

CREATE CHANGE

Queensland Alliance for Environmental Health Sciences

Annual Report 2023-2024



Contents

01.	Our Alliance with Queensland Health	2
02.	Foreword	3
03.	Director's Report	3
04.	About Us	7
05.	Governance	9
06.	Strategic Direction	11
07.	Research	13
08.	Education and Training	37
09.	Communication and Impact	45
10.	Collaborations and Partnerships	55
11.	Appendices	60
	Appendix A: QAEHS staff and students	61
	Appendix B: Major partners and collaborators	67
	Appendix C: Community and professional activities	69
	Appendix D: Research publications	70

Queensland Alliance for Environmental Health Sciences acknowledges the Traditional Owners and their custodianship of the lands on which we live, work and learn.

We pay our respects to their Ancestors and their descendants, who continue cultural and spiritual connections to Country. We recognise their valuable contributions to Australian and global society.



01.

We strive for world-class outcomes in research, training, and partnership engagement, while meeting the needs of Queensland and the wider community.

Key objectives

- Provide opportunities for Queensland Health, through enhanced engagement with the research sector, to influence the research agenda in the field of environmental health science.
- Build the capacity of key Queensland Health staff to assess and manage risks to human health from environmental threats.
- Encourage ongoing innovation and research in the environmental health science field.
- Facilitate access for Queensland Health staff to scientific and academic environmental health experts from the university research sector to ensure government policy and advice reflects the latest scientific findings.

Our alliance with **Queensland Health**

Aligned with our vision to improve human health through environmental health science, our mission, conducted in partnership with Queensland Health, aims to address local, national, and global environmental health science challenges.

Our researchers provide extensive academic and scientific expertise focussed on managing environmental sources of risk to human health.

Impact goals

- Maintain a high guality and dynamic program of interdisciplinary research that solves current and emerging global environmental health challenges.
- · Provide an education and training program that builds national capability.
- Be the recognised experts as the first point of call for environmental health science in Australia.
- Be a provider of science-based knowledge that leads to policies aimed at improving health outcomes.

02. Foreword



I am pleased to share this year's Annual Report for the Queensland Alliance for Environmental Health Sciences (QAEHS) highlighting activities and achievements in the 2023-24 financial year.

QAEHS is a partnership between Queensland Health and the University of Queensland with the aim of improving health through environmental health science research, education and engagement.

The Alliance Management Committee provides strategic direction and advice to support QAEHS's vision for environmental health science in Australia and internationally. This year we welcomed the extension of QAEHS to 2028, together with a refresh and review of the Centre's strategy and governance. We would particularly like to thank Professor Bruce Abernathy, former Executive Dean of the Faculty of Health and Behavioural Sciences, for his efforts as an AMC member since 2017. Bruce is moving on to a new role to support the Olympic and Paralympic Games in Brisbane in 2032.

Some highlights for QAEHS this year included the operationalisation of the newly constructed Australian Environmental Specimen Bank (AESB), a key resource of human and environmental samples for researchers and regulators. QAEHS has continued to build and participate in partnerships with technology providers such as the ARC HyTech training centre, a 5-year program led by the University of Tasmania. Minderoo Foundation has also pledged further funding support for QAEHS's research on plastics in the environment and human health over the next 3 years.

QAEHS's sustained success depends largely on a dedicated cohort of staff and students. Since its inception in 2016, QAEHS has had 36 PhD student completions, with many going on to careers in academia, government and industry. QAEHS currently has 39 PhD students, with eight new students commencing this year. Several higher degree students were represented, and Coral Jeffries won an award for best student oral presentation, at the Society for Environmental Toxicology conference in Townsville in September.

Dr Elvis Okoffo won the Australian Academy of Science Max Day Award for his research investigating the extent of microplastic pollution in Moreton Bay and its potential impact on marine ecosystems. A/Prof Phong Thai, co-Theme leader for Environmental Health Risk Assessment was also successful in gaining an ARC Industry Fellowship to work closely with Queensland Health. Industry placements for HDR students have been a key focus this year, with four established this year and a further three placements underway.

Upgrades to the QAEHS website this year have led to increasing media coverage and improved visibility of QAEHS. QAEHS has continued its outstanding record of attracting new research funding and eminent international visitors, producing many publications in high ranked journals, and engaging with the community such as at the 2024 World Science Festival in Brisbane.

Looking forward, priorities in 2024/25 will be to ensure QAEHS remains prominent as a Centre in the merger of the UQ Faculties of Medicine and Health and Behavioural Sciences. This will be informed by the upcoming septennial review of QAEHS in November by the UQ's Academic Board and external review panel members.

Finally, on behalf of AMC members, I would like to congratulate Professor Kevin Thomas for his exceptional leadership of QAEHS which has been integral to positioning QAEHS as a world leader in environmental health science.

Professor Jennifer Stauber FAA FTSE **SETAC Fellow**

Chair, Alliance Management Committee



03. Director's Report

At the heart of our work is a vision to enhance human health through advancements in environmental health science.

Our strength, I firmly believe, lies in our collaborative spirit. We bridge gaps, connect dots, and bring together diverse interests. We unite people, groups, and organisations across various disciplines, sectors, and regions to jointly tackle environmental and human health challenges.

Throughout the past year, our Centre has remained steadfast in its mission to address global environmental health research challenges. We have made numerous notable achievements that deserve recognition. While it's impossible to cover everything in this introduction, I would like to highlight a few accomplishments that stand out.

This year, we have been successful in securing \$19M for 24 new grants and projects. In addition, our satellite themes have won an additional 4 projects to the value of \$9M, bringing the total to \$28M in new environmental health sciences research funding. This is a significant achievement for our alliance and will greatly benefit the environmental health sciences community. Our success rate for competitive funding grants remains highly competitive. This year, we achieved a 37% success rate for applications led by QAEHS researchers, a testament to the quality and impact of our work.

I congratulate Associate Professor Phong Thai on his prestigious Mid-Career Industry Fellowship awarded by the ARC in partnership with Queensland Health and the Australian Tax Office. This fellowship supports innovation in research and industry, facilitating the translation of lab research into real-world applications.

Communicating our science to the broader community is fundamental to our mission. This year, two students found creative ways to share their work with diverse audiences. PhD students Belinda Moore and Lachlan Chadwick participated in the Future Science Talks Brisbane Science Comedy Program as part of the Brisbane Comedy Festival, and SETAC's Science Slam competition, respectively.



Community outreach activities play a key role in sharing our work and I commend our researchers, staff, and PhD students who have dedicated their personal time to community events and volunteer groups this year.

Our 2024-29 strategic plan is under development this year, where we aim to refine our research, engagement, and impact activities to achieve our goals. Essential to this planning is ensuring we continue to provide the best tools, equipment, infrastructure and resources to help our team do what they do to the best of their abilities to continue to deliver world-class science.

Last year, we announced the completion of the Australian Environmental Specimen Bank's construction. This year, we made it operational, and it is now about 80% full. The AESB is Australia's only national biobank designed for storage of both human and environmental samples and is an invaluable resource for our researchers and collaborators, offering access to a wide range of current and historical samples from across Australia, some dating back to the 1940s.

We celebrate the completion of four PhDs and wish Joe, Bastian, Carla, and KM Shahunja all the best in their post-PhD careers and life. We're also excited to share updates on QAEHS alumni Dr. Phil Choi and Dr. Francisca Ribeiro and their career journeys since completing their PhDs.

I'd like to thank Professor Bruce Abernethy for his valuable commitment and contribution to QAEHS over the past 7 years.

Looking ahead, we welcome the Centre's formal review by UQ's Academic Board in November. It is important to reflect on our successes and identify areas for improvement. We are also planning a Queensland roadshow to facilitate Rapid Risk Assessment workshops for Queensland Health staff later this year.

I am pleased to present our 2023–24 Annual Report, highlighting many achievements across the alliance. It's an honour to work with such inspiring researchers and PhD students, and dedicated professional staff, and I extend my sincere thanks to them all.

Professor Kevin Thomas Director

2023-2024 snapshot





625M people

* Media mentions are a reference to a keyword (QAEHS) across all types of media.



22% Student demographics 78%



About us

Healthy people in a healthy environment.

Through our partnership with Queensland Health, we share a vision to improve human health through environmental health science.

Based at The University of Queensland, QAEHS is supported by Faculties of Health and Behavioural Sciences, Engineering Architecture and Information, Medicine, and Humanities and Social Sciences.

Our research addresses issues of critical and emerging concern to the global community. As a centre of distinction in research and engagement, we are driven by collaboration and a common commitment to address current and emerging global challenges in environmental health.

We bring together government policymakers, industry practitioners, and researchers to tackle environmental and human health threats. By leading an interdisciplinary highquality research program, we aim to achieve first class results in research, training, and partnerships, addressing both current and emerging challenges, and collaborating with global experts and organisations.

Vision

Improving human health through environmental health science.

Mission

Address local, national, and global environmental health science challenges and achieve first class outcomes in research, training and partnership engagement while meeting the needs of Queensland and the wider community.

Goals

- Identify and contribute to solving current and emerging national and international environmental health challenges
- Build expert capability in the environmental health sciences
- To be Australia's internationally recognised research centre within the environmental health sciences
- Provide science-based knowledge to Queensland Health and the wider community



Governance

Our Centre is governed by the Alliance Management Committee (AMC), responsible for providing strategic direction and oversight of the Centre's activities.

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The AMC comprises an independent Chairperson, two members from The University of Queensland, two members from Queensland Government and the Director of the Centre.

The AMC is supported by one subcommittee, the Scientific Planning Committee (SPC). The SPC offers advice and support to the Director and the AMC to ensure the Centre's research is well-coordinated, collaborative, relevant, and complementary across all research themes. The SPC includes the Director, QAEHS theme leaders, and research executives from Queensland Health and the University of Queensland.

Our daily operations are managed by the Director and a small administrative team, with support from the University of Queensland.

Alliance Management Committee

The Alliance Management Committee offers expert, balanced, and timely advice and oversight on the Centre's strategic direction and activities. This ensures that QAEHS, through the Director and the Scientific Planning Committee, continues to lead in environmental health sciences research, education, innovation, impact, and engagement both in Australia and globally.

AMC year in review

AMC meetings focus on a variety of strategic and operational topics essential for the growth and sustainability of QAEHS. The AMC met three times during the reporting period on 11 July 2023, 14 November 2023 and 30 April 2024.

This year, the AMC welcomed presentations from new Environmental Health Risk Assessment Theme Leaders, Associate Professors Sarit Kaserzon and Phong Thai, who outlined their research strategies. Key discussions included the upcoming septennial Centre review by UQ's Academic Board scheduled for late 2024 and the priorities for QAEHS in response to the 2025 merger between UQ faculties of Medicine and Health and Behavioural Sciences. The committee provided oversight of the 2023 review of UQ's Master of Environmental Health Sciences (MEHS) course. The Centre's extension to 2028 and new objectives directed the committee's focus towards strategies to enhance communication and collaboration activities, including the advice and oversight of the establishment of Special Interest Groups, expanding the Centre's collaborations with Queensland Health and other industry, government, and research specialists. A review of the AMC's performance highlighted its value and identified initiatives to realign the committee to strengthen its impact, along with a refresh of its terms of reference to align with strategic goals.

The committee extends its gratitude to Professor Bruce Abernethy, former Executive Dean of the Faculty of Health and Behavioural Sciences, for his valuable contributions since the committee's inception in 2017 through to December 2023.

Members

Professor Jenny Stauber (Chair), Chief Research Scientist CSIRO

John Piispanen, Executive Director, Health Protection Branch Queensland Health

Professor Bruce Abernethy, Executive Dean, Faculty of Health and Behavioural Sciences University of Queensland (to Dec 2023)

Professor Louise Hickson, Executive Dean, Faculty of Health and Behavioural Sciences University of Queensland (from Jan 2024)

Dr Mark Jacobs, Deputy Director-General Science and Technology Division Queensland Department of Environment and Science

Professor Greg Montieth, Associate Dean (Research), Faculty of Health and Behavioural Sciences University of Queensland

Professor Kevin Thomas, Director Queensland Alliance for Environmental Health Sciences

Scientific Planning Committee

The Scientific Planning Committee (SPC) operates both strategically and operationally to ensure coordinated environmental health research across our thematic areas to meet stakeholder needs, maximise the quality and quantity of scientific outputs, and foster national and international industry and government partnerships. Membership includes Queensland Health and University of Queensland stakeholders to ensure ongoing collaboration and relevance to evolving needs and emerging challenges.

SPC meetings aim to facilitate comprehensive understanding of collective research efforts across QAEHS, foster interdisciplinary connections across themes, and identify future research directions. Discussions cover current research updates, contributions to the field, collaborations, and identification of opportunities for further collaboration across themes and stakeholders.

SPC year in review

The SPC met on four occasions during the reporting period in September and November 2023 and March and June 2024.

This year, meetings have been focused on several key topics critical to the Centre's strategic direction including identifying priority topics for Queensland Health, ensuring alignment with current Special Interest Groups (SIGs), and addressing the impacts of climate change on public health. Guest presenter Dr. Jagadish Thaker provided insights into public attitudes about climate change and health research.

Additionally, there has been a strategic emphasis on operationalising the Special Interest Groups to optimise their effectiveness in advancing collaborative research initiatives. The committee also engaged in planning for the Centre's upcoming review and strategic alignment across thematic areas, aiming to enhance research coherence and maximise impact.

Members

- Dr Greg Jackson, Director, Water Unit Queensland Health
- **Dr Amy Jennison**, A/Executive Director Queensland Health Forensic and Scientific Services
- **Professor Greg Montieth**, Associate Dean (Research) Faculty of Health and Behavioural Sciences University of Queensland
- **Professor Kevin Thomas**, Director Queensland Alliance for Environmental Health Sciences
- **Professor Kelly Fielding**, Theme Leader University of Queensland
- **Professor Jochen Mueller**, Theme Leader University of Queensland
- **Professor Jianhua Gao**, Theme Leader University of Queensland
- A/Professor Gilda Carvalho, Theme Leader University of Queensland
- A/Professor Nick Osborne, Theme Leader University of Queensland
- A/Professor Sarit Kaserzon, Theme Leader University of Queensland
- A/Professor Phong Thai, Theme Leader University of Queensland
- **Dr Dung Phung**, Theme Leader University of Queensland

Strategic direction

We are committed to advancing our strategic direction through a multifaceted approach that addresses research, value, people, education, communication, and collaboration.

Our strategic direction, goals, and objectives are aligned to support Queensland Health's 2032 research strategy, contributing to the department's research goals. Key to this alignment are purposeful collaboration activities that bridge research, government, and industry practitioners, and research impact through evidence-based translation of outcomes to inform policy development. This report highlights our achievements in meeting the ongoing strategic goals of the Centre this year.

Key goals

Research

Regularly refresh and refine research theme priorities to foster cross-theme collaboration, translation, and uptake of QAEHS research into Queensland Health operational activities.

Reople Nurture ar

Nurture and develop the next generation of key early and mid-career researchers in environmental health sciences through mentorship, professional growth opportunities and recognition, while building and retaining a dedicated and professional team.

Education

Continuous delivery of key components of the Master of Environmental Health Sciences program and targeted promotion to domestic students; provide quality professional development courses for Queensland Health staff; maximise efforts to attract exceptional domestic and international PhD students.

Looking ahead

Value

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- QAEHS Centre Review by UQ's Academic Board
- Refreshing our strategy through our 2024-2029 Strategic Plan
- Rapid Risk Assessment Workshops
 Queensland Roadshow

Broaden and diversify income streams

to enhance the value of research return

to Queensland Health, enhancing overall

research value and Centre sustainability.

Implement effective and innovative

communication and engagement strategies

activities broadly and effectively to various

to promote and disseminate the Centre's

Communication

stakeholders.

Collaboration

• Identify and explore new and creative strategies for deeper engagement with stakeholders.

Achievements against strategic plan

Strategic Goal	Objectives	Measures of Success	Achievements 2023-24
Identify and contribute to solving current and emerging national and international environmental health challenges	Establish a program of high-quality interdisciplinary research	Grant income Peer-reviewed publications Conference presentations HDR completions	New grant funding awarded of \$322K ARC, \$847K NHMRC, \$10M contract research and \$8M philanthropic. 166 peer reviewed publications 70 conference presentations 4 HDR completions
Build an expert capability in the environmental health sciences	Maintain and develop an Environmental Health Sciences education and training program	Established training program, stakeholder for a Masters of Environmental Health	University of Queensland is ranked number 1 in Australia for environmental science and engineering and 5 in the Australia for Public Health (Global Ranking of Academic Subjects 2023). The Master of Environmental Health Sciences program is ranked 18 in the world for environmental sciences in 2024, up two ranking spots from 20 in 2023 (QS World University Rankings 2024). Steady student enrolments, with 29 students enrolled in 2023-24, down from 34 students in 2022-23. QAEHS student numbers: 39 PhD and 2 Masters
To be Australia's internationally recognised research centre within the environmental health sciences	Engage with internal and external partners to deliver transdisciplinary environmental health science	Representation on national and international advisory and expert panels. Number of publications co-authored with non UQ co-authors	QAEHS theme leaders are represented on many national advisory and expert panels – refer to Appendix D. Of the 166 reported research publications, 144 were co-authored with non-UQ co-authors.
Provide science- based knowledge to Queensland Health and the wider community	Work with Queensland Health to target and deliver improved health outcomes for Queenslanders Provide a working environment that fosters interdisciplinary research	Translation of science to policy QAEHS sought after by stakeholders as a provider of advice, Commissioned projects	Seminar Series featuring researchers and industry practitioners from diverse fields, facilitating interaction and collaboration. Theme Leader presentations to Queensland Health's 'lunchbox talks'. Annual Research Forum. Funding support provided to ACWEB microbiology lab to facilitate access to shared facilities for interdisciplinary projects. QAEHS Leveraging program promotes interdisciplinary research through grant partnership schemes; cash commitments from other industry partners are strongly encouraged. Establishment of Special Interest Group collaborative digital platform for sharing ideas and knowledge both ways. Membership in the CRC SAAFE in partnership with Qld Health facilitating a cross-disciplinary research opportunity. Scientific Planning Committee meetings involve theme leaders, Queensland Health representation through the Water Unit and Forensic and Scientific Services. Quarterly meetings focus on promoting multidisciplinary research across themes, targeted research topics, knowledge sharing and outcome translation for policy development.

Foster genuine collaboration across research themes; strengthen networks with industry, government, and research organisations locally and globally; pursue new collaborations; be the conduit between Queensland Health and global environmental health science research networks to promote international best practice.

07. Research

13

Research themes

Our research program centres around seven integrated research themes, complemented by an overarching education and professional development theme.

The Centre's focused research activities are continuously shaped and refreshed through ongoing, collaborative dialogue with Queensland Health, ensuring alignment with the department's evolving needs and challenges.

Our Theme Leaders support Queensland Health's vision to improve the health and wellbeing of Queenslanders by providing current. science-based advice and insights on local and global environmental health issues. Leveraging their expertise and insights, they guide the development and implementation of research initiatives, ensuring our work is relevant, impactful, and aligned with the department's priorities.

Environmental Health Toxicology Prof Kevin Thomas

Theme Leader

Understand the harm that chemicals, substances or situations can have on people, animals and the environment through assessing exposure and effects.

Emerging Environmental **Health Risks**

Prof Jochen Mueller Theme Leader

Develop and conduct research, including sampling and archiving programs, that allow rapid recognition and identification of emerging health risks.

Environmental Health Epidemiology

A/Prof Nicholas Osborne Theme Leader

Draw on epidemiologic methods to advance understanding of how physical, chemical, biological, social and economic factors affect human health.

Environmental **Health Risks** Assessment

A/Prof Sarit Kaserzon, A/Prof Phong Thai Theme Leader

Advance knowledge through research, education and training to enable improved understanding of the source, exposure and toxicological effects of single and mixed environmental pollutants.













Environmental **Health Risk** Communication



Prof Kelly Fielding Theme Leader

Promote an engagement approach to risk communication that develops capacity in experts and the community.

Climate Change and Health



Dr Dung Phung Theme Leader

Improve public health through research, education, advocacy and training on the health impacts of climate change and how best to ameliorate them through adaptation and mitigation.

Environmental Health Microbiology

Prof Jianhua Guo, Dr Gilda Carvalho Theme Leader



Determine how microorganisms in the environment may be beneficial or harmful to human health or our activities.

Education and Professional Development

Led by QAEHS management

Build capacity to assess, examine and respond to environmental health challenges in a changing world.

Research activities

Presented on the following pages are research highlights for the 2023–24 year, detailing our activities, theme leader involvement, numbers of research fellows and students, key funding sources, encompassing awarded, submitted, and planned research applications, with emphasis on leveraging investment from Queensland Health.

Further information about specific projects can be found at https://qaehs.centre.uq.edu.au/projects.



Wastewater surveillance for environmental hazards and exposures

Key research activities

QAEHS continues to be a leader in wastewater surveillance research. We have been developing and applying advanced analytical methods to identify and monitor a wide range of substances, including chemical and biological hazards, in systematically collected wastewater samples. Our projects, which include the long-standing National Wastewater Drug Monitoring Program and the SewAus Census projects, are diverse in nature. These projects aim to provide valuable insights into public health trends, assist in the detection of emerging hazards, and contribute to the development of evidence-based environmental and public health strategies.

The ARC Linkage Project Understanding Australia by analysing wastewater during the Census 2021 (SewAus) builds on the successful SewAus Census 2016 Linkage Project. It aims to link population exposure to chemical and biological hazards with socio-demographic data through systematic wastewater analysis. The team collects daily samples over a 1-week period each year from 118 sites across Australia, capturing data from over 50% of the Australian population. Currently, they are preparing for the penultimate 2024 sample collection. Since the first SewAus project in 2016, annual sample collection has provided valuable longitudinal data linked with socio-economic information from the Australian Census. Seven additional papers were published from this project in 2023–24, highlighting its ongoing impact.

The Australian Criminal Intelligence Commission renewed its contract with QAEHS to extend the National Wastewater Drug Monitoring Program (NWDMP) for 4 more years, in partnership with the University of South Australia. The NWDMP comprehensively monitors drug use in Australia by analysing wastewater samples from various locations, covering approximately 57% of the Australian population. It continues to offer insights into drug consumption patterns and trends, informing policy development and targeted interventions. <u>Reports 19, 20, and 21</u> were released during the reporting period. Additionally, QAEHS conducted short periods of higher frequency sampling at specific sites of interest to the Australian Criminal Intelligence Commission.

In 2023–24, A/Prof Phong Thai and his team used wastewater to monitor tobacco use across Australia using anabasine as a biomarker to distinguish with nicotine use from vaping and other nicotine replacement therapies. Their research, funded by an ARC Linkage Project grant and the Australian Taxation Office, revealed a significant increase in vaping prevalence in recent years. The study was published in the leading journal *Water Research*. The team also participated in a successful NHMRC Ideas Grant application on wastewater-based monitoring of vaping. A/Prof Thai was awarded a prestigious 4-year ARC Mid-Career Industry Fellowship to establish a world-leading wastewater-based surveillance program to monitor the prevalence of illicit vaping and illicit tobacco use in the Australian population, a project that is particularly timely with new vaping legislation coming into effect 1 July 2024. Commencing in early 2025, the project will involve key government partners Queensland Health, the Australian Criminal Intelligence Commission, and the Australian Taxation Office. This fellowship provides A/Prof Thai with an opportunity to work directly with Queensland Health for one day per week throughout the fellowship.

David Sellars, Dr Kylie Morphett's PhD student, presented findings from a national survey of Australians' knowledge and attitudes towards cigarette filters and cigarette butt litter at the Society for Research on Nicotine & Tobacco (SRNT) Annual Meeting in Edinburgh (March 2024). He also shared this research at the SRNT Oceania Conference in Brisbane (June 2024). As part of his PhD, Mr Sellars plans to conduct a media analysis on representations of tobacco waste and interview stakeholders.

Dr Morphett is part of a working group that added questions about attitudes towards tobacco and vape waste, as well as disposal behaviours, to the International Tobacco Control (ITC) Policy Evaluation Study. This valuable data, collected from Australia, Canada, USA, and England, will be available in 2025.

PhD candidate Zhe Wang and collaborators have successfully analysed wastewater samples collected from a correctional centre in Queensland and <u>published the results</u>. This is the first study that was able to monitor substance use in a correctional setting for almost a year in a facility with different levels of access restriction. The outcomes are informative and could be used as the basis for evidence-based policy for substance control in correctional centres across Queensland.

Publication highlights

<u>Tscharke et al.</u> tracked alcohol consumption in Australia over a 7-year period from 2016 to 2023, revealing higher consumption in outer regional and remote areas and among socioeconomically advantaged groups, with overall declining trends across the board.

Shimko et al. used wastewater analysis to map the emergence and usage trends of performance-enhancing substances in Australia from 2009 to 2021 using archived samples. Data revealed an increase in detection and concentration of various drugs over time, suggesting growing popularity of these substances among the general population.

Knight et al. analysed the spatial and temporal distribution of 64 pesticides in Australian wastewater, revealing site-specific contamination patterns and potential environmental risks from certain pesticides in effluents.

Wang, Z. et al. developed a direct injection liquid chromatography-tandem mass spectrometry method for efficiently quantifying tobacco-specific alkaloids and nitrosamines in wastewater, achieving high accuracy precision, and stability, and successfully applied it to samples from Australian wastewater treatment plants.

Li, J. et al. assessed the stability of 31 health-related urinary biomarkers in a laboratory sewer sediment reactor to evaluate their suitability for wastewater-based epidemiology, finding that 13 biomarkers had sufficient stability and detectability for monitoring population health, while 18 were unsuitable due to rapid degradation and/or undetectable levels in treated wastewater.

Staff and students

23

Theme Leaders: Mueller, Thomas, Thai, Carvalho, Guo 8 Research Fellows, 10 PhD students

Dr Richard Bade continues to explore innovative analytical strategies for detecting emerging drugs and their metabolites in wastewater. His research, supported by an ARC Discovery Early Career Research Award (DECRA), assists health departments to understand and monitor emerging drugs of public health concerns, such as synthetic opioids.

Professor Jochen Mueller and colleagues secured an ARC Linkage Project Grant, with Queensland Health leveraging funds, to identify and quantify sources of contaminants of concern entering Australian sewer systems by mapping industrial inputs into catchments. A world-first systematic sampling and archiving program will be established for trade waste, combined with an ongoing analytical program to profile chemical contaminants linked to industry. The project will also determine baselines for domestic inputs and associated chemical fingerprints. Project outcomes are expected to guide effective source control measures, reducing chemical contaminant releases into wastewater treatment plants and receiving environments. The project is set to begin in 2025.

Key funding

O'Brien, Dewapriya, Tscharke)

UQ HaBS (Zammit)

Current:

ACIC NWDMP (Tscharke, Mueller, Thomas, Verhagen, Thai, Bade, O'Brien) ACIC (Tscharke, Mueller, Thai, O'Brien, Verhagen) ARC DECRA (Bade) ARC Discovery Project (Thai, O'Brien) ARC Linkage Project (Thomas, Thai, Tscharke, O'Brien) ARC Linkage Project (Mueller, O'Brien, Tscharke, Bade, Thai, Kaserzon, Carvalho) ARC Linkage Project (Mueller, O'Brien, Tscharke, Bade, Thai, Kaserzon, Carvalho) ARC Linkage Project (Thai, Tscharke) NHMRC Ideas Grant (Thai, Zheng) NSW Ministry of Health (Bade, Verhagen) QLD Water Directorate (Li, Verhagen) Sport Integrity Australia (Thomas, Tscharke, Shimko) Universities Australia – Germany Joint Research Cooperation Scheme (Bade,

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Key research activities

Human biomonitoring is a key research program at QAEHS aimed at better understanding how environmental exposures impact human health. Leveraging partnerships and resources like the Australian Environmental Specimen Bank, QAEHS researchers and collaborators have access to an extensive range of current and historical biological samples from across Australia, including blood, urine, breast milk, and silicone breast implants, to help answer questions about Australia's chemical exposome.

Our interdisciplinary strategy merges cutting-edge analytical techniques with epidemiological perspectives, enabling us to identify trends, assess risks, and inform public health policies. From assessing pesticide exposure in agricultural communities to tracking emerging contaminants in urban populations, our biomonitoring research empowers evidence-based decisionmaking for a healthier future.

Traditional biomonitoring techniques, which involve analysing individual samples from participants, are notably laborious, costly, and intrusive. Under Prof Jochen Mueller's leadership, and in partnership with Sullivan Nicolaides Pathology, QAEHS has pioneered a novel approach using surplus, de-identified pathology samples. Pooling these low-cost samples allows us to answer key questions about population exposure without ethical challenges.

One of QAEHS's major biomonitoring projects involves assessing changes in blood serum per- and polyfluoroalkyl substances (PFAS) concentrations over time in individuals identified as having elevated concentrations, such as firefighters. This research, supported by the NHMRC and Airservices Australia, aims to investigate the effectiveness of exposure controls and identify factors contributing to successful exposure reduction. Since the project began in 2002, blood concentrations of certain PFAS have decreased in the general Australian population. However, occupational exposure and environmental contamination have led to elevated PFAS blood concentrations in some individuals, including firefighters and community members from affected areas. PFAS are persistent, man-made compounds that have been used in firefighting foam due to their heat-resistant properties. In the first blood collection round (2021/22), over 500 firefighters and 300 community members provided blood samples. An overall decrease in PFAS blood concentration was observed compared to their initial samples from a previous PFAS exposure study (2017-2019) was observed. The second round of blood collection commenced in 2023 and is ongoing, with a participant retention rate of 83% among firefighters and 88% among community members. Further data analysis will be conducted once participants have provided both blood samples.

Professor Kelly Fielding continues to serve as a risk communication expert in the project. She provides feedback on communication to research participants and is involved in community forums related to the project.

Specific expected outcomes of this work include an understanding of PFAS concentration trends in individuals and influencing factors, development of a model for estimating exposure levels, and an assessment of the relationship between changes in PFAS serum concentration and health biomarkers. The team has also found that there is an association between blood donations and changes in PFAS concentration over time, with a greater number of donations linked to a greater decrease in PFAS serum concentration. Preliminary study findings and updates are available as factsheets and information session recordings <u>on our website</u>.

A/Professor Sarit Kaserzon and her team are collaborating with Queensland Health, the Department of Transport and Main Roads, Massey University, James Cook University, the Australian Catholic University, and 3M on an ARC Linkage Project aimed at understanding exposure pathways for high-

Staff and students Theme Leaders: Mueller, Thomas, Kaserzon, Thai 4 Research Fellows, 3 PhD students

use chemicals, focusing on glyphosate. The primary objective is to develop effective mitigation strategies to reduce associated risks. This is the first study in Australia (and only the second internationally) to systematically examine occupational exposure to glyphosate. The research involves evaluating biomonitoring data from urine, dermal swabs, and hair samples, as well as assessing glyphosate spraying methods and personal protective equipment use. Preliminary findings have received significant media attention both in Australia and internationally.

Dr Xianyu (Fisher) Wang is collaborating with Massey University to investigate occupational pesticide exposure among New Zealand farmers. The team uses dermal patches and urine samples to measure exposure. Initial findings indicate that dermal patches accurately reflect the types of pesticides used by farmers, validating this method of measuring skin exposure. The team is now analysing urine samples for exposure biomarkers and expects a correlation between higher patchidentified exposure levels and higher biomarkers in urine.

Dr Wang is also leading an ARC Discovery Early Career Research Award (DECRA) project to establish a national indoor air monitoring program to identify hazardous chemicals and their sources and trends under a changing climate. His team are conducting a pilot study and recruiting participating homes. Additionally, he received a Halton Foundation grant to develop sorbent materials for new air cleaner designs that effectively remove semi-volatile organic compounds (SVOCs) from indoor air.

Key funding

Current:

83

ARC Laureate Fellowship (Mueller) ARC DECRA (Wang) ARC Linkage (Kaserzon, Mueller, Wang) Halton Foundation (Wang) Massey University (Wang, Jayarathne, Ghorbani Gorji, Kaserzon) Minderoo Foundation (Thomas, Mueller) NHMRC-EU Collaborative grant (Mueller) NHMRC-EU Collaborative grant (Mueller) NHMRC Targeted Research (Mueller) Universities Australia – Germany Joint Research Cooperation Scheme (Nilsson, Mueller, Orr)

Ma. Katreena Danielle Que, under the supervision of Prof Mueller, is conducting doctoral research to establish baseline levels of benzotrazoles (BZTs) and benzotriazole UV-stabilisers (BUVs) in the Australian population. Her work involves development of methods to detect and analyse these chemicals in human samples and to utilise systematic analysis to understand Australian exposure trends over the last decade. BZTs and BUVs, used as anti-corrosives and pharmaceutical precursors, are emerging pollutants with significant health concerns. They have been detected in various environmental matrices and human samples such as breast milk, adipose tissue, urine, and blood, and have been linked to adverse health effects in both animals and humans.



Key research activities

With support from ARC, NHMRC, industry partners, and government agencies, QAEHS is at the forefront of PFAS exposure science and communication. Our multidisciplinary research spans areas like serum concentration assessments (see *Human biomonitoring for environmental exposures* section), exposure pathway characterisation, effectiveness of exposure control, development of passive sampling tools, discovery of novel PFAS, assessment of remediation technologies, and risk communication strategies.

Prof Jochen Mueller and A/Prof Phong Thai are investigating PFAS retention and release from concrete at firefighting training grounds. Subcontracted by Arcadis for a U.S. Department of Defense (DoD)-funded project, they aim to understand PFAS release from concrete cores and how sealants can prevent future leaching. In parallel, they are working on another DoD grant led by Colorado School of Mines to study PFAS leaching from aged concrete and asphalt.

Prof Mueller, A/Prof Thai, Dr Pradeep Shukla, along with collaborators, have been contracted by the Commonwealth Government to monitor and review PFAS remediation and destruction technologies. Their report evaluates the effectiveness, benefits, financial viability, scalability, and social acceptability of these technologies, aiming for implementation within 5-10 years.

A/Prof Sarit Kaserzon and Dr Fisher Wang, in collaboration with Queensland Health, Queensland Department of Environment, Science and Innovation (DESI), NSW DECCEW, Australian Packaging Covenant Organisation and Packaging Industry, were awarded an ARC Linkage Project grant to study chemicals, including PFAS, in food contact products in Australia and their persistence in recycling and compost reuse streams. The project commenced in 2024. Contracted by the Queensland Department of Environment, Science and Innovation (DESI), QAEHS conducted sampling and analysis of organics collection services (Food Organics Garden Organics; FOGO) to understand PFAS prevalence in input materials and finished products. The findings have informed national guidelines and policies for PFAS concentrations in FOGO.

A/Prof Kaserzon and international colleagues published the Zurich II statement on PFAS regulation, addressing scientific and regulatory needs managing PFAS in the environment. Additionally, A/Prof Kaserzon, Dr Pradeep Dewapriya, and Dr Sara Ghorbani Gorji published a review on PFAS occurrence in consumer products, highlighting the need for better characterisation and regulation to protect health.

With support from the U.S. DoD and NHMRC, Dr Ghorbani Gorji and Dr Dewapriya have developed high-resolution mass spectrometry (HRMS) methods to detect a broader range of PFAS compounds. Their research has uncovered several novel PFAS, contributing valuable insights and resulting in publications in the journal *Environmental Science & Technology*.

Staff and students

Theme Leaders: Mueller, Thomas, Fielding, Kaserzon, Thai 5 Research Fellows, 4 PhD students

Dr Morphett, Prof Fielding, and Dr Carla Magi-Prowse have studies on PFAS communication, focusing on the complexity and understandability of PFAS fact sheets and the impact of information sources and scientific uncertainty on public concern. Two papers have been submitted during the reporting period.

As part of Professor Kevin Thomas's NHMRC grant on the PFAS exposome, Dr Morphett and Dr Magi-Prowse interviewed individuals affected by PFAS contamination to understand their communication experiences and preferences. They also conducted an experimental study on the impact of message formats on PFAS communication, with data collection complete and analysis underway.

Dr Xianyu Wang's NHMRC-funded research examining human exposure pathways for PFAS has continued with sample collection from homes of exposed communities and the public. Study findings will inform PFAS exposure risk assessment, management and mitigation.

QAEHS has provided PFAS analytical services to the Queensland, New South Wales, and Victorian state governments throughout the reporting period.

Key funding

Current:

8

Arcadis and Exxon Mobil (Thai, Mueller) ARC Linkage Project (Dewapriya) ARC Linkage Project (Kaserzon, Wang) Commonwealth Government (Mueller, Thai) NHMRC Targeted Call for Research (Mueller, Fielding) NHMRC Targeted Call for Research (Thomas, Kaserzon, Morphett) NHMRC Targeted Call for Research (Wang, Thai) NSW Dept Climate Change, Energy, the Environment and Water (Kaserzon, Ghorbani Gorji, Nilsson) QLD Dept Environment, Science and Innovation (Kaserzon, Ghorbani Gorji, Mueller) UNEP (Kaserzon, Mueller, Ghorbani Gorji) U.S. DoD ESTCP (Mueller, Thai) U.S. DoD SERDP (Mueller, Thai) U.S. DoD SERDP (Kaserzon, Mueller) Victorian Environmental Protection Authority (Nilsson)

Victorian Environmental Protection Authority (Kaserzon, Ghorbani Gorji)

Publication highlights

Dewapriya et al. identified 30 PFASs, including three novel compounds, in whole blood and serum samples of cattle exposed to AFFF-contaminated groundwater with some predominately detected in whole blood, highlighting the need for whole-blood analysis to accurately assess toxicological risks of PFAS exposure.

Ghorbani Gorji et al. investigated the sorption behaviour of 45 PFASs with 11 commercial sorbents to inform the development of effective monitoring tools, finding that hydrophilic-lipophilic balanced (HLB) and anion exchange (AE) sorbents with hydroxyl functionalities are the most effective for passive sampling, especially in complex matrices like wastewater.

Beggs et al. used passive sampling technology to measure 11 PFAS at nine sites along the Danube River, finding that while total PFAS concentrations did not exceed EU drinking water guidelines, PFOS exceeded environmental quality standards at all locations, with significant PFAS mass loads at Ruse and Budapest likely due to industrial and urban runoff.

Nguyen et al. measured PFAS concentrations in effluent and biosolids from 75 Australian wastewater treatment plants during the 2016 Census period, finding significant levels of 21 PFAS compounds, with annual discharges of approximately 250 kg, and noting that while perfluoroalkyl carboxylic acids increased in effluent, perfluoro sulfonic acids either decreased or remained stable through the treatment process.

Li, Y. et al. found that AFFF-impacted asphalt and concrete can leach PFAS into the environment, with asphalt exhibiting a higher PFAS release rate compared with concrete.

Development of a passive sampler for monitoring PFAS

Widespread contamination of environmental waters by per- and poly-fluoroalkyl substances (PFAS) is a global issue. Effective monitoring techniques are essential to assess human and environmental exposure and mitigate risk. To address this challenge, a U.S. Department of Defense Strategic Environmental Research and Development Program (SERDP) grant, led by A/Prof Sarit Kaserzon, aimed to develop and validate a suite of quantitative passive sampling tools for PFAS. This project, a collaboration with Colorado School of Mines, Griffith University, and Jacobs Australia, is now in its final year.

The Microporous Polyethylene Tube (MPT) passive sampler was developed as part of this project. This cost-effective device provides reliable and sensitive monitoring of a wide range of PFAS in surface, ground, storm and waste waters. It can be used to determine PFAS concentrations, evaluate spatial-temporal trends, assess environmental fate, measure mass flux at contaminated sites, and support risk assessments.

The MPT sampler was calibrated and validated at various Australian and U.S. Defense sites and applied to surface, ground, and wastewater matrices. These tools have proven highly sensitive and effective in sampling a wide range of PFAS. Ongoing work aims to characterise additional PFAS of concern, to inform environmental risk profiles from PFAS at Australian sites, and to inform PFAS remediation efforts. Training materials and a fact sheet on the technology are available on the <u>QAEHS</u> and SERDP web pages.

The MPT sampler is now used by agencies worldwide for PFAS investigation and monitoring. Seven peer-reviewed journal articles have been published from this work. The grant also supported the training of PhD student Rachel Mackie.

View the YouTube video explaining the development of the MPT sampler and passive sampling methodologies for Per- and Polyfluoroalkyl Substances.





Plastics and plastic-related chemicals

Key research activities

The Minderoo Centre – Plastics and Human Health received an additional \$9.1M in funding from Minderoo Foundation to support the research program over the next 3 years.

Led by Prof Kevin Thomas, the Minderoo Centre is focused on developing novel protocols to accurately sample and measure plastic chemicals and particles in humans, particularly in the brain, urine, and blood. The Minderoo Centre consists of three teams: one at QAEHS working on detecting plastic additives in brain, urine and blood, another at QAEHS developing methods for detecting micro- and nanoplastics in human samples, and a third at Neuroscience Research Australia (NeuRA) working on plastic-free brain tissue collection and immunohistochemistry and enzyme-linked immunosorbent assay (ELISA).

The QAEHS additives team has developed an analytical method for detecting and quantifying plastic additives (seven bisphenols and 14 phthalate metabolites) in brain tissue. They also developed a novel method for detecting plastic additive metabolites in human urine, enhancing sensitivity by 2-20 times depending on the chemical. Early findings show per and polyfluoroalkyl substances (PFAS) presence in human brain tissue, with a relationship between the fluoroalkyl chain length and brain entry. The QAEHS particles team has developed new analytical methods for detecting low levels of micro- and nanoplastics in human samples, improving detection limits by up to 80 times over conventional methods. They published the first peer-reviewed study showing that fatty samples can provide false positives for certain plastics and that current methods do not effectively remove these interferences. The team is developing new extraction methods to effectively remove these interferences with methods fully developed for urine analysis and final validations of blood analysis underway.

Dr Elvis Okoffo and Prof Thomas have detected nanoplastics in municipal drinking water (440 particles per litre in one sample) and store-bought bottled water. It remains unclear how plastic particles enter municipal water supplies, but variability exists between different houses. Their findings on plastics in water from Ottawa, Canada are presented in a forecast by Minderoo Foundation online (https://plasticforecast. com/), and on multiple advertisement media in Ottawa during the United Nations Environmental Programmes Intergovernmental Negotiating Committee's 4th meeting on the Global Plastics Treaty. Dr Okoffo, awarded a Max Day Environmental Science Fellowship Award as well as funding from the Goodman Foundation and UQ, is researching microplastic pollution in Moreton Bay. His research aims to assess microplastic types and concentrations to evaluate risk to marine organisms. A 2024 paper by Dr Okoffo and colleagues revealed significant plastic pollution in Moreton Bay's surface sediments, primarily polyethylene (PE) and polyvinyl chloride (PVC), estimating 7000 tonnes of plastics stored in the top 10 cm of sediments.

Simran Kaur's doctoral research, supervised by Dr Cassandra Rauert and Prof Thomas, examines tyre wear particles and tyre additive chemicals in the Australian environment. In collaboration with the Queensland Department of Environment, Science and Innovation, the team studies the presence of these pollutants in Moreton Bay to understand their movement and accumulation in the environment.

Other PhD projects currently underway at QAEHS are looking at microplastics in the air (Stacey O'Brien), in our diet (Coral Jeffries), and in infant milk powder, breast milk and breast milk storage bags (Laura Puente). Yufei Pan is using human cell cultures to study the behaviour and fate of micro- and nanoplastics in contact with and across the blood-brain barrier to expand our understanding of the health risks of plastic particles. Honglin Chen is investigating the fate of micro and nanoplastics in the human body following their ingestion or inhalation to determine whether particles accumulate in the body and what impact this might have on human health.

Staff and students Theme Leaders: Thomas, Mueller 5 Research Fellows, 14 PhD students 23



Publication highlights

Okoffo, Tcharke, et al. (2024) explored the origins of plastics in biosolids, suggesting that both sewerage infrastructure and trade waste contribute to the plastics found in wastewater treatment plants.

Okoffo et al.'s 2023 research on plastic contamination forecasted a substantial rise in plastics entering agricultural land through biosolids, underscoring the need for better emission controls.

<u>Moore et al.</u> established a statistical method to differentiate contributions of bisphenols and phthalates from diffuse and point sources in Australian wastewater, revealing significant inputs from both sources.

Tang et al. systematically examined chemical migration from multilayer plastic pouches used for baby food in Australia, detecting various harmful substances, including bisphenols and phthalic acid diesters, and identifying new non-intentionally added substances that may pose a toxicological concern.

Okoffo and Thomas developed and validated a method allowing for the identification and quantification of nine nanoplastic types in environmental and potable water.

Key funding

Current:

ARC Discovery (Kaserzon) ARC Industrial Transformation Training Centre IC210100023 (Thomas) ARC Industrial Transformation Training Centre IC220100035 (Thomas, Rauert, O'Brien) Australian Academy of Science (Okoffo) EU MSCA IF Grant (Schacht, Thomas) Goodman Foundation (x2 Okoffo, Thomas) Minderoo Foundation (x2 Thomas, Mueller) Minderoo Foundation (Thomas, Okoffo) Telethon Kids Institute (Wang, Jayarathne)

Research Council of Norway (Thomas)

UQ HaBS (Okoffo)



Photo description goes here

Key research activities

QAEHS Theme Leaders Prof Kevin Thomas, Prof Jochen Mueller, A/Prof Sarit Kaserzon, and A/Prof Phong Thai, along with their teams are spearheading multiple research projects to advance global sampling and analytical capabilities for improved surveillance of chemical hazards in humans and the environment.

Non-target analysis using liquid chromatography coupled with high resolution mass spectrometry (LC-HRMS) has become a leading analytical strategy for characterising a wide range of chemical contaminants. Unlike targeted analysis, which focuses on specific contaminants, nontarget analysis screens all chemical constituents in a sample. However, this approach generates complex datasets with thousands of compounds per sample. To manage this, prioritisation strategies and statistical approaches are needed to identify significant chemical features. Research Fellows Dr Sara Ghorbani Gorji and Dr Pradeep Dewapriya have been developing non target workflows and guality assurance processes that apply HRMS for characterising water and blood samples to identify concerning contaminants. Their work has resulted in several publications over the past year. In collaboration with Queensland Health, the University of Amsterdam, and Seqwater, A/Prof Kaserzon has applied for ARC funding to support the advancement of these methods in the development of a risk warning system for chemical hazards in drinking water.

For the past decade, QAEHS has conducted catchment water quality risk assessments across 40 sites in South East Queensland for Seqwater. These assessments are part of Seqwater's Catchment and Drinking Water Quality Micro Pollutant Monitoring Program, ensuring safe and reliable drinking water from the region's reservoirs. The results from each summer and winter campaign are publicly available on the Seqwater website. The data generated through this project continues to inform the water industry regarding water quality risks and guideline exceedances. The tools and data from this project have been applied in other sampling campaigns across Australia, providing valuable long-term insights into temporal trends.

Through the collaboration with Seqwater, QAEHS has developed new tools to address challenging water pollutants, including glyphosate, per and poly-fluorinated chemicals, tyre wear particles, and UV filters. The partnership has led to proof-of-concept applications for various monitoring technologies and ongoing exploration of innovative solutions for emerging chemicals of concern.

Publication highlights

The Minderoo Centre – Plastic and Human Health published a paper in Journal of Hazardous Materials presenting the blueprint for the design, construction, and validation of the plastic and phthalate-minimised laboratory that was constructed at QAEHS, showing that the new laboratory achieved background levels of micro- and nanoplastics and phthalates were more than 100 times lower compared to a Physical Containment Level 2 (PC2) laboratory environment.

Okoffo and Thomas used pyrolysis gas chromatography-mass spectrometry to determine the mass concentration and removal rates of nine selected nanoplastics (<1 μ m) in three Australian wastewater treatment plants, finding significant reductions in nanoplastic levels from influent to effluent, with removal rates of 91-96% and annual environmental discharges estimated at 0.7-24 kg per plant.

Developing and applying a suspect-screening and non-target analysis approach, <u>Ghorbani Gorji et al.</u> identified 88 diverse PFASs in groundwater samples contaminated by historic AFFF use, including 11 ultrashort-chain PFASs reported for the first time in Australian groundwater and two newly reported PFAS compounds, revealing that standard target analysis likely underestimates the full extent of PFAS contamination.

Li et al. developed a new, sensitive direct injection method using liquid chromatography-tandem mass spectrometry (LC-MS/MS) to quantify 109 antimicrobials and their metabolites in wastewater, demonstrating high accuracy, precision, and low limits of quantification. The new method was successfully applied to samples from six Australian wastewater treatment plants, detecting and quantifying 37 analytes in influent and 22 in effluent.

A recently completed ARC Linkage Project led by A/Prof Kaserzon addressed the need for improved monitoring of Australia's water resources. The project developed novel passive sampling technologies to monitor toxic ionized organic chemicals in various water sources, providing costeffective tools to detect emerging chemicals in drinking water, ground water, surface water, and wastewater. These passive samplers have been successfully applied in Australia, Spain, the Czech Republic, and the Netherlands, detecting a range of chemicals of emerging concern. The project resulted in a book chapter and eight published papers.

Research at QAEHS leverages *InSpectra*, a global opensource high-resolution mass spectrometry data processing platform developed under Prof Thomas's leadership and with the support of an ARC Discovery Project. The platform provides automated, vendor-independent workflows for systematically detecting newly identified emerging chemical threats.

Dr Richard Bade and his team used a suspect screening workflow with LC-HRMS and *InSpectra* to investigate the presence of new psychoactive substances and other drugs of abuse in wastewater, detecting up to 50 compounds from various sites, including eight new psychoactive substances, three of which have not previously been reported in municipal wastewater samples.

Key funding

Current:

ARC Discovery Project (Wang) ARC Industrial Transformation Training Centres (Thomas, Rauert, O'Brien) ARC Australian Laureate Fellowship (Mueller)

ARC Linkage Project (Kaserzon, Thomas)

ARC Linkage (Thai, Wang)

Commonwealth Dept Climate Change, Energy, the Environment and Water (Mueller) EU Horizon 2020 Grant (Mueller)

Future Fisheries Veterinary Service (Kaserzon, Ghorbani Gorji)

Great Barrier Reef Marine Park Authority (Kaserzon, Thompson, Mueller, Taucare) Halton Foundation (Wang)

NHMRC-EU Collaborative Grant (Mueller)

NSW Dept Climate Change, Energy, the Environment and Water (Kaserzon) Seqwater (Kaserzon, Mueller)

Victoria Environment Protection Authority (Mueller, Alongi)





Over the past year, QAEHS has continued its collaboration with the Great Barrier Reef Marine Park Authority to assess trends and risks of photosystem II herbicides in the Great Barrier Reef Inshore area. This data contributes to the long-term dataset spanning two decades and informs herbicide risk assessment and government pesticide management policies.

A/Prof Thai's work on household methamphetamine contamination has provided supporting information for the Western Australian Department of Health's <u>Guide</u> for testing and remediation of methylamphetamine and illicit drug residues in residential properties. Research on methamphetamine penetration into household materials and its dissipation continues with the support of an ARC Linkage Project grant and is expected to deliver impactful results.

Carla Alongi's doctoral research, under the supervision of Prof Mueller, is investigating honeybee and human exposure to neonicotinoids, a group of chemicals used to control harmful insects. Her project has facilitated a collaboration with the Victorian Environmental Protection Authority for honey sampling to investigate hive health across Victorian beehives.



The Australian Environmental Specimen Bank (AESB) is the first and only national biobank designed for the storage of both human and environmental samples, facilitating retrospective studies on exposure assessment and environmental toxicology.

Construction of a new facility to house samples was completed in January 2023. The new AESB facility has more than double the storage capacity of the original AESB and includes a large-scale -20° Celsius walk-in freezer, six -80° ultra-low-temperature freezers, and plans for a vapour phase LN2 freezer pending funding availability.

Over the past year, we have appointed a full-time project manager to coordinate the setup of the new facility, which is now at 80% capacity. Over the coming year, the project manager will continue to work to optimise processes and procedures for sample management and establish governance structures.

The AESB aims to serve as a lasting national resource, enhancing exposure research capabilities in Australia and enabling effective management and regulation of chemical and biological hazards.

By retrospectively mapping hazards from their sources to exposure in communities and the environment, the AESB contributes to social, environmental, and economic benefits through focused and timely intervention strategies to mitigate adverse exposures. The AESB archive will support longitudinal and cross-sectional studies to assess the trends in exposure to chemical and biological hazards among the Australian population and play a crucial role in identifying emerging hazards and providing a scientific foundation for policy-making and regulatory actions. It serves as a valuable tool for implementing targeted measures that safeguard public health and the environment.



HyTech: ARC Training Centre for Hyphenated **Analytical Separation Technologies**

August 2023 saw the official launch of the new Australian Research Council (ARC) Training Centre for Hyphenated Analytical Separation Technologies, also known as HyTech.

This training centre partners The University of The HDR students also have increased exposure to Queensland (UQ)/QAEHS with the University of Tasmania senior researchers who are leaders in their fields across and Deakin University along with numerous industry the multiple nodes. Additionally, the HDR students will partners such as Thermo Fisher Scientific Australia, spend at least 12 months of their scholarship in industry Trajan Scientific and Medical, Norske Skog Paper placements, working on research outcomes relevant Mills, Derwent Estuary Program, Advanced Materials to the industry collaborator and learning 'real-world' Technology, Australian Antarctic Division including UQ's skills. The research and collaboration opportunities with partners from Queensland Health, AB Sciex Australia, these industry partners will lead to the development of and Shimadzu Scientific Instruments. improved instrument technologies and produce highly skilled, industry ready HDR students and postdoctoral HyTech seeks to address end-user needs by understanding complex systems and developing and applying the research fellows.

latest hyphenated analytical technology. Hyphenated technology represents the coupling together of different technologies, for example, liquid chromatography or gas chromatography coupled with detection technologies, to improve and advance research applications.

The HyTECH Training Centre will:

- provide expert training for a postgraduate cohort in advanced hyphenated analytical separation technologies,
- · work with technology providers, including sector leaders within the analytical technology industry,
- establish an innovative research network, driven from end-user analytical challenges,
- · establish critical mass in research and researchers, and
- bring innovation and new intellectual property to advance hyphenated analytical separation technology and methodologies and processes.

Within the HyTech centre, QAEHS is placed within the environmental science and monitoring research theme. The QAEHS researchers, led by Prof Kevin Thomas, include Dr Cassandra Rauert, Dr Jake O'Brien, Dr Elvis Okoffo along with two commenced PhD students, Tobias Hulleman and Ruvini Weerasinghe. Two additional PhD students will join the team before the end of 2024. The team will investigate a range of research topics including plastics/nanoplastics, highly persistent chemicals and contaminants of emerging concern.

HyTech has the unique aspect of an increased level of training for the HDR students. There are two annual Early Career Researcher forums run by two senior researchers within the centre, including Dr Cassandra Rauert, aimed at teaching the HDR students research and industry relevant skills.

While it is still within early stages of the program, to date QAEHS has successfully hosted an all-HyTech meeting at the PACE building, Dutton Park Campus in March and more recently hosted a meeting with the UQ industry partners to start planning for the extensive placements that the students are required to complete.

In May, Dr Elvis Okoffo spent 5 days at HyTech in Hobart. This visit was coordinated to coincide with the ARC Media interview and video about the Centre's activities, which Elvis was featured in along with HyTech researchers, Professor Brett Paull (University of Tasmania) and Dr Yada Nolvachai (Deakin University). Elvis delivered a workshop on the essential practical considerations and routine operation of a pyrolysis GC-MS instrument as well as meeting collaborators from the Derwent Estuary Program to discuss projects on the analysis of microplastics pollution levels in Derwent Estuary, Antarctica and stormwater. Finally, the first HyTech joint seminar was held during this visit covering applied materials and portable instruments, food systems and natural products, and environmental science and monitoring, with Elvis presenting on Quantitative analysis of micro- and nano-plastics in environmental samples by pyrolysis gas chromatography mass spectrometry.



Environmental epidemiology

Key research activities

Environmental epidemiology theme leader A/Prof Nick Osborne's research during the reporting period spans various areas, including examining the impact of climate change on health outcomes, exploring the relationship between greenspaces and non-communicable diseases, and studying the effects of pollen exposure on respiratory health. His work aims to enhance our understanding of how environmental factors influence human wellbeing and to inform strategies for promoting healthier communities.

One of the key studies led by A/Prof Osborne, alongside PhD candidate Chinonso Odebeatu, examined the relationship between different types of greenspace and the risk of obesityrelated cancer using data from 279,326 participants in the UK Biobank. Over a median follow-up of 7.82 years, 9,550 participants developed obesity-related cancer. The study found that increased exposure to private residential gardens within a 100m buffer was associated with a reduced risk of overall obesity-related cancer, breast cancer, and uterine cancer. However, no significant association was found between other types of greenspace and obesity-related cancer, except for uterine cancer. The protective effect of private residential gardens on obesity-related cancer risks was partly mediated by nitrogen dioxide levels and modified by physical activity, serum 25-hydroxyvitamin D, particulate matter (PM2.5), and various sociodemographic factors. The study suggests that future research should focus on functional types of greenspace to identify targeted interventions for cancer prevention.

In another significant study, A/Prof Osborne and colleagues investigated the relationship between socioeconomic deprivation and poor bone health in 502,682 UK Biobank participants. They found that deprivation significantly increased the odds of low bone mineral density (osteopenia), falls, and fractures.

A/Prof Osborne is also conducting research to better understand the contribution of plant pollen to respiratory health. His team aims to examine what biologics are in the air column in Delhi and Brisbane using new environmental DNA (eDNA) techniques.

Staff and students Theme Leaders: Osborne, Phung, Thai 2 Research Fellows, 17 PhD students





Key research activities

South-East Asian countries.

One notable study led by Dr Phung assessed the impact of high temperatures on the risk of hospital admissions for various causes and heat-sensitive diseases across eight ecological regions in Vietnam. Utilising hospitalisation and meteorological data from the eight provinces, a time series analysis with generalised linear and distributed lag models revealed that a 1°C increase above 19°C raised the national risk of hospitalisations for all causes by 0.8% and for infectious diseases by 2.4% at a lag of 0-3 days. The effects on respiratory diseases and mental health disorders were not significant. Regional analysis showed that the Northern regions had a higher risk than the Southern regions. This study, one of the few national-scale assessments in Vietnam, provides valuable insights for developing heat-health action plans based on evidence of temperature-related hospitalisation risks.

Dr Phung and colleagues also examined how different weather information sources affect outcomes related to extreme heat events through a survey of hospitalised heat stress patients in Central Vietnam. The study found that various information channels, including official agencies and social media, significantly

Key funding

Current:

These techniques allow samples of plant pollens

using stored data (DNA barcode library) or other

and fungal spores to be collected and analysed

sequencing techniques. Additionally, the team

will analyse respiratory morbidity data from

exposure to pollen.

the two cities to understand the health risk of

PhD candidate Diana García, supervised by

A/Prof Osborne, is leveraging data from the

Longitudinal Study of Australian Children

to investigate environmental and genetic

risk factors for food allergies and asthma

on the potential role of Vitamin D and UV

exposure. Using indirect markers such as

in Australian children. Her research focuses

hypoallergenic formula prescriptions, EpiPen

prescriptions, and emergency department

aims to explore the correlation between

geographic distance from the equator, UV

exposure, and food allergy prevalence. Given

Australia's high prevalence of food allergies,

eczema, and asthma, and its extensive north-

to examine these associations. The study

will also examine generational changes in the

relationship between mental health and asthma.

south geographical span, it is an ideal country

admissions for anaphylaxis, her PhD project

EU Research and Innovation Action (Thomas, Wang, Rauert, Mueller)

*NHMRC Partnership (Thomas)

NHMRC Ideas Grant (Wang) NHMRC-NAFOSTED APP1155241 (Thai, Phung)

- UQ Global Strategy and Partnerships Seed Funding (Phung)
- Wellcome Trust (Phung, Osborne)

Current:

Key funding

NHMRC e-ASIA (Phung) NHMRC Healthy Lives and Environment (Osborne) ARC Discovery Project (Fielding) UQ Medicine Seed Funding (Phung)

Staff and students

Theme Leaders: Phung, Fielding, Osborne 2 Research Fellows, 10 PhD students



Climate change

Theme leader Dr Dung Phung has continued his research on climatesensitive health outcomes, with a specific focus on heat-related health risks and infectious diseases. His research spans various topics, including the impact of heat on mortality and morbidity, heat-health vulnerability assessment, and the effectiveness of policy and practical interventions for climate-sensitive health risks. His research is conducted across Australia and

reduced the Cost of Illness (COI) from heatrelated ailments, with social media proving highly effective for climate adaptation. Enhancing the clarity and accessibility of official weather information is vital, especially for households with different income levels. Demographic factors like age and gender should guide communication strategies, with special focus on individuals with underlying health conditions who are more vulnerable to extreme heat. The study highlighted the importance of widespread weather information dissemination and reducing economic burdens on impacted populations.

A/Prof Nick Osborne, Dr Dung Phung and colleagues conducted a study examining the impact of the heat-health alert and response system (HARS) on temperature-related mortality in Victoria, Australia, by comparing data from before (1992-2009) and after (2010-2019) the system's implementation. The study found a significant reduction in temperaturerelated mortality post-HARS.

PhD candidate Patrick Amoatey, supervised by Dr Phung and A/Prof Osborne, investigated the association between diurnal temperature range (DTR) and the risk of all-cause mortality and emergency department (ED) presentations in Victoria. Australia, using data from 2000 to 2019. A quasi-Poisson time-series regression analysis revealed that a one-degree increase in daily DTR was associated with a 0.33% increase in mortality risk and a 0.094% increase in ED presentation risk. The effect was more pronounced in children and the elderly.

Prof Kelly Fielding supervised the PhD thesis of Carla Magi-Prowse on how young people cope with and respond to climate change. Her thesis Climate change coping and communication: understanding how to increase engagement, efficacy, and pro-environmental behaviour was submitted in 2024.

Microbiology and anti-microbial resistance

Key research activities

Theme leaders Prof Jianhua Guo and A/Prof Gilda Carvalho have expanded on the research activities in health-related water microbiology issues, under the guidance of Queensland Health, academic, clinical and industry collaborators. In the last year, Prof Guo and A/Prof Carvalho have been involved in more than 35 publications related to Environmental Health Microbiology.

To comprehensively understand and manage waterborne opportunistic pathogens in drinking water supply systems, the team has developed workflows involving culturedependent and culture-independent methods with a focus on Legionella and nontuberculous mycobacteria. Prof Guo and Dr Casey Huang have collaborated with Profs Rachel Thomson and Scott Bell's teams from the Gallipoli Research Medical Foundation (GMRF)/The University of Queensland, cumulating in a publication in Water Research X on water stagnation in non-healthcare public buildings during the COVID-19 pandemic. The study found that elevated microbial growth and opportunistic pathogens such as nontuberculous mycobacteria and Legionella were prevalent in stagnant systems, reiterating the need for regular monitoring of operational parameters of the water systems (such as residual chlorine) and the need for implementing water risk management plans in non-healthcare public buildings.

Extending upon this collaboration with the teams from Profs Thomson and Bell, along with Dr Warish Ahmed's team at the CSIRO, Prof Guo and Dr Huang are involved with assessing the presence of nontuberculous mycobacteria in the water systems of healthcare facilities as part of a joint initiative as part of the Herston Infectious Diseases Institute (HeIDI) CSIRO Infectious Disease Resilience (IDR) and Antimicrobial Resistance (AMR) Mission-Affiliated project grant. This has also extended into disinfection control and management of nontuberculous mycobacteria in drinking water environments, with further research assessing panels of conventional and non-conventional disinfectants applied against various panels of planktonic and biofilm forms of nontuberculous mycobacteria. Dr Huang presented this work as part of Prof Rachel Thomson's "Respiratory Research Update" in Gallipoli Medical Research's Ramsay Research Month Grand Rounds, and during the 2023 NTM (nontuberculous mycobacteria) Symposium hosted by the UQ School of Medicine.

In another study published in Water Research X and presented during the 10th International water Association Microbial Ecology and Water Engineering Specialist Conference, under the supervision of Prof Guo, Dr Greg Jackson and Dr Phil Choi from the Water Unit at Queensland Health, PhD student Yu Wang has developed a novel tiling amplicon sequencing method (ATOPlex) for wastewater epidemiology-based surveillance of SARS-CoV-2. A/Prof Nick Osborne and colleagues conducted a study investigating the prevalence and relationships between antimicrobial resistance genes (ARGs), mobile genetic elements (MGEs), and antimicrobial residues in sediment samples from 20 tilapia farming ponds in southern China. Using high-throughput quantitative PCR, 159 ARGs and 29 MGEs were quantified, revealing significant correlations between abundance of antimicrobial resistance genes and antimicrobial residues. Antimicrobial resistance genes, while sediment properties and mobile genetic elements also significantly influenced ARG proliferation. These findings highlight the link between antimicrobial use and ARG proliferation in aquaculture, providing insights for better management strategies to mitigate antimicrobial resistance.

Dr Jake O'Brien is in the third year of his 5-year NHMRC Investigator Fellowship, which aims to use wastewater analysis to provide a surveillance strategy for monitoring antimicrobial resistance (AMR) in the general population and to develop a national wastewater surveillance program for AMR. Under the supervision of Dr O'Brien, PhD student Jinglong Li has developed a direct injection LC-MS/MS method for the ultra-trace determination of >60 antimicrobial compounds in wastewater influent on a state-of-the-art SCIEX 7500 system. now applied to samples collected across the country. Two manuscripts were published in 2024. This project has been discussed with the Australian Department of Agriculture, Water and the Environment who are particularly interested in the analytical method developed to date and would like to apply this method to effluent and biosolids. This method will also be applied for monitoring purposes for CRC-SAAFE, and there is discussion of a collaboration with Animal Industries Antimicrobial Stewardship Strategy. This project has also resulted in a relationship with the Interim Australian Centre for Disease Control Antimicrobial Resistance Policy section.

QUEX PhD candidate Pooja Lakhey's doctoral research is focused on assessing the suitability of the wastewaterbased epidemiology approach for antimicrobial resistance surveillance with an emphasis on characterising and reducing uncertainties. Her research is a collaboration between QAEHS and the University of Exeter, where Ms Lakhey will be based for some of her studies. Ms Lakhey recently passed her confirmation progress review.

Key funding

Current:

ARC Discovery Project (Guo, Carvalho) ARC Discovery Project (Guo) ARC Industrial Transformation Training Centre (Guo) ARC Linkage Project (Guo) ARC Linkage Project x2 (Carvalho) China Petrochemical Technology Company Ltd (Guo) Cooperative Research Centre (O'Brien, Thomas) Metro North HHS (Guo) NHMRC Investigator (O'Brien)

Staff and students Theme Leaders: Guo, Carvalho, Thomas 4 Research Fellows, 13 PhD students





Research outputs

Research quality

Comparison of QAEHS research outputs with leading Australian research institutions reveals that QAEHS researchers consistently rank above average in quality, as indicated by three key metrics shown in the figure below.

In 2023–24, QAEHS researchers were active across twentyone subject areas.

The high relevance and impact of our work are evident through our publication and citation numbers:

- 121 publications in 2023 and 76 in 2024 to date
- 11,681 citations in 2023 and 8,401 in 2024 to date

The quality of our 2023–24 work is notable with 65.2% of our publications appearing in Q1 journals (top 25%) and 6.0% of our papers ranking in the top 1% cited, compared to 3.1% of The University of Queensland (UQ).

The chart below compares our research metrics with those of UQ, CSIRO and the Group of Eight Universities (Go8). Plotted is the field weighted citation impact (a measure of the citation impact compared to global averages) against the percentage of publications in the top 25% of journals. Each bubble represents the percentage of publications in the top 10% worldwide based on number of citations (see legend).





Funding and recognition

Competitive research funding

We were awarded \$19 million in new funding in 2023–2024, bringing QAEHS' total funding awarded for all projects from 2016 to 2024 (to date) to \$91 million. Additionally, satellite theme leaders were awarded \$9 million of research funding this year, supporting research in the environmental health sciences field. Queensland Health have access to all research activities, outcomes and researchers across the alliance.

Outcomes for 18 competitive grant applications submitted in 2023–24, worth an additional \$12 million, are still pending.

QAEHS researchers maintain a high level of participation in competitive grant schemes, with 44 applications submitted, 31 of which were led by QAEHS researchers. As of 30 June 2024, 21 competitive grant applications are under preparation. The success rate for QAEHS-led applications this year was 37%.

Details of research grants and other funding awarded in 2023–24, as well as prior grants active during the year, are provided in Appendix A.

Fellowships

A/Prof Phong Thai: Australian Research Council (ARC) Mid-Career Industry Fellowship - Measuring the prevalence of vaping and illicit tobacco in Australia (2025-2028).

Awards and prizes

Prof Jianhua Guo: Letter of Commendation, UQ Awards for Excellence in Graduate Research Training, 2023

A/Prof Phong Thai: Japan Society for the Promotion of Science Invitational Fellowship to visit Kanazawa University, 2023

Dr Richard Bade: Olaf Drummer Education Award, 2023

Dr Ian Zammit: UQ Health and Behavioural Sciences Early Career Academic Research Accelerator Award, 2024

Dr Elvis Okoffo: Max Day Environmental Science Fellowship Award (Australian Academy of Science), 2024; Goodman Foundation Research Grants, 2024

Dr Jiaying Li: Max Day Environmental Science Highly Commended (Australian Academy of Science), 2024

Simran Kaur: Young Science Ambassador Award, Wonder of Science, 2024; SETAC (Society of Environmental Toxicology and Chemistry) Student Travel Award, 2023; First Place, School of Pharmacy/QAEHS 3 Minute Thesis competition, 2024

Coral Jeffries: Best Student Oral Presentation in Environmental Chemistry at SETAC Australasia, 2023

Liam O'Brien: Commendation, Queensland Mass Spectrometry Symposium, 2024

Lachlan Chadwick: Second Place, SETAC Global Science Slam competition, SETAC Europe 34th Annual Meeting, 2024

Chantal Keane: Runner Up, School of Pharmacy/QAEHS 3 Minute Thesis competition, 2024

Pooja Lakhey: Poeple's Choice award, School of Pharmacy/ QAEHS 3 Minute Thesis competition, 2024

Zeyang Zhao: Best QAEHS Poster, School of Pharmacy/ QAEHS HDR Day, 2024



Awarded funding by year

QAEHS Best HDR Student Publication Awards 2024

The HDR Student Best Publication Awards are maintained by annual funding from QAEHS to encourage and reward HDR students who are the primary authors of high-quality publications. Four HDR students submitted applications which were reviewed by a judging panel (Dr Greg Jackson Queensland Health, Dr Dung Phung QAEHS Theme Leader, Dr Ester Lopez Garcia Postdoctoral Research Fellow and Dr Peter Moyle Director of HDR UQ).

1st place: Ken Tang - Evaluation and identification of chemical migrants leached from baby food pouch packaging published in Chemosphere.

2nd place (tie): Dr Bastian Schulze - Bastian Schulze: Is nontarget analysis ready for regulatory application? Influence of peak-picking algorithms on data analysis published in Analytical Chemistry.

2nd place (tie): Zhe Wang - Monitoring medication and illicit drug consumption in a prison by waster-based epidemiology: Impact of COVID-19 restrictions published in *Water Research.*

Commendation: Dr Joseph Clokey - Calibration of a microporous polyethylene tube passive sampler for polar organic compounds in wastewater effluent published in Science of the Total Environment.

07.

Education and training

Training the next generation of environmental health science leaders is crucial to our mission of creating solutions for the world's toughest environmental health challenges.

Higher degree by research

Our PhD Program remains steady across the 2023-24 reporting period. By the end of the reporting period, we had 39 HDR students.

Eight PhD scholarships were competitively awarded through the UQ Graduate School. This year we also had two Masters students successfully convert to PhD candidates. Four PhD students have completed in 2023-24.

QAEHS scholarships

Supporting the QAEHS/Queensland Health partnership, the UQ Graduate School have contributed three domestic PhD scholarships to the Alliance for the new 2023-2028 term. The scholarships will be competitively awarded to PhD projects that align with Queensland Health priority areas.

Further details on our HDR students, including PhD topics and QAEHS scholarship holders, are provided in Appendix B.

QAEHS PhD graduates 2023–24



Bastian Schulze

Evaluation and Implementation of Methods to increase Comprehensiveness of Non-Target Analysis.

Joseph Clokey

Improved monitoring of hydrophilic aquatic contaminants of emerging concern.

Carla Magi-Prowse *

Climate change coping and communication: Understanding how to increase engagement, efficacy, and pro-environmental behaviour.

KM Shahunja *



Trajectories of asthma symptom and their associations with family, neighbourhood, and psychosocial environmental factors among children in Australia.

* QAEHS Scholarship holder

Industry placements

Industry placements connect higher degree by research (HDR) talent with industry organisations to work on a project-based experience, for typically sixty days. These placements enable students to grow and develop in a real-world environment, while also making a significant contribution to the industry organisation. Placements can also offer industry staff the opportunity to develop and mentor emerging researchers.

This year, four QAEHS PhD students completed industry placements and another three students are currently engaged in placements.

Student	Industry Organisation
Grechel Taucare	Seqwater
Carly Beggs	Queensland Department of Environment, Science and Innovation
Kavitha Karanam	SynergenMet
Tania Toapanta	Direccion del Parque Nacional Galapagos
Simran Kaur	Queensland Department of Environment, Science and Innovation
Stacey O'Brien	Advisory Board Centre
Liam O'Brien	Advisory Board Centre

HDR 3 Minute Thesis Competition 2024

The 3MT® is an academic competition that challenges PhD students to explain their research in just three minutes to a general audience. It celebrates the discoveries made by research students and enhances their ability to communicate the importance of their research to the broader community.

Students participated in the annual School of Pharmacy/QAEHS 3 Minute Thesis competition live at the Dutton Park campus auditorium.

The competition saw an unprecedented number of participants this year, with 15 QAEHS students presenting their research: Jinglong Li, Zhe Wang, Ken Tang, Lily Weir, Garth Campbell, Chantal Keane, Simran Kaur, Edward Zhai, Laura Puente, Dhaya Nadarajan, Zeyang Zhao, Nicole Schroeter, Gabriel De la Torre, Pooja Lakhey and Lachlan Chadwick.

QAEHS Director, Prof Kevin Thomas, expressed his appreciation for all the participants, stating, "All students did an excellent job with their 3-minute presentations. The high quality of the presentations made it a challenging task for the judges to select a winner."

This year, Simran Kaur received first place with 'The secret life of tyres: unveiling their hidden impact', Chantal Keane received runner-up with 'CSI: Trade Waste Investigations' and Pooja Lakhey won the People's Choice award for 'Monitoring antimicrobial resistance, one flush at a time!'.

Chantal and Simran (pictured) advanced to UQ's Health and **Behavioural** Sciences Facultylevel competition.



"Working at Seqwater was an excellent experience. It enabled me to apply the knowledge acquired during my PhD and deepen my understanding of the industry and its practices. I also had the opportunity to meet some wonderful people and build valuable connections for my career. Overall, it was a rewarding experience that significantly contributed to my professional and personal growth."

Grechel Taucare, PhD Candidate, QAEHS

"During my placement with the Department of Environment, Science and Innovation (DESI), I worked with the Water Quality and Investigations and Aquatic Ecosystem Health teams. One of the focal points of my work involved the population study of freshwater turtles, where I actively participated in sampling and investigating these magnificent creatures. Engaging with the turtles and their habitat not only provided practical experience in field research but also deepened my understanding of ecosystem dynamics and conservation challenges. This hands-on involvement underscored the importance of proactive monitoring and highlighted the interconnectedness of species within our natural environments.

Furthermore, my time with DESI allowed me to collaborate on various investigation projects aimed at understanding and preserving Queensland's diverse ecosystems. I am grateful for the opportunity to have contributed to the Ecosystem Health Monitoring Program and to have worked alongside dedicated professionals at the forefront of environmental research and conservation in Queensland. This experience has unquestionably shaped my perspective, enhanced my skills, and I eagerly anticipate applying these insights to my future research endeavours." Simran Kaur, PhD Candidate, QAEHS

49 QAEHS HDR students from 22 countries

Summer and winter research program

The University of Queensland's Summer and Winter Research Programs, run during the summer and winter university breaks, providing undergraduate students with an opportunity to gain research experience working on dedicated projects alongside leading academics and researchers.

The summer and winter programs run for 6 and 4 weeks respectively. Our researchers actively participate in the program and this year, we have hosted 15 research students.

	Student	Project and supervisor
	Renfu Zhang	Exploring the fate of PFASs during novel sludge treatment process (Jiaying Li)
	Mingwei Liu	Developing a suspect screening library for exploring new chemicals in trade waste (Richard Bade)
	Vivienne Noonan	Women's health: Do Lifestyle choices correlate with environmental contaminants exposure (Sara Ghorbani Gorji)
	Yiwen Wang	Estimating pesticide intake via food consumption (Fisher Wang)
	Nuan-Nuan Chang	Becoming Sherlock: Looking at WBE data for usage patterns (Phong Thai)
	Ishaan Deswal	Assessing impact tyre wear and related chemicals on the urban environment (Cassandra Rauert)
	Natasha Thomson	How do large events impact the population? (Richard Bade)
	Yean Ai Jolin Tan	Release of micro and nanoplastics from containers, bottles, cups and detergent (Elvis Okoffo)
	Sherry Zhang	Per- and poly-fluoroalkyl substances (PFAS) in consumer products (Pradeep Dewapriya)
	Xiao Chen	Analysing wastewater for combating gout in populations (Qiuda Zheng)
	Xinyu Zhang	Plastic additive chemicals in menstruation cups and tampons (Ian Zammit)
	Rosanna Materazzo	Release of micro and nanoplastics from containers, bottles, cups and detergent (Elvis Okoffo)
	Viet Dung Truong	Exploring the WBE data for prediction of behaviour patterns (Phong Thai)
	TongYu Li	Improved monitoring of human exposure to hazardous chemical pollutants (Pradeep Dewapriya)
	Amish Rai	Advancing analytical methods for surveillance of vaping trends in Australia (Pradeep Dewapriya)

The Summer/Winter Research Programs serve as a crucial *pathway* for the discovery and progression of students into further study after completing their undergraduate degrees.

Since QAEHS began participating in the program in 2017, we have hosted 57 students over the past seven years. Of these students, eight (-15%) have pursued or are currently pursuing further study at QAEHS. Two students received QAEHS-funded Honours positions, three students completed their Honours and are now working on their PhDs, two students are currently completing their PhDs after participating in the program, and one current student from the 2024 winter research program will be undertaking a semester placement for her Masters degree with QAEHS later this year.



Master of environmental health sciences

The Master of Environmental Health Sciences (MEHSc) commenced in the first semester of 2019 with three award options – Masters, Graduate Certificate and Graduate Diploma in Environmental Health Sciences.

The MEHSc program aims to equip mid-career professionals and future leaders with the skills to manage complex environmental health challenges more effectively. By leveraging the strengths of multidisciplinary teams and perspectives for addressing complex challenges, the program prepares graduates for various roles, including providing science-based information and advice, developing policies, regulations, and guidelines, identifying hazards, assessing and managing health and safety risks, and communicating risks and mitigation strategies to stakeholders.

The Masters of Environmental Health Sciences had 6 students graduate in 2023–24.

There are presently 29 students enrolled in this program:

- 26 Masters, 1 Graduate Diploma, 2 Graduate Certificate
- 79% are international students

This year, the Masters program saw a total of 710 enrolments across its individual courses. The course with the highest enrolment was Introduction to Epidemiology, accounting for 29% of all enrolments.

Intro to Epidemiology 29%
Intro to Biostatistics 24%
Intro to Environmental Health 15%
System Dynamics 13%
Dynamics of Public Policy 9%
Risk Communication 4%
Environmental Health Risk – Biological Hazards 4%
Environmental Health Risk – Chemical Hazards 2%



View the course online

Ranked #39

in the world for public health

(Global Ranking of Academic Subjects 2023)

Ranked #18 in the world for environmental sciences

(QS World University Rankings 2024)

Teaching

Our Theme Leaders and team members are coordinating four courses in the MEHSc program.

- Risk Communication (Core), Semester 2, 2023 A/Prof Kelly Fielding
- Chemical Hazards (Core), Semester 2, 2023 Dr Jake O'Brien
- Biological Hazards (Core), Semester 1, 2024 Dr Gilda Carvalho
- Preventing Disease through Healthy Environments (Core), Semester 2, 2023, Dr Dung Phung

Other teaching

In addition to the Master of Environmental Health Sciences courses, QAEHS researchers have also contributed to teaching or course coordination in the following courses:

- Sewer Networks Design, Operation, and Maintenance (UQ), Dr Jiaying Li
- Emerging Issues in the Urban Water Cycle and Public Health (UQ), Dr Jiaying Li
- Pollution Science (UQ), Dr Jake O'Brien
- Human Health, Environment and Climate Change (ANU), Dr Jake O'Brien



Guest Lectures

QAEHS researchers share their work through guest lectures at universities, and industry and community events. This year, the following researchers have delivered guest lectures:

- Dr Richard Bade, NPS in Wastewater Update at Forensic Sciences Queensland, August 2023.
- Dr Qiuda Zheng, Advancements and Future Outlook in Wastewater-Based Epidemiology in China at the Beijing University of Technology, November 2023.
- Dr Qiuda Zheng, Application of wastewater-based epidemiology in China at the Huazhong University of Science and Technology, December 2023.
- Dr Richard Bade, Detection of new psychoactive substances in wastewater at the University of Tasmania, March 2024.
- Dr Richard Bade, Exploring Wastewater for the Use of New Psychoactive Substances, at the ANZFSS, Queensland Branch, April 2024.
- Dr Elvis Okoffo, Microplastic pollution in Moreton Bay, at the Rotary Redcliffe Sunrise Inc program on Family Turtle Awareness Day at Queens Beach, Scarborough, April 2024.
- Dr Elvis Okoffo, Microplastic pollution in Moreton Bay, at the UQ, Centre for Marine Science, TalkFest, April 2024.
- Dr Elvis Okoffo, Quantitative analysis of micro- and nano-plastics in environmental samples by pyrolysis gas chromatography mass spectrometry, at HyTech (ARC Training Centre), University of Tasmania, May 2024.

Professional development

Lunchbox sessions with Queensland Health

QAEHS enthusiastically participated in Queensland Health's 'Lunchbox Sessions', a 30-minute talk and Q&A via Microsoft Teams, held during lunchtime. Our sessions focused on a QAEHS theme, presenting current developments within the topic. The Lunchbox sessions held in 2023–24 were well attended and featured engaging Q&A discussions.

- Passive exposure to methamphetamine in properties contaminated with methamphetamine smoking, A/Professor Phong Thai, 19 July 2023
- Eliminating opportunistic pathogens from premise plumbing biofilms, Professor Jianhua Guo, 25 October 2023
- What we know and don't know about public acceptance of recycled water, Professor Kelly Fielding, 6 December 2023
- Climate Change in Australia and beyond, A/Professor Nicholas Osborne, 12 June 2024.

Alumni

Since 2016, QAEHS has seen 36 PhD graduates. Approximately half have pursued postdoctoral research careers in academia, while others have moved into key positions in industry, government organisations, and research institutions.

We invited two QAEHS alumni, Dr Francisca Ribeiro and Dr Phil Choi, who are pursuing careers in industry and government respectively, to share insights into their post-PhD journeys.



Dr Francisca Ribeiro Consulting Senior Associate, ERM

PhD Title:

Assessing dietary exposure to microplastics through seafood consumption and potential accumulation of microplastics in aquatic organisms

What was your PhD about?

The focus of my PhD was to study the dietary exposure to microplastics through seafood consumption. To achieve that, I developed more suitable and accurate analysis techniques for the quantification of micro- and nanoplastics in edible parts of different Australian seafood species. This was an innovative method that allows the plastic quantification in seafood on a mass-based concentration. On the other hand, I was also interested in understanding the uptake and elimination kinetics of nanoplastics in a high commercial value bivalve – oysters - to assess whether the depuration mechanisms of this organism were effective at depurating the plastic particles.

How did QAEHS assist in the development of your PhD research?

QAEHS had excellent facilities, with the most recent instruments for microplastics detection, allied with a supporting team of analysts that supported me through the process of method development. QAEHS was defined by a very collaborative work environment with top experts from their fields and there was room for constructive discussions that, step by step, helped me shape my thesis. The most positive fact about QAEHS was the work environment, that contributed to my success in a new country. Everyone was very kind and helpful, and after a few years now, I can still say it was one of the best places I have ever worked in.

What does your current career involve?

Currently at <u>ERM</u> I work on the registration and approval process for plant protection products in the European Union. I have a dual role where I work as a Project Manager, being the link between the client and the technical teams and I am also part of the Ecotox team, where I support in doing risk assessments to the environment. Besides the work I do in crop protection, I also work in a few REACH projects (mainly related to chemicals regulation in the EU) and a little bit of research on microplastics.

Do you do research there?

The research component, as mentioned above, relates to tire road wear particles (TRWP). We are currently monitoring TRWP's concentrations in several locations across the globe, to better understand their sources and fate in the environment.



Dr Phil Choi Senior Environmental Health Scientist, Water Unit, Queensland Health

PhD Title: Population diet and stress estimates using wastewater-based epidemiology

What was your PhD about?

When I started my PhD, wastewater-based epidemiology was mostly limited to tracking drugs and contaminants. I showed that you could go beyond this and use wastewater to get an idea about the consumption of vitamins, fibre and other indicators related to diet and health. I also found that there were very strong relationships between compounds in wastewater and the socioeconomics of the respective communities. All of my work was possible thanks to help and input from like-minded colleagues.

How did QAEHS assist in the development of your PhD research?

Now that I think about it, the atmosphere within the QAEHS community was one of innovation, collaboration and possibilities. I really appreciate that there were always visiting academics or students who one could talk to and gain new ideas and insights. My supervisory team gave me opportunities to present and network in Australia and overseas, and the freedom to dive into tangential research, or experiment with new techniques.

What does your current career involve?

I use my science background to help protect the public from chemicals and microbes in water, including drinking water, recycled water, recreational water and wastewater. While I don't do any lab work, I interpret laboratory reports, literature and guidelines to provide environmental health and public health advice about water. I also get to provide input into government policy, investigations and new guidelines related to water. I also help to run wastewater surveillance for SARS-CoV-2 in Queensland.

What does your current research look like?

In my current role I am fortunate enough to get involved in research projects with academics from different universities, where the academics are investigating research questions that we want answered. For example, I am involved in an NHMRC funded project looking at associations between disinfection byproducts in drinking water and adverse birth outcomes. I am also on the supervisory team for a microbiology related PhD project.

I am regularly involved in initiatives or investigations that, in a way, include a heavy research component. This ranges from topics like surveying PFAS in fish to using satellites to track harmful algal blooms in remote Queensland. 09.

Communication and impact

Communicating research through diverse channels is crucial for reaching and engaging a wide range of audiences.

Traditional methods like publications, media releases, conferences, workshops, symposiums, and seminars remain foundational for scholarly communication and peer recognition. However, leveraging modern platforms such as websites and social media allows researchers to present their work in more accessible and engaging formats, broadening their reach. Unconventional modes such as community events provide unique opportunities to connect with the public, spark curiosity, and inspire a deeper understanding of scientific issues, making research more relatable and engaging to a broader audience.

These varied approaches ensure that our research findings are disseminated widely and understood by diverse audiences, enhancing their overall impact. Increased visibility and relevance of our research foster informed decision-making, drive innovation, and address societal challenges. By transforming technical knowledge into actionable information, researchers can contribute to positive change and ensure their work has a lasting and meaningful impact.

This year, in line with our strategic plan, we have advanced our efforts to enhance communication avenues for the dissemination of our research activities and outputs, ensuring our findings are accessible to policymakers, industry professionals, and the general public.

Our established reputation is demonstrated by the growing awareness and engagement we experience at local, national, and global levels. This is reflected in the significant utilisation of our research outputs (research reach), prestigious invitations to present at national and international conferences, invited opportunities to guest lecture at university, industry and community events, increased attendance at our seminars and events, and extensive media reach. These indicators highlight the significant impact and recognition of our work.

Research reach

Our research outcomes are primarily disseminated to the wider scientific community, government, and the public through peer reviewed publications in leading journals.

Publication outputs decreased in 2023, likely due to the departure of former Theme Leader Prof. Abdullah Mamun, who was a significant contributor. However, 2024 data indicates that publication outputs are stabilising and are expected to return to pre-COVID numbers. Publications and citations peaked in 2020 and 2021, likely because COVID-19 lockdowns restricted physical access to research facilities, giving researchers more flexible schedules to focus on desk-based research and writing.Despite the fluctuations in publication numbers, citations have remained steady outside the 2020-21 COVID period, indicating that our publications continue to be highly relevant and impactful.

Our work is highly collaborative with international significance and reach. In 2023-24 our research was published in collaboration with over 138 different institutions in Australia and overseas and has been cited in 119 countries. The impact of our work contributes to influencing policies, practices, and knowledge globally.



Seminar series

The QAEHS Seminar Series' continuous run in 2023–24 has been instrumental in expanding our audience reach and value through the inclusion of engaging speakers and topics.

The line-up of speakers this year has enriched the seminar content, providing fresh perspectives and innovative research. The value of the Seminar Series fosters knowledge exchange and facilitates meaningful discussions among attendees, created an environment for interdisciplinary collaboration.

Streaming the seminars online has allowed wider stakeholder participation and provides a great opportunity to engage with Queensland Health staff and members of industry and the scientific community interested in our research. Every seminar is advertised on the QAEHS website.

In 2023–24, forty-seven external, internal, and visiting researchers and students presented their recent research findings, including:

- Professor Olivier Jolliet, Technical University Denmark "The Australian and NHANES Human Biomonitoring Databases: Age and time trends of PFAS, Dioxins, PCBs, BFRs and OCPs from cradle to grave!"
- Dr Matt Landos, Director of Future Fisheries Veterinary Service Pty Ltd – "The decoupling of science, regulation, health and the public interest- water pollution."
- Professor Roland Kallenborn, Norwegian University of Life Sciences - "Poly and perfluoroalkyl substances (PFASs) as local Arctic pollutants: Svalbard as case study"
- Dr Emma Juanay, University of South Australia "Is population health reflected in wastewater collected from a sustainable living community compared to the general population?"
- Professor Sally Gaw, University of Canterbury "Consumer products as a source of diffuse environmental contamination."
- Dr Cheneal Puljević, UQ's School of Public Health "A snapshot of public health research projects on global trends in alcohol and cannabis use during COVID-19, and drug use at festivals."
- Dr Dwan Vilcins, Children's Health and Environment Program, The University of Queensland – "A pilot study to determine the impacts of prescribed burns on indoor air quality and associated health impacts for residents."
- Professor Luhong Wen, Scientific Instrumentation Innovation Team, Ningbo University – "Some new and innovative technologies and products for drug testing and sewage sampling."



 Professor Hongwen Sun, Professor at College of Environmental Science, Nankai University, Tianjia, China

 "Sources and fate of perfluoroalkyl substances in the environment."

 Professor Chris Higgins, Professor at the Colorado School of Mines – "Treating for Legacy PFASs: Promising Remediation Technologies."

• Dr Karl Bowles, Senior Principal Environmental Scientist with Jacobs Australia – "The Problem of Regulating PFAS as a Single Class Compound."

• **Professor Derek Muir**, Emeritus Senior Scientist with Environment and Climate Change Canada's Water Sciences and Technology Directorate – "How many chemicals have been identified in environmental media? A progress report."

 A/Professor Jennifer Schumann, Victorian Institute of Forensic Medicine, and Monash University's Department of Forensic Medicine – "The emerging drugs network of Australia (EDNA) and EDNA-Vic: illicit drug intoxications in emergency departments informing a national early warning system in Australia."

• A/Professor Dimitri Abrahamsson, New York University, Grossman School of Medicine – "Applications of nontargeted analysis in serum samples from pregnant women. Characterizing the exposome and discovering lesser-known or previously unknown exposures."

• Dr Katja Shimko, Biobot Analytics – "Insights on transitioning between academia and a start-up company."

Media and social media

Traditional Media

Media reach plays a crucial role in enhancing the visibility and impact of our research findings by raising awareness and promoting public engagement. Extensive media coverage this year has showcased our research across various media outlets, spanning television, radio, print, and online platforms, effectively reaching diverse audiences at local, national, and international levels, amplifying the societal relevance and impact of our research.

During the 2023–24 reporting year, QAEHS research amassed 616 media mentions, reaching a potential 625 million people. Of these mentions, 87% were within Australian media outlets, while 13% were international, with the UK representing the highest number of mentions after Australia.

Notable media articles this year:

- PFAS prevalent in common household products, <u>UQ HaBS</u> <u>News</u>, Dr Pradeep Dewapriya and Dr Sarit Kaserzon.
- Smoking rates surge during COVID-19, <u>UQ News</u>, A/Prof Phong Thai and Dr Ben Tscharke.
- The new mile-high club: Why airline toilets could give early warning of the next pandemic, <u>The Telegraph UK</u>, Prof. Kevin Thomas.
- Moreton Bay and Plastics, <u>10 News</u> and <u>9 News</u>, Dr Elvis Okoffo.



Additionally, an article co-authored by former QAEHS PhD student Samuel Namonyo, and QAEHS Theme Leaders Jianhua Guo, and Gilda Carvalho, titled "<u>The effectiveness and role</u> of phages in the disruption and inactivation of clinical P. <u>aeruginosa biofilms</u>" was published in *Environmental Research* in 2023. This research publication achieved a significant total reach with a potential audience of 32 million people. The study explores the use of phages to disrupt and inactivate clinical P. aeruginosa biofilms, offering significant insights into potential clinical applications. Two significant articles garnered exceptional media attention this year:

Dr. Ben Tscharke and A/Prof Phong Thai's article on the <u>socioeconomic link to alcohol consumption</u> <u>revealed through wastewater analysis</u> was one of the top-performing media releases of 2024. This research achieved national coverage across online, radio, and print media, contributing to a total media exposure of 182 items and a potential news reach of 211 million people. Social media engagement included 968 impressions on UQ's X and 126 impressions on UQ's Facebook.



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Dr. Richard Bade's research on a <u>deadly opioid</u> <u>detected in wastewater for the first time</u> received coverage from the Mudgee Herald and the Washington Post, leading a total media exposure of 79 items and a potential news reach of 141 million readers. This story has the highest number of pageviews for any story on *UQ News* since 2022, with 60,189 views at this time.

The Washington Post

The University of Queensland in Australia <u>announced</u> Friday that a team of international researchers identified protonitazene in samples from Illinois and Washington. It's the first time protonitazene has been detected in wastewater, which is increasingly <u>tested</u> for clues on drug trends.

YouTube

Last year, we launched a dedicated YouTube playlist aimed at enhancing visibility, impact, and accessibility of our research findings. This mode of communication offers an additional platform to share our work in an engaging and accessible way, facilitating global outreach enabling our research to reach audiences beyond geographical boundaries and academic circles. The platform's interactive features foster discussions and feedback that contributes to knowledge exchange in the environmental health sciences community. Initially, we developed a series of seven videos summarising on our research themes, providing insights into our diverse fields of research.

Since its creation in November 2022, the YouTube playlist has garnered 585 views, with the QAEHS introduction video accounting for approximately half of the total views. As we expand our playlist with new videos, we envision becoming a central hub for QAEHS research and knowledge dissemination.

Visit our YouTube playlist.



Facebook

Facebook is an excellent supporting social media outlet for research dissemination due to its broad and diverse user base, and provides an additional platform to share research our activities, awards, and available PhD scholarships.

This year, we shared 22 posts. The posts that received the highest engagement were the HyTech PhD scholarships and the media release on PFAS prevalence in common household products.

Follow us on Facebook.

Website

This year, website engagement has remained consistent with previous years in terms of total visitor numbers. Peaks in engagement typically correlate with specific events, such as media articles. A slight increase in visitor numbers between 2021 and 2023 can be attributed to our COVID-19 research and the Testing the Waters conference.

Our global audience has expanded, with visitors from 137 countries, and Japan entering the top 10 for the first time since 2019. Sixty percent of visitors are from Australia, followed by the USA and China maintaining the same engagement levels as the 2022-23 period.

Most visited page is the home page followed consistently by the 'our people' page. There has been a significant increase in traffic to the PhD positions available page, aligning with the high number of PhD scholarships available this year, particularly the HyTech ones.

During this reporting period a major upgrade to the website was launched in March 2024, featuring an updated research section with informative summaries of every QAEHS research and PhD project. The new pages include a summary of the project, expected outcomes, project outputs, and key team members with contact details. We anticipate higher engagement numbers in the coming year due to the significant amount of new content now available on the site. Further upgrades are planned for 2024-25 to continue our goal of creating an engaging and informative digital space for our stakeholders and community.



QAEHS Website visitors 2018–24

Conferences

Attending conferences is important for knowledge exchange, networking, and the dissemination of our research outcomes, offering a platform for our researchers to stay informed about the latest developments in our field, keep abreast of emerging trends, and gain insights from leading experts. This engagement enhances their expertise and contributes to their professional growth.

This year, our researchers have actively participated in 42 national and international conferences, with presenting their work through oral presentations, poster sessions, and workshops. These opportunities have allowed them to share their research with a wide audience, increasing the visibility of our work and fostering new collaborative opportunities.

Conference attendance was evenly distributed across online, domestic, and international participation. This balanced approach allows for effective knowledge exchange, leveraging the convenience of online attendance and the networking opportunities of in-person domestic and international conferences.



Queensland Mass Specrometry Symposium

QAEHS hosted the Queensland Mass Spectrometry Symposium (QMSS) at UQ's Dutton Park campus in February 2024. The one-day symposium was well attended with 130 delegates from a range of universities and industry organisations.

QMSS is an annual event hosted by different member organisations each year, designed to connect the Queensland mass spectrometry community and those interested in this technology from various disciplines. The event was supported by sponsors, PM Separations, Shimadzu, SCIEX and Peak Scientific.

Attendees showcased their research through 26 presentations and a plenary talk by Professor Susan Bengtson Nash from Griffith University. The event facilitated networking around mass spectrometry technology and sample preparation methodologies in biomedical, biochemical, chemical, environmental, and analytical research and applications, and included a tour the QAEHS research facilities.

Winners were selected by a Judging Panel comprising Professor Sally-Ann Poulsen and Dr Michaela Lerch, Griffith University, Mr Jeff Herse and Dr Ashley Tronoff, Queensland Health, Dr Raj Gupta and Dr Wan-Ping Hu, QUT, Dr Utpal Bose and Dr Cassandra Pegg, CSIRO, and Dr Nathan Charlton, Dr Ian Zammit, Dr Cassandra Rauert and Dr Ayomi Jayarathne, UQ.

QAEHS PhD student Liam O'Brien received a Commendation for presentation "Applying the self-adjusting feature detection algorithm to gas chromatography high resolution mass spectrometry data: the challenges of working with large, noisy data". "I thoroughly enjoyed the SETAC conference. It was great to see how my research fits in with the bigger picture and what else is being done in the microplastics area. Winning the award for best student oral presentation in environmental chemistry was the icing on the cake." - Coral Jeffries, PhD Candidate, winner, best student oral presentation, SETAC Australasia 2023

"Attending SETAC Australasia was a fantastic opportunity to network with national and international scientists from my field, get feedback on my current research, share experiences, and have a lot of fun!" - Gabriel De la Torre, PhD Candidate

"It was a great opportunity to meet researchers from different fields and have a peek at what they are doing. The comments from others also provide sparks for my project and potential future collaborations." - Ken Tang, PhD Candidate

"The conference was an enriching experience, filled with insightful sessions, networking opportunities, and the chance to learn from experts in the field. This event not only expanded my knowledge but also allowed me to connect with likeminded individuals who share a passion for environmental health."

- Simran Kaur, PhD Candidate



Society of Environmental Toxicology and Chemistry (SETAC)

Australasia 2023 - "Source to sink: Engaging with stakeholders to protect our environment"

A significant QAEHS cohort of 10 researchers and 10 PhD students attended the SETAC Australasia conference in Townsville in August 2023.

Dr Cassandra Rauert, Dr Elvis Okoffo, Dr Pradeep Dewapriya, Dr Rose Nguyen and Dr Sara Ghorbani Gorji, along with PhD students Carla Alongi, Carly Beggs, Coral Jeffries, Garth Campbell, Ken Tang, Laura Puente, Simran Kaur, Stacey O'Brien and Tania Toapanta were selected to give platform talks. Dr Sandra Nilsson and Dr Veronika Schacht along with PhD students Gabriel De la Torre, Simran Kaur and Stacey O'Brien were selected to showcase posters.

Europe 34th Annual Meeting - "Science-Based Solutions in Times of Crisis: Integrating Science and Policy for Environmental Challenges"

A/Prof Sarit Kaserzon and three of her PhD students, Carly Beggs, Garth Campbell and Lachlan Chadwick attended the SETAC Europe Meeting in May 2024.

Lachlan secured a coveted spot in the SETAC Science Slam competition, featuring five contestants who compete by presenting their research in an engaging and entertaining manner. Lachlan showcased his research *Non-Target Analysis*, *I'll Drink to That* and was awarded second place in the competition.

The pitch that secured his selection for the competition was:

Using the analogy of a taste test I will show how flavours (which represent PFAS) can be detected not just in wine (which represents Food Contact Materials) but in other drinks such as rum that have been aged in the wine barrels. The barrels in this analogy represent contaminated compost/FOGO, and the rum would represent plants that are subsequently contaminated from the compost/FOGO. The taste testing panel will be a demonstration of a non-target LC-MS run. The smell portion of the taste test will be compared to the LC portion of a run, where the glass is swirled with the more volatile and smaller molecules being aerosolised first and therefore smelled (detected) first followed by less volatile and larger molecules. This will be followed by the tasting where the molecules responsible for giving the drinks their flavour would be broken down by the tongue to fire off certain ion pathways which feed information to the brain on the taste of the drinks. This process is comparable to non-target analysis in so far as it can detect a large variety of flavours (molecules) more than a targeted analysis could, but unlike a target analysis, it cannot give a definitive concentration value to what has been detected.



Annual Research Forum

Our Annual Research Forum took place at Queensland Health on 13 November 2023. This event featured presentations from Theme Leaders, PhD students, and researchers, who shared their latest findings and ongoing projects. Topics covered a wide range of environmental health science areas, aimed at both internal and external audiences, including Queensland Health staff, industry stakeholders, and members of the AMC.

Hosting the forum at Queensland Health provides an opportunity for direct engagement with key stakeholders. This setting fosters networking opportunities between Queensland Health employees and our researchers and students, facilitating valuable knowledge exchange and relationship-building. Additionally, the forum also served as a platform for the launch of the Special Interest Groups and introduction to the Special Interest Group leaders.

This year, Queensland Health selected five PhD projects of particular interest to present their research, highlighting the collaborative spirit and commitment to nurturing emerging talent within the field.

Student	Presentation
Jinglong Li	Nationwide surveillance of antimicrobials in Australia by wastewater analysis
Carly Beggs	Fate and behaviour of neonicotinoids in Australian aquatic environments
Laura Puente	Evaluation of infant exposure to micro and nano plastics
Joong Nam	Third-hand smoking of methamphetamine: an investigation of airborne methamphetamine level and remediation approach
Lily Weir	Unravelling the fate of chemicals: exploring biodegradation in Queensland surface waters

Community engagement

Community outreach activities are important for communicating research, contributing to improving public understanding and appreciation of science, informing decision-making and building trust in science. They offer researchers valuable feedback and new perspectives and can inspire the next generation of scientists.

Future Science Talks Brisbane Science Comedy Program

The <u>Future Science Talks</u> Science Comedy Program is a national initiative designed to help participants master their storytelling techniques, polish their public speaking skills and improve their stage presence through a series of workshops and culminating in a presentation during the Brisbane Comedy Festival.

QAEHS HDR student, Belinda Moore, participated in 2024 and described the experience: "the Future Science Talks comedy program was an excellent way to challenge my science communication skills. I love public outreach, but this set of workshops and final performance was a big step in my professional development. Everything that we covered was applicable for professional settings as well as the stage, and it has made me want to continue to seek out more engagement opportunities."



EcoMarines CHECK Event

The <u>EcoMarines Foundation</u> is a not-for-profit organisation providing comprehensive environmental education programs to schools and learning centres across Queensland. They aim to create a community of environmental leaders and educate the next generation of conservation heroes.

In August 2023, EcoMarines hosted CHECK 2023 (Culture, History, Environment, Careers and Kindness), a conference style event for secondary students interested in environmental topics and careers. Run by students for students, CHECK was held at the Brisbane Convention and Exhibition Centre and was attended by approximately 200 students from 18 schools across Southeast Queensland, primarily from grades 10-12.

The event featured an eco-innovation panel, where PhD student Belinda Moore was invited to share her research and insights into future study possibilities.

World Science Festival

Since 2019, our Microplastics team has been invited to host a stall at the Queensland Museum's <u>World Science</u> <u>Festival</u> and were invited back again in 2024 marking their fourth year at the festival.

This popular annual event attracts a diverse audience, including school students, educators, and the general public, offering a unique opportunity to educate and engage with communities about the global issue of microplastic pollution and its environmental and health impacts.

Brains with Beers

Hosted and supported by Brisbane based Helios Brewing Company, Brains with Beers sessions are casual science sessions accessible to a wide community audience. In August 2023, Dr Jake O'Brien and Dr Richard Bade presented their research analysing chemicals in wastewater to understand what chemicals are being used within the population.

The Loop

<u>The Loop</u> is a collaboration between a team of chemists, health and harm reduction workers and researchers who directly interact with clients from the community to deliver vital drug checking services. The service operates as <u>CheQpoint</u>, located in Bowen Hills and first opened its doors in April 2024.

"It was a wonderful opportunity to be involved with the Hatchery program at the World Science Festival. We met thousands of very engaged school students and members of the public to provide them with information about the latest research regarding microplastics and other environmental contaminants."

Stacey O'Brien, QAEHS PhD student and organiser



Several members of QAEHS are involved in working at the Loop in a Chemist capacity. We use transmission-fourier transform infrared (FTIR) spectroscopy and reagent testing to provide immediate results to clients on the composition of their drugs. FTIR is rapid and requires no sample prep. Test samples are placed directly on a diamond crystal where an infra-red light is beamed through and absorbed by the sample. The light is reflected into a detector that will illustrate the unique chemical bonds involved in the sample make-up. The test is non-destructive, and sample can be recovered. There are limitations with this type of analysis, including that anything below 5% of sample concentration will likely not be detected.

Using open-source libraries from SWGDRUG, BCCSU, ENFSI and The Loop UK/AUS, the software will automatically analyse the spectra and provide a best-fit match. Chemists can use the software to perform a subtraction of the primary component that removes the major peaks to determine a secondary component (usually a cutting agent). Over the first few months of operation, we've found several substances to contain completely different drugs to what was believed to be purchased, including a case of what was thought to be 2C-B (a psychedelic phenylethylamine) which turned out to instead be a mixture of ketamine and MDMA. We've had clients self-report disappointing or unusual effects when taking pharmaceutical benzodiazepines, which aligns with the fact that these drugs in particular are almost always counterfeit due to the regulations in the Australian market for things like Alprazolam.

When people know what's in their drugs and have a conversation with the harm reduction worker (sometimes the first time ever talking to someone about drug use) they can make more informed and safer decisions surrounding their drug use. Sometimes if the result is unexpected, clients will choose to dispose of their sample, instead of taking a risk with consuming it.

The recent fatal overdoses across Australia have been linked to a new class of synthetic opioids called nitazenes, which have been infiltrating the supply of other psychoactive drugs. Due to the fact that nitazenes can be stronger than fentanyl and hundreds of times more potent than heroin, presence in very small doses is enough to be deadly. Although the limitations of FTIR mean that it is unlikely to be picked up with FTIR, The Loop utilises nitazene test strips that detect the presence/ absence of this particular toxic substance. This stresses how vital drug testing can be in reducing harm to the community.

As part of a partnership with Chemists at Griffith University, The Loop is also collecting steroid samples that are analysed and reported as a collective.

Collaborations and partnerships

We understand that our science can truly make an impact when applied beyond the lab.

By building strong relationships with partners, we help to identify effective ways for our research to support their environmental health science challenges.

We operate with the foundational support of the Queensland Department of Health and over 122 partners and collaborators spanning industry organisations, research institutions, government agencies, analytical instrument providers, and community organisations, By valuing and fostering these collaborations, we ensure our research is innovative and impactful, driving long-term research programs, joint grants, and strategic alliances to address solutions to complex problems.

"The ACIC has worked with QAEHS for more than a decade on drug-related wastewater projects in Queensland and nationally. The partnership is mutually beneficial and delivers tangible outcomes for the Australian community. The ACIC's National Wastewater Drug Monitoring Program and other bespoke wastewater work is regarded as world best practice due to the expertise of the team at QAEHS. The team has continued to innovate in this space over the life of the Program and we are constantly amazed at the ability of the QAEHS team to overcome any challenge we present them. This was never more evident than during the early months of the COVID epidemic when, following a request from the ACIC, QAEHS worked with CSIRO to detect the virus in wastewater, leading to a critical new capability for international, national and state governments as part of the COVID response. We look forward to a prosperous ongoing association with OAEHS."

Australian Criminal Intelligence Commission

Partners and collaborators

- Aeris Cleantec AG
- Airservices Australia
- Arcadis
- Australian Catholic University
- Australian Criminal Intelligence Commission
- Australian Department of Climate Change, Energy, the Environment and Water
- Australian Department of Health
- Australian National University
- Australian Oganics Recycling Association Limited
- Australian Packaging Covenant Organisation Ltd
- Australian Tax Office
- Barwon Water
- Biotage Sweden AB
- Boston University
- Busselton Health Study
- Candy Soil Holdings Pty Ltd
- Cape York Water Partnerships
- Colorado School of Mines
- CSIRO
- Curtin University
- Deakin University
- Dundee Precious metals
- Eurofins Environment Testing Australia
- Flemish Institute for technological research
- Food Packaging Forum
- Freie Universitaet Berlin
- Future Fisheries
- · Gold Coast City Council
- Great Barrier Reef Marine Park
- Authority

- Healthy Land and Water Helmholtz Centre for Environmental
- in Mechanical and Industrial
- Italian National Institute of Health

- Jacobs
- Jožef Stefan Institute
- Karlstad University
- - Karolinska Institutet
 - LaTrobe University
 - Masaryk University

Institute

Research

Authority

Innovation

Innovation

• QUT

RPS

SA Water

Seqwater

Ramboll

RCSI Bahrain

RMIT University

SINTEF OCEAN

NeuRA

- Massey University

- Brisbane Airport Corporation

- Griffith University
- HBM4EU
- research
- Institute of Science and Innovation Engineering

- James Cook University
- Kimberly-Clark Australia Pty Ltd
- Melbourne Water
- Minderoo Foundation
- Murdoch Children's Research
- Norske Skog Paper Mills Ltd Norwegian Institute for Air Research Norwegian Institute for Water
- NSW Department of Planning, Industry and Environment NSW Environment Protection
- NSW Ministry of Health
- Plantic Technologies Ltd
- Queensland Corrective Services
- Queensland Department of
- Environment, Science and
- Queensland Department of State Development, Tourism and
- Queensland Health • Queensland Health Forensic and scientific services
- Queensland Water Directorate
- · Republic of Estonia Health Board
- Shimadzu Scientific Instruments
- Sport Integrity Australia • Stanford University

- Stichting VU
- Stockholm University
- Sullivan Nicolaides Pathology
- Swiss Federal Institute of Aquatic Science & Tech
- Sydney Water
- The Chemours Company (Australia) Pty Ltd
- The University of Western Australia
- The Wesley Hospital
- Thermo Fisher Scientific Australia
- Trajan Scientific and Medical Pty Ltd
- Umea Universitet
- Unilever Global IP Ltd
- United Nations Environment Programme
- United States Centre for Disease Control
- University of Adelaide
- University of Amsterdam
- University of Antwerp
- University of Athens
- University of Bath
- University of Birmingham
- University of Calgary
- University of Cambridge
- University of Exeter
- University of Helsinki
- University of Hohenheim
- University of Luxembourg
- University of Melbourne
- University of Plymouth
- University of South Australia
- University of Tartu
- University of Tasmania
- University of the South Pacific
- University of Wollongong
- Urban Utilities
- Ventia Utility Services
- Victoria Environment Protection Authority
- Vrije Universiteit Amsterdam
- Water Research Australia Ltd
- Wellington Laboratories

Special interest groups

This year, we established special interest groups (SIGs) to facilitate communication and discussion between Queensland Health and QAEHS/UQ on key topics in environmental health sciences. Four initial topics were chosen from Queensland Health's ten nominated priority areas.

The SIGs are collaborative communities that provide a shared forum for advancing knowledge, sharing the latest scientific findings, discussing research ideas, addressing industry challenges, and exploring potential collaborations. Members work together to develop solutions within their specific fields, fostering innovation and progress.

Wastwater Surveillance

Wastewater analysis can monitor the population-level consumption of a substance or exposure to a pathogen based on the analysis of the urine and/or faeces residues present in influent wastewater. Wastewater analysis has the advantage of being cost-effective and capable of high-resolution sampling to collect information between locations and over time, providing complimentary data to support conventional epidemiological methods. This Special Interest Group will explore the use of wastewater to monitor and evaluate exposure by a range of analysis tools and sampling methods.

Activity

The wastewater group has met twice this year, focussing on participants' main interests from Queensland Health, including pathogen surveillance, sequencing work, and the effectiveness of wastewater treatment at plants.

Special Interest Group Leaders



Dr Rory Verhagen rory.verhagen@uq.edu.au A/Prof Phong Thai p.thai@ug.edu.au

Antimocrobial Resistance (AMR)

Antimicrobial resistance (AMR) is a looming threat to public health world-wide. AMR occurs when bacteria, parasites, fungi and viruses evolve over time and no longer respond to medicines, making infections harder to treat and increasing the risk of disease spread, severe illness and death. Resistant bacteria can be found in clinical settings and throughout the natural environment. When antibiotics and antimicrobial compounds are consumed by humans or animals, they do not completely break down during metabolism and are excreted into the environment - whether that be via wastewater treatment plants, animal manure, aquaculture reservoirs, and water bodies. This Special Interest Group will explore the exposure caused by AMR using a wide range of analysis tools and sampling methods.

Activity

The AMR group has met three times this year. Presentations from PhD students Jinglong Li, Pooja Lakhey and Edward Zhai on their wastewater antimicrobial and AMR surveillance research.

Special Interest Group Leaders



Dr Ji Lu j.lu2@uq.edu.au



Dr Jake O'Brien j.obrien2@ug.edu.au

Per- and poly-fluoroalkyl substances (PFAS)

Per- and poly-fluoroalkyl substances (PFAS) are a large group of chemicals commonly used in a range of consumer and industrial applications. Due to their properties and widespread use, PFAS are frequently found in the environment and detected in humans worldwide. More than 4,700 PFAS are in use globally, most of these have been identified as potential precursors to specific PFASs that bioaccumulate in humans (e.g. perfluoroalkyl acids, PFAAs). Transformation of PFAS precursors in the environment, or their metabolism in humans, leads to indirect exposure pathways for the same bioaccumulative PFAS. This Special Interest Group will explore the use of targeted and nontarget techniques for the detection and monitoring of PFAS in a range of programs including but not limited to biomonitoring programs and wastewater surveillance.

Activity

The PFAS group met once this year, resulting in the development of community-oriented factsheets on PFAS. These factsheets will aim to help Queensland Health and regulators explain/interpret the science to a broader audience.

Special Interest Group Leader



Dr Sara Ghorbani-Gorgi s.ghorbanigorji@uq.edu.au



The Games 2032

The 2032 Olympic Games will be held in Brisbane, Australia and will provide numerous research areas both in the lead-up to and during the games. This Special Interest Group will explore broad research topics related to environmental health science and the Olympics, including but not limited to population health, drugs in wastewater and drinking water quality.

Activity

The Games 2032 group has met three times this year. The group discussed ideas for a potential HDR scholarship project for submission for a QAEHS scholarship. Richard has facilitated internal discussions to align the group with UQ's Games Committee, and the Research and Innovation Working Group.

Special Interest Group Leader



Dr Richard Bade r.bade@uq.edu.au

> Dr Sara Ghorbani-Gorji introducting PFAS Special Interest Group at the Annual Research Forum, Queensland Health, 2023



11.

Appendices

Appendix A - QAEHS Staff and Students

Academic staff

Staff Member	FTE
Ben Tscharke	1
Cassandra Rauert	1
Dung Phung	0.2
Elvis Okoffo	1
Ester Lopez Garcia	1
Fisher Wang	1
Gilda Carvalho	0.1
lan Zammit	1
Jake O'Brien	1
Jianhua Guo	0.1
Jiaying Li	1
Jochen Mueller	1
Katja Shimko	1
Kelly Fielding	0.2
Kevin Thomas	1
Nicholas Osborne	0.2
Phong Thai	1
Pradeep Dewapriya	1
Qiuda Zheng	1
Richard Bade	1
Rory Verhagen	1
Rose Nguyen	1
Sandra Nilsson	1
Sara Ghorbani Gorji	1
Sarit Kaserzon	1
Veronika Schacht	1

Professional staff

Staff Member	Appointment
Angus Bagley	Senior Research Assistant/Analyst (from August 2023)
Ayomi Jayarathne	Senior Research Assistant
Chris Paxman	Research Assistant
Christina Carswell	Senior Research Technician
Daniel Barry	Senior Research Technician
Elizabeth Sadowy	Executive Assistant (from April 2024)
Emerson Aldridge	Senior Research Assistant/Analyst (from August 2023)
Gabriele Elisei	Scientific Research Team Leader
Geoff Eaglesham	Senior Analytical Chemist
Jessie Smith	Executive Assistant (to April 2024)
Julia Lin	Senior Research Analyst
Joseph Clokey	Senior Research Analyst (from May 2024)
Josh Tynan	Senior Project Officer (from January 2023)
Justine Haddrill	Workplace Health and Safety Coordinator and Laboratory Manager
Kirsten Marano	Senior Research Technician
Kristie Thompson	Senior Research Analyst
Lauren Gubbin	Centre Manager
Melissa Brinums	Research Manager (Operations)
Michael Gallen	Analytical Chemist
Nathan Charlton	Research Assistant
Pritesh Prasad	Research Analyst
Ryan Shiels	Research Analyst
Stephanie Hall	Senior Administration Officer
Summer Xia	Senior Research Technician
Tim Reeks	Analytical Chemist
Xuan Qu	Senior Research Technician
Yan Li	Senior Research Assistant

Honorary and adjunct staff

Staff Member	Affiliation	Appointmen
Amy Heffernan	Eurofins	Honorary
Andreas Sjödin	Centers for Disease Control and Prevention	Honorary
Andrew Banks	Queensland Racing Integrity Commission	Adjunct
Bastian Schulze	Landeskriminalamt (Lower Saxony State Criminal Police)	Adjunct
Beate Escher	Eberhard Karls University Tubingen	Honorary
Chang He	Guangdong University of Technology	Honorary
Christine Baduel	French Research Institute for Sustainable Development	Honorary
Christopher Higgins	Colorado School of Mines	Honorary
Clive Paige	Queensland Health	Adjunct
Daniel Drage	University of Birmingham	Honorary
Daniel Francis	Queensland Health	Adjunct
Darryl Hawker	Griffith University (Emeritus)	Honorary
Emma Knight	Norwegian Institute for Water Research	Adjunct
Foon Yin Lai	Swedish University of Agricultural Sciences	Honorary
Greg Jackson	Queensland Health	Adjunct
lan Hosegood	QANTAS	Adjunct
Jack Ng	The University of Queensland	Emeritus Professor
Janet Cumming	Queensland Health	Adjunct
Jennifer Bräunig	NSW Department of Planning, Industry and Environment	Adjunct
Jeremy Prichard	University of Tasmania	Honorary
John Corfield	Brisbane Airport Corporation	Adjunct
John Piispanen	Queensland Health	Adjunct
Karl Bowles	Jacobs	Adjunct
Katja Shimko	Biobot	Adjunct
Leisa-Maree Toms	QUT	Honorary
Linda Birnbaum	National Institute of Environmental Health Sciences	Honorary

Staff Member	Affiliation	Appointment
Maria Jose Gomez Ramos	Universidad de Almeria	Honorary
Matthew Taylor	NSW Department of Primary Industries Fisheries	Honorary
Michael Bartkow	Seqwater	Honorary
Michaela Lerch	Griffith University	Honorary
Munro Mortimer	Prior - Queensland Department of Environment and Resource Management (DERM)	Adjunct
Peter Hobson	Sullivan Nicolaides Pathology	Adjunct
Peter Vallely	Australian Criminal Intelligence Commission	Adjunct
Phil Choi	Queensland Health	Adjunct
Phong Vo	University of Technology Sydney	Honorary
Rizalyn Albarracin	Queensland Health	Adjunct
Saer Samanipour	University of Amsterdam	Honorary
Siobhan Rigby	Department of Environment and Science	Honorary
Sophie Dwyer	Prior - Queensland Health	Adjunct
Suzanne Huxley	Queensland Health	Adjunct
Thi Minh Hong Nguyen	Ramboll	Adjunct
Walter Vetter	University of Hohenheim	Honorary
Warish Ahmed	CSIRO	Honorary

Students – Higher Degrees by Research submitted or completed in 2023–24

Student	Advisory team	Торіс	Degree
Bastian Schulze	Sarit Kaserzon, Jochen Mueller, Kevin Thomas, External	Evaluation and Implementation of Methods to increase Comprehensiveness of Non-Target Analysis	PhD
Carla Magi-Prowse*	Kelly Fielding, External	Climate change coping and communication: Understanding how to increase engagement, efficacy, and pro-environmental behaviour	PhD
Hao Chang	Kelly Fielding	The Australian government's communication strategies for COVID-19 vaccination promotion on social media	PhD
Joseph Clokey	Sarit Kaserzon, Kevin Thomas, External	Improved monitoring of hydrophilic aquatic contaminants of emerging concern	PhD
KM Shahunja *	Abdullah Mamun, Peter Sly	Trajectories of asthma symptom and their associations with family, neighbourhood, and psychosocial environmental factors among children in Australia	PhD
Leah Clarke	Kevin Thomas, Jake O'Brien, Jianhua Guo, External	Characterisation of novel substances in wastewater that select for antimicrobial resistance	PhD
Linh Tran	Dung Phung	Working in hot weather: Health impacts and strategies for health promotion programs for rice farmers in Vietnam	PhD
Natascha Rossi	Gilda Carvalho, External	PFAS removal in water using advanced technologies	PhD
Xiongzhi Wang	Kelly Fielding, External	Owning nature: A communication frame to facilitate pro- environmental behaviours	PhD

* QAEHS scholarship holders

Students – Higher Degrees by Research continuing in 2023–24

Student	Advisory team	Торіс	Degree
Adebunmi Bojuwoye	Nicholas Osborne, External	Equitable access to vaccines, diagnostics and therapeutics for SARS-CoV-2 and other emerging or reemerging infectious diseases(erids) in low- and lower-middle income countries	PhD
Alexander Wang	Gilda Carvalho, External	Biological methods to identify and quantify PAO/GAO microorganisms and their activity in wastewater treatment	Masters
Amy Samson	Kelly Fielding, External	The untold story of Australian farming women, social media and climate change	PhD
Anh Kim Dang	Phong Thai, Dung Phung, External	The metabolic syndrome in relation to nutritional status among adults in Vietnam	PhD
Arzoo Dhankhar	Nicholas Osborne, External	Pollen and its contribution to respiratory outcomes in subtropical regions	PhD
Ava Disney	Kelly Fielding, External	Call me anything, just don't call me an Environmentalist	PhD
Belinda Moore	Ben Tscharke, Fisher Wang, Jiaying Li, External	An exploration of contaminants of emerging concern (CECs) in QLD wastewater	PhD
Carla Alongi	Jochen Mueller, External	Investigating the fate of Neonicotinoids in soil and runoff	PhD
Carly Beggs	Sarit Kaserzon, Kevin Thomas, Sara Ghorbani Gorji	Developing strategies to tackle pollution from per- and poly- fluorinated chemicals (PFAS) in the environment	PhD
Chantal Keane	Jochen Mueller, Jiaying Li	Characterisation of CECs: top-down and bottom-up approaches to a waste convergence story	PhD
Charlotte Pittaway	Kelly Fielding, External	The future under threat: Young adults and future orientation in times of climate uncertainty	PhD
Charlotte Wardby	Nicholas Osborne	Thunderstorm asthma, physics and climate	PhD
Cheng Tang	Fisher Wang, Jochen Mueller, Sarit Kaserzon, External	Chemical exposure through consuming food in multilayer plastic food package (MLPP) for infants	PhD
Chinonso Odebeatu	Nicholas Osborne, External	Impacts of land use on health: understanding landscape nexus with public health	PhD
Coral Jeffries	Kevin Thomas, Cassandra Rauert	Assessing dietary exposure to plastics and associated chemicals	PhD
David Sellars	Kylie Morphett, Coral Gartner, External	Regulating the design and construction of nicotine and tobacco products	PhD
Dhaya Nadarajan	Richard Bade, Jochen Mueller,	Facilitating the detection of new psychoactive substances in wastawater	PhD

Student	Advisory team	Торіс	Degree
Diana Garcia Sanchez	Nicholas Osborne, External	Epidemiology of atopy and inflammation in Paediatric Cohorts	PhD
Ellen Sursara	Kelly Fielding, External	How does social advantage or disadvantage influence capacity for environmental concern?	Masters
Emily McLeod	Kelly Fielding, External	Ethical wildlife tourism: creating positive experiences for people and wildlife	PhD
Eryn Wright *	Simon Reid, Russell Richards	Understanding human-bat interactions using systems dynamic modelling	PhD
Gabriel De la Torre Picho	Kevin Thomas, Cassandra Rauert, Elvis Okoffo	Assessing microplastic inputs from ships	PhD
Garth Campbell	Sarit Kaserzon, Kevin Thomas	Reducing exposure from high use practices	PhD
Giang Vu	Phong Thai, External	Determinants of alcohol drinking, and tobacco smoking, and e-cigarette vaping in Vietnamese young people and young Vietnamese migrant in Australia: implications for public health interventions and substance-use	PhD
Grechel Taucare	Jochen Mueller, Ben Tscharke, External	Data mining for characterisation of the chemical exposome in Australia	PhD
Hannah Van Dijken	Nick Osborne, Dung Phung, External	Biodiversity and immune health	PhD
Honglin Chen	Cassandra Rauert, Kevin Thomas	Human exposure and accumulation of plastics	PhD
Hongmin Wang	Gilda Carvalho, External	Sustainable and cost-effective biological phosphorus removal technology in urban water systems	PhD
Hung Trinh	Dung Phung, External	The cost-effectiveness of the E-Dengue, a decision support tool, in the Mekong Delta Region	PhD
Janquel Acevedo	Kelly Fielding, External	The psychology of gridlock: Compromise, coalitions and radicalisation	PhD
Jen Pett	Nicholas Osborne	Field epidemiology of CKD in Sri Lanka	PhD
Jiahui Li	Jianhua Guo, External	A unique and overlooked microbial process for scavenging two greenhouse gases	PhD
Jianan Ren	Phong Thai, Jochen Mueller, Jiaying Li, External	Assessing and modelling spatiotemporal trends in drug consumptions in the community by wastewater-based epidemiology	PhD
Jinghan Zhou	Jianhua Guo	Reduction of salmonella on raw chicken meat by bacteriophage cocktail and antimicrobial peptide treatment	Masters
Jinglong Li	Kevin Thomas, Jake O'Brien	Antibiotics and other chemicals that select for resistance in the environment	PhD
Jingyu Liu	Jack Ng, External	Occurrence and health risk assessment of arsenic and rare earth elements in the food chain	PhD
John Pearce	Kelly Fielding, External	Turning climate change into a success story	PhD
Joongcheon Nam	Phong Thai, External	Understanding the exposure and dissipation of recreational methamphetamine use in Australian residential properties	Masters
Jun Hui Yap	Jianhua Guo, External	Enrichment and understanding novel microorganisms enabling complete ammonification and ammonia oxidation	PhD
Kavitha Karanam	Kevin Thomas, Elvis Okoffo, External	Microplastics in water system: Issues and treatment	PhD
Kien Quoc Do	Dung Phung, External	Effectiveness of digital Dengue early warning system (E-DENGUE) for Dengue control in the Mekong Delta Region	PhD
Lachlan Chadwick	Sarit Kaserzon, Sara Ghorbani Gorji, Kevin Thomas	Emerging contaminants in Food Organics and Garden Organic (FOGO) materials	PhD
Laura Puente	Kevin Thomas, Cassandra Rauert	Determination of micro and nanoplastics in breast milk, blood and meconium samples from mothers-infants in Australia	PhD
Le Gao	Jianhua Guo, External	Emerging pollutants in spreading antimicrobial resistance in urban water ecosystems	PhD
Leonie Hodgers	Gilda Carvalho, External	Determining the level of treatment required to achieve safe levels of helminths in treated wastewater appropriate for irrigation	PhD
Liam O'Brien	Jake O'Brien, Kevin Thomas, External	Developing the framework for a national wastewater antimicrobial resistance and antimicrobial use surveillance method	PhD

Student	Advisory team	Торіс	Degree
Lijalem Tesfaw	Nicholas Osborne, External	Statistical modelling, epidemiology, and associated factors of the most prevalent non-communicable diseases in Africa	PhD
Lily Weir	Jochen Mueller, Sarit Kaserzon, External	Understanding the efficiency of regulating chemicals for controlling environmental and human exposure	PhD
Linjie Zhou	Jianhua Guo, External	Simultaneous biogas upgrading and biofuel production	PhD
Lu Zheng	Jianhua Guo, External	Simultaneous biogas upgrading and biofuel production	PhD
Ma. Katreena Que	Jochen Mueller, Fisher Wang	Understanding human exposure to benzotriazoles (BZTs) and benzotriazole UV-stabilizers (BUVs) in the Australian population using human biomonitoring and wastewater analysis	PhD
Marina Suzuki	Jochen Mueller, Fisher Wang	Chemicals contaminants in the brain (broadly) and links to neurological disease	PhD
Mathieu Feraud	Kevin Thomas, Jake O'Brien, Sarit Kaserzon. Pradeep Dewapriya, External	Comprehensive characterisation of the human PFAS exposome	PhD
Mehrnaz Safarniya Zidehi	Jianhua Guo, External	Sequestration of micropollutants in modified biochars by coupling adsorption and advanced oxidation/reduction processes	PhD
Min-Tz Weng	Qiuda Zheng, External	Beyond smoking and mum: Indigenous perOgestational tobacco and nicotine use, Ngabang (mother), Babun (father), Walbai (baby)	PhD
Mingyue Hu	Gilda Carvalho, External	Cost-effective and low-maintenance treatment of groundwater for safe drinking water production	PhD
Naixiang Zhai	Jake O'Brien, Kevin Thomas	Investigation of the inflammatory response of human cells to silica dust exposure	PhD
Nate George	Nicholas Osborne	Climate change in the Pacific	PhD
Ni Made Sri Suliartini	Gilda Carvalho, External	Development of a new electro-chemical technology to remove nitrate and heavy metals from groundwater for remote communities	PhD
Nicole Schroeter	Jochen Mueller, Jake O'Brien, Richard Bade	Understanding use and fate of ingredients in consumer products	PhD
Patrick Amoatey	Dung Phung, Nick Osborne, External	Investigating air pollutants emissions and health impacts of bush fires	PhD
Patrick Stewart	Nicholas Osborne	Post overdose driving on release from hospital	Masters
Pooja Lakhey	Jake O'Brien, Kevin Thomas, External	The suitability of wastewater-based epidemiology for AMR surveillance	PhD
Rachel Mackie	Sarit Kaserzon, Jochen Mueller, Sara Ghorbani Gorji, Kevin Thomas	Development of passive sampling methodologies for per- and polyfluoroalkyl substances	PhD
Ruochen Chao	Jianhua Guo, External	Characterization of metabolic potentials and pathways for the Feammox reaction	PhD
Ruvini Weerasinghe	Cassandra Rauert, Jake O'Brien, Kevin Thomas, Elvis Okoffo	Development of specialised hyphenated methodologies for quantifying new halogenated plastic materials	PhD
Shu Chen	Kelly Fielding, External	Communicating our way to successful koala conservation	PhD
Shuo Chen *	Jochen Mueller, Phong Thai, Ben Tscharke, Richard Bade, External	Bioaccumulation potential of chlorinated paraffins (CPs) in humans	PhD
Simran Kaur	Kevin Thomas, Cassandra Rauert	The fate of plastics in soils	PhD
Stacey O'Brien	Kevin Thomas, Jochen Mueller, Jake O'Brien, Sarit Kaserzon	Microplastic exposure	PhD
Suliasi Mekerusa Batikawai	Nicholas Osborne, External	Spatio-temporal analysis of Acute Watery Diarrhea and its association with meteorological factors and drinking water quality – A 7 year time series in the Central Division, Fiji	Masters
Tania Toapanta	Sarit Kaserzon, Kevin Thomas, Elvis Okoffo, External	Development of accurate quantitative methods for microplastics in the terrestrial and marine environments	PhD
Thi Thanh Thao Nguyen	Dung Phung, External	Forecasting models and early warning system for dengue prevention in Mekong Delta Region – Vietnam	PhD

Student	Advisory team	Торіс	Degree		
Tobias Hulleman	Jake O'Brien, Kevin Thomas, Elvis Okoffo, Cassandra Rauert, External	Non-targeted high-resolution mass spectrometric characterisation of highly mobile and highly persistent chemicals	PhD		
Thudawe Yohani Shavindi	Dung Phung, External	The effects of maternal exposure to heatwaves on adverse pregnancy and birth outcomes in Queensland	PhD		
Ulfah Najamuddin Ambo Rappe	Sara Ghorbani Gorji, External	Evaluation and development of rice bran based-protein protein product	PhD		
Vineetha Vincent	Nicholas Osborne, External	Heat events and health burden in the tropics under the global warning	PhD		
Wenzheng Li	Jianhua Guo, External	Novel membrane-aerated biofilm reactor to simultaneously remove nitrogen and emerging contaminates from wastewater	Masters		
Xiawei Liu	Jianhua Guo, External	Simultaneous removal of multiple oxidized contaminants using membrane-based membrane biofilm systems	PhD		
Xinyu Shi	Gilda Carvalho, External	A sustainable biological nutrient removal and recovery process for cost-effective wastewater treatment	PhD		
Yan Lu	Jianhua Guo, External	Simultaneous nitrogen removal and greenhouse gas (methane) mitigation from domestic sewage	PhD		
Yicheng Ma	Jianhua Guo, External	In-depth understanding of bioprocess and microbial community in a novel methane-based membrane biofilm reactor	PhD		
Yu Wang	Jianhua Guo, External	Microbial benchmarking at wastewater treatment plants	PhD		
Yuanyuan Kang	Jianhua Guo, External	The emergence and spread of antimicrobial resistance between bacteria and environments	PhD		
Yufei Pan	Cassandra Rauert, Kevin Thomas, External	Human exposure and fate of micro/nanoplastics	PhD		
Yujie Li	Jianhua Guo, Gilda Carvalho	Understanding roles of disinfection agents on the emergence and spread of antibiotic resistance	PhD		
Yuxin Hu	Jianhua Guo, External	Bioremediation of oxidized contaminants using natural gas in membrane biofilm reactors	PhD		
Yuya Cheng	Fisher Wang, Jochen Mueller, Ian Zammit	Human exposure pathways for plastic additives	PhD		
Zeyang Zhao	Phong Thai, Jake O'Brien, Qiuda Zheng	Assessment of biomarker transformation in the wastewater system	PhD		
Zhe Wang	Phong Thai, Jochen Mueller, Jake O'Brien, Kevin Thomas, Ben Tscharke	Estimating use of tobacco and nicotine products through wastewater analysis	PhD		
Zhuojing Yang	Pradeep Dewapriya, External	Highly efficient, selective and reusable technology for long-term implementation of PFAS capture	PhD		
Zicheng Su	Jianhua Guo, External	In-depth understanding of bioprocess and microbial community in a novel methane-based membrane biofilm reactor	PhD		
Zubaria Ishaq	Fisher Wang, Jochen Mueller, Phong Thai	Human exposure pathways for per- and polyfluoroalkyl substances (PFAS)	PhD		
Zuo Meng Gan	Gilda Carvalho, External	The development of process control strategies to optimise biological phosphorus removal and recovery	PhD		
' QAEHS scholarship holders					

Appendix B - Major partners and collaborators

Kevin Thomas

- Australian Criminal Intelligence Commission
- Deakin University
- DES (Qld)
- Griffith University
- Murdoch Children's Research Institute
- Minderoo Foundation
- Norwegian Institute for Water Research
- NeuRA
- University of Exeter
- SCIEX
- Shimadzu
- Frontier Labs
- Queensland Health
- QUT
- Sports Integrity Australia
- Stockholm University
- University of Tasmania
- University of Amsterdam
- Victoria Environment Protection Authority

Kelly Fielding

- Dr Kylie Morphett, UQ
- Dr Ans Vercammen
- Prof Jochen Mueller
- Dr Angela Dean
- Healthy Land and Water
- As part of the Connecting Climate Minds, Dr Ans Vercammen collaborated with the Wellcome Trust and a large number of academics and partner from the Oceania region including Australian Youth Climate Coalition, Lonely Conservationists, and the Pacific Islands Climate Action Network.

Jianhua Guo

- Queensland Health (Greg Jackson and Phil Choi)
- Urban Utilities
- Melbourne Water
- Seqwater
- MGI, Australia,
- Profs Scott Bell and Rachel Thomson, GMR/QIMR/Faculty of Medicine, UQ
- Dr Warish Ahmed, CSIRO Environment
- Dr Erica Donner, University of South Australia

Nicholas Osborne

67

- Indian Institute of Technology Delhi
- "Air Health", an Australia-wide service that will provide access to real time. location specific air quality information for the millions of Australians sensitive to air hazards such as pollen, pollution and bushfire smoke.

Queensland Alliance for Environmental Health Sciences | Annual report 2023-2024

Jochen Mueller

- Australian National University
- Airservices Australia
- Arcadis
- Australian Criminal Intelligence Commission
- · City of Gold Coast
- Colorado School of Mines
- CSIRO
- DAWE
- DESI (Qld)
- EPA Victoria
- Healthy Land and Water
- · Institute of the Ruhr-University Bochum (IPA)
- Jaume I University
- Massey University
- Melbourne Water Corp
- Minderoo Foundation
- PFAS Free Australia
- Qantas
- Queensland Health
- Queensland Urban Utilities
- QUT
- Queensland Water Directorate
- South East Water Corporation
- Stockholm University
- Sullivan Nicolaides Pathology
- · Townsville City Council
- · University of Amsterdam
- University of Antwerp
- · University of South Australia
- University of Sydney
- Victoria Environment Protection Authority
- Water Research Australia Ltd

Gilda Carvalho

- Segwater
- Queensland Health
- SAWater
- AnoxKaldnes

Phong Thai

- Arcadis/ExxonMobil
- ACIC
- · Australian Tax Office
- Qld Corrective Services
- MTK group (Methamphetamine testing and decontamination)

Dung Phung

- · National Institute of Hygiene and Epidemiology, Vietnam
- · Yale School of Public Health, Yale University, USA
- Pasteur Institute in Ho Chi Minh City, Vietnam
- Hanoi Medical University, Vietnam
- University of Medicine and Pharmacy in Ho Chi Minh City, Vietnam
- Southern Cross University, Australia
- Australian National University, Australia
- Tsukuba University, Japan
- Griffith University, Australia

Sarit Kaserzon

Seqwater

APCO

EPA Victoria

Candy Soil

Massey University

Food Packaging Forum

Veolia Water Australia Pty Ltd

• Dr Alberto Celma, SLU, Sweden

Dr Yong-Lai Feng, Health Canada

• Dr Ian Allan - NIVA, Norway

- Great Barrier Reef Marine Monitoring Program
- · Ministry of Environment Lands and Agricultural Developments, Kiribati
- Queensland Government Department of Environment, Science and Innovation (DESI)
- NSW Department of Planning, Industry and Environment (NSW DPIE)
- Great Barrier Reef Marine Park Authority

Australian Recycling Organics Association

• Dr A.Prof. Branislav Vrana - Recetox, Czech Republic

• Dr Prof Yolanda Pico - University of Vallencia, Spain

· Dr Prof Chris Higgins - Colorado School of Mines, USA

· Dr Maria Jose Gomez Ramos - University of Almeria, Spain

Appendix C - Community and professional activities

Kevin Thomas

- 2020 present: Editorial Board Member for Environmental Science and Technology Letters
- 2020 2023: Steering Group member EU Horizon 2020 project, Harmonization Assuring Reproducible Monitoring and Assessment of Plastic Pollution (EUROgCHARM)
- 2019 present: Member of Core Science Group, Global Panel on the Chemical Pollution of the Environment (gpcpe. org/)
- 2013 present: Associate Editor for Science of the Total Environment
- 2022-2023: Guest Editor for Environmental Sciences: Advances
- 2022 present: Member of the Boggo Road Collaboration Leadership Group

Kelly Fielding

- Part of the team delivering the information forum to participants involved in the "Assessing effectiveness of PFAS exposure control in individuals from exposed communities and occupationally exposed cohorts such as fire fighters" - December 2024
- Ongoing member of the Social Advisory Panel for Healthy Land and Water guiding the organisation's annual Social Monitoring survey.
- Organiser of the Network of Environmental Social Scientists at UQ
- Member of the UQ Mental Health in Climate Change Transdisciplinary Research Network.

Jianhua Guo

- 2021 present: Editor of Journal of Hazardous Materials
- 2020 present: Associate Editor of Water Research
- 2019 present: Edit of Water Science & Technology
- 2019 present: Deputy Director Research, ACWEB UQ
- Member of International Society of Microbial Ecology (ISME).
- Member of International Water Association (IWA)
- Member of Australian Water Association

Gilda Carvalho

- Member of the Organising Committee of the 10th IWA Microbial Ecology and Water Engineering Specialist Conference
- · Presented in an Engineers Without Borders event, and in the Major Night for Environmental Engineering that was organised by the student society ChESS.

Nicholas Osborne

- · The environmental epidemiology group has monthly meetings at UQ SPH and is open to all.
- Professional development training attending the UQ SPH master's course "Public Health in Pandemics".
- Dr Osborne was an invited speaker on "Hygiene as The Foundation for Healthier Business" at ISSA Melbourne, Nov 2023.

Dung Phung

- Dr Dung Phung led the SPH team to successfully conducted a global partnership workshop "Strategic Engagement Research Identification and Translation" with multiple organization partners in Hanoi, Vietnam, October 2023.
- Dr Dung led the UQ team to collaborate with the National Institute of Epidemiology and Hygiene (NIHE) to launch the E-Dengue project. The event was honoured by the executive leaders of Vietnam Ministry of Health, The Vice Chancellor and President of the UQ, and the representatives of the Australian Embassy, UK Embassy, WHO in Hanoi, Vietnam, October 2023.
- E-Dengue project team including Dr Dung Phung (PI) and Mr Quoc Do (PhD) were invited to join the panel discussion on the session "The Power of Health Innovation: Futureproofing infectious disease management" at Philanthropy Asia Summit in Singapore, April 2024
- Dr Dung Phung, on behalf of the FoM, joined UQ Info days in Hanoi and Ho Chi Minh City, Vietnam and gave a public talk "Public Health in the 21st Century: Lesson Learnt from the Pandemic", May 2024.
- Dr Dung Phung and Dr Nina Lansbury at the SPH are involved in setting the UQ-wider Climate Research Network led by Dr Justine Bell-James at the UQ TC Beime School of Law. The Climate Change and Health will be a key theme of this network.

Sarit Kaserzon

- 2023–2024 Guest Editor, special issue in Chemosphere. Development and applications of High-Resolution Mass Spectrometry (HRMS) for Chemicals of Concern
- 2022–2025 NORMAN network Joint Program of Activity, Co-Lead. Identification of PFAS in consumer products using HRMS.
- 2022–2024 QUEX Co-Theme lead, Global Environmental Futures.
- 2023–2025 International Passive Sampling Workshop -Scientific Committee Member

Appendix D - Research Publications

Book Chapters

Ng J.C. Campolina D. Gutiérrez-Aviña X. Islam M.N. and Ciminelli V.S.T. 2023. Urinary arsenic speciation in a Brazilian population serving as a baseline for future environmental biomonitoring studies. In Arsenic in the Environment: Bridging Science to Practice for Sustainable Development As2021 (pp. 246-247), CRC Press. Zheng, J., Noller, B.N., Huynh, T., Taga, R., Diacomanolis, V., Ng, J.C., Aitken, J. and Harris, H.H., 2024, Arsenic speciation in dust dispersion from mining to Mount Isa city. In Arsenic in the Environment: Bridging Science to Practice for Sustainable Development As2021 (pp. 148-149), CRC Press.

Schulze, B. and Kaserzon, S.L., 2024. Quality Assurance and Quality Control (QA/QC) for High-Resolution Mass Spectrometry (HRMS) Non-target Screening Methods. Rousis, N.I., Bade, R., Dewapriya, P., Li, J., Duan, H. and Thomaidis, N.S., 2024. Removal of emerging contaminants from wastewater by various treatment technologies in wastewater treatment plants. In Sustainable Technologies for Remediation of Emerging Pollutants from Aqueous Environment (pp. 389-409). Elsevier.

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Wu, J., Zhang, S., Chen, Y., Zhao, J., Prosun, T., O'Brien, J.W., Mueller, J.F., Tscharke, B.J., Coin, L.J., Luby, S.P. and Hai, F.I., 2023. Associations between Wastewater Microbiome and Population Smoking Rate Identified Using Wastewater-Based Epidemiology. Environment & Health.

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Bade, R., Huchthausen, J., Huber, C., Dewapriya, P., Tscharke, B., Verhagen, R., Puljevic, C., Escher, B. and O'Brien, J., 2023. Improving Wastewater-Based Epidemiology for New Psychoactive Substance Surveillance by Combining a High-Throughput In Vitro Metabolism Assay and LC- HRMS Metabolite Identification.

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Wang, Y., Ni, G., Tian, W., Wang, H., Li, J., Thai, P., Choi, P.M., Jackson, G., Hu, S., Yang, B. and Guo, J., 2023. Wastewater Tiling Amplicon Sequencing Reveals Longitudinal Dynamics of SARS-CoV-2 Variants Prevalence in the Community. medRxiv, pp.2023-10.

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