. *Separation and Purification Technology*, 2025. **361**: p. 131641.

19. Wang, Z., Yang, J., Yong, M., Zeng, X., Tebyetekerwa, M., Sun, K., Bie, C., Xing, C., Wang, H., Andreeva, D.V., Novoselov, K.S. and Zhang, X., From Layered Crystals to Permselective Membranes: History, Fundamentals, and Opportunities. *Chemical Reviews*, 2025. **125**(14): p. 6753-6818.

20. Wibowo, A.A., Tebyetekerwa, M., Sun, Z., Nomoto, K., Bui, A.D., Ringer, S.P., Yin, Z., Lu, Y., Macdonald, D. and Nguyen, H.T., Synthesis and Light-Matter Interaction of Low-Dimension Ordered–Disordered Layered Semiconductors. *Advanced Materials*, 2025. **37**(11): p. 2415795.

21. Wu, C., Long, L., Yang, Z., Hu, Y., Peng, L.E. and Tang, C.Y., Unraveling the role of funnel effect vs. gutter effect in water permeance and antifouling performance of polyamide nanofiltration membranes. *Water Research*, 2025. **285**: p. 9.

22. Xie, W., Wang, Z., Yin, Y., Bai, Y., Yang, J., Miao, D., Zeng, X., Yang, S. and Wang, G., Selective polymerization of chlorophenols in hypersaline wastewater via surface-complex-mediated electron transfer over Ce-doped CuO. *Water Research*, 2025. **284**.

23. Xie, Y., Chen, M., Yong, M., Wang, Z., Wang, H., Xia, Z., Li, C., Li, M., Huang, L., Yan, J. and Zhang, H., Cobalt regulation biocathode with sulfate-reducing bacteria for enhancing the reduction of antimony and the removal of sulfate in a microbial electrolysis cell simultaneously. *Environmental Research*, 2025. **270**: p. 120955.

24. Xu, R., Yu, H., Ren, J., Zhang, W., Kang, Y., Wang, Z., Feng, F., Xia, X., Liu, J.Z., Peng, L., Zhang, X. and Pan, B., Regulate Ion Transport in Subnanochannel Membranes by Ion-Pairing. *Journal of the American Chemical Society,* 2025. **147**(20): p. 17144-17151.

25. Yang, F., Yong, M., Li, Z., Yang, Z. and Zhang, X., Breaking the trade-off between lithium purity and lithium recovery: A comprehensive mathematical modeling based on membrane structure-property-performance relationships. *Water Research*, 2025. **281**: p. 123678.

26. Yang, J., Yin, H., Du, A., Tebyetekerwa, M., Bie, C., Wang, Z., Sun, Z., Zhang, Z., Zeng, X. and Zhang, X., Unveiling O_2 adsorption on non-metallic active site for selective photocatalytic H_2O_2 production. *Applied Catalysis B: Environment and Energy*, 2025. **361**: p. 124586.

27. Yang, J., Zeng, X., Zhu, B., Rahman, S., Bie, C., Yong, M., Sun, K., Tebyetekerwa, M., Wang, Z., Guo, L., Sun, X., Kang, Y., Thomsen, L., Sun, Z., Zhang, Z. and Zhang, X., Self-Trapped Excitons Activate Pseudo-Inert Basal Planes of 2D Organic Semiconductors for Improved Photocatalysis. *Advanced Materials*, 2025. **37**(30).

28. Yin, H., Jia, R., Jiang, K., Li, J., Zeng, H., Sun, K. and Xu, B., Metal-organic framework on graphene derived hierarchical carbon supported tin dioxide nanocomposite for superior lithium ion storage. *FlatChem*, 2025. **49**.

29. Yong, M., Tang, M., Sun, L., Yang, J., Wang, Z., Xing, C., Tian, H., Xie, L., Wang, Z., Zhang, X. and Li, Z., Chelator-Enhanced nanofiltration process for selective lithium extraction and Magnesium utilization from salt lake brines. *Separation and Purification Technology*, 2025. **379**: p. 134967.

30. Yong, M., Yang, Y., Sun, L., Tang, M., Wang, Z., Xing, C., Hou, J., Zheng, M., Chui, T.F.M., Li, Z. and Yang, Z., Nanofiltration Membranes for Efficient Lithium Extraction from Salt-Lake Brine: A Critical Review. *ACS Environmental Au*, 2025. **5**(1): p. 12-34.

31. Yong, M. and Zhang, X., Constructing lithium-exclusive pathways in $LiFePO_4$ electrodes. *Nature Water*, 2025. **3**(12): p. 1344-1345.

32. Zhang, H., Xie, F., Yang, Z., Xu, Z., Mo, J.-W., Ma, X.-H. and Xu, Z.-L., Crumpled polyamide membranes templated by macroporous scaffolds for ultra-permeable nanofiltration. *Desalination*, 2025. **612**.

33. Zhang, H., Yong, M., Hu, T., Kang, Y., Wang, Z., Xu, Z., Li, X., Sun, X., Guo, L., Sheng, F., Zeng, X., Li, Z., Li, X., Wang, H., Xu, T. and Zhang, X., Multifunctional intercalants create stable subnanochannels in MoS_2 membranes for wastewater treatment. *Nature Communications*, 2025. **16**(1).

34. Zhao, C., Miao, W., Yu, J., Xiong, F., Tong, M., Yong, M., Tang, M., Sun, L., Luo, W., Liu, Z., Li, E., Li, Z. and Zhang, X., Analysis of dissolved organic matter distribution in A zero-discharge system for coking wastewater treatment at A Typical steel plant. *Separation and Purification Technology*, 2025. **364**: p. 132310.

35. Zhou, H., Zhang, X., Li, Z., Qiu, Z., Yang, Z., Dai, R. and Wang, Z., Amphiphilic nanowire-assisted monomer shuttling enables ultra-selective reverse osmosis membranes for water purification. *Nature Communications*, 2025. **16**(1).

Reports

1. McCall, A., Zhang, Y., Habibollahzade, A., Bolt, R., Wade, B., Greig, C., Smart, S., Davis, D., and Brear, M., Australia's Progress to Net Zero by 2050, in Net Zero Australia. 2025.

2. McCall, A., Zhang, Y., Vecchi, A., Jones, R., Eckard, R., Keenan, R., Mumford, K., Bolt, R., Wade, B., Davis, D., Greig, C., Smart, S. and Brear, M., Updated Net Zero Pathways for Australia, in Net Zero Australia. 2025.

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