THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

Queensland Alliance for Environmental Health Sciences
Annual Report 2022–2023

Contents

01. Our Alliance with Queensland Health

Our research is guided by our vision to improve human health through environmental health science. Working in partnership with Queensland Health our mission is to address local, national, and global environmental health science challenges and achieve world-class outcomes in research, training, and partnership engagement, while meeting the needs of Queensland and the wider community.

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

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.

02.
Director's Report

I am pleased to share this year's Annual Report highlighting QAEHS' activities and achievements for the 2022-23 financial year.

Firstly, I am pleased to announce that Queensland Health have confirmed their commitment to a new term for the continuation of Queensland Alliance for Environmental Health Sciences (QAEHS) from 2023 to 2028.

This year saw the successful completion of the construction of the Australian Environmental Specimen Bank (AESB), the first and only national biobank in Australia designed for storage of both human and environmental samples. Funded by an ARC Linkage Infrastructure, Equipment and Facilities grant awarded to Prof Jochen Mueller, the AESB is a valuable resource that will play a pivotal role in our future research endeavours.

We were successfully awarded $11 million in new research funding from various sources this year, further strengthening our research capabilities and the breadth of our research programs. We have again exceeded our competitive grant leveraging target of 15% of Queensland Health's total investment in the centre – this year reaching 50% of Queensland Health's total investment between 2018-2023, converting to $11.3 million in research returns to the department.

I extend my congratulations to Dr Fisher Wang for being awarded the prestigious ARC DECRA (Discovery Early Career Researcher Award) fellowship. This recognition is a testament to Dr Wang's research capabilities and reflects the high calibre of talent within QAEHS.

We said goodbye to theme leaders A/Prof Abdullah Mamun and Emeritus Prof Jack Ng, and welcomed new theme leaders, A/Prof Sarit Kaserzon and A/Prof Phong Thai. We thank both Jack and Mamun for their contributions.

Our PhD cohort has continued to grow, adding another 10 students for a total active cohort of 48. It has been great to see the recommencement of in-person graduation ceremonies, and we were delighted to acknowledge and celebrate 8 PhD completions in 2022-23. This is an incredible achievement and testament to the hard work of our students and their supervisors. Our PhD students make an important contribution to QAEHS and form part of the contribution that the Centre is making to global future capacity in environmental health sciences. We feature two QAEHS alumni in this report providing insights into their post-PhD journeys. These success stories exemplify the career trajectories of our alumni and highlight the significance of our research training programs.

QAEHS Theme Leaders and researchers have demonstrated exceptional productivity, effectively overseeing their ongoing research programs, securing new projects, identifying emerging environmental science and human health issues and preparing grant applications to address these challenges. Furthermore, they have actively expanded their collaboration networks and sought out diverse funding opportunities, broadening and enriching their research programs.

This year, we have established formal strategic partnerships with two prominent analytical instrument suppliers, SCIEX and Shimadzu. Our collaboration has been longstanding, focused on joint research and development, as well as application of advanced analytical technologies. QAEHS and Queensland Health have joined forces as partners in the recently awarded ARC Training Centre for Hyphenated Analytical Separation Technologies (HyTECH), of which SCIEX and Shimadzu are also partners. These strategic partnerships hold great potential, particularly in advancing our research and development efforts and extending them to training the next generation of early career researchers.

Our involvement in events such as the World Science Festival and Pint of Science Festival enables us to reach a wider audience and ignite a passion for science in the community.

Finally, we launched a new YouTube playlist featuring a suite of videos on our research themes, an initiative that expands our reach and promotes knowledge dissemination.

QAEHS' work would not be possible without the active support of our team, our connections and collaborations with research institutes, universities, Queensland Health and wider industry partners. I express my thanks to our talented researchers, dedicated staff and valued stakeholders for their support and for their contribution to our activities and outcomes this year.

Professor Kevin Thomas, Director
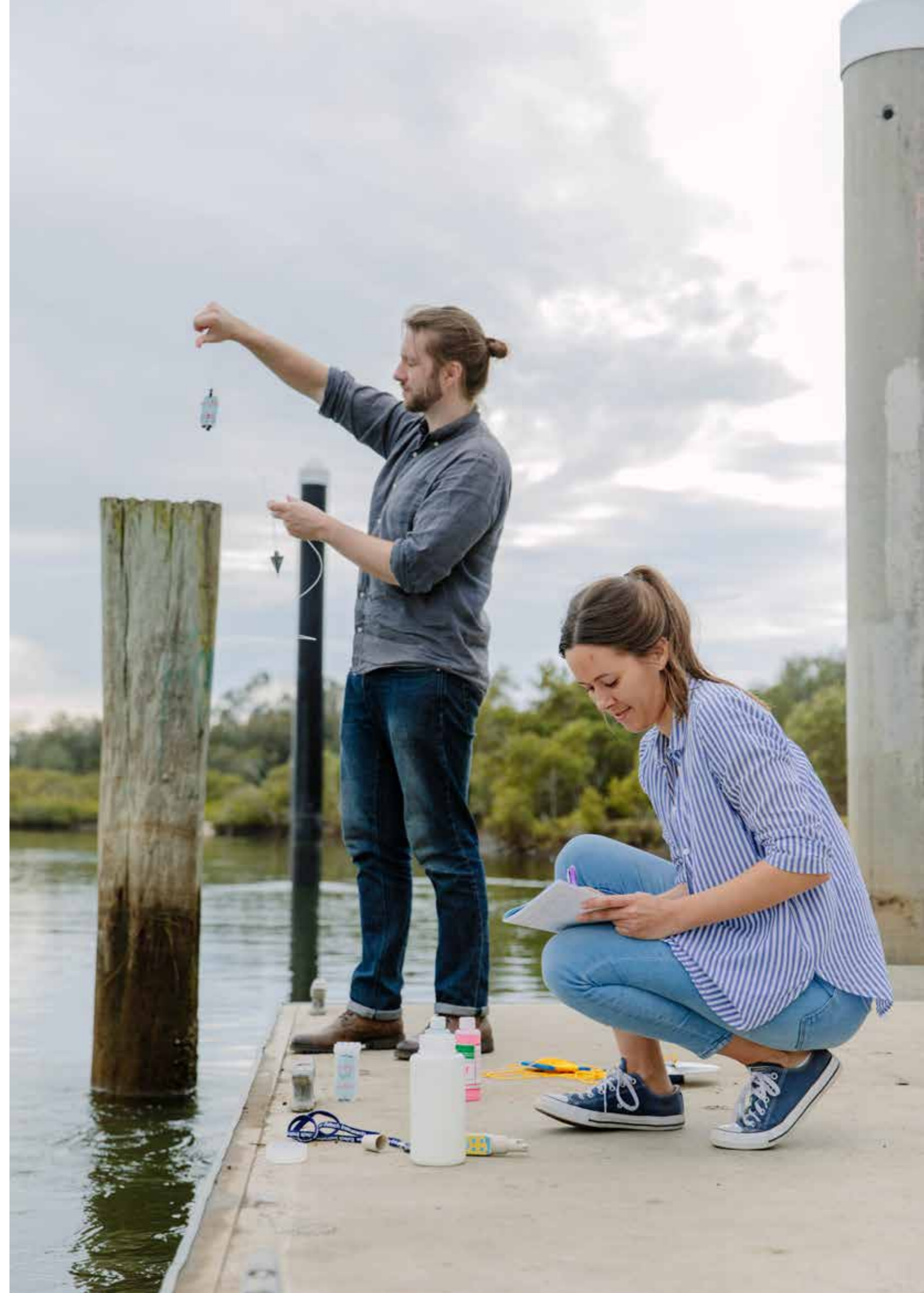
2022-2023 Snapshot

28 new grants/ projects

50% ARC success

1 new fellowship

7 years

154 projects

$18M ARC funding

$11 million new funding

- other grants 7%
- contract research 22%
- ARC 28%
- industry partner 3%
- NHMRC 4%
- philanthropic 36%

$74 million total 2016-23

- other grants 9%
- contract research 38%
- ARC 21%
- industry partner 8%
- NHMRC 14%
- philanthropic 10%
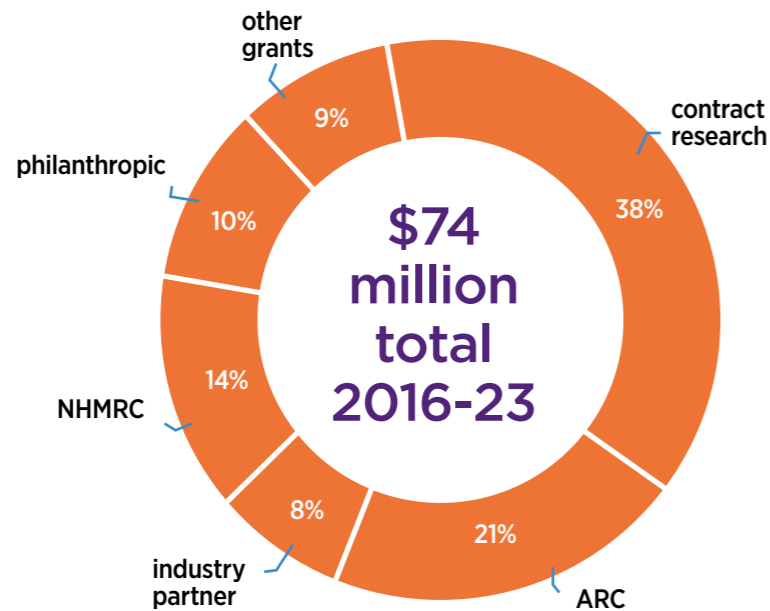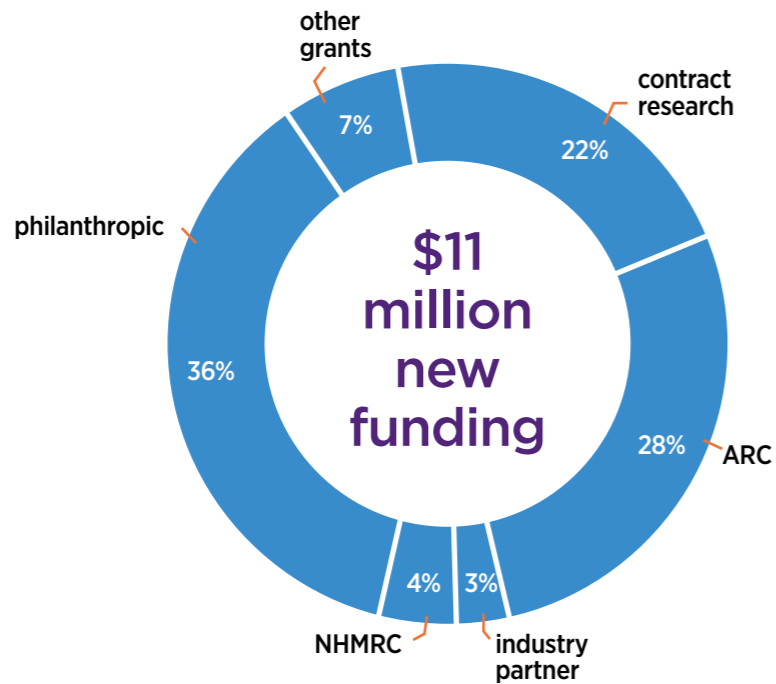
Meaningful COLLABORATIONS with national and international organisations

- **45** government & industry
- **48** research organisations

48 Higher Degree by Research Students

from **22** countries

9 PhD completions

156 Publications
87% in top quartile journals

9,966 Citations from 91 countries

Queensland Mass Spectrometry Symposium 2022 attendance
148 delegates

- Equipment/Supplier 1%
- Laboratory 14%
- Government 11%
- University/Research 74%

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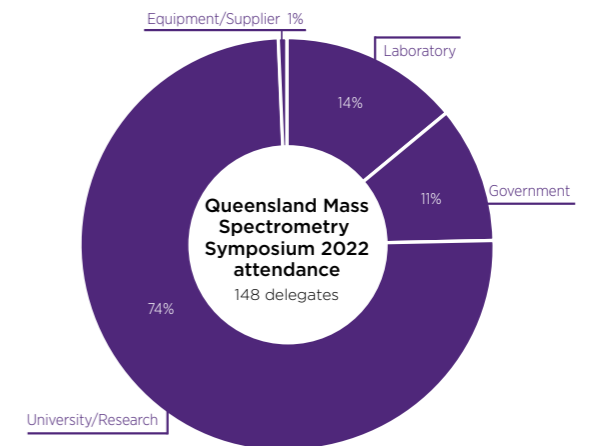
381 media mentions* potentially reaching **358M** people

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

website
6% increased unique visits
2021–22 2022–23

facebook
42% increased engagement
2021–22 2022–23

YouTube playlist and new content created
345 views

03. Performance Against Activities

Governance

Our Centre is governed by the Alliance Management Committee (AMC), responsible for the strategic direction and oversight of the centre's activities. 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 has one sub-committee, the Scientific Planning Committee (SPC), which provides advice and support to the Director and the AMC in ensuring that the Centre's research is coordinated, collaborative, relevant and complimentary across all research themes. The SPC comprises the Director, QAEHS theme leaders, and Queensland Health and University of Queensland research executives.

QAEHS operations are managed by the Director and a small administrative team and are supported by The University of Queensland.

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Scientific              Alliance
Planning   ————        Management
Committee               Committee


Theme                                    Centre
Leaders  - - -  Director  ————  Management
                                          Team
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ALLIANCE MANAGEMENT COMMITTEE

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

AMC YEAR IN REVIEW

The AMC met once during the reporting period on 29 November 2022. A meeting scheduled for 18 April 2023 was rescheduled to 15 July 2023 and will be appropriately included in the 2023-24 annual report.

The focus of the November 2022 meeting was mostly operational, with discussion around QAEHS themes and changes to theme leader roles. Specific attention and in-depth discussions were held regarding the future focus of research within the Environmental Health Risk Assessment theme due to theme leader Emeritus Prof Jack Ng, retiring in July 2022.

MEMBERS

Dr Jenny Stauber (Chair), Chief Research Scientist, CSIRO

Prof Bruce Abernethy, Executive Dean, Faculty of Health and Behavioural Sciences, University of Queensland
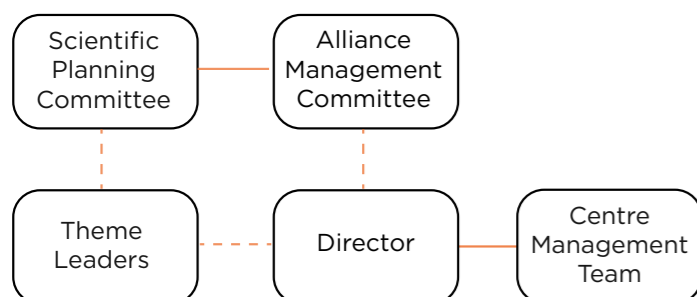
John Piispanen, Executive Director, Health Protection Branch, Queensland Health

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

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

Prof Kevin Thomas, Director, Queensland Alliance for Environmental Health Sciences

SCIENTIFIC PLANNING COMMITTEE

The Scientific Planning Committee (SPC) functions at an operational and strategic level to ensure that the Centre's research in environmental health is conducted in a coordinated fashion across our themes of research to meet the needs of all stakeholders, maximise quality and quantity of scientific outputs, and to promote industry and government linkages nationally and internationally. The Scientific Planning Committee includes stakeholders as members, to ensure collaboration and continued relevance to their current needs and challenges.

The aim of the SPC meetings is to facilitate a comprehensive understanding of the collective research efforts within QAEHS, to foster interdisciplinary connections across the themes and identify relevance and areas for future research. Meetings include discussions around current research, sharing of contributions to the field, and current and potential collaborations across themes and stakeholders.

SPC YEAR IN REVIEW

The SPC met on four occasions during the reporting period in September and November 2022 and February and June 2023. Focussed meeting topics this year included:

- Human Biomonitoring

- Future direction of the Environmental Health Risk Assessment theme

- Formation of Special Interest Groups

- Continuation of new term for QAEHS (2023-2028), Special Interest Group topic selection and QAEHS' research program and its future direction.

MEMBERS

Prof Kevin Thomas, Director
Queensland Alliance for Environmental Health Sciences

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

Dr Greg Jackson, Director, Water Unit
Queensland Health

Dr Claire Heney, A/Executive Director
Queensland Health Forensic and Scientific Services

Dr Gilda Carvalho, Theme Leader
University of Queensland

Prof Jianhua Gao, Theme Leader
University of Queensland

Prof Jochen Mueller, Theme Leader
University of Queensland

Prof Kelly Fielding, Theme Leader
University of Queensland

A/Prof Nick Osborne, Theme Leader
University of Queensland

A/Prof Sarit Kaserzon, Theme Leader
University of Queensland

A/Prof Phong Thai, Theme Leader
University of Queensland

Dr Dung Phung, Theme Leader
University of Queensland

INVITEES

Janet Cumming, Queensland Health Buddy
Queensland Health

Daniel Francis, Queensland Health Buddy
Queensland Health

Suzanne Huxley, Queensland Health Buddy
Queensland Health

Clive Paige, Queensland Health Buddy
Queensland Health

Uma Rajappa, Queensland Health Buddy
Queensland Health

Rebecca Richardson, Queensland Health Buddy
Queensland Health

The 2022-23 performance towards deliverables defined in the 2018–2023 Queensland Health contract are individually addressed in the subsequent sections of this report.

Strategic direction

QAEHS collaborates broadly with government policy makers, regulators and clients, industry practitioners and other research experts to address local, national, and global environmental health science challenges. Through our research and education themes, we had continued to deliver first class outcomes in research, training, and partnership engagement, providing social and economic benefit to Queensland and the wider community.

Our focus is to maintain delivery of a high quality and dynamic program of interdisciplinary research that solves current and emerging global environmental health challenges, an education and training program that builds national capability, and provision of science-based knowledge that leads to policies aimed at improving health outcomes.

The Centre's strategic direction was updated and endorsed by the AMC in May 2022. During this reporting period, significant progress has been made in advancing our efforts towards achieving the key goals outlined in the strategic plan and evidenced throughout this report.

Looking ahead

- Queensland Health have renewed QAEHS funding for a new term, 2023-2028.
- Develop a 2023-2028 strategic plan.
- Review and refresh research program and research topics aligned to Queensland Health's current and emerging priorities.
- Identify and explore new and creative strategies for deeper engagement with Queensland Health stakeholders.

KEY GOALS

Research
Regularly refresh and re-focus research theme priorities to achieve cross-theme collaboration, translation, and uptake of QAEHS research into Queensland Health operational activities
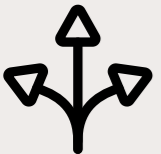
Value
Continue to diversify income streams to enhance the value of research return to Queensland Health

People
Foster, mentor and develop the next generation of key early and mid-career researchers in environmental health sciences

Education
Promote the Master of Environmental Health Sciences Program with increased flow of research project students through QAEHS and maximise our efforts to attract exceptional domestic and international PhD students

Communication
Deliver effective mechanisms of communications and engagement to ensure widespread promotion of the Centre's activities

Our 2022-23 achievements in meeting the ongoing strategic goals and objectives of the Centre are summarised in the table below.

ACHIEVEMENTS AGAINST STRATEGIC PLAN

Strategic Goal	Objectives	Measures of Success	Achievements 2022-23
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 of $3M ARC, $500k NHMRC, and $2.3M in contract research • 156 peer reviewed publications • 49 conference presentations • Eight 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	• Masters of Environmental Health Sciences has maintained its ranking as number 2 in Australia for public health (Global Ranking of Academic Subjects 2022). There was a small ranking shift from number 19 in 2022 to 20 in 2023 in the world for environmental sciences (QS World University Rankings 2023). • Maintained steady student enrolments, with 34 students enrolled in 2022-23, up from 33 students in 2021-22. • QAEHS student numbers: 47 PhD and 1 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 156 reported research publications, 126 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	• QAEHS continued to manage the SARS-CoV-2 Wastewater Surveillance program which provided data analysis and advice to Queensland Health, contributing to the department's comprehensive response to the COVID-19 pandemic • Scientific Planning Committee meetings involve all theme leaders and focus on promoting multidisciplinary research across the themes. Queensland Health buddies are invited to SPC meetings to ensure targeted research topics, knowledge sharing and outcome translation for policy development.

Research themes

QAEHS' research program centres around seven integrated research themes and an education and professional development theme that spans all seven research themes.

Development of our focused research activities is shaped by Queensland Health's needs and is refreshed regularly through continuous and collaborative dialogue to ensure the centre's activities are aligned with the department's current challenges.

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.

ENVIRONMENTAL HEALTH RISK COMMUNICATION

Prof Kelly Fielding
Theme Leader

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

ENVIRONMENTAL HEALTH MICROBIOLOGY

Prof Jianhua Guo,
Dr Gilda Carvalho
Theme Leaders

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

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.

CLIMATE CHANGE & 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 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 RISK ASSESSMENT

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

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

EDUCATION & PROFESSIONAL DEVELOPMENT

Led by QAEHS management

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

Research activities

The following research highlights are presented for the year outlining key activities that have taken place in 2022–23, theme leaders working in each space and numbers of research fellows and students, key funding sources including awarded, submitted, and planned future research applications and those supported by Queensland Health leveraging investment.

Wastewater surveillance for chemical and biological hazards

KEY RESEARCH ACTIVITIES

The Queensland Alliance for Environmental Health Sciences (QAEHS) is at the forefront of wastewater surveillance research, utilising innovative methods to analyse systematically collected wastewater samples for the presence of various substances, including chemical and biological hazards. Through the various ongoing projects described here, this research provides valuable insights into public health trends, helps identify emerging issues, and informs evidence-based strategies for environmental and public health management. The research program continues to be incredibly productive in 2022-2023.

The team working on the ARC Linkage Project *Understanding Australia by analysing wastewater during the Census 2021 (SewAus)* is continuing to make progress towards the project's objectives to link exposure to chemical and biological hazards with socio-demographic data via systematic wastewater analysis. They are currently preparing for the 2023 sample collection, with 118 sites across Australia recruited to provide daily samples over a 1-week period. Samples have been collected annually since the first SewAus project in 2016, providing important longitudinal data that can be linked with socio-economic data through the Australian Census. 2021 Australian Census data has recently been released and the team are now using that data to identify catchments with the greatest temporal change in population distribution and/or socioeconomics to help identify factors influencing changes in exposures. Several papers have been published in the reporting period that reveal interesting links between socioeconomic factors, various health conditions, prescription drug consumption, and/or chemical exposure.

In 2022-2023, QAEHS has continued to lead the Australian Criminal Intelligence Commission's *National Wastewater Drug Monitoring Program (NWDMP)* in partnership with University of South Australia. The NWDMP is a comprehensive initiative that monitors drug use in Australia at a population level by analysing wastewater samples from various locations across Australia, covering approximately 57% of the Australian population. The program continues to provide valuable insights into drug consumption patterns and trends across the country, helping inform policy development and targeted interventions to address drug-related issues. Reports 17 and 18 were released in the reporting period. In addition to the NWDMP, QAEHS is also conducting short periods of higher frequency sampling at a few sites of interest to the Australian Criminal Intelligence Commission.

QAEHS has been working to develop new methods and discover new biomarkers to monitor both licit and illicit drug use through wastewater. In 2022-2023, Postdoctoral Research Fellow Dr Qiuda Zheng and team evaluated the use of anabasine and anatabine as biomarkers for monitoring tobacco use in wastewater and found that anabasine performed better as a biomarker, with similar per capita loads in urine and wastewater samples. Dr Zheng is now working on developing a method for vaping biomarkers. These new methods can be used as part of monitoring programs to inform government policies and interventions around smoking and vaping, and wastewater approaches can also be used as a complementary method to help track illicit tobacco sales in Australia.

In 2022, Dr Katja Shimko submitted her PhD thesis on an evaluation of the suitability of wastewater analysis for the detection and monitoring of performance- and image-enhancing drug (PIED) use, with the support and collaboration of Sport Integrity Australia and the Australian Sports Drug Testing Laboratory. In a world-first, Dr Shimko's PhD research aimed to identify biomarkers, develop analytical methods, and investigate the temporal and spatial trends of PIED use in the Australian community. She measured wastewater samples from 51 Australian communities and found PIED use in 96% of these communities. The study found that larger catchments showed a larger number of different PIEDs and that nonsteroidal PIEDs were emerging in the population, with concentrations increasing after their first detection. The research provides insights into PIED use that are being used by Sport Integrity Australia to inform them as to where they might need to focus their anti-doping activities, and it further highlights the potential of wastewater analysis for monitoring and understanding drug trends in the community. Post-PhD Dr Shimko is continuing to monitor the testing pool for trends and the team are looking to use the method for site specific collections, such as sporting grounds and Games villages. Dr Shimko's research has been featured in Sport Integrity Matters.

Dr Richard Bade's ARC Discovery Early Career Research Award (DECRA) Fellowship aims to develop and apply novel analytical methods for detecting new psychoactive substances (NPS) in wastewater. NPS are a complex addition to the international drug problem. They are intentionally developed to circumvent legislation and have been marketed as 'legal highs', thereby intimating they are safe alternatives to drugs such as ecstasy, methamphetamine, cocaine, and cannabis. Little or no toxicity information is available for these substances, and (co)-ingestion of these compounds has led to hospitalisation and fatalities. Over the past two years of the fellowship, Dr Bade has led an annual international sampling program with samples from more than 50 sites across 20 countries to identify trends in NPS use over the new year period. In collaboration with Helmholtz Centre for Environmental Research (UFZ), Germany, Dr Bade and the team at QAEHS are also working towards identifying unique metabolites of several new psychoactive substances. In September, Julia Huchthausen (UFZ) visited QAEHS, bringing her expertise in S9 incubation to simulate in vitro metabolism to help establish a method at QAEHS, which was applied to 11 NPSs, allowing for the identification of 17 metabolites.

A key application of QAEHS's extensive wastewater surveillance and sample archiving programs is the ability to assess the impact of events or interventions on exposures, particularly when there is a limited window of opportunity to collect samples. Over the past 12 months, QAEHS has published several papers showing how specific events (e.g., COVID-19 lockdowns) and interventions (e.g., rescheduling of codeine-containing medications) have impacted drug and alcohol consumption in Australia.

Wastewater surveillance has also been an important tool to government health departments for tracking the spread of COVID-19, including tracking SARS-CoV-2 variants. One collaborative study with CSIRO and Qantas investigated the use of wastewater surveillance from repatriation flights as an additional tool to complement individual clinical testing for COVID-19. Wastewater samples from 37 long-haul flights carrying repatriated Australians were tested for the presence of SARS-CoV-2 RNA. Despite all passengers testing negative before departure and undergoing a 14-day quarantine upon arrival, wastewater from 64.9% of the flights tested positive for SARS-CoV-2 RNA. The study found that wastewater surveillance had a high positive predictive value (87.5%) and accuracy (83.7%) in detecting COVID-19 cases during the post-arrival quarantine period. This highlights the potential of wastewater surveillance as an effective method for monitoring the importation of the virus and informing the management of returning travellers. In 2023, QAEHS continued to support Queensland Health's SARS-CoV-2 wastewater surveillance program.

STAFF & STUDENTS

Theme Leaders: Mueller, Thomas, Thai, Carvalho, Guo

8 Research Fellows, 9 PhD students

KEY FUNDING & PLANNED SUBMISSIONS

Current:
*ARC Linkage Project (Mueller, O'Brien, Tscharke, Thai, Kaserzon, Carvalho)
*ARC Linkage Project (Thai, Tscharke)
*ARC Linkage Project (Thomas, Thai)
ARC Discovery Project (O'Brien)
ARC Discovery Project (Mueller, Thomas)
ARC Discovery Project (Thai, O'Brien)
ACIC (NWDMP) (Mueller, Tscharke, O'Brien, Thomas)
ACIC (Tscharke, Mueller, Thai, O'Brien, Verhagen)
ACIC (Thomas, O'Brien, Shimko, Mueller)
QH (COVID-19) (Mueller, Thomas)
EU H2020 Marie-Curie Fellowship (Rousis, Thomas)
Sport Integrity Australia (Thomas, Shimko)
UQ HaBS (x3) (Li)
Massey University (Mueller)
ARC DECRA (Bade)
NHMRC Investigator Grant (O'Brien)
UA-DAAD (Bade, O'Brien, Dewapriya, Tscharke)

Submitted:
ARC Discovery Project (Thai, Tscharke)
ARC Discovery Project (Bade, Mueller, Tscharke)
ARC Future Fellowship (Thai)
ARC Discovery Project (Li, Zheng)
UQ Foundation Research Excellence Award (Bade)

Planned:
ARC DECRA (Zheng)
ARC DECRA (Okoffo)
ARC DECRA (Li)
ARC Linkage Project (Mueller, Tscharke, Bade)
ARC Linkage Project (Thomas, Shimko)
ARC Industrial Transformation Training Centre (Thomas)
ARC Early Career Industry Fellowship (Li)
NHMRC Investigator (Bade)

*QH leveraging funds

Human biomonitoring

KEY RESEARCH ACTIVITIES

Under Prof Jochen Mueller's leadership, a new direction that QAEHS are excited to be taking is linking our wastewater program with the human biomonitoring program. Wastewater-based exposure monitoring is limited to chemicals that are resistant to biological degradation (i.e., they don't break down in sewers) and/or contribution from sources other than human excretion (i.e., domestic and industrial input of biomarkers for plastic additives). On the other hand, pooling of stratified surplus pathology samples is limited to sample numbers and representativeness of samples (i.e., potential over representation of medication use and underrepresentation of drug users). Combining the approaches provides entirely new insights.

This has become the focus of recently recruited postdoctoral research fellow Dr Thi Minh Hong (Rose) Nguyen's research. This year, Dr Nguyen has been working on monitoring various exposures (including licit and illicit drugs, pesticides, personal care products, and PFAS) in human urine samples collected from across Australia over the period 2012-2023 and linking findings with QAEHS's well established wastewater program data to examine whether human biomonitoring is an effective complementary tool for exposure monitoring. So far, she has found that human biomonitoring can provide new information beyond the scope of wastewater data, such as how exposures may vary as a function of age and gender. For example, the human biomonitoring data has revealed that males aged 30-45 are exposed to smoking-related chemicals at higher levels than women of the same age. These new insights can be helpful for informing targeted intervention strategies.

With our ongoing collaboration with Sullivan Nicolaides Pathology, we have continued to expand our archive of pooled human blood and urine samples in the Australian Environmental Specimen Bank, which enables us to establish spatiotemporal trends in exposure to known chemicals and can also be used to assess intervention efficacy. For example, we have identified the emergence of bisphenol S (BPS) exposures and reductions in exposure to bisphenol A (BPA), triclosan, and triclocarban. It is also noteworthy that persistent organic pollutants (POPs) like PFAS and others are decreasing, confirming previous knowledge in this area.

As part of a collaborative ARC Linkage Project involving Queensland Health, the Department of Transport and Main Roads, Massey University, James Cook University, the Australian Catholic University and 3M, A/Prof Sarit Kaserzon and her team are focused on gaining a comprehensive understanding of exposure pathways for high-use chemicals, with a particular emphasis on glyphosate. The primary objective is to develop effective mitigation strategies to reduce associated risks.

Glyphosate, commercially known as "Round-Up", is the most widely used herbicide in Australia and worldwide, deployed for weed control in agriculture, forestry, park maintenance, and even home gardening. However, the widespread use of glyphosate has raised public concern owing to potential adverse health effects from exposure.

This project will be the first study in Australia (and only the second internationally) to systematically examine occupational exposure to glyphosate. The research approach involves evaluating biomonitoring data collected from urine, dermal swabs, and hair samples, alongside an assessment of glyphosate spraying methods and use of personal protective equipment.

Preliminary findings have already garnered attention and coverage in various news outlets in Australia and internationally.

Dr Xianyu (Fisher) Wang also has an ongoing collaboration with Massey University, New Zealand, investigating occupational pesticide exposure of New Zealand farmers. They are looking at exposures captured by both dermal patches and urine samples. So far, the team have found that exposures identified by the patches align with farmers' self-report of the types of pesticide(s) they are using, showing that patches can be used as a valid measure of pesticide exposure to the skin. The team are now analysing urine samples for biomarkers of exposure and expect that higher levels of exposure as identified by the patches should correlate with higher levels of exposure biomarkers in urine.

Another of Dr Wang's studies looks at firefighters' occupational exposure to polycyclic aromatic hydrocarbons (PAHs), which are organic compounds that are produced by the incomplete combustion of organic matter, such as during forest fires. Collaborating with Massey University in New Zealand and Portuguese Research Centre for Sustainable Chemistry LAQC-Associated Laboratory for Green Chemistry, Dr Wang and his PhD student Michelle Engelsman are analysing urine samples from Australian, New Zealand, and Portuguese firefighters for biomarkers of exposure to fire-related emissions to assess how long exposure lasts. The team were part of a grant application to the U.S. National Institution of Health for funding to support further research into the public health effects of wildfire smoke. In related work with firefighters, the team have published a paper on an exploratory analysis of firefighter reproduction through survey data and biomonitoring showing risk factors of occupational chemical exposure on reproduction and fertility.

This past year, Dr Wang was awarded a prestigious ARC Discovery Early Career Research Award (DECRA) to support his research aiming to establish a national indoor air monitoring program to identify hazardous chemicals and their sources and trends under a changing climate. Dr Wang has also been part of a successful EU Horizon Europe application, along with Prof Kevin Thomas, Prof Jochen Mueller, and Dr Cassie Rauert, to fund an international collaborative effort to assess indoor environmental quality, factors influencing human exposure, and impacts on human health. The Australian component is funded by a 5-year NHMRC-EU grant.

Finally, Dr Wang's PhD student Cheng (Ken) Tang has been assessing chemical exposure through consuming food packaged into multilayer plastic food packaging, such as baby food and yoghurt pouches. They have identified a number of non-intentionally added substances in simulant food and the next step for this research is analysing food for the identified chemicals.

KEY FUNDING & PLANNED SUBMISSIONS

Current:
ARC Laureate Fellowship (Mueller)
ARC Discovery (Thomas)
ARC Discovery (Mueller, Thomas)
NHMRC Project (Mueller)
NHMRC-EU Collaborative grant (x2) (Mueller, Thomas, Wang, Rauert)
NHMRC-NAFOSTED Collaborative (Thai)
Minderoo Foundation (Thomas, Mueller)
Commonwealth government (Mueller)
*ARC LIEF (Mueller)
*ARC Linkage (Kaserzon)
AXA Fellowship (He)
ARC DECRA (Wang)

Submitted:
ARC Discovery (Rauert, Thomas)
NIH (Wang)

Planned:
U.S. Department of Defense CDMRP (Kaserzon)

*QH leveraging funds

STAFF & STUDENTS

Theme Leaders: Mueller, Thomas, Kaserzon

5 Research Fellows, 13 PhD students

Per- and poly-fluoroalkyl substances (PFAS)

Image courtesy of SERDP/ESCTP

KEY RESEARCH ACTIVITIES

With significant funding from various sources, including ARC and NHMRC initiatives, as well as collaborations with industry partners and government agencies, QAEHS is at the forefront of investigating PFAS exposure science and communication. Our research program spans a wide range of areas, such as serum concentration assessments, exposure pathway characterisation, effectiveness of exposure control, development of passive sampling tools, discovery of novel PFAS, assessment of remediation technologies, and risk communication strategies. With a multidisciplinary approach and numerous ongoing projects, QAEHS continues to contribute valuable knowledge and insights into the complex challenges posed by PFAS contamination.

The ARC Special Research Initiative for PFAS remediation led by Prof Jochen Mueller, *Remediation of PFAS contaminated soil using a soil washing treatment train*, was finalised in early 2023. The project considered several PFAS technologies combined in a treatment train – soil washing and immobilisation. Soil washing is performed in a treatment process that receives the contaminated soil following excavation and applies a wash solution to the soil that removes PFAS from the soil matrix. Immobilisation involves adding amendments to the soil to bind PFAS within the soil matrix and prevent it from leaching into surface water and groundwater. The project has, to date, provided a scientific basis for understanding the benefits and limitations associated with the soil washing technology, the immobilisation techniques, and an understanding of the biotransformation potential of PFAS from precursors remaining in the remediated soil. So far, five papers have been published from this project, with another three in preparation. Dr Thi Minh Hong (Rose) Nguyen was awarded her PhD in 2023 from her work on this project.

A project funded by the NHMRC, under the leadership of Prof Jochen Mueller, aims to assess serum concentrations of PFAS in individuals previously identified as having elevated levels. The primary objectives include investigating the effectiveness of exposure control measures and identifying factors contributing to the successful reduction of PFAS exposure. Additionally, the study seeks to evaluate historical temporal trends of PFAS serum concentrations in individuals with background PFAS exposure before the 2000s.

To achieve these objectives, participants from the PFAS Health Study of Airservices exposure studies were recruited. They filled out questionnaires and provided blood samples over the past two years for PFAS and health biomarker analysis. The study successfully obtained blood samples from approximately 300 community members and 500 firefighters. An overall decrease in PFAS blood concentration has been observed in these participants compared to the initial samples collected during the PFAS Health Study or Airservices exposure studies.

Over the remaining 2 years of the project, the research team expects to identify factors associated with PFAS trends in exposed individuals and develop a model for estimating individual PFAS exposure levels. Furthermore, the team plans to investigate the relationship between changes in PFAS serum concentrations and health biomarkers.

Prof Kelly Fielding has played a significant role in optimising participant recruitment and providing risk communication advice related to reporting project results to the participants.

Risk communication is an important element in the NHMRC TCR PFAS and Health grants. Prof Kelly Fielding was interviewed this year by ABC in relation to PFAS in Katherine.

Dr Kylie Morphett has been preparing a research paper based on previous collaborative work with Prof Kelly Fielding. The forthcoming publication is titled: Does information source and level of scientific uncertainty influence concern about emerging contaminants? The case of PFAS in Australia.

In addition, work is underway on a cross-country analysis and comparison fact sheet about PFAS. This analysis is collecting data on the content, format, and quantitative and qualitative risk messages about PFAS (data analysis currently being finalised). Work is about to begin on a study looking at knowledge and beliefs about PFAS exposure pathways amongst those at risk of higher levels of exposure (ethics application approved, interviews about to begin).

Dr Xianyu Wang's NHMRC Targeted Calls for Research project aims to characterise the PFAS exposure pathways of air inhalation, dust ingestion, and dermal contact for exposed cohorts and evaluate the role of precursor exposure and biotransformation as a source for body burden of PFAS. Over the past 12 months, the team have been busy with sample collection and have also developed a new design for the passive air sampling device. At the time of writing, many QAEHS staff and students have samplers set up in their homes to collect information about baseline exposures.

QAEHS currently has three PFAS projects funded by the U.S. Department of Defense, with a further two applications under assessment.

A Strategic Environmental Research and Development Program (SERDP) grant led by A/Prof Sarit Kaserzon aims to develop and validate a robust, modular suite of quantitative passive sampling tools for a range of PFAS. Approaching its final year, the monitoring tools developed from this grant have been calibrated and validated at a range of Australian Defence and U.S. Defense sites and applied to surface, ground, and wastewater matrices. The tools have proven extremely sensitive and effective in sampling a wide range of PFAS with work continuing to better characterise additional PFAS of concern, to inform the environmental risk profiles from PFAS at Australian sites, and to inform PFAS remediation efforts.

Prof Jochen Mueller and A/Prof Phong Thai are collaborating with Arcadis on a newly awarded U.S. Department of Defense Environmental Security Technology Certification Program (ESTCP) grant to investigate management and mitigation of PFAS leaching from concrete. The team have also just received notice of a successful outcome on a SERDP application looking at leaching of PFAS from aqueous film forming foam (AFFF)-impacted construction materials in collaboration with Colorado School of Mines.

The historical use of PFAS at firefighting training grounds has resulted in the retention of PFAS within concrete, leading to subsequent releases to the environment. Arcadis has subcontracted QAEHS to conduct research aimed at gaining a better understanding of PFAS release from concrete cores collected from an old firefighting training site. The research approach involved assessing the vertical profile of concrete cores, followed by conducting surface ponding and rainfall simulations on them. Among the PFAS compounds analysed, perfluorooctane sulfonate (PFOS) exhibited the highest concentrations in the cores and in the ponded water on their surface, followed by 6:2 fluorotelomer sulfonate (6:2 FTS) and perfluorohexane sulfonate (PFHxS). The runoff water from five rainfall simulations displayed similar maximum PFAS concentrations, indicating a recurring release of PFAS from the concrete impacted by AFFF. This ongoing release may be sustained by the upward transport of PFAS in the concrete's subsurface layers, potentially driven by a "wicking" effect. To date, three journal articles have been published based on this research, and the collaboration has led to the recent successful ESTCP and SERDP grants described above.

Dr Pradeep Shukla's Advance Queensland Industry Research Fellowship, focused on developing a technology for treatment of PFAS contaminated fluids, was finalised in this reporting period. The fellowship led to the development of two technologies. The first technology is a Counter-Current Foam-Fractionation process that separates PFAS from water, while producing a small reject stream that is just 0.001% to 0.0005% of the treated liquid. The second technology is a Steam Plasma process that provides >99.9% destruction of the reject stream. Both technologies are now being offered as commercial processes in Australia and USA.

Dr Shukla, Prof Jochen Mueller, A/Prof Phong Thai and collaborators have also been contracted in 2022-2023 by the Commonwealth Government for provision of monitoring and reviewing peer reviewed literature on evolving and emerging PFAS remediation and destruction technologies and evaluating the effectiveness, benefits, financial viability, feasibility to upscale technologies within a 5–10-year time frame, and social acceptability of each solution.

Following on from the success of Dr Emma Knight's UQ Knowledge Exchange and Translation Fund Award looking at the leachability of PFAS and their precursors into food from compostable food contact materials, the team including Dr Knight, A/Prof Sarit Kaserzon, and Dr Wang and in collaboration with Queensland Health and Queensland Department of Environment and Science were awarded an ARC Linkage Project application investigating the chemicals (including PFAS) present in food contact products available in Australia and how they persist in the recycling and compost reuse streams.

They have also been contracted by the Department of Environment and Science to conduct sampling and analysis of organics collection services (Food Organics Garden Organics; FOGO) to better understand the prevalence of contaminants, particularly PFAS in both the potential input materials and the finished product from these services. The results of this study are expected to contribute to national guidelines for sampling and analysis of PFAS in FOGO and inform state-wide and national policy to derive guideline values for PFAS concentrations in FOGO.

KEY FUNDING & PLANNED SUBMISSIONS

Current:
*ARC Special Research Initiatives (x2) (Mueller)
*ARC Special Research Initiatives (Thomas)
ARC Special Research Initiatives (Carvalho)
*ARC Linkage Project (Knight, Kaserzon, Wang)
ARC Linkage Project (Dewapriya)
NHMRC Targeted Call for Research (Mueller, Fielding)
NHMRC Targeted Call for Research (Thomas)
NHMRC Targeted Call for Research (Thomas, Kaserzon, Mueller)
NHMRC Targeted Call for Research (Wang, Thai, He, Mueller, Thomas)
Advance Qld Industry Research Fellowship (Shukla)
Commonwealth Government (Shukla, Mueller, Thai)
U.S. DoD SERDP (Kaserzon, Mueller)
Airservices Australia (Mueller)
Arcadis and Exxon Mobil (Thai, Mueller)
UQ Amplify (Shukla)
UQ Knowledge Exchange and Translation (Knight, Wang)
U.S. DoD ESTCP (Mueller, Thai)
U.S. DoD SERDP (Mueller, Thai)
QLD DES (Kaserzon)

Submitted:
ARC Discovery Project (Gorji)
U.S. Department of Defense SERDP (Shukla, Kaserzon, Thomas, Mueller)

Planned:
ARC Linkage Project (Kaserzon)
ARC Industry Fellowship (Kaserzon)

*QH leveraging funds

With the funding support of the U.S. DoD and NHMRC, Dr Sara Ghorbani Gorji and Dr Pradeep Dewapriya have developed analytical methods using high-resolution mass spectrometry (HRMS) to detect a broader range of PFAS compounds in environmental assessment and biomonitoring. The team has uncovered several novel PFAS and hitherto unreported compounds through non-target analysis and suspect screening methods, adding valuable insights to PFAS monitoring.

STAFF & STUDENTS

Theme Leaders: Mueller, Thomas, Fielding, Kaserzon, Thai, Carvalho

6 Research Fellows, 6 PhD students

Plastics and plastic-related chemicals

KEY RESEARCH ACTIVITIES

Humans are exposed to plastics daily, through the air we breathe, the food we eat, and the water we drink. However, it remains uncertain whether these plastic particles pass through our bodies or accumulate within them, and what impacts they may have on human health.

KEY FUNDING & PLANNED SUBMISSIONS

Current:
The Minderoo Foundation (Thomas, Mueller)
ARC Discovery (Kaserzon)
Research Council of Norway (Thomas)
QUEX (x3) (Fielding, Thomas)
EU Marie Curie Fellowship (Schacht, Thomas)

ARC Industrial Transformation Training Hub (Thomas, Rauert, O'Brien)
UQ Research Infrastructure (Thomas)
Goodman Foundation (Okoffo)
QLD Department of Environment and Science (Rauert)
UQ HaBS (Okoffo)

Submitted:
ARC Discovery Project (Thomas, Rauert)

Planned:
ARC DECRA (Okoffo)
NIH (Thomas)
ARC Linkage Project (Rauert)

To address these questions, the *Minderoo Centre – Plastics and Human Health*, led by Prof Kevin Thomas, is focused on developing novel mass spectrometry protocols to accurately sample and measure plastic chemicals and particles in humans, with a particular emphasis on human brains, as well as urine and blood samples.

Due to the ubiquitous nature of plastic, one of the critical challenges in this research is ensuring that the plastic chemicals and particles found in human samples originate from the samples themselves and not from background contamination or introduced during sampling. Consequently, these cutting-edge mass spectrometry techniques are being developed within a state-of-the-art low-contamination laboratory established at QAEHS, built almost entirely out of welded stainless steel.

A significant achievement of the team this year is the successful development of a method to eliminate interferences. This ensures that the observed substances in samples genuinely represent plastic particles and not interference from endogenous components.

The team have also been exploring the potential introduction of plastic in samples through sampling procedures. Disposable plastic sampling and collection equipment are commonly used in medical procedures, such as biopsies. A recent study by the team investigated potential contamination in samples collected using disposable plastic equipment in two respiratory system sampling methods. The study identified high concentrations of certain plastic polymers, namely polyethylene (PE) and polyvinyl chloride (PVC), likely originating from the collection containers or background contamination. However, the study also demonstrated that samples collected using this equipment could still be used for quantifying other plastics like polypropylene (PP), polymethyl methacrylate (PMMA), polycarbonate (PC) and, for certain methods, PVC.

Additionally, the team is close to establishing a working method for analysing bisphenols and phthalate metabolites in brain tissue. Ongoing research collaborations with Telethon Kids Institute, University of Western Australia, and RCSI Bahrain are examining plastic-associated chemicals in human urine samples.

QAEHS is also actively investigating the presence and impact of plastic contamination in the environment. Tyre road wear particles are one of the biggest microplastic pollution sources to the environment and the additive chemicals in tyres can leach into waterways and pose a significant risk to aquatic species. With support from the Queensland Department of Environment and Science (DES), Dr Cassie Rauert and Prof Kevin Thomas have investigated concentrations of tyre additive chemicals and tyre road wear particles in Cairns and Brisbane waterways and have detected for the first time in Australia a toxic chemical – 6PPD-quinone – implicated in mass deaths of aquatic species in North America. The team have applied for an ARC Discovery Project grant to further this research and evaluate the occurrence, transformation, and pathways of road-related plastics pollution in key environmental systems.

A study by Dr Elvis Okoffo, Dr Rauert, and Prof Kevin Thomas, published this year in *Science of the Total Environment*, investigated the mass concentrations and removal rates of seven common plastic types in wastewater treatment plants (WWTPs) across Australia. The findings revealed that the total plastic content in the raw influent samples ranged from 840 to 3116 µg/L, with the majority (over 99%) being removed during the pre-treatment stages. The plastic mass concentrations in the treated effluents and reference water samples were below the reporting limits. Among the plastic types examined, polyethylene and polyvinylchloride emerged as the most dominant, while other types made up a smaller proportion.

A second study examined the occurrence and contribution of plastic particles in biosolids (treated sewage sludge). Such research is important because in Australia about two thirds of all biosolids produced are applied to the land as a fertiliser, soil conditioner or soil replacement product. The researchers used sequential size fractionation to assess the mass concentration of seven common plastics, including particles below 25 µm. The study found that the smallest size fraction (<25 µm) contained the highest proportion (27%) of the total plastic mass, with polyethylene being the dominant polymer. The study provided the first confirmation of the presence of plastic particles in biosolids below a size fraction that many methods fail to capture, and which may have implications for environmental and human health.

Research Fellow Veronika Schacht has commenced a 2-year secondment at QAEHS as part of her EU Marie Skłodowska-Curie Actions Fellowship, working under the supervision of Prof Kevin Thomas. Her research employs a multidisciplinary approach to determine the extent of plastic contamination in agricultural soils as well as the fate of plastic and its impact on soil processes and she is gaining knowledge and training at QAEHS that she can take back to the EU at the end of the secondment where she will be based at Freie Universitat Berlin, Germany.

Prof Kevin Thomas, Dr Cassie Rauert, and Dr Pradeep Dewapriya are part of an international collaborative project funded by The Research Council of Norway looking at how microplastics and their associated chemical additives affect marine ecosystems by addressing long-term effects, accumulation, and trophic transfer throughout the marine food-web. The project has provided new data on chemicals leaching out of common plastic consumer products on the effects on a range of marine organisms. Guidelines have been developed for methods for assessing effects of microplastics on the environment.

With the support of a Goodman Foundation Moreton Bay Research Grant and seed funding from the Sustainable Urban Seascapes – Moreton Bay Project, Dr Elvis Okoffo is conducting research aimed at investigating the extent of microplastic pollution in Moreton Bay and its potential impact on marine ecosystems. Sediment samples from the Bay have revealed the presence of various types of plastics, with the highest concentrations found in the northern bay, mangroves and seagrass areas, highlighting the need for a comprehensive understanding of microplastics in the Bay to protect ecosystems, human well-being, and the natural beauty of the marine environment. Collaboration with local organisations and publications of finding in scientific journals and public forums will contribute to ongoing monitoring and management efforts.

STAFF & STUDENTS

Theme Leaders: Thomas, Mueller
6 Research Fellows, 8 PhD students
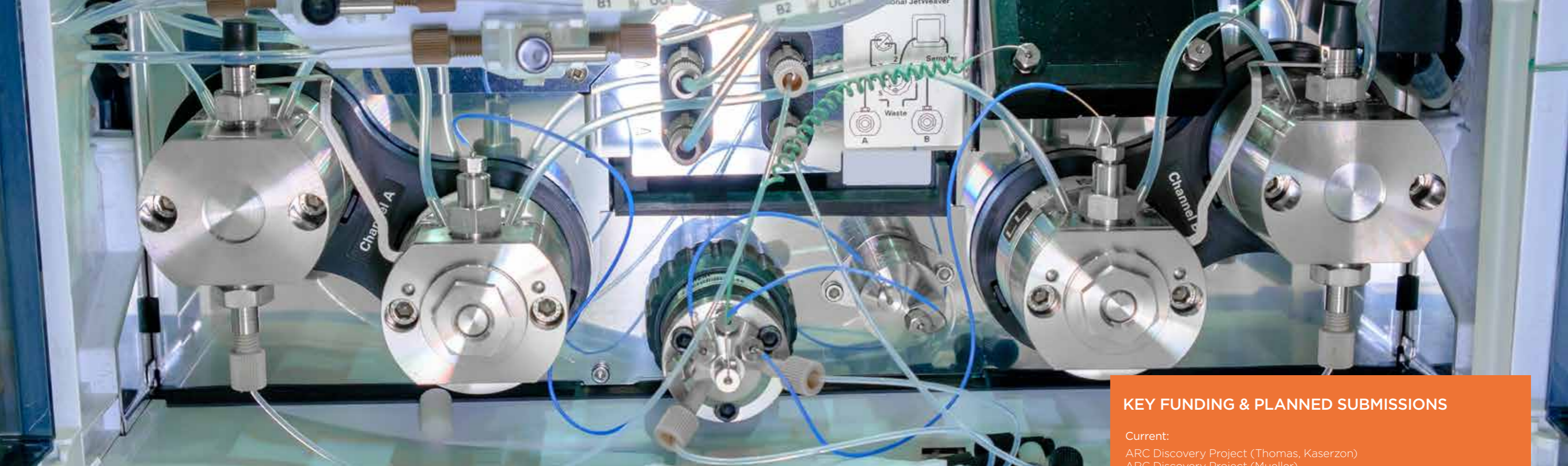
Advanced surveillance techniques

KEY RESEARCH ACTIVITIES

QAEHS Theme Leaders Prof Kevin Thomas, Prof Jochen Mueller, and A/Prof Kaserzon and Research Fellows in their teams are leading several research projects to advance global sampling and analytical capabilities to achieve 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 the leading analytical strategy in recent years to address the challenges of characterising a wide range of diffuse and highly dynamic chemical contaminants. This approach, different from the routine targeted analysis strategy of contaminants, is not biased towards a small number of target contaminants. Rather, the approach screens for all existing chemical constituents in a sample. However, data produced from HRMS analysis generates highly complex datasets with thousands of chemical compounds to be analysed for each sample. To deal with such large and complex datasets, prioritisation strategies are needed to identify the chemical features of significance using statistical approaches. Research Fellows Dr Sara Ghorbani Gorji and Dr Pradeep Dewapriya have been developing non-target workflows that apply HRMS to characterise samples, including water and blood, to identify concerning contaminants. It is anticipated that these non-target workflows will be translated into a risk warning system for chemical hazards in, for example, drinking water.

The ARC Discovery Project led by Prof Kevin Thomas focused on advancing the detection of emerging chemical threats through the development of a global platform called *InSpectra* was completed this year. By leveraging open collaboration and cutting-edge technology, InSpectra enables researchers to proactively identify, track, and prioritise newly identified chemical risks. The platform allows users to upload high-resolution mass spectrometry (HRMS) data, access a community curated HRMS library, and benefit from real-time data interrogation. This proactive approach reduces response time, improves risk management, and provides valuable insights into the spatial and temporal distribution of emerging chemical threats, ultimately enhancing health and environmental outcomes. A peer-reviewed journal article is available from Journal of Hazardous Materials.

For the past 9 years, 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, which ensures the safe and reliable supply of drinking water from the region's reservoirs. We are pleased to announce that this program has been extended for an additional 2 years. The results from each summer and winter campaign have been made publicly available to all Australians via the Seqwater website. The data generated through this project continues to inform the water industry regarding water quality risks and guideline exceedances. Tools applied and developed through this project have been utilised in multiple other sampling campaigns across Australia. The project provides a valuable and unique long-term dataset offering insights into temporal trends.

Through the collaboration with Seqwater, QAEHS has made significant progress in developing and applying new monitoring tools to address challenging water pollutants, including glyphosate, per and poly-fluorinated chemicals, tyre wear particles, and UV filters. The partnership has led to the implementation of proof-of-concept applications for various monitoring technologies and the team continues to explore and innovate with developed technologies that address current and emerging chemicals of concern.

An ARC Linkage Project led by A/Prof Kaserzon addresses the need for improved monitoring of Australia's limited water resources. Using an integrated monitoring approach, the project aims to develop and implement novel passive sampling technologies to monitor toxic ionized organic chemicals of emerging concern in various water sources. The outcomes of this project will provide cost-effective tools to detect emerging chemicals in drinking water, ground water, surface water, and wastewater, ultimately safeguarding essential water resources for millions of Australians. Passive samplers developed and calibrated through this project have been successfully applied to monitoring campaigns in Australia, Spain, and the Czech Republic, detecting a range of chemicals of emerging concern. The work has resulted in a book chapter and seven published papers.

QAEHS, in partnership with the University of Tasmania and Deakin University, has recently been awarded ARC funding to establish the ARC Training Centre for Hyphenated Analytical Separation Technologies. The QAEHS node, led by Training Centre Deputy Director Prof Kevin Thomas, Dr Cassie Rauert, and Dr Jake O'Brien, will focus on applying novel hyphenated methods to complex environmental systems and train the next generation of researchers in this space. The training centre will commence its work in Q3 2023 with the QAEHS node hosting four PhD students and a post-doctoral research fellow.

Dr Xianyu Wang is working on a collaborative ARC Discovery Project led by Griffith University aiming to identifying hazardous chemicals in the Polar regions. The Polar regions are a relatively pristine and untouched wilderness, and improving our understanding of what manmade chemicals we can see in the polar region helps us better understand chemical persistence and mobility, two requisite risk criteria for regulatory action. The project is in its initial stages.

Over the past 12 months, QAEHS has continued collaborating with the Great Barrier Reef Marine Park Authority to assess spatial and temporal trends and the risk of photosystem II herbicides in the Great Barrier Reef Inshore area. This data adds to the long-term dataset spanning two decades and informs herbicide risk assessment and government pesticide management policies.

STAFF & STUDENTS

Theme Leaders: Thomas, Mueller, Kaserzon
6 Research Fellows, 10 PhD students

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. Through his research, A/Prof Osborne aims to enhance our understanding of how environmental factors influence human well-being and inform strategies for promoting healthier communities.

K M Shahunja's PhD research investigates the effects of family and neighbourhood environmental changes on asthma and lung function of Australian children. He produced two publications during the reporting period. The first aimed to understand how the environment in which children live can affect their asthma symptoms over time. The researchers looked at data from the Longitudinal Study of Australian Children and found that children living in neighbourhoods with heavy traffic and poor living conditions were more likely to have persistent or recurring asthma symptoms. On the other hand, children in neighbourhoods with less traffic and better living conditions had a lower risk of experiencing ongoing asthma symptoms. These findings suggest that improving neighbourhood safety and reducing traffic could help children with asthma have fewer and milder symptoms. The second paper also analysed data from the Longitudinal Study of Australian Children with the aim of understanding how asthma symptoms develop and change over time in Australian children. The researchers found that children exposed to certain environmental factors, such as maternal smoking, poor home conditions, and tobacco smoke inside the house, were more likely to have persistent or recurring asthma symptoms. On the other hand, children in healthier home environments had a lower risk of experiencing ongoing asthma symptoms. These findings suggest that improving the home environment and reducing exposure to tobacco smoke could help children with asthma have better outcomes and experience fewer symptoms.

The collaborative NHMRC Partnership Project involving Queensland Health aiming to investigate the association between trihalomethanes (THMs) levels and birth outcomes in pregnant women in Queensland, particularly those residing in high-risk areas, has been progressing well. The research involves spatial-temporal analyses of THMs levels from 2007 to 2020 and linking this data with the Queensland Perinatal Data Collection to examine the impact on birth outcomes. Case studies are conducted to identify gaps in current practices and develop effective solutions, while interviews with key stakeholders provide insights into risk management, incident resolution, and THMs exposure minimisation. The study has so far produced two literature reviews on THMs and two quantitative manuscripts on birth outcomes.

STAFF & STUDENTS

Theme Leaders: Osborne, Phung
1 Research Fellow, 8 PhD students

KEY FUNDING & PLANNED SUBMISSIONS

Current:
*NHMRC Partnership (Thomas)

Submitted:
NHMRC-GACD (Osborne)

Planned:
MRFF (Osborne)

*QH leveraging funds

Climate change

KEY RESEARCH ACTIVITIES

Theme leader Dr Dung Phung has continued his research on climate-sensitive 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 South-East Asian countries. Under the theme, Dr Phung and his team have submitted four manuscripts for review and have successfully secured a large grant pertaining to climate change and health.

Dr Phung was recently awarded a UK Wellcome Trust Fund grant in support of an international multidisciplinary project aimed at developing a user-friendly digital prediction tool for dengue prevention in the Mekong Delta Region of Vietnam. The work will be one of Dr Phung's focus areas over the next 5 years.

Another future direction for Dr Phung's research includes the continuation of heat-health studies, with a particular emphasis on evaluating the efficacy of interventions including policy measures to reduce heat-related health risks among vulnerable populations, including the elderly, outdoor workers, and pregnant women.

Furthermore, the research team will pursue investigations into the development of an early warning system for climate-sensitive infectious diseases through the application of wastewater surveillance in collaboration with QAEHS colleagues.

Prof Kelly Fielding has continued working with Research Fellow, Dr Ans Vercammen, whose research focuses on the mental health implications of climate change. Dr Vercammen is currently working with colleagues from UQ and 'Climate Cares' on a Wellcome Trust grant focused on Global Dialogues on the intersection between climate change and mental health. The group at UQ (including Dr Vercammen) has been contracted to lead the Oceania Regional Community dialogues.

Carla Magi-Prowse is nearing the completion of her PhD investigating adaptive and maladaptive ways that people cope with climate change and communication strategies to increase individuals' climate-efficacy. Her recent research has explored the role of narratives in communicating about climate change. She has worked with colleagues from Seqwater on a collaborative paper exploring whether there is a social license to introduce a potable recycled water scheme in SEQ.

STAFF & STUDENTS

Theme Leaders: Phung, Fielding
1 Research Fellows, 3 PhD students

KEY FUNDING & PLANNED SUBMISSIONS

Current:
UK Welcome Trust Fund (Phung)
NHMRC e-ASIA (Phung)
ARC Discovery Project (Fielding)

Submitted:
ARC Industrial Transformation Training Centre (Fielding, Carvalho, Kaserzon)

Microbiology and anti-microbial resistance

KEY RESEARCH ACTIVITIES

Under the guidance of Queensland Health colleagues, theme leaders Prof Jianhua Guo and Dr Carvalho have increased research activities in health-related water microbiology issues. The team has developed culture-dependent and culture-independent methods to address the problems of waterborne opportunistic pathogens in drinking water supply systems, with a focus on *Legionella and Nontuberculous mycobacteria*.

In the last year, Prof Jianhua Guo and Dr Carvalho have been involved in more than 40 publications related to Environmental Health Microbiology.

In one study published in *Environmental Research*, Dr Carvalho and her team explored the use of bacteriophages (viruses that infect bacteria) to combat biofilms formed by Pseudomonas aeruginosa, a resilient pathogen that causes infections. The researchers found that several phages were effective in disrupting and inactivating the biofilms, reducing their biomass and causing the detachment and killing of bacterial cells. The study suggests that phages have potential as alternative treatments to antibiotics and disinfectants in combating P. aeruginosa biofilms, highlighting their role in developing novel therapeutic approaches.

Over the past year, Prof Jianhua Guo and his team have been conducting research on various aspects of wastewater treatment and microbial interactions. Their studies have focused on developing innovative technologies to enhance bioenergy recovery in wastewater treatment plants, investigating the role and distribution of specific bacteria involved in ammonia oxidation, exploring the potential of using short chain gaseous alkanes for nitrate reduction, and uncovering the microbial ecology and functional importance of microbial guilds in nitrogen removal processes. Additionally, their research has expanded our understanding of the occurrence and adaptation of comammox Nitrospira bacteria in diverse thermal habitats, and they have examined the spatial distribution of microorganisms within methane-based membrane biofilm reactors. These findings have important implications for the development of more efficient and sustainable wastewater treatment methods.

Antimicrobial Resistance (AMR) is internationally recognised as a global crisis, projected to cost the global economy US$100 trillion and cause 10 million deaths per annum by 2050. QAEHS researchers, including theme leaders Prof Jianhua Guo and Dr Gilda Carvalho are focused on the understanding of the emergence and spread of antimicrobial resistance (AMR) in the environment, and efficient solutions to mitigate the adverse impacts of AMR.

Prof Jianhua Guo, Dr Carvalho, Dr Jake O'Brien, and Prof Kevin Thomas are founding members in the Cooperative Research Centre *CRC SAAFE: Solving Antimicrobial resistance in Agribusiness, Food & Environments*. The Federal Government awarded $34.5M in grant funding to leverage more than $112M in cash and in-kind contributions from 53 partners, including Queensland Health (leveraging funding). The new Cooperative Research Centre will address the impacts of Antimicrobial Resistance on Australia's agribusinesses. The Centre was in its establishment phase in 2022-2023.

A recent study by Prof Jianhua Guo and team showed that certain antidepressants, at clinically relevant concentrations, can significantly increase the transfer of antibiotic resistant genes (ARGs) in bacteria. This effect is attributed to various factors, including the overproduction of reactive oxygen species and the stimulation of gene expression related to cell membrane permeability, stress response, and ATP synthesis. These findings highlight the need to consider the potential risks of antidepressant use in contributing to the dissemination of antibiotic resistance in clinical settings.

Dr Jake O'Brien is in the second year of his 5-year NHMRC Investigator Fellowship, which aims to use wastewater analysis to provide a surveillance strategy for monitoring antimicrobial resistance in the general population and to develop a national wastewater surveillance program for AMR. So far, Dr O'Brien 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 are in preparation. A PhD student has also been recruited who is currently developing non-targeted screening detection algorithms within high-resolution mass spectrometry data which will be applied for the detection on antibiotics in environmental samples.

Dr O'Brien was also awarded funding from Melbourne Water to conduct preliminary investigations relating to the role of cyanobacterial blooms in the amplification and dispersal of antimicrobial resistance. The analytical method originally proposed has been expanded to a wider suite of compounds and further optimised on the state-of-the-art SCIEX 7500 LC-MS/MS. This method will be applied on samples collected during an algal bloom which has yet to occur.

STAFF & STUDENTS

Theme Leaders: Guo, Carvalho, Thomas

3 Research Fellows, 11 PhD students

KEY FUNDING & PLANNED SUBMISSIONS

Current:
ARC Discovery Project (Guo, Carvalho)
ARC Discovery Project (Guo)
ARC Linkage Project x2 (Carvalho)
ARC Linkage Project (Guo)
*Advance Qld Industry Research Fellowship (Li)
Collaborative Research Centre (O'Brien, Thomas)
NHMRC Investigator (O'Brien)
HaBS-EAIT (Li)
QUEX (O'Brien, Thomas)
Metro North HHS (Guo)

Submitted:
ARC Discovery Project (Carvalho)
ARC Industrial Transformation Training Centre (Carvalho)
NHMRC-JPIAMR (O'Brien)
CUREator (Guo, Carvalho, Thomas, O'Brien)

Planned:
NHMRC Partnership (O'Brien, Thomas)

*QH leveraging funds
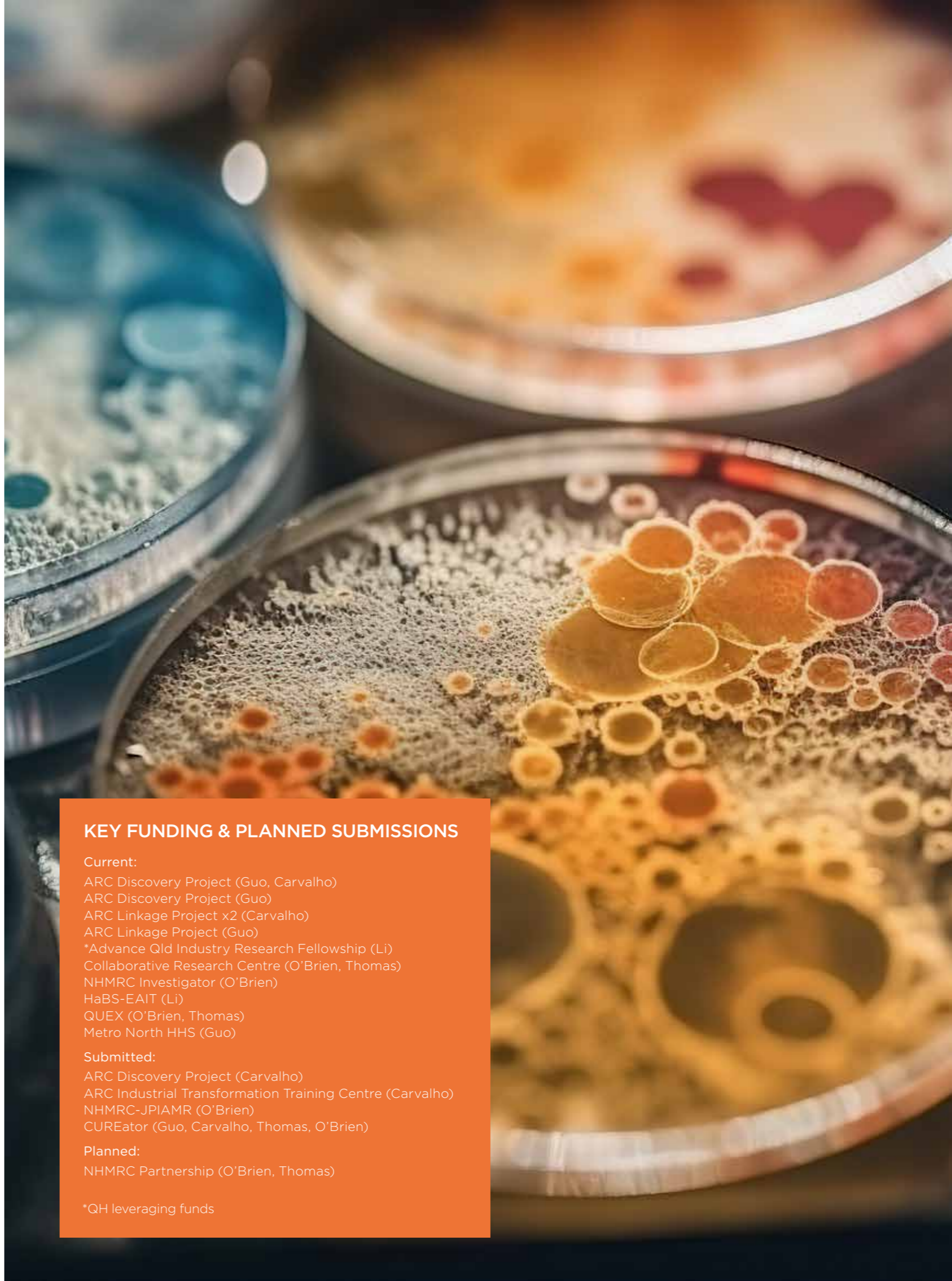
Australian Environmental Specimen Bank

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. The original facility, established in 2009 at UQ's PACE building, features -20° and -80° Celsius freezer storage. In 2021, the AESB received additional funding from the Australian Research Council and various research and government partners to expand its storage capacity and enhance the capabilities of the national repository. This expansion aimed to accommodate appropriately collected and preserved samples, along with their associated metadata, from environmental or biomonitoring programs across Australia by creating a second larger AESB storage facility located at UQ's Long Pocket precinct in Brisbane.

With the completion of the construction phase 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. This purpose-built facility is currently being set up and will be fully operational by the end of 2023. It features a comprehensive online database, sample scanning and tracking with barcoded samples, and ongoing monitoring capabilities.

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.

Australian
Environmental
Specimen Bank

Research outputs

RESEARCH QUALITY

Comparison of the research outputs of the QAEHS team with leading Australian research institutions shows that QAEHS researchers continue to rank above average in relation to quality of outputs (three key metrics are shown in figure below).

For 2022-23, QAEHS researchers were active across twenty subject areas.

High relevance and impact of our work, demonstrated through steady publication output and engagement through citation:

- 136 publications in 2022 and 90 in 2023 to date
- 13,485 citations in 2022 and 7,816 in 2023 to date

High quality of our work in 2022-23 is demonstrated through publications in high quality journals:

- 87% of publications in Q1 journals (top 25% of journals)
- 8.7% of papers in the top 1% cited, compared to 2.5% of UQ

Our research metrics compared to The University of Queensland (UQ), CSIRO and the Group of Eight Universities (Go8) are shown in the chart below. Plotted is the field weighted citation impact (a measure of the citation impact compared to global averages in the field) 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).
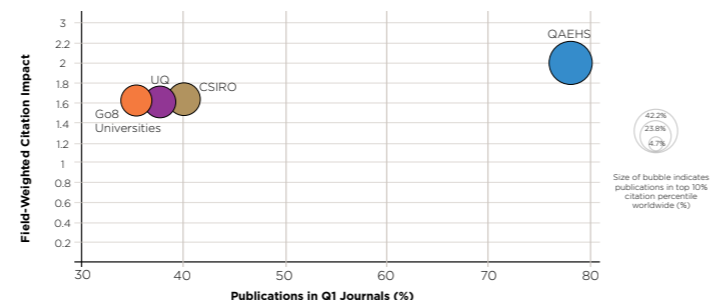
Funding and recognition

COMPETITIVE RESEARCH FUNDING

We received $11 million in new funding in 2022—2023. This brings the total funding awarded to QAEHS for all projects from 2016 to 2023 to $74 million. Outcomes for several competitive grant applications submitted in 2022—2023 are pending, worth an additional $17 Million.

QAEHS researchers continue to submit a high number of applications for competitive granting schemes, participating in 45 applications with 30 of these led by QAEHS researchers. As of 30 June 2023, 21 competitive grant applications are under preparation.

Success rate this year for competitive funding was 39% for QAEHS-led applications. Australian Research Council (ARC) applications return our highest success rate at 50% for 2022-23, well above the national average of 19%.

Details of research grants and other funding awarded in 2022—23, as well as prior grants active during the year, are provided in Appendix A.
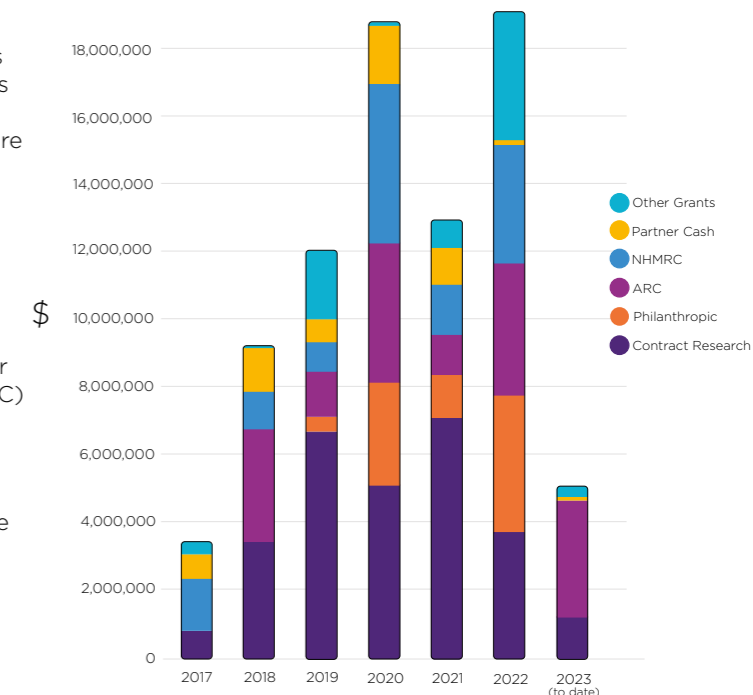
AWARDS AND PRIZES

Prof Jianhua Guo: IETI 2nd Young Researcher Award, International Engineering and Technology Institute, 2023

Dr Gilda Carvalho: UQ EAIT Teaching and Learning Excellence Award, 2022

Dr Pradeep Dewapriya: Runner Up for Best Early Career Researcher Presentation at the Australian Symposium on Advances in Separation Science, Hobart, Tasmania, 2023

Dr Elvis Okoffo: 2023 Goodman Foundation Research Grants; HaBS Early Career Academic Research Accelerator Award, 2023; People's Choice Best Flash Poster presentation at the Queensland Mass Spectrometry Symposium, Brisbane, 2022

Dr Cassie Rauert: Runner Up for Best Early Career Researcher Oral Presentation at the Queensland Mass Spectrometry Symposium, Brisbane, 2022

Bastian Schulze: People's Choice award for Best Poster at the Queensland Mass Spectrometry Symposium, Brisbane, 2022

Bastian Schulze, Belinda Moore, Carly Beggs, Garth Campbell: First Place in UQ's Craft-Your-Thesis Competition

Carly Beggs: Runner Up at the UQ School of Pharmacy/QAEHS 3 Minute Thesis competition

Simran Kaur: Runner Up for Best Student Poster at the Queensland Mass Spectrometry Symposium, Brisbane, 2022

Stacey O'Brien: People's Choice award for Best Oral Presentation at the Queensland Mass Spectrometry Symposium, Brisbane, 2022

ARC DECRA Fellowship

Dr Fisher Wang

Establishing a national program to characterise indoor chemical exposures

2023 QAEHS Best HDR Student Publication Awards

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. Applications were reviewed by a judging panel (Dr Greg Jackson Queensland Health, Prof Jianhua Guo QAEHS Theme Leader and Dr Peter Moyle Director of HDR UQ).

1st place: Dr Katja Shimko - In-sewer stability assessment of anabolic steroids and selective androgen receptor modulators published in Environmental Science & Technology.

2nd place: Dr Rose Nguyen - Assessment of mobilization potential of per- and polyfluoroalkyl substances for soil remediation published in Journal of Hazardous Materials.

Commendation: Md Nazrul Islam - Effects of shipwrecks on spatiotemporal dynamics of metal/loids in sediments and seafood safety in the Bay of Bengal published in Environmental Pollution.

Education

Postgraduate

Our PhD Program continued to grow in the 2022—23 reporting period. By the end of the reporting period, we had 48 HDR students.

Ten PhD scholarships were competitively awarded through the UQ Graduate School. This year we also welcomed 1 Masters student to our postgraduate student cohort.

Eight PhD students have submitted or completed in 2022—23.

QAEHS SCHOLARSHIPS

As part of the 2018-23 Alliance agreement, the UQ Graduate School were to provide a minimum of five targeted QAEHS PhD scholarships over the course of the term and six scholarships were competitively awarded exceeding the minimum requirement.

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

INDUSTRY PLACEMENTS

An industry placement connects higher degree by research (HDR) talent with industry organisations to work on a project-based experience, for generally 60 days. Industry placements help students to grow and develop in a real-world environment, while also making a significant contribution to the industry organisation. Placements can also provide industry staff with the experience of developing and mentoring emerging researchers.

In this reporting period, QAEHS PhD student Bastian Schulze completed an industry placement with Queensland Health Forensic and Scientific Services.

QHFSS work across several environmental forensic approaches and techniques to characterize and identify sources of contaminants in the environment.

Bastian's industry placement project involved the development and validation of a forensic method to analyse illegal by-products in nicotine containing vapes and e-cigarettes.

QAEHS PHD GRADUATES 2022—23

Katja Shimko
Evaluating the suitability of wastewater analysis for the detection and monitoring of performance- and image-enhancing drug use.

Hong Le
Wearing masks to reduce exposure to traffic-related air pollution and improve respiratory health in children.

Md Nazrul Islam
Health risk assessment of mixed metal/loids at and near open beaching shipwrecking yards in Bangladesh.

Michelle Engelsman
Firefighter exposure risks and subsequent reproductive effects.

Samuel Namonyo
The potential of phage therapy against biofilms of pseudomonas aeruginosa originating from urban water systems.

Sandra Nilsson
Exposure of firefighters to PFAS (Per and Polyfluoroalkyl Substances): Serum concentrations and temporal trends after exposure control.

Steve Burrows
Microplastic pollution: From nanoscale surface interactions to public perceptions.

Thi Minh Hong (Rose) Nguyen
Fate and transport of per- and polyfluoroalkyl substances (PFASs) in the soil environment.

Canada (2)
USA (1)
Eccuador (2)
Colombia (1)
Peru (1)
Brazil (1)
United Kingdom (3)
Netherlands (1)
Germany (2)
Sweden (1)
France (1)
China (9)
Republic of Korea (2)
Philippines (1)
Pakistan (1)
Kenya (1)
India (2)
Bangladesh (2)
Malaysia (1)
Vietnam (3)
Australia (11)
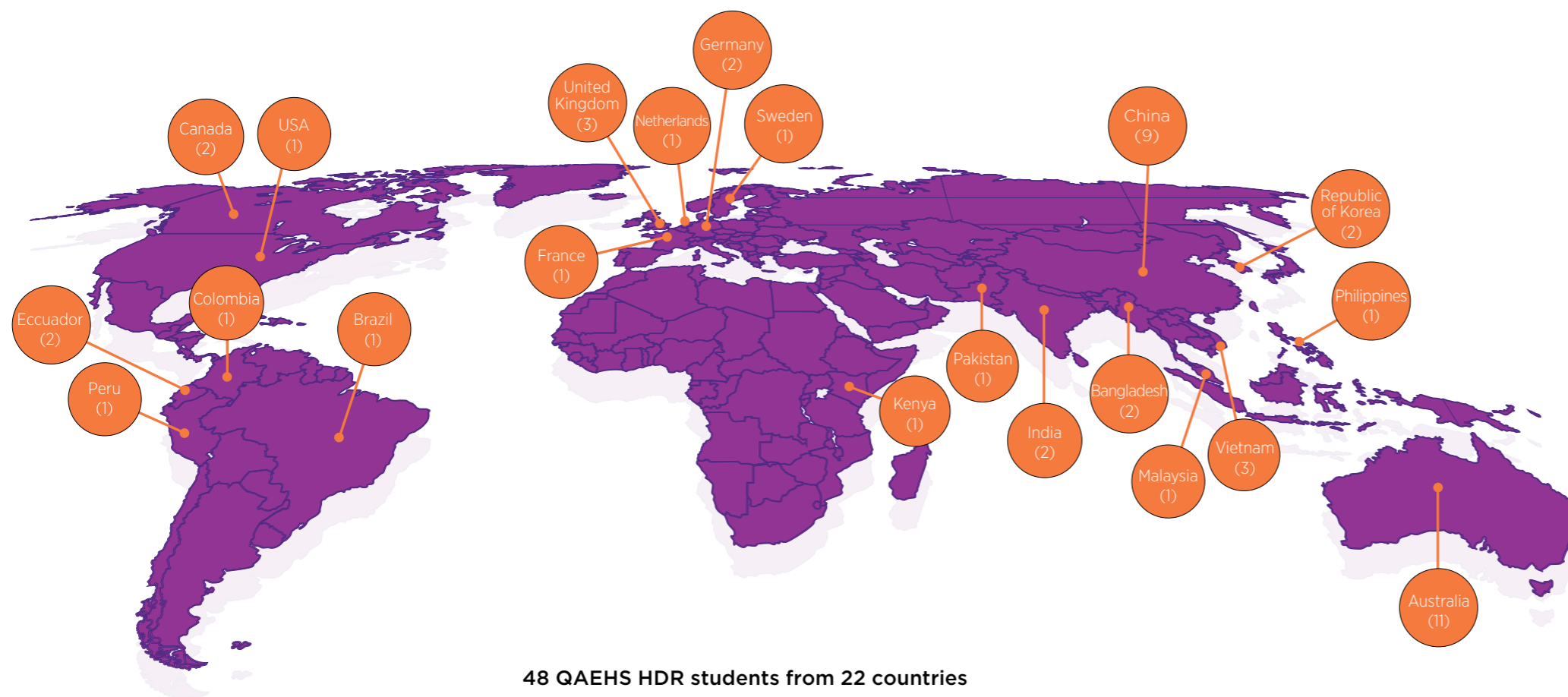
48 QAEHS HDR students from 22 countries

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 aim of the MEHSc program is to prepare mid-career professionals and future leaders to manage complex environmental health challenges more effectively. It aims to build on the demonstrated strengths of multidisciplinary teams and perspectives for addressing complex challenges, preparing graduates for roles and responsibilities including, for example, providing information and advice based on science, formulating or contributing to the development of policy, regulations and guidelines, and identifying hazards and assessing and managing risks to human health and safety, and approaches to communicating the risks and mitigation options for stakeholders.

The Masters of Environmental Health Sciences has had 4 students graduate in 2022-23.

There are presently 34 students enrolled in this program:

- 29 Masters, 4 Graduate Diploma, 1 Graduate Certificate
- 75% are international students

Intro to Biostatistics	31%
Intro to Environmental Health	13%
Dynamics of Public Policy	10%
System Dynamics	4%
Environmental Health Risk - Biological Hazards	2%
Risk Communication	2%
Environmental Health Risks - Chemical Hazards	1%
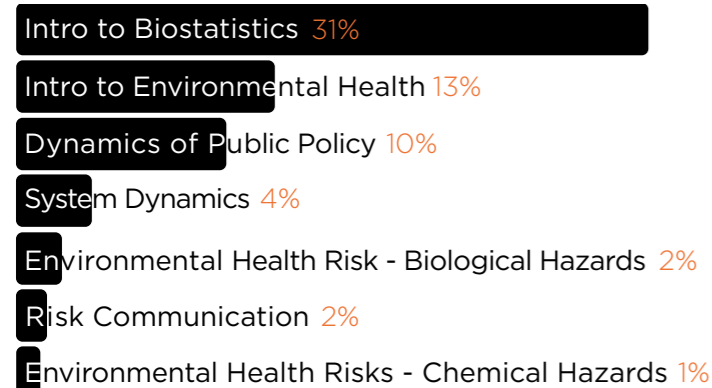
This year, there were 1,221 total enrolments in the individual courses offered in the Masters program. Intro to Biostatistics had the most enrolments in an individual course, with 31% of all individual course enrolments.

Our Theme Leaders and team members are teaching four of the MEHSc courses.

- Risk Communication (Core), Semester 2, 2022 - A/Prof Kelly Fielding
- Chemical Hazards (Core), Semester 2, 2022 - Dr Jake O'Brien
- Biological Hazards (Core), Semester 1, 2023 - Dr Gilda Carvalho
- Preventing Disease through Healthy Environments (Core), Semester 2, 2022, Dr Dung Phung

Ranked #2
in Australia for public health (Global Ranking of Academic Subjects 2022)

Ranked #20
in the world for environmental sciences (QS World University Rankings 2023)

Professional development and education

LUNCHBOX SESSIONS WITH QUEENSLAND HEALTH

QAEHS enthusiastically contributed to Queensland Health's 'Lunchbox Sessions', a 30-minute talk and Q&A via Microsoft Teams, held over lunchtime. A QAEHS theme is selected, and a topic is presented on what is currently happening in the scheduled theme. Lunchbox sessions held in 2022–23 were well attended and the Q&A sessions engaging.

- *Climate change and health*, Dr Dung Phung, 14 September 2022
- *Thoughts about future applications of wastewater-based surveillance techniques: Airplanes, disadvantaged communities and the Olympics*, Prof Jochen Mueller, 12 October 2022
- *What do we know (and don't know) about exposure to plastic particles*, Prof Kevin Thomas, 7 December 2022
- *Herbicide (glyphosate) spraying in water catchments*, A/Prof Sarit Kaserzon, 21 June 2023.

PUBLIC HEALTH IN PANDEMICS – UQ SUMMER COURSE

A number of places in UQ's School of Public's Health's short course Public Health in Pandemics were offered to Queensland Health and was attended by two employees in November–December 2022.

Public Health in Pandemics, a short course run by QAEHS theme leader A/Prof Nicholas Osborne, is designed to provide students with a broad understanding of the role of public health in identifying and responding to emerging infectious diseases in the context of the COVID-19 pandemic. The course covered communicable disease control including surveillance, outbreak investigation and interventions, the public health impacts both direct and indirect, and broader social, economic and health impacts in the population.

Delivered over five days:

- Start of the Pandemic: history, available tools, initial response
- Initial Actions and Failures: disease control and characterising uncertainties, understanding infrastructure, differences in responses
- The Second Wave: Why do we get a second wave and how is the response different?
- Communication sets a new agenda: Short- and long-term behaviour change, what will the new normal look like?

SUMMER AND WINTER RESEARCH PROGRAM

QAEHS participate in 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 alongside some of the university's leading academics and researchers. During the reporting year we have hosted 7 Summer and Winter research students.

Alumni

QAEHS has had 30 PhD graduates since 2016. Half have gone on to postdoctoral research careers, others have moved into key positions in industry or government organisations and other research organisations.

We invited two QAEHS alumni, Dr Andrew Banks, who has pursued a career in industry, and Dr Elvis Okoffo, pursuing a career in research academia, to provide some insight into where they are now, post PhD.
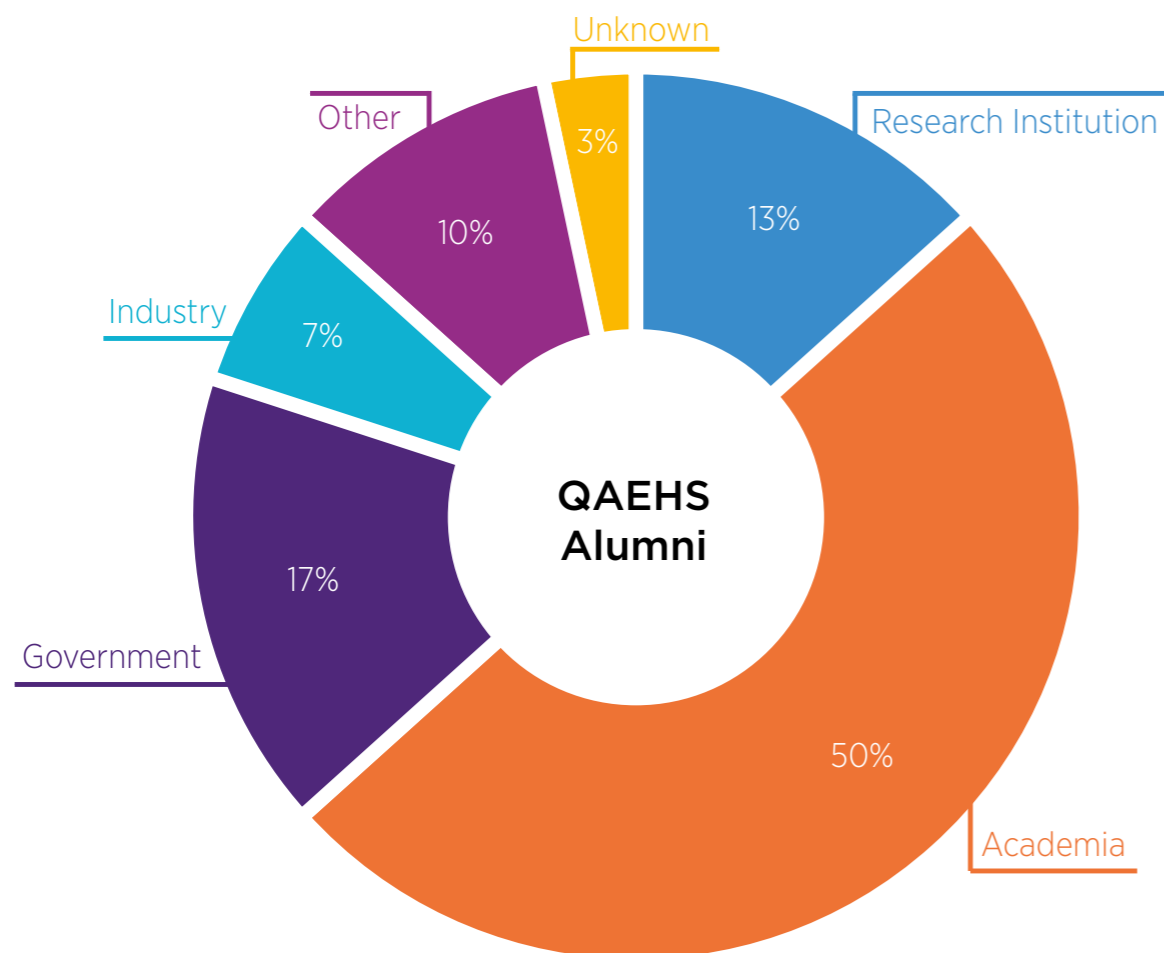
Dr Andrew Banks

Principal Chemist, Racing Science Centre, Queensland Racing Integrity Commission

PhD Title: Firefighters' exposure to potentially toxic combustion products

Dr Elvis Okoffo

Postdoctoral Research Fellow, QAEHS, UQ

PhD Title: An assessment of plastic residues in Australian biosolids

QAEHS Alumni

- Unknown 3%
- Research Institution 13%
- Academia 50%
- Government 17%
- Industry 7%
- Other 10%

Dr Andrew Banks

What was your PhD about?

My PhD research examined occupational exposure of firefighters to PAHs, OPFRs and PBDEs. This PhD project provided an insight into the exposure firefighters have to this group of chemicals, from within fire stations, while attending fires and potentially from firefighting uniforms. My research observed higher background concentrations of select chemicals in firefighters than the general population, that current decontamination techniques may not be effective at removing semi-volatile organic chemicals (SVOCs) from firefighters' uniforms and firefighting uniforms contribute to the load of SVOCs in the micro-environments they are stored. By understanding the significance of these exposure pathways, future strategies for reducing chemical exposure to firefighters can be assessed.

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

QAEHS provided me with the resources I needed to pursue my research interests during my PhD by offering me collaborative research partners who helped shape the direction of my research. A leadership team who were accomplished and insightful researchers who were excellent role models, teaching me how to critically evaluate my own and other research. It also provided me with the foundations required for my future outside of QAEHS including diverse research techniques, strong leadership, method development and project management.

What does your current career involve?

The Racing Science Centre role is to assist in upholding the integrity of the state's racing industry. In this position, I lead and coordinate a team of 11 chemists who perform routine analysis of equine and greyhound samples for the presence of prohibited and banned substances under relevant rules of racing. My day-to-day responsibilities include team management, project management, automating workflows, workforce development, method development and industry-related research.

Do you do research there?

Research and development currently being conducted at the Racing Science Centre includes the updating and modernising of analytical methods and workflows. This included automation of routine sample aliquoting and solid phase extraction throughout the laboratory. One of several methods that is being updated is the screening method for Total Carbon Dioxide (TCO2) in plasma.

TCO2 is measured to monitor alkalizing substances administered to horses in the racing industry. The objectives of this research are to verify that the new GCMS methods are comparable to the previously used DxC600 and move towards a more modern analysis technique eliminating the reliance on individual instruments.

Dr Elvis Okoffo

What was your PhD about?

Plastics are contaminants of emerging concerns that can enter the environment from multiple sources, including via land application of treated sewage sludge (biosolids). Although studies have reported the presence of plastics in biosolids, there is limited research on the mass concentration of plastics present or released into the environment through biosolids end-use worldwide. My PhD research aimed to provide insightful understanding of plastics contamination in biosolids by determining the mass concentration of plastics in biosolids and estimate the per-capita and national release loads of plastics to the Australian environment via biosolids end-use. The outcomes provided a much-needed methodological framework for the first time to investigate the mass concentrations of plastics residues in biosolids from WWTPs – my results also providing the first per-capita mass release loads estimates and an estimation of plastics discharged to Australian environments annually. Likewise, my study provided the first global insight into the relationship between mass concentrations of plastics in biosolids that are applied to land and global plastic production and consumption using statistical modelling.

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

My PhD journey was very rewarding academically and personally. The QAEHS community was wonderful, and the atmosphere provided by my supervisors, fellow PhD students and the administration team was so helpful in the development of my research. My supervisors offered adequate guidance as I worked towards my PhD aims. Equipped with state-of-the-art facilities, QAEHS offered abundant resources and a comfortable learning environment to an international student like myself.

What does your current career involve?

I am currently a Postdoctoral Research Fellow at QAEHS in Prof Kevin Thomas's group. The focus of my research is on expanding the quantitative analytical methods I developed for plastics analysis during my PhD to include other polymer types of interest, and to understand the sources and fate of plastics in WWTPs and releases into the environment. I am a key member of our group, actively training, supporting, and mentoring junior researchers and students to perform method development and plastics analysis. I am an associate supervisor of one master's, and three PhD students, primarily through assisting with experiment design, laboratory analysis, data interpretation and analysis and writing of scientific publications.

What does your current research look like?

My current research focuses on developing novel sampling approaches and analytical techniques for monitoring plastic and bioplastics residues and their chemical additives in environmental samples including wastewater, marine sediment, surface water, drinking water, reservoir water and biosolids from WWTPs and to identify and understand the key sources of plastics to the environment.

Communication

The QAEHS strategic plan for 2022-23 included a dedicated focus on enhancing communication avenues for current research activities and dissemination of outputs.

QAEHS' communication approach focuses on translation, delivery, and targeted dissemination of our outputs to enhance the visibility and impact of our research. It is a priority for our researchers to not only produce valuable findings; but to also effectively bridge the gap between academia and the broader audience by transforming complex scientific jargon into accessible language, making our research outcomes understandable and relatable to policymakers, industry professionals, and the general public.

Utilising various channels, including social media, website, press releases, and collaborations with stakeholders, has enabled our researchers to reach their intended audience directly, ensuring that their findings are heard, understood, and potentially implemented to address critical challenges.

The centre is dedicated to building strong relationships with our stakeholders through ongoing dialogue and collaboration to ensure that our research remains aligned with their requirements and expectations. Through our Scientific Planning Committee, we actively seek feedback and input from Queensland Health stakeholders to refine our research initiatives continually.

QAEHS' reputation and established presence are evident as awareness and engagement locally, nationally, and globally continues to grow. This is reflected in the continued increase in utilisation of our outputs (research reach), seminar series and event attendance, media reach and website visitors.

As we continue to make strides in research excellence, we are dedicated to maintaining our reputation and further expanding our presence, ensuring that our research continues to create a positive and lasting impact.

Media & social media

TRADITIONAL MEDIA

Awareness of the Queensland Alliance for Environmental Health Sciences has experienced another significant boost, both nationally and internationally, thanks to extensive media coverage. Through various media outlets, including television, radio, print, and online platforms, our research has reached a diverse and wide-reaching audience at local, national and international levels.

Media mentions increased (up 22% from the 2021-22 reporting year), with a total of 381 mentions and a potential reach of 358 million people.

Media articles are published on the QAEHS website.

YOUTUBE

This year we launched a dedicated YouTube playlist aimed at further disseminating our research, serving as an additional opportunity to share our research in an engaging and accessible format. Initially, a series of video summaries of our research themes have been created to provide comprehensive insights into the various fields of our research.

As we embark on this journey, we envisage the YouTube playlist becoming a hub of QAEHS research and knowledge dissemination.

Since the playlist's creation in November 2022, the videos in the playlist have had 345 views, with the QAEHS introduction video receiving approximately one-third of the total views.

Website

The website had steady growth in engagement with an increase in page views to 53,910 in this reporting period, up from 52,556 in the 2021-22 reporting period.

The 'Home' and 'Our People' pages continue to be the most viewed. The Queensland Mass Spectrometry Symposium, Prof Kevin Thomas and Dr Elvis Okoffo pages were regularly in the top 3 visited pages over the reporting period.

The website has had a more widespread global audience in this reporting year, with visitors from 196 countries engaged with the website, an increase from 145 countries in the last reporting period. Our audience consists of approximately half of visitors these from Australia. The USA and China, second and third respectively, had the most engagement with the site outside of Australia again this year.

During this reporting period a significant amount of time has been invested in planning for a further upgrade to the website which, in addition to easier navigation and refreshed content, will include the addition of project pages, summarising all QAEHS research and PhD projects and their related content. Implementation is scheduled for late 2023, and following the upgrades we expect engagement to continue to grow, allowing us to effectively disseminate knowledge and make a more substantial impact on a broader scale.

The website is regularly reviewed, and continuous improvements made to ensure valuable and current information is shared as we strive to create an engaging and informative digital space for our stakeholders and community.

Research reach

QAEHS research outcomes are primarily communicated to the wider scientific community, government, and the public via peer reviewed publication in top ranking journals.

Both publications and citations for the combined QAEHS research team across all themes increased steadily each year from 2017 to 2019. Publication outputs and citation numbers were at their highest in 2020 and 2021, likely due to COVID-19 lockdowns restricting physical access to our research facilities and laboratory. Working remotely provided researchers more flexible schedules and with extra time and fewer distractions, allowing them to focus on desk-based research and writing.

The number of publications published in 2022 show a return to the steady upward trajectory from the 2019 numbers. Citations are high in 2022, compared with 2019, indicating our publications continue to be of high relevance and impact. Steady 2023 publication outputs are tracking to be on par with 2022.

QAEHS' work is highly collaborative with international significance and reach. In 2022-23 QAEHS' work was published in collaboration with over 170 different institutions in Australia and overseas and has been cited in 91 countries. The impact of our research contributes to influencing policies, practices, and knowledge on a global scale.
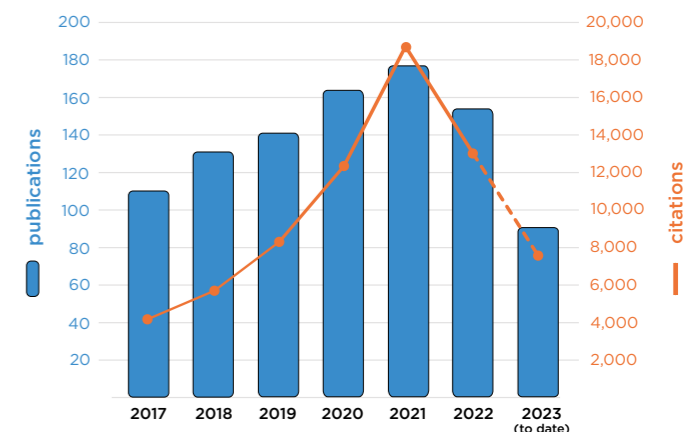
Conferences

Conference attendance facilitates knowledge exchange, networking, and the dissemination of our research outcomes. Additionally, it provides a platform for our researchers to learn about developments in our field, stay updated on the latest trends, and gain insights from experts, enriching their knowledge and expertise.

Following two years of travel restrictions due to the pandemic, in-person attendance at national and international conferences has resumed this year. QAEHS researchers have showcased their work through oral presentations, poster sessions, and workshops at 22 inter/national conferences throughout 2022-23, enabling them to disseminate their research outcomes to a wide audience and enhance the visibility of our work.

- 31 platform presentations
- 10 poster presentations
- 4 invited speaker
- 2 plenary presentations
- 2 keynote presentations

The pandemic and advancements in virtual conference technology has shown that remote attendance can be an effective way to disseminate research outcomes to a global audience, offering a wider reach, as they enable participation from individuals who face constraints in physically attending. In-person interactions allows for deeper discussions, constructive feedback, and the exchange of ideas, fostering collaboration and potential future research partnerships. QAEHS researchers have embraced attendance at both virtual and in-person conferences this year, providing a balance between accessibility and personal interaction, creating a dynamic and inclusive approach to knowledge dissemination and scientific collaboration.

QUEENSLAND MASS SPECROMETRY SYMPOSIUM

The Queensland Mass Spectrometry Symposium (QMSS), hosted by QAEHS and UQ's School of Pharmacy in 2022, was held over two days at UQ's PACE building in Woolloongabba, Brisbane, in December 2022.

Queensland Mass Spectrometry Symposium (QMSS) is an annual event, serving to connect the Queensland mass spectrometry user base, and those interested in this technology across a diverse range of disciplines.

The conference was a 2-day in-person event focused on the science and applications of mass spectrometry. Researchers, scientists, academics, and industry professionals gathered to share and discuss the latest advancements, research findings, and technical developments in the field of mass spectrometry.

148 delegates attended representing universities and research institutes, Australian state and federal government, commercial laboratory organisations and laboratory equipment suppliers.

Events

Seminar Series

The QAEHS Seminar Series' continuous run in 2022-23 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 cutting-edge research.

The value of the Seminar Series fosters knowledge exchange and facilitates meaningful discussions among attendees.

Streaming the seminars online has allowed wider stakeholder participation and provides a great opportunity to engage with Queensland Health staff, members of industry, and the scientific community interested in our research.

In 2022-23, seventeen external, internal, and visiting researchers and students presented their recent research findings, including:

- **Dr Daniel Drage**, University of Birmingham - "The barriers of alternative flame retardants to XRF screening for compliance with legislation."

- **Julia Huchthausen**, PhD student, Department of Cell Toxicology, Helmholtz Centre for Environmental Research, Leipzig - "Experimental exposure assessment of chemicals in In Vitro Cell-Based Bioassays."

- **Janina Beyer**, NSW Department of Planning and Environment, Science Economic and Insights Division - "Exploring the data – can we explain the variability in PFOS bioaccumulation in aquatic biota?" and "Thinking outside the box - exploring how to capture emerging contaminants and emerging issues using cluster analysis."

- **Dr Cheng Zhang**, Australian Institute for Bioengineering and Nanotechnology, UQ - "A Versatile and Scalable Technology for PFAS Remediation."

- **Andrew Chappell**, Institute of Environmental Science and Research - "The New Zealand Drugs in Wastewater Programme - a continually evolving beast".

- **Dr Pablo Gago Ferrero**, Human Exposures to Organic Chemicals (Expo-Hum) Research Group, Swedish University of Agricultural Sciences, Sweden - "The chemical exposome in maternal blood and placenta and the potential use of sewage sludge to prioritize hazardous substances & the chemical exposome in brain cancer."

QAEHS' Annual Research Forum

The Annual QAEHS Research Forum was held at Queensland Health on 5 December 2022. QAEHS Theme Leaders, PhD students and researchers presented a varied range of topics highlighting the research being undertaken within their respective themes and recent findings to an internal and external audience, including Queensland Health staff, industry stakeholders and members of the AMC.

Hosting the forum at Queensland Health this year created a valuable platform for our team to present our work directly to key stakeholders in person. This collaborative setting facilitated networking opportunities between Queensland Health employees, and QAEHS researchers and students, enabling knowledge exchange and forming and strengthening relationships.

World Science Festival, Brisbane, 2023

Pint of Science Festival, Brisbane, 2023

Community engagement

World Science Festival

Our Microplastics team were invited back to the Queensland Museum's World Science Festival in 2023.

The popular event's main audience, consisting of school students, educators, and the general public, provides a unique opportunity to educate and engage with diverse communities on the global issue of microplastic pollution and its impact on the environment and health.

> "It is always so wonderful to participate in The Hatchery program at World Science Festival. I really enjoy engaging with Queensland school students and the public to provide the latest and meaningful information about environmental plastics."
>
> – Stacey O'Brien, QAEHS PhD student and organiser

Pint of Science Festival

Pint of Science Festival is a national festival that celebrates the wonders of science by bringing scientists to local pubs. This event offers a twist on traditional academic conferences, where researchers have the opportunity to present their latest discoveries in an engaging and accessible manner, taking science out of the laboratories and into the relaxed atmosphere of pubs, making science more approachable and enjoyable for the general public.

QAEHS researchers and students presented and attended the festival in Brisbane:

- Presentation: Dr Richard Bade, 24 May 2023, "Where the Party At? Investigating the Use of New Drugs"

- Presentation: Belinda Moore, 22 May 2023, "BPA free? Plastic Additives in Australia"

- Carly Beggs (PhD Candidate) and Veronika Schacht (Postdoctoral Research Fellow) MC'd at venues across the festival.

04. Appendices

Appendix A - Research Funding

New Funding in 2022–23

Years	Funding Source	CIs	Project
2023-2027	ARC Industrial Transformation Training Centre	B. Paull, K. Thomas, R. Shellie, C. Rauert, E Sanz Rodriguez, V. Gupta, F. Alejandro, P. Haddad, A. Bowie, S. Jadhav, R. Keast, J. O'Brien	ARC Training Centre for Hyphenated Analytical Separation Technologies
2023-2026	ARC Linkage Project	C. Zhang, A. Whittake, P. Dewapriya, L. Sprague, C. Macintosh	Removal of Perfluorinated Chemicals Using New Fluorinated Polymer Sorbents
2023-2026	ARC DECRA	X. Wang	Establishing a national program to characterise indoor chemical exposures
2023-2026	ARC Discovery Project	J. Guo, M. Zheng, I. Vanwonterghem, T. Liu, H. Daims, S. Luecker	A novel microbial process breaking through the nitrogen cycling
2023-2026	ARC Linkage Project	P. Thai, J. Connor, B. Tscharke, W. Hall	Using multiple data sources to understand the opioid crisis in Australia
2023-2026	ARC Linkage Project	E. Knight, S. Kaserzon, X. Wang, S. Schmidt	Chemicals in compostable food contact paper packaging materials
2023-2026	U.S. DoD SERDP	J. Mueller, P. Thai	Leaching of PFASs from AFF-Impacted Construction Materials
2023-2025	Seqwater	S. Kaserzon	Water quality micro-pollutant passive sampler monitoring program
2023-2025	Victoria EPA	J. Mueller, C. Alongi	Investigating the occurrence of neonicotinoid insecticides in Australian honey samples
2023-2024	NSW DPE	S. Kaserzon	Proof of concept study: The use of passive samplers to inform sampling campaigns to update seafood dietary advice for PFAS
2023-2024	Victoria EPA	S. Kaserzon	Calibration of PFAS using passive samplers (MPTs) in major catchments around Melbourne
2023	Arcadis	P. Thai	Evaluation of PFAS release from impacted concrete
2023	Telethon Kids Australia	X. Wang	Understanding the role of sampling and storage conditions in defining the background of plastic-related chemical analysis in urine samples
2023	QLD Government Department of Environment and Science	C. Rauert	Tyre additives in Moreton Bay
2023	NSW EPA via CSIRO	E. Okoffo, K. Thomas	Sampling and analysis of microplastics in recovered wastes
2023	Seqwater	S. Kaserzon	Sample extraction and analysis for cane toad toxins
2023	Victoria EPA	S. Nilsson	EPA emerging contaminants and citizen science: PFAS in bees
2023	Sport Integrity Australia	K. Thomas, B. Tscharke, K. Shimko	Performance and Image Enhancing Substances in Wastewater
2023	Goodman Foundation	E. Okoffo	Understanding the microplastic pollution budget of Moreton Bay
2022-2027	NHMRC-EU	K. Thomas, L. Morawska, X. Wang, C. Rauert, Z. Ristovski, J. Mueller	Identification of chemical and biological determinants, their sources, and strategies to promote healthier homes in Europe (INQUIRE)
2022-2026	Minderoo Foundation	K. Thomas, J. Mueller	Developing protocols to measure plastic chemicals in human brain, blood and urine
2022-2024	ACIC	B. Tscharke, J. Mueller, P. Thai, R. Verhagen	Strategic wastewater monitoring of drug consumption in regional areas
2022-2024	QLD Government Department of Environment and Science	S. Kaserzon, E. Knight, T.M.H. Nguyen	FOGO contamination including PFAS sample and analysis

Years	Funding Source	CIs	Project
2022-2024	Massey University	X. Wang	Interventions to rescue pesticide exposure and associated ill health in pesticide exposed workers and family members
2022-2023	Great Barrier Reef Marine Park Authority	S. Kaserzon, G. Taucare, J. Mueller	Pesticide analysis for the inshore Great Barrier Reef Marine Monitoring Program (MMP)
2022-2023	Queensland Health	K. Thomas & J. Mueller	Wastewater – COVID-19
2022-2023	UQ QUEX Workshop	J. O'Brien	Wastewater-based epidemiology for Antimicrobial Resistance Monitoring
2022-2023	University of Western Australia	X. Wang	Plastic-related chemical analysis in urine samples
2022-2023	RCSI Bahrain	X. Wang	Plastic-related chemical analysis in urine samples
2022-2023	James Cook University	S. Kaserzon	Trop Water passives sampling
2022-2023	Cape York Water Partnership	S. Kaserzon	Cape York passives sampling
2022	Australian Tax Office	P. Thai	Wastewater testing

Active Funding in 2022–23

Years	Funding Source	CIs	Project
2022-2026	NHMRC 2020 Special Initiative in Human Health and Environmental Change	S. Vardoulakis, N. Osborne, plus 50 CIs	Healthy Environments and Live (Heal)
2022-2026	NHMRC Investigator Grant	J. O'Brien	A National Wastewater Surveillance Program for Antimicrobial Resistance
2022-2026	ARC Discovery Project	S. Bengtson Nash, X. Wang	Uncovering Antarctica's Secret Chemical Voyagers for Expedited Regulation
2022-2025	ARC Discovery Project	P. Thai, B. Tscharke, J. O'Brien	Realistic assessment of biomarker transformation in the wastewater system
2022-2025	ARC DECRA	R. Bade	Facilitating detections of new psychoactive substances in wastewater
2022-2025	ARC Linkage Project	S. Kaserzon, J. Mueller	Reducing glyphosate exposure from high use practices
2022-2025	NHMRC Ideas	N. Osborne, R. Fuller, S. Reid, G. Griffith, P. Dennis, D. Darssan, R. Richards	New eDNA measures of greenspace biodiversity and its linkage chronic disease
2022-2025	ARC Discovery Project	R. Colvin, W. Louis, K. Fielding	The effect of unconventional advocates on public support for climate policy
2022-2024	UQ Research Support Package	F. Zare, N. Ghasemi, P. Shaw, N. Bansal, N. Osborne, Q. Li, K. Thomas, M. Veidt, A. Abbosh, A Rakic	Minimising Human Health Risks from Antibiotic Resistant Bacteria in Wastewater Using a Novel Pulsed Power Technology
2022-2024	ARC Linkage Project	P. Thai, X. Wang, C. He, T. Prow, P. Culshaw, C. Wilkins	Understanding third hand exposure of Australian people to methamphetamine
2022-2024	ARC Discovery Project	J. Guo, G. Carvalho	Novel disinfection to combat antibiotic resistance
2022-2024	EU MSCA-IF	V. Schacht, K. Thomas	Fate and impact of past, present and future consumer plastic on soil
2022-2024	UQ Amplify	P. Shukla	Advance Queensland Mid-Career Fellowship
2022-2023	U.S. DoD ESTCP	J. Mueller, P. Thai	Management and mitigation of PFAS leaching from concrete
2022-2023	Metro North HHS	R. Thomson, J. Guo, W. Ahmed, S. Bell, A. Burke, G. Jackson	Eliminating opportunistic pathogens from premise plumbing biofilms in healthcare facilities
2022-2023	Universities Australia: Australia-Germany Joint Research Cooperation Scheme	R. Bade, J. O'Brien, B.	Assessing the toxicity and metabolism of new psychoactive substances and their presence in wastewater

Years	Funding Source	CIs	Project
2022	UQ ECR Knowledge Exchange & Translation Grant	E. Knight	The leachability of per- and poly- fluoroakyl substances (PFASS) and their precursors from compostable food contact materials (FCMS) into food
2022	UQ HABS - EAIT ECR seed grant	Jiaying Li	Network-wide modelling for illicit drugs and pharmaceuticals in sewer systems
2022	UQ HABS - EAIT ECR seed grant	Jiaying Li	Green disinfection to combat antibiotic resistance
2022	Royal Society of New Zealand via Massey University	J. Mueller	Dark side of the Net: Exploring and modelling the impact of online illegal drug markets
2022	Melbourne Water	J. O'Brien, K. Thomas, Jinglong Li	Preliminary investigations relating to the role of cyanobacterial blooms in the amplification and dispersal of antimicrobial resistance
2022	Goodman Foundation Research Grants 2022	J. Clokey, C. Beggs	Evaluating the presence of pesticides in Moreton Bay/ Quandamooka's seagrass after a La Niña summer
2022	Goodman Foundation Research Grants 2022	J. Clokey, C. Beggs	Understanding exposure and risk from widespread use of neonicotinoids in the Moreton Bay Catchment
2021-2024	Queensland Correctional Services	P. Thai, J. Mueller, K. Thomas, J. O'Brien, R. Verhagen	Drug testing consumables and confirmatory services including wastewater analysis
2021-2023	Queensland Health	K. Thomas	Queensland Alliance for Environmental Health Sciences
2021-2022	UQ Research Support Package	K. Thomas	Strategic growth of the Queensland Alliance for Environmental Health Sciences (QAEHS)
2021-2022	Arcadis	P. Thai	Evaluation of PFAS release from impacted concrete
2021-2022	EU Horizon MSCA-IF	N. Rousis & K. Thomas	NTS-EXPOSURE: The innovative wastewater-based epidemiology approach with the advances of high resolution mass
2020-2024	ARC Australian Laureate Fellowships	J. Mueller	Transforming our understanding of the chemical exposome
2020-2024	U.S. DoD Strategic Environmental Research Development Program	S. Kaserzon, J. Mueller, D. Hawker & C. Higgins	Development of passive sampling methodologies for per- and polyfluoroalkyl substances
2020-2024	NHMRC Targeted Call for Research	J. Mueller, M. Kirk, L. Fritschi, J. Bräunig, L. Toms, K. Fielding, M.P. Kay, L. Aylward & others	Assessing effectiveness of PFAS exposure control in exposed communities and fire fighters
2020-2024	NHMRC Targeted Call for Research	L-M. Toms, J. Bräunig, K. Thomas, O. Cheneval	Human biomonitoring of PFAS: assessing reliability and validity
2020-2023	NHMRC Targeted Call for Research	K. Thomas, J. Martin, S. Kaserzon, S. Samanipour & K. Morphett	Comprehensive characterisation of the PFAS exposome
2020-2023	NHMRC Targeted Research	X. Wang, P. Thai, C. He, T. Prow	Human exposure to PFAS and their precursors in the human environment and their biotransformation processes
2020-2024	ARC Linkage Project	J. Mueller, J. O'Brien, B. Tscharke, J. Gerber, R. Bade, P. Thai, S. Kaserzon, C. Gartner, G. Carvalho, N. Crosbie, M. McLachlan, A. Covaci, C. Ort, S. Samanipour, P. Leahy, R. van Egmond, P. Maxwell, R. Mann, P. Sherman, M. Williams, A. Zamyadi	Understanding Australia by analysing wastewater during the Census 2021
2020-2023	ARC Linkage Project	S. Kaserzon, K. Thomas, D. Hawker, C. Veal, M. Bartkow, A. Hinwood, J. Cumming, J. & I. Allan	Improved monitoring of aquatic pollutants in national water resources
2020-2023	ARC Linkage Project	A. Oehmen, L. Ye, G. Carvalho, R. Lemaire, M. Stokholm-Bjerregaard, D. Gale, M. Hordern, M. Albuquerque	Sustainable water reuse and resource recovery through cost-effective BNR
2020-2023	Commonwealth Government Department of Climate Change, Energy, the Environment and Water	J. Mueller	Specimen banking services
2020-2022	ARC Discovery Project	B. Laycock, P. Lant, P. Dennis, S. Pratt, S. Kaserzon & M. MacLeod	Bioplastics in the environment: lifetimes and toxicology
2019-2024	NHMRC-EU	J. Mueller & A. Ponsonby	Novel Testing Strategies for Endocrine Disruptors in the Context of Developmental Neuro Toxicity (ENDpoiNTS)
2019-2023	ACIC	J. Mueller, B. Tscharke, J. O'Brien, K. Thomas, C. Gerber, J. White & R. Bade	National Wastewater Drug Monitoring Program
2019-2023	ARC Special Research Initiative	J. Mueller, M. McLaughlin, J. Braeunig, R. Kookana, N. Nagle, C. Grimison, C. Barnes, R. Symons	Remediation of PFAS contaminated soil using a soil washing treatment train
2019-2023	ARC Special Research Initiative	J. Keller, G. Carvalho, K. Doederer, J. Braeunig, C. Barnes, P. Nadebaum, A. Farhat, J. Dwyer	Integrated, scalable technology solutions for PFAS removal and destruction
2019-2023	ARC Special Research Initiative	I. Pikaar, W. Clarke, P. Jensen, J. Braeunig	Efficient PFAS removal from urban wastewater using a novel 2-step approach
2019-2023	NHMRC-NAFOSTED Joint Call	P. Sly, A. Pham, S. Ranganathan, H. Le, P. Thai, D. Phung, R. Ware, D. Tran, & others	Wearing masks to reduce traffic-related air pollution exposure and improve children's respiratory health
2019-2022	Advance Queensland Industry Research Fellowships	P.Shukla	A technology for PFAS remediation from contaminated surface and ground water
2019-2022	ARC Discovery Project	K. Thomas, S. Kaserzon, B. Kasprzyk-Hordern, E. Schymanski, S. Samanipour	A global platform for identifying emerging chemical threats
2019-2022	ARC Discovery Project	G. Jiang, J. O'Brien, L. Coin & S. Luby	Revolutionizing real-time genomic epidemiology in urban wastewater systems (ARC Discovery Project administered by the University of Wollongong)
2019-2022	Norwegian Institute for Water Research	K. Thomas	Microplastics: Long-term Effects of plastics and Additive Chemicals on marine organisms (MicroLEACH)

Appendix B - QAEHS Staff and Students

Academic staff

Staff Member	FTE
Ayomi Jayarathne	1
Ben Tscharke	1
Cassandra Rauert	1
Chang He	1
Dung Phung	0.2
Elvis Okoffo	1
Emma Knight	1
Fisher Wang	1
Gilda Carvalho	0.1
Ian Zammit	1
Jack Ng	0.2
Jake O'Brien	1
Jianhua Guo	0.1
Jiaying Li	1
Jochen Mueller	1
Justin Cormick	1
Katja Shimko	1
Kelly Fielding	0.2
Kevin Thomas	1
Nicholas Osborne	0.2
Phong Thai	1
Phong Vo	1
Pradeep Dewapriya	1
Pradeep Shukla	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
Ayomi Jayarathne	Senior Research Assistant (from June 2023)
Chris Paxman	Research Assistant
Christina Carswell	Senior Research Technician
Daniel Barry	Senior Research Technician
Gabriele Elisei	Scientific Research Team Leader
Geoff Eaglesham	Senior Analytical Chemist
Henry Simila	Workplace Health and Safety Coordinator and Laboratory Manager (to December 2022)
Jasper Bowman	Senior Research Technician (to June 2023)
Jessie Smith	Executive Assistant (from February 2023)
Julia Lin	Senior Research Analyst
John Fagerholm	Project Officer (to September 2022)
Josh Tynan	Senior Project Officer (from January 2023)
Justine Haddrill	Workplace Health and Safety Coordinator and Laboratory Manager (from March 2023)
Kirsten Marano	Senior Research Technician
Kristie Thompson	Research Assistant
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	Appointment
Amy Heffernan	Eurofins	Honorary
Andreas Sjödin	Centers for Disease Control and Prevention	Honorary
Andrew Banks	Queensland Racing Integrity Commission	Adjunct
Beate Escher	Eberhard Karls University Tubingen	Honorary
Chang He	Guangdong University of Technology	Honorary
Christine Baduel	Instit de Recherche pour le Developpement	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

Staff Member	Affiliation	Appointment
Foon Yin Lai	Swedish University of Agricultural Sciences	Honorary
Greg Jackson	Queensland Health	Adjunct
Ian 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	RPS	Adjunct
Leisa-Maree Toms	QUT	Honorary
Lesa Aylward	Summit Toxicology	Honorary
Linda Birnbaum	National Institute of Environmental Health Sciences	Honorary
Maria Jose Gomez Ramos	Universidad de Almeria	Honorary
Matthew Taylor	NSW Department of Primary Industries Fisheries	Honorary
Michael Bartkow	Seqwater	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	Queensland Health	Adjunct
Suzanne Huxley	Queensland Health	Adjunct
Walter Vetter	University of Hohenheim	Honorary
Warish Ahmed	CSIRO	Honorary

Students – Higher Degrees by Research submitted or completed in 2022-2023

Student	Advisory team	Topic	Degree
Hong Le	Phong Thai, Dung Phung, External	Wearing masks to reduce exposure to traffic-related air pollution and improve respiratory health in children	PhD
Katja Shimko	Kevin Thomas, Jochen Mueller, Ben Tscharke, Jake O'Brien, External	Evaluating the suitability of wastewater analysis for the detection and monitoring of performance- and image-enhancing drug use	PhD
Md Nazrul Islam	Jack Ng, External	Health risk assessment of mixed metal/loids at and near open beaching shipwrecking yards in Bangladesh	PhD
Michelle Engelsman	Jochen Mueller, Fisher Wang, External	Firefighter exposure risks and subsequent reproductive effects	PhD
Samuel Namonyo *	Gilda Carvalho, Jianhua Guo, Karen Weynberg	The potential of phage therapy against biofilms of pseudomonas aeruginosa originating from urban water systems	PhD
Sandra Nilsson	Jochen Mueller, External	Exposure of firefighters to PFAS (Per and Polyfluoroalkyl Substances): Serum concentrations and temporal trends after exposure control	PhD

Student	Advisory team	Topic	Degree
Steve Burrows	Kevin Thomas, Sarit Kaserzon, External	Microplastic pollution: From nanoscale surface interactions to public perceptions	PhD
Thi Minh Hong (Rose) Nguyen	Jochen Mueller, Sarit Kaserzon, External	Fate and transport of per- and polyfluoroalkyl substances (PFASs) in the soil environment	PhD

Students – Higher Degrees by Research continuing in 2022-2023

Student	Advisory team	Topic	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	Masters
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
Bastian Schulze	Sarit Kaserzon, Jochen Mueller, Kevin Thomas, External	Remediation of PFAS contaminated soil using a soil washing treatment train	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
Carla Magi-Prowse *	Kelly Fielding, External	Exploring the antecedents and consequences of ecoanxiety	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	Masters
Charlotte Pittaway	Kelly Fielding, External	The future under threat: Young adults and future orientation in times of climate uncertainty	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, Cassie Rauert	Assessing dietary exposure to plastics and associated chemicals	PhD
Dhaya Nadarajan	Richard Bade, Jochen Mueller, External	Facilitating the detection of new psychoactive substances in wastewater	PhD
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, Cassie 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

Student	Advisory team	Topic	Degree
Grechel Taucare	Jochen Mueller, Ben Tscharke, External	Data mining for characterisation of the chemical exposome in Australia	PhD
Hongmin Wang	Gilda Carvalho, External	Sustainable and cost-effective biological phosphorus removal technology in urban water systems	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
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
Joongcheon Nam	Phong Thai, External	Understanding the exposure and dissipation of recreational methamphetamine use in Australian residential properties	Masters
Joseph Clokey	Sarit Kaserzon, Kevin Thomas, External	Improved monitoring of aquatic pollutants in national water resources	PhD
Kavitha Karanam	Kevin Thomas, Elvis Okoffo, External	Microplastics in water system: Issues and treatment	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
Laura Puente	Kevin Thomas, Cassie Rauert	Determination of micro and nanoplastics in breast milk, blood and meconium samples from mothers-infants 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
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
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
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
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
Mingyue Hu	Gilda Carvalho, External	Cost-effective and low-maintenance treatment of groundwater for safe drinking water production	PhD
Monika Walia	Kelly Fielding, External	Climate change and mental health: exploring trends across Australia and the UK	PhD
Naixiang Zhai	Jake O'Brien, Kevin Thomas	Investigation of the inflammatory response of human cells to silica dust exposure	PhD
Natascha Rossi	Gilda Carvalho, External	PFAS removal in water using advanced technologies	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
Rachel Mackie	Sarit Kaserzon, Jochen Mueller, Sara Ghorbani Gorji, Kevin Thomas	Development of passive sampling methodologies for per- and polyfluoroalkyl substances	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, Cassie 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
Thudawe Yohani Shavindi	Dung Phung, External	The effects of maternal exposure to heatwaves on adverse pregnancy and birth outcomes in Queensland	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
Xiongzhi Wang	Kelly Fielding, External	Owning nature: A communication frame to facilitate pro-environmental behaviours	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
Yujie Li	Jianhua Guo, Gilda Carvalho	Understanding roles of disinfection agents on the emergence and spread of antibiotic resistance	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
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 C - 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
- Queensland Health
- QUT
- Sports Integrity Australia
- University of Tasmania
- Victoria Environment Protection Authority

Jochen Mueller
- Airservices Australia
- Arcadis
- CSIRO
- DAWE
- DES (Qld)
- Healthy Land and Water
- Massey University
- Minderoo Foundation
- PFAS Free Australia
- Queensland Health
- QUT
- Stockholm University
- Sullivan Nicolaides Pathology
- University of Amsterdam
- University of Antwerp
- University of South Australia
- Urban Utilities
- Victoria Environment Protection Authority
- Water Research Australia Ltd

Kelly Fielding
- Dr Kylie Morphett, UQ
- Prof Jochen Mueller
- Dr Robyn Gulliver, UQ
- Prof Winnifred Louis, UQ
- Prof Matthew Hornsey, UQ
- Prof Jonathan Rhodes, UQ
- Prof Sarah Bekessy, RMIT
- Dr Dan Lunney, University of Sydney
- Dr Md Sayed Iftekhar, Griffith University
- Dr Rebecca Colvin, ANU
- Tweed Shire Council
- NSW Biodiversity Conservation Trust
- Seqwater
- Healthy Land and Water

Nicholas Osborne
- Water Unit, Queensland Health
- Public Health Unit, Queensland Health
- Western Queensland Primary Health Network
- Women's and Children's Stream - Metro North Hospital and Health Service (RBWH)
- Indian Institute of Technology Delhi

Jianhua Guo
- Queensland Health (Greg Jackson & Phil Choi)
- Urban Utilities
- Melbourne Water
- Seqwater
- MGI, Australia,
- Profs Scott Bell and Rachel Thomson, UQ Faculty of Medicine
- Dr Erica Donner, University of South Australia

Dung Phung
- National Institute of Hygiene and Epidemiology, Vietnam
- Yale School of Public Health, Yale University, USA
- Griffith University, Australia
- Australian National University, Australia
- Southern Cross University, Australia

Sarit Kaserzon
- Queensland Department of Environment and Science (DES)
- NSW Department of Planning, Industry and Environment
- Great Barrier Reef Marine Park Authority
- Seqwater
- EPA Victoria
- Australian Packaging Covenant Organisation (APCO)
- Food Packaging Forum
- Australian Recycling Organics Association
- Candy Soil
- Massey University
- Veolia Water Australia Pty Ltd
- Dr A.Prof. Branislav Vrana - Recetox, Czech Republic
- Dr Prof Yolanda Pico - University of Vallencia, Spain
- Dr Ian Allan - NIVA, Norway
- Dr Prof Chris Higgins - Colorado School of Mines, USA
- Dr Maria Jose Gomez Ramos - University of Almeria, Spain

Phong Thai
- Arcadis/ExxonMobil
- Australian Tax Office
- Qld Corrective Services
- MTK group (Methamphetamine testing and decontamination)
- WA Health (Environmental Health Unit)

Appendix D - Community and Professional Activities

Kevin Thomas
- 2020 – present: Editorial Board Member for Environmental Science & Technology Letters
- 2020 – 2023: Steering Group member EU Horizon 2020 project, Harmonization Assuring Reproducible Monitoring and Assessment of Plastic Pollution (EUROqCHARM)
- 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

Jochen Mueller
- 2006 – present: Adjunct Prof, School of Public Health, Griffith University
- 2012 – present: Member of SETAC (ASE joined SETAC in 2011)
- 2009 – present: Member of Australian Water Authority
- 2003 – present: NATA Assessor
- 2003 – present: Technical Expert, International Accreditation New Zealand

Kelly Fielding
- Director of Research, School of Communication and Arts, UQ (1 July 2022 – 1 February 2023)
- Organiser of the Network of Environmental Social Scientists at UQ
- Member of the UQ Mental Health in Climate Change Transdisciplinary Research Network
- Member of the Social Research advisory committee of Healthy Land and Water
- Member of the Seqwater social advisory group
- Member of the Editorial Board of Journal of Environmental Psychology
- Advisory Board to the 'Nature in your Face' project (Norwegian University of Science & Technology)
- Climate Compass Academic Advisory Panel member (Research run by the Sunrise Project)
- Provision of expert feedback to Queensland Health, Health Protection Branch on their consultation paper on DIY asbestos removal by homeowners in Queensland
- Report reviewer for the New Mexico Water Resources Research Institute at New Mexico State University: https://nmwrri.nmsu.edu/wp-content/uploads/TR/tr402.pdf
- Kylie Morphett: Member of the Commonwealth Government Tobacco Product Health Information Expert Advisory Group (Feb 2023-current).

Jianhua Guo
- Nominated as affiliate professor at IMB, UQ
- As one a co-chair, Jianhua has been organising the 10th IWA Conference on Microbial Ecology and Water Engineering (MEWE), which will be held in September 2023, Brisbane, Australia
- 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, AWMC 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 are open to all

Dung Phung
- Participating the co-design meeting to develop a Community of Practice for those working on climate-sensitive infectious disease modelling digital tools and open-source software.
- Joined the Global Heat Health Network for knowledge sharing and potential collaborations with colleagues worldwide.

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

Phong Thai
- National Science Week lightning talks at QH FSS
- Engagement talk at Logan Water about Covid-19 wastewater surveillance program
- Webinar on Covid-19 wastewater surveillance to Beijing Normal university and Dalian Maritime University
- Webinar discussion organised by Nature Water on the applications of Wastewater-based Epidemiology.

Appendix E - Research Publications

Book Chapters

Sousa, G., Delerue-Matos, C., Wang, X., Rodrigues, F. and Oliveira, M., 2022. Potential of Saliva for Biomonitoring of Occupational Exposure: Collection of Evidence from the Literature. In Occupational and Environmental Safety and Health IV (pp. 587-598). Cham: Springer International Publishing.

Gabriel, S., Wang, X., Rodrigues, F.P.L.M. and de Oliveira, M.M.M., 2022. An introduction to occupational exposure. An Essential Guide to Occupational Exposure, pp. 1-22.

Vo, H.N.P., Chaiwong, C., Zheng, L., Nguyen, T.M.H., Koottatep, T. and Nguyen, T.T., 2022. Algae-based biomaterials in 3D printing for applications in medical, environmental remediation, and commercial products. In Algae-Based Biomaterials for Sustainable Development (pp. 185-202). Elsevier.

Peer Reviewed Journal Articles

Rousis, N., Bade, R., Romero-Sánchez, I., Mueller, J.F., Thomaidis, N.S., Thomas, K.V. and Gracia-Lor, E., 2023. Festivals following the easing of COVID-19 restrictions: prevalence of new psychoactive substances and illicit drugs. Environment International, p.108075.

Wang, X., Fielding, K.S. and Dean, A.J., 2023. Psychological ownership of nature: Relationships with pro-environmental intentions in less environmentally-oriented individuals. Personality and Individual Differences, 213, p.112304.

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Ahmed, F., O'Brien, J.W., Keshaviah, A., Hall, W.D., Bade, R., Tscharke, B., Matus, M., Mueller, J.F., Thomas, K.V. and Burgard, D.A., 2023. Wastewater-based monitoring could help guide responses to the USA opioid epidemic. Nature Water, pp.1-4.

Nguyen, P.Y., Marques, R., Wang, H., Reis, M.A., Carvalho, G. and Oehmen, A., 2023. Water Research X. Water Research, 10(19), p.100177.

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van Herwerden, D., O'Brien, J., Lege, S., Pirok, B., Thomas, K. and Samanipour, S., 2023. Cumulative Neutral Loss Model for Fragment Deconvolution in Electrospray Ionization High-Resolution Mass Spectrometry Data.

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