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The official journal of Water New Zealand – New Zealand's only water environment periodical.

Established in 1958, Water New Zealand is a non-profit organisation.

On the cover: Te Kuru wetland. Image courtesy of Christchurch City Council

What a conference, what a year



Tim Gibson

President

Water New Zealand

Congratulations to everyone who shared their energy and expertise to help us deliver a such a world class international event – the IWA-ASPIRE and Water New Zealand Conference & Expo 2025.

This was clearly a success on every level – from the record-breaking number of delegates to the quality of keynote and technical presentations, workshops and networking opportunities.

It's worth reflecting just how much work went on behind the scenes to bring this event to Aotearoa New Zealand. After nine years of planning – including two years of delay due to Covid – we were finally on track to welcome delegates from 50 countries to Tāmaki Makaurau Auckland. Then at the start of the year, came an unexpected challenge - the NZICC Convention Centre, our planned venue, would clearly not be ready in time.

Suddenly, we faced the unnerving prospect, to say the least, of hosting a major international conference without a venue.

What followed was an incredible demonstration of teamwork and resilience. Thanks to the agility of our event organisers, Avenues Event Management, we executed a rapid pivot to Ōtautahi Christchurch. And it could not have gone better.

The conference drew outstanding feedback from our members and our international colleagues. Thank you to everyone involved, and to Ōtautahi Christchurch for your exceptional manaakitanga.

Also, at the beginning of the year we published our third pulse survey of business conditions. This showed a very subdued and uncertain outlook. As we prepare to release our next survey, I am optimistic that the picture will look brighter.

The reform process has reached a new milestone. While around 40 entities may not be the long-term quantum of water services providers, the formation of new council-controlled organisations (CCOs) will provide the foundation for much-needed, long-term investment.

That investment will be crucial to addressing infrastructure challenges and enabling innovation. It will also help us to keep our skills and talent here.

We also need to support innovation through well targeted research. That's why another big focus for Water New Zealand in 2025 has been our 'Water Research Roadmap' funded by the Water Services Managers' Group.

The roadmap – currently in draft – draws on expertise from councils, iwi, academia, and industry. It aims to set out a shared vision and coordinated path for research, investment, and innovation. The timing is important as our science and research organisations are in the midst of reform. Read about this on page 6.

This year our advocacy work on behalf of the industry has been a huge focus for the team, with a whopping 20 submissions to government on the many reform issues.

In our latest submission, the Commerce Commission's Water Services Information Disclosure Draft Decision, we have recommended that the information disclosure should focus on consistent data definitions and achieving data confidence to inform and support the water services providers' decisions. All our submissions are available on our website.

We are expecting to see the two RMA replacement bills (a natural environment bill and a planning bill) introduced to Parliament before Christmas as well as a review of the Public Works Act and Emergency Management Bill. As always, we'll be seeking members' support and feedback.

This is the last Water Journal for 2025, before we start winding down for the summer break, I hope you too have been able to reflect on a job well done and are looking forward to more certainty about our direction of travel.

I have every confidence that the year ahead will bring further progress.

Ngā mihi nui.

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President

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Research roadmap sets out water sector collaboration

The draft 'Water Research Roadmap' marks a big step forward for the water sector. It draws on insights from more than 200 experts across councils, iwi, academia, and industry, and is now available online for comment ahead of its formal launch at the Water Services Managers' Group meeting on 27 November.

Why this roadmap, and why now?

Aotearoa New Zealand's science and innovation system is in the midst of major reform. New structures such as Research Funding NZ, with its four pillars – economy, advanced technology, environment, and health & society – alongside the consolidation of Crown Research Institutes into Public Research Organisations, are designed to make research more connected, strategic, and impact-focused.

For the water sector, this shift is both timely and essential. Decades of underinvestment, climate impacts, new regulatory standards, changing contaminant levels, and community expectations for safe, affordable services have created a complex set of challenges that cannot be solved by infrastructure renewal alone.

Research is a key lever for progress. International evidence shows that every dollar invested in water research can yield five to tenfold returns in economic and social value.

By embedding research at the heart of the sector's transformation, we can ensure that every infrastructure dollar is spent more effectively, delivering resilient systems, smarter technologies, and better outcomes for people and the environment.

What we did

The Research Roadmap was commissioned by the Water New Zealand Water Services Managers' Group and developed with support from Cogo, a locally-based international company working in the carbon management/climate technological space.

More than 200 sector voices, ranging from practitioners to researchers, iwi representatives, and funders, helped shape its direction. The work has identified 12 research priorities grouped under three themes: water resilience and future infrastructure; governance and social impact; and water intelligence and emerging technologies.

These themes align with Water New Zealand's 'Transformation 2050' vision, connecting research with the sector's broader goals of restoring trust, embedding te ao Māori worldviews, and achieving climate-ready, people-centred infrastructure.

Why this matters for the sector

In a time of fiscal constraint and rates capping, strong research and innovation offer the path to both efficiency and long-term value.

Better evidence leads to smarter investment and targeted interventions – reducing maintenance costs, enabling predictive management, and supporting resilient communities.

Research also opens doors to new partnerships and funding pathways, including collaboration with government, iwi, and the private sector.

But there is a deeper imperative: water touches every part of life. From agriculture and food production to recreation, tourism, and economic well-being, the way water is managed affects our collective future. A strong, coordinated research base can help the sector lead nationally, showing how collaborative, evidence-driven work across infrastructure can improve outcomes for everyone.

Building on innovation pathways

This roadmap builds on Water New Zealand's ongoing innovation initiatives. In a previous article, we highlighted how technological and financial innovation must work hand in hand to secure the sector's future. As we noted, innovation isn't just about new tools, it's about new ways of thinking, fostering ecosystems that bridge councils, research institutions, and private partners.

Case studies from around the world show the power of sustained, mission-led innovation. In Spain, for example, Valencia's digital twin network reduced water leakage by 30 percent through predictive analytics, while Singapore's PUB system integrated culture, technology, and community engagement to create circular, resilient water systems.

Aotearoa New Zealand can harness similar momentum, supported by the ongoing national science reforms, to embed innovation more deeply within our water systems.

What needs to happen next

For the roadmap to deliver its promise, the sector must act collectively and with ambition. The report lays out a phased approach for the years ahead:

1. Align and integrate sector research priorities with emerging national structures like the National Research Council and Public Research Organisations.
2. Secure sustainable funding pathways that move beyond short-term projects and enable long-term, co-invested research programmes.
3. Build collaboration and capability through shared hubs, data standards, and research platforms.
4. Deliver measurable impact by embedding mātauranga Māori, monitoring progress, and linking research outcomes to national goals.

Achieving this will require support from councils, regulators, industry, and the wider membership of Water New Zealand. Financial commitment will be essential in the long term, but so too will be engagement and advocacy.

The draft roadmap provides a unifying framework through which every part of the sector can contribute, ensuring that research effort is coordinated, coherent, and aligned with national priorities.

Looking ahead

As the draft roadmap moves toward finalisation, it offers both direction and opportunity. It shows how the water sector can play a leading role in the country's broader science reforms, championing applied, mission-driven research that delivers tangible public benefit.

It also demonstrates the strength of collaboration across our sector. When councils, researchers, iwi, and industry come together around a shared vision, we can build the evidence base needed for a sustainable, resilient, and equitable water future.

The draft report is available for review on the Water New Zealand website, and feedback from the sector is encouraged.

The final version, set to be launched formally in November, will form the backbone of future engagement with government, researchers, and funders, guiding investment and helping to secure a sustainable, evidence-led water future for Aotearoa New Zealand.

Reimagining water sector learning with blockchain credentials

By Belinda Cridge, Water New Zealand technical lead (drinking water quality and education)

Sometimes a new technology comes along that quietly changes how things work. For training and education, blockchain-verified credentials may be one of those shifts. Blockchain is reshaping how people prove their skills, and for the water sector – where safety and trust matter every day – that's worth attention.

Blockchain credentials are secure digital certificates; tamper-proof records of qualifications that live online. No lost paperwork, no delays, instantly verifiable. Employers, regulators, and training providers can confirm authenticity at a glance.

A US pilot with Grand Valley State University shows what's possible: students earn and store verified credentials for academic and technical skills in a digital wallet, even before entering the workforce. If applied here, students completing a water-related micro-credential at school, could step into an apprenticeship already carrying authenticated proof of their skills.

For workers, blockchain could create a personal learning passport, bringing together Connexis qualifications, Water New Zealand digital

badges, and NZQA micro-credentials in one trusted, portable record. It doesn't replace accredited training; it connects it, keeping the learner in control.

Why it matters

Blockchain could align closely with the Authorisations Framework being developed by the Department of Internal Affairs and The Water Services Authority Taumata Arowai. Linking training, qualifications, and authorisation data would allow regulators to instantly confirm current certifications while ensuring operators retain ownership of their records.

At its core, this isn't about code, it's about people. Every credential represents effort and pride in doing the job well. Blockchain simply protects that achievement and makes it easier to share. With collaboration between Water New Zealand, Connexis, and regulators, blockchain could soon become the invisible plumbing behind a trusted, connected learning ecosystem for the water sector.

Strengthening connections to safeguard drinking water

By Brian Brown, Backflow Group chair

The Drinking Water Protection Conference 2025, held in Ōtautahi Christchurch in August, brought together 56 delegates from various sectors including local councils and industry specialists.

The conference fostered knowledge sharing, professional development, and strengthened collaboration between Aotearoa New Zealand and Australian water and plumbing industries,

reinforcing the important connections in advancing drinking water safety practices.

We were very pleased to host the chief executive of the Backflow Prevention Association of Australia, Peter McLennan, and vice president Peter Damaso. Biosecurity and food safety minister Andrew Hoggard also spoke at the conference.

The two-day event featured 19 presentations

on drinking water protection and backflow prevention, along with practical training sessions sponsored by Hynds Water.

Thank you to all our event sponsors. Hydroflow Distributors sponsored the well-attended welcome function and Promains sponsored the highly enjoyable conference dinner. Thank you also to Amtac and Deeco for their sponsorship and support.



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- Managing expectations: the right level of detail
- Beyond Three Waters (fluvial, coastal, groundwater, etc)
- Data analytics
- Wildcard

Lessons in leadership

By Lisa Mace, associate process engineer, Beca

As I write this on the flight home from Chicago, I'm reflecting on an incredible journey that took me from Wellington to Washington DC, through six months of early morning webcasts and group projects, and finally to WEFTEC in Chicago, one of the world's largest water conferences.

Thanks to a full scholarship from Water New Zealand and the support of Beca, I had the privilege of participating in the Water Leadership Institute (WLI); a programme run by the Water Environment Federation (WEF) of which Water New Zealand is a member association.

WLI is a competitive entry programme designed to develop emerging leaders in the water sector. With participants ranging from recent graduates to seasoned professionals with 30 or more years' experience, the diversity of experience and role was one of the programme's greatest strengths.

My cohort included engineers, contractors, operators, regulators, researchers, asset managers and directors. I was thrilled, and a little surprised, to be accepted, and even more so when Water New Zealand offered me a scholarship to cover my travel and course costs. That gesture made me feel truly believed in and appreciated.

The six month programme kicked off with a two-day, in-person workshop in Washington DC in April. From there I returned home and continued to engage in monthly webcasts and discussion groups, returning to the US in a final wrap-up session in Chicago the day before WEFTEC began. The curriculum topics were rich and varied, covering public speaking, leading with emotional intelligence, exploring diverse perspectives, unconscious bias, managing and leading through change and many more.

Each webcast was followed by a discussion session a few days later, both usually at 6am NZ time. Despite the early starts, this format worked well. It gave us time to reflect and led to deep, meaningful conversations about challenges in our careers and personal growth. These discussions were only possible because of the strong connections we'd built as a cohort.

My project group of six focused on a question that plagues many in our industry: Why do capital projects in the water sector tend to go over budget? This sparked fascinating conversations with colleagues and led us to identify key themes, including budgets often being set too early without sufficient detail and the critical importance of choosing the right delivery model.

We were so passionate about the topic that we struggled to trim down our content for the two videos and article we produced, now available on the WEF website. Huge thanks to our mentor, David Grace, who guided us through the content creation journey.

WEFTEC itself was overwhelming in the best way, with nearly 25,000 attendees and an expo hall that felt endless. One standout event was the Operations Challenge, a high-energy competition for operators that I'd love to see replicated here.

Another highlight was the launch of the Water-AI Nexus Center of Excellence, a collaboration between WEF, Amazon, The Water Center at the University of Pennsylvania, and The Leading Utilities of the World. This initiative aims to use AI to solve global water challenges while ensuring AI infrastructure uses water sustainably. In celebration of this, I used AI to help draft some of this article; proof that the future is already here.

I had some great conversations at WEFTEC about how AI can support treatment plant operations, replacing traditional O&M manuals with smart,



Lisa Mace

searchable systems that keep institutional knowledge at your fingertips. Other key themes included recycled water and the very topical challenge of PFAS.

Thanks to the connections of Garry Macdonald, I had the opportunity to co-present at the Global Center and attend some of the most exciting events of the week. These experiences were unforgettable and added a whole new layer to the programme.

This journey has been one of hard work, personal growth, and immense pride. It involved two trips away from my family, which was challenging, especially with toddlers at home. I'm incredibly grateful to my husband, who not only read my applications but also managed solo parenting while I travelled.

I'm proud to be the fifth Kiwi to complete the WLI programme, and I know others are keen. I had a supportive group of cheerleaders encouraging me to apply, and examples of New Zealanders who had gone before me.

So, I'll end with a question: Are we ready for WLI Aotearoa? We have a vibrant water industry here, and a local version of this programme could help us connect across disciplines, career stages, and regions. It could start small, but the structure WEF has developed over many years is solid and something we could build on.

I know I've made lasting friendships and gained insights that will shape my career for years to come. Let's keep the momentum going.

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Learning, growing, and applying knowledge

By Sheshant Kumar, three waters manager, South Waikato District Council

This year, I was fortunate to receive support from Water New Zealand to take part in the Biological Wastewater Treatment: Principles, Modelling and Design course, developed by IHE Delft. I want to share what this learning experience has meant for me, and how it connects directly to the challenges and opportunities we face in our district.

Working in local government water services, I've always believed that every new learning opportunity should come back to one simple question: How does this help us run better plants and deliver better outcomes for our communities?

This course has really reinforced that thinking. It has pushed me to go beyond the day-to-day operational perspective and dive deeper into the science and modelling that sits behind our treatment processes.

Connecting theory to practice

A major benefit has been getting a much clearer picture of how the different biological processes fit together, from activated sludge to nutrient removal, final settling, and sludge characteristics.

While many of us pick up bits and pieces of this knowledge on the job, the course has pulled it together in a structured way. It has helped me understand not just what we do at our plants, but why the processes behave the way they do under different loading, flow, and operating conditions.

For example, the modelling work has given me new ways to think about things like sludge settleability and recirculation rates. I can now see how design principles link directly to the operational choices we make every day, whether that's adjusting return activated sludge, managing MLSS levels, or responding to load shocks.

This kind of understanding is invaluable when we're troubleshooting or planning upgrades.

Tokoroa's MBBR-PDNA

The timing of the course couldn't have been better, because we're currently working on some exciting and challenging projects.

At Tokoroa Wastewater Treatment Plant, we are developing a Moving Bed Biofilm Reactor (MBBR) Partial Denitrification-Anammox (PDNA) process – the first of its kind in our region.

Being part of the course has helped me to better interpret design choices, evaluate how different biological pathways interact, and think carefully about the operational support we'll need to make PDNA successful.

PDNA is an advanced process and not something you can run on intuition alone. Having the extra knowledge behind me means I feel more confident in discussions with consultants

(Louis Ortenzio, chief engineer, Lutra), peer reviewers, and my own team.

It has also highlighted the importance of planning for monitoring, instrumentation, and operator training right from the start.

Putāruru's denitrification challenge

Another key project on my desk is the Putāruru Wastewater Treatment Plant upgrade. Our resource consent requires us to consistently meet tight ammonia limits by 2026. The consultant's report recommended a new MBR plant, but budget constraints mean we need to innovate with existing assets and consider options like enhanced denitrification.

The course has been directly useful here. Sections on biological nutrient removal and side-stream processes have given me insights into how we might strengthen denitrification without the full capital outlay of a brand-new plant.

It has made me think about design compromises, process integration, and the role of chemical versus biological solutions in a real-world council setting where affordability is always a factor.

A personal takeaway

On a personal level, this course has been a reminder of why I love working in this field. Wastewater treatment isn't just about pipes and pumps; it's about biology, chemistry, physics, and people all coming together to protect our environment.

The balance between theory and practice has kept me engaged, and I've genuinely enjoyed going back to the textbooks, something I haven't done at this depth since university.

I also see the benefit for my team. As a manager, being able to explain the 'why' behind process decisions helps me mentor staff and build confidence across the group. The more I can share these learnings, the better equipped we are collectively to operate, optimise, and adapt.

Looking forward

I'm very grateful to Water New Zealand for supporting me with this opportunity. The knowledge gained is already shaping how I approach current projects, and it will continue to guide me as we face the next wave of challenges in wastewater treatment.

Whether it's adopting new technologies like PDNA, upgrading existing assets under financial pressure, or simply improving our day-to-day plant operations, the tools I've gained from this course are already proving their worth. And most importantly, they're helping us deliver safer, more sustainable, and more resilient water services for our communities.

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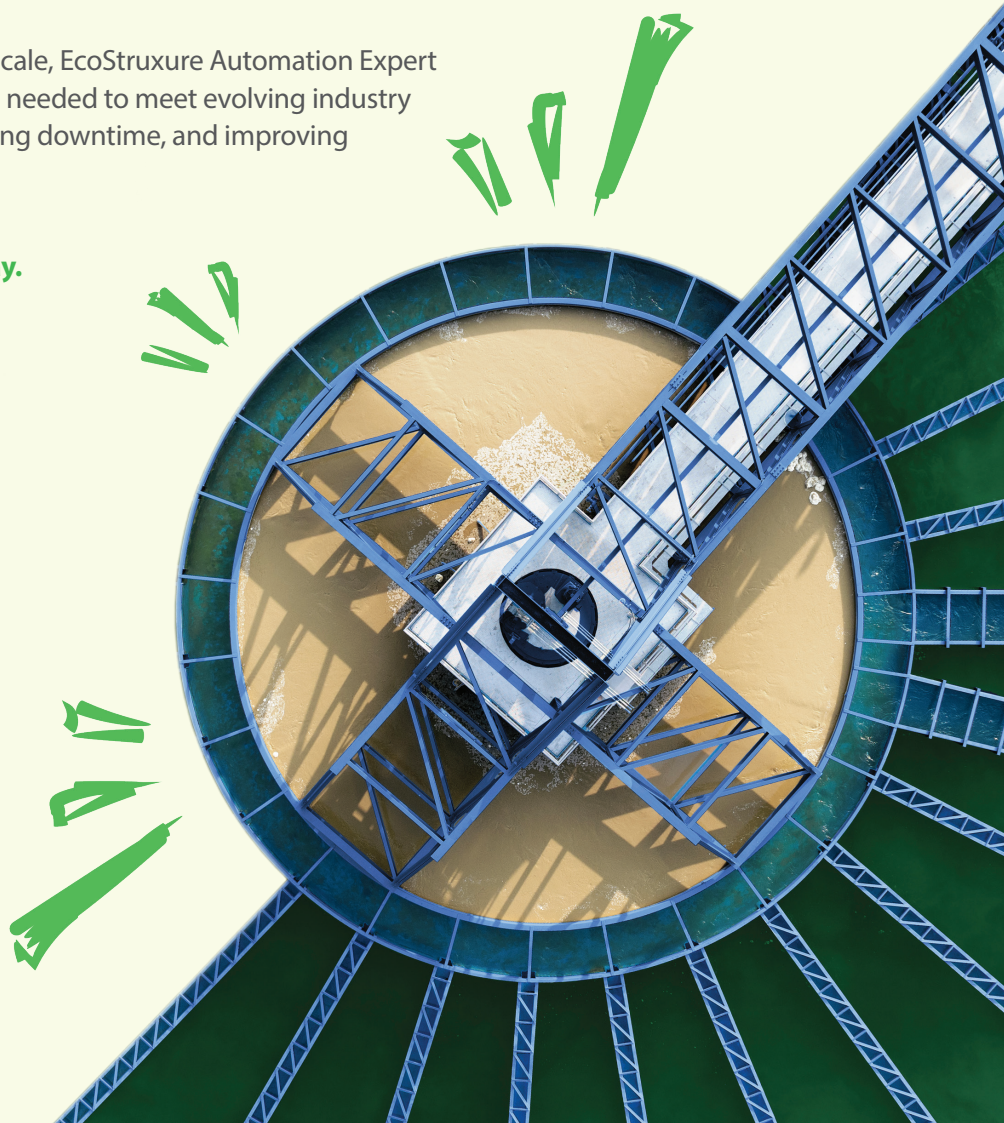
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Shaping Tomorrow's Water Future

Across Aotearoa New Zealand, the way we manage water and the environment is evolving. PDP's Azam Khan and Steve Pearce share how collaboration, innovation, and purpose are shaping enduring solutions for people and place.

Leading with experience and purpose

The management of water, wastewater and infrastructure across Aotearoa is changing, driven by environmental pressures, community expectations and the need for long-term resilience. At the forefront are Steve Pearce, Group Director of Water Infrastructure, and Azam Khan, Technical Director and Executive Director, at **Pattle Delamore Partners (PDP)**. Together they bring deep technical expertise and a shared commitment to practical, evidence-based solutions that deliver enduring value.

With more than 300 specialists across Aotearoa, PDP brings national reach and local understanding to every project. Steve and Azam have led work across the three waters, industrial water systems, and infrastructure planning. Both see PDP's strength not just in its technical capability, but in how it connects disciplines, people, and perspectives to deliver outcomes that work for the environment and the communities they serve.

"Leadership isn't about being the loudest voice in the room," says Azam. "It's about setting direction and bringing others along."

"It's about being the kind of business that listens and learns, not just one that delivers," adds Steve.

Listening before acting

As an Engineering Fellow and one of Aotearoa's most experienced environmental engineers, Azam has spent his career helping industries and councils find better ways to manage water and wastewater. His philosophy is simple: listen first, then act. "Every site, every community, every client is different," he says. "The solutions that work are the ones grounded in understanding."

For Steve, whose background is in mechanical engineering and project delivery, purpose comes from connection. "Technical excellence is a given,"

“ Every site, every community, every client is different. The solutions that work are the ones grounded in understanding.” *Azam Khan*

he says. "It's what happens beyond that which sets us apart: how we collaborate, how we engage, and how we make decisions that endure."

Water at the heart of change

Both leaders agree New Zealand's water and wastewater sector is at a defining point. Ageing infrastructure, growth, and climate change are reshaping how councils, industries, communities, and the people who rely on these systems plan for the future.

"We're seeing more organisations wanting to move beyond compliance to find sustainable solutions," says Azam. "That means thinking differently about how we manage water, recovering nutrients, improving energy efficiency, and designing for resilience."

Steve adds, "Water connects everything, including communities, industry, and ecosystems. The best outcomes come when hydrology, ecology, planning, and engineering work together from the start."

Mā te mahi tahi ka ora ai te wai – through working together, the water will thrive.

Guided by mātauranga Māori and scientific evidence, PDP works alongside iwi, councils, and communities to protect wai and ensure solutions reflect both environmental and cultural values.

Innovation through collaboration

At PDP, innovation is grounded in curiosity and collective thinking. “When we bring together engineers, planners, and scientists, and when we listen to iwi, councils, and communities, we find smarter, more enduring solutions,” says Steve

Azam agrees. “Innovation isn’t always about doing something new,” he says. “It’s about doing what we already do, better.”

That mindset has guided projects that balance environmental goals with practical outcomes, from the Cambridge Wastewater Treatment Plant upgrade and Fonterra Te Awamutu wastewater optimisation to the Taniwha Springs source protection project, helping safeguard one of Rotorua’s key freshwater supplies.

“Water connects everything, including communities, industry, and ecosystems.” *Steve Pearce*

Working across disciplines

Collaboration sits at the heart of Steve’s leadership. “No one discipline can solve the challenges we’re facing,” he says. “The best results come when our people work across boundaries, hydrologists with ecologists, engineers with planners, scientists with project managers.”

Projects such as the Fonterra Hautapu and Russell Wastewater Treatment Plant re-consenting demonstrate this multidisciplinary strength. Both required close coordination between technical experts and local partners to deliver outcomes that were environmentally sound, culturally aligned, and future-focused.

People, purpose, and the future

For Steve, optimism for the future starts with people. “He tangata, he tangata, he tangata, it’s the people,” he says. “What makes me optimistic is the calibre of our people and the partnerships we’re building. There’s a new generation of engineers, planners, and scientists who think holistically and want to make a difference.”

Azam shares that sense of purpose. “It’s impossible to have a great life unless it’s a meaningful one,” he says. “That sense of purpose drives me, to know the work we’re doing has a positive impact on the environment and people’s lives.”

He believes PDP’s strength lies in its people. “At PDP, we’re not driven by hierarchy, we’re driven by purpose. We listen, collaborate, and focus on what genuinely makes a difference.”

Closing reflection

At PDP, shaping tomorrow is not about slogans or quick wins. It is about the everyday decisions that strengthen systems, build trust, and protect natural resources.

“Today Shapes Tomorrow isn’t a slogan for me,” says Azam. “It’s a reminder that everything we do now has an impact, even the small decisions.”

Steve adds, “The future isn’t something we wait for, it’s something we build.”

From municipal and industrial water treatment to land, groundwater, and ecological restoration, PDP’s work spans the full spectrum of environmental challenges. The purpose remains constant: helping clients make better decisions today for a more resilient tomorrow. Together with iwi, councils, and communities, PDP is shaping enduring partnerships and practical solutions that protect Aotearoa’s environment for generations to come.

To find out more about PDP’s work supporting communities, iwi, and industry across Aotearoa, visit pdp.co.nz.



Shaping tomorrow, together.

Across Aotearoa, PDP partners with clients, iwi, and communities to design practical water solutions that protect people, place, and environment.



PATTLE DELAMORE PARTNERS

An incredible record-breaking week

By Gillian Blythe, CEO, Water New Zealand



After nine years in the making, we were thrilled to welcome a record 2494 delegates and exhibitors from around 50 countries to the 10th IWA-ASPIRE and Water New Zealand Conference & Expo 2025 in Ōtautahi Christchurch.

This was an ambitious event – hosting the International Water Association and having them join us for our annual conference. However, the gathering didn't just break our own records, it set a new benchmark for events at both Te Pae Christchurch Convention Centre and the Christchurch Town Hall.

Ngā mihi nui to everyone who helped make this unforgettable event such a success.

Across the plenaries and thought-leadership sessions, delegates explored a myriad of ideas, from indigenous water and WASH models to planetary boundaries, climate resilience, natural disaster recovery, and the future of our water workforce.

We were honoured to host indigenous leaders from Canada and Australia, hear about nature-based solutions in China, and gain insights into climate adaptation and resilience efforts across Asia.

Even before the main conference began, our pre-conference symposium, Local Water Done Well: Moving to the Implementation Phase, drew an impressive 339 attendees. With 27 speakers sharing their expertise, this full-day session delved into what is vital information for councils and the key aspects and lessons involved in establishing new council-controlled organisations.

The symposium unpacked the real-world challenges and opportunities of the Local Water Done Well reform, covering everything from governance, regulation, and funding to IT systems and stakeholder engagement – equipping participants with tools and insights to drive effective, locally-led water organisations.



Attendees can go to our website to view presentation slides.

Over the week, more than 200 technical presentations across 13 separate streams were given. Topics spanned smart solutions, AI and digital innovation, asset management, and much more. We showcased the best of global research and practical know-how, thought leadership presentations and workshops along with 273 exhibition sites.

Above all, our conference brought together the world's leading researchers, practitioners, and innovators to connect, collaborate, and create lasting change for the future of water.

A huge thank you to everyone who made it possible: our incredible Avenues Event Management team, the organising, technical, and programme committees, and our generous partners – Citycare Water, Hynds, Neura, Veolia and Fulton Hogan Water. Supporting partners, Datascape, and our regulatory partner, Water Services Authority Taumata Arowai. Thanks also to our conference sponsors Lutra, Applied Instruments, Bluecurrent, Flovac, Aurecon, Gentrack and of course our Gala Dinner sponsor, Downer.

Jamie Sinclair to chair new water CE forum

Watercare chief executive, Jamie Sinclair, in coordination with Water New Zealand, has announced the formation of a water industry chief executives' forum.

He made the announcement while speaking to an audience at the IWA-ASPIRE and Water New Zealand Conference & Expo, saying he's happy and proud to support the new forum and take on the role of chair.

He says that the new forum will supplement and enhance the work that Water New Zealand already does through the special interest groups.

During his presentation he reflected on the changes the company had gone through and the lessons learned from the transformation into the new structure.

He says that Watercare had gone from

being on the brink of disestablishment to now having its own financial independence and own business plan. These were huge enablers, he says, but had come with a new set of responsibilities and expectations.

Watercare has reset how the organisation engages with partners, stakeholders, mana whenua as well as shareholders and regulators.

Importantly, the new structure allows for Watercare and Auckland Council to be considered as separate organisations for debt and credit purposes. This enables the organisation to deliver and grow more capital than what otherwise would have been the case, at levels more appropriate to a monopoly service provider.

However, he pointed out that alongside this new financial freedom is economic regulation,

with new settings to give confidence to banks and ratings agencies.

Watercare earlier this year executed the country's largest corporate debt capital raising of \$3.4 billion of liquidity at very competitive pricing. This enables the delivery of services and investment for Auckland's 10-year business plan.

Nationally, he says, the water sector needs to collaborate, particularly around issues of economic regulation and information disclosure requirements.

This will place a huge focus on asset management and on financial sustainability as well as how the sector ties outcomes and customer needs to investment while ensuring as much efficiency as possible.

Crossing the boundaries – water links to a planet under pressure

In a keynote address on the planetary boundaries Katherine Richardson, professor of biological oceanography at the University of Copenhagen, told delegates that as a result of human activity, we have passed the threshold of the planet's life support systems and we are now at risk of irreversible environmental damage.

Speaking by Zoom, she said sustainability is about managing this relationship with the planet so that our demand for resources stays within what Earth can supply.

The planetary boundaries framework defines nine key systems – including climate, biodiversity, land, freshwater, and pollution – that determine the stability of our environment.

Six or seven of these boundaries have already been crossed, increasing risks for the planet.

And water is central to all of them. It's not only a local resource but a global integrator, connecting climate, biodiversity, land systems, and the movement of nutrients and pollutants.

Indications show we're already outside the safe operating space for blue and green water (surface and soil moisture).

Tracking our environmental ledger

Ministry for the Environment chief science adviser Alison Collins says that the environmental reporting programme run jointly with the Ministry and Statistics New Zealand tracks progress across nine planetary boundaries.

She said planetary boundaries, environmental reporting, and evidence together form the guardrails of Aotearoa

New Zealand's environmental ledger – the data that helps keep the country on course.

The release of Environment 2025 in April, along with the Marine Environment 2025 report, provides a three-year synthesis of what's happening across our environmental domains and boundaries.

Alison leads the work on translating evidence into policy and decision-making.

She told conference delegates that the reporting framework shows us where to act; measuring what matters; providing evidence for guardrails, and helping design for the future.

But ultimately, she said that keeping us on track will come down to the choices we make every day, as councils, engineers, communities, and individuals.

Collective action needed to tackle water challenges

'How to kill a good idea' formed a key part of opening plenary speaker Te Maire Tau's address to delegates when he talked about efforts to reduce water contamination in the Ngai Tahu tribal area.

Te Maire Tau, pou whakarae of the University of Canterbury, believes that governance and ideology prevent the good management of water, and that title for water ought to be held jointly by the crown and his tribe, Ngai Tahu.

He began his speech by outlining details of the decades-long debate over recognising the tribe's rangatiratanga and co-management claims over its awa. He observed that throughout the debate he had seen too much ideology. Finding solutions, he says, was a lot harder than being committed to ideology.

Te Maire then spoke about the challenges facing his region and what he saw as missed opportunities to balance the agricultural economy with the need to protect the water environment. He believes a water trading environment is needed, but must be based on hydrological data with clear lines of understanding about what is needed for the environment and public health, and then what is available for industry.

"We need data and solutions that can be implemented because I have seen far too many planning documents from local government concerned with the future, not the now."

He says that Ngai Tahu has spent some time and energy on the idea of smart water markets.

"I understand the view that we can't impose a water quota for an environment because it's a living being. But here's another truth... commerce and trade are simply facts of being human, and we need clear boundaries for the environment or else we will have a continual threat."

He went on to discuss a 2019 Environment Canterbury (ECAN) report prepared for the Ministry for the Environment which looked at how to reduce nitrates by 76 percent and phosphates by 50 percent in a plan change for the Selwyn-Waiholā zone. The report, he says, was a fascinating paper on how to kill an idea.

It came up with two findings. One was shifting away from intensive land use to dry land use – sheep, beef and dairy farming. That would cut the catchment's operating surplus by 80 percent – from \$348 million to \$45 million. The second option – to purchase and construct a wetland – would cost \$373 million.

"It almost reads on how to write a report to go nowhere. I suspect that was on purpose," he says.

In addressing the economics, Te Maire points out that the biggest land owner is Ngai Tahu because the tribe owns the Lake Waiholā bed. But why should Ngai Tahu carry the costs of pollution and the dangers posed by nitrogen and phosphorus?

So who should pay for the wetland construction? The answer, he says, is obvious: The businesses that use nitrogen and phosphate.

"But I'm realistic enough to know that that won't happen so the burden has to fall on the region, and that includes Ngai Tahu."

He also pointed out that the 2019 report failed to note also that ECAN owns roughly 6000 hectares and the Christchurch City Council owns 5000 hectares of land. The second option, the wetland construction



required 5000 hectares and Ngai Tahu has already put land aside for that.

He said it was interesting that no one engaged with those ideas.

"Ngai Tahu could assert a property right argument for water but that ignores reality."

He says it was important to focus on growing the economy rather than hindering it. But also to recognise that the dairy industry is responsible not only for nitrogen and phosphorus, but also for the over-allocation of water in the area.

"But let's be honest, we're all part of the same hypocrisy. New Zealand benefits from the economy."

"There are answers to the problem, but there is a need for infrastructure because nothing will work without it."

"The question that I want to know is, where is the contribution at a national level that benefits from it? And I think, at a regional level, Canterbury has to own this problem – and that's everyone."

"If we're going to deal with this, we have to trade off our ideology."

"For the tribe, the question is how many customs are you willing to trade. Do we try to revive our extinct mahinga kai fishing places or do we create new ones in the new economy?"

"Does the industry really think they can dump their externalities on the people at Taumutu?"

"I suspect morally they think not, but the question is what's the solution for dealing with it?"

The ECAN paper, he says, was fascinating but it didn't go anywhere because no one critically engaged with it.

"All of these answers are on the table – the big problem we face is governance."

Democracy, he says, does not lead to good governance of water. Title for water is best held jointly by the tribe and the crown.

Professor Te Maire Tau (ūpoko of Ngāi Tūāhuriri, a hapu of Ngāi Tahu) is a historian on oral traditions, tribal genealogies, and indigenous knowledge systems. He became the first director of the Ngāi Tahu Research Centre at the University of Canterbury in 2011.

Smart Water Management in Pine Harbour, Auckland



Scaling community water networks through smart metering and sustainable operations

A Forward-Looking Utility for a Growing Community

Pine Harbour Water delivers drinking water to a rapidly growing residential community in Auckland, New Zealand. With 500 households already connected and plans to reach 5,000 over the next decade, the utility is proving that small-scale systems can achieve large-scale results through smart technology.

Despite its small scale, Pine Harbour Water operates under the same Drinking Water Quality Assurance Rules (DWSQAR) as major suppliers like Watercare. Its underground flow source requires vigilant monitoring to minimize wastage and preserve quality.

The organization's approach is guided by three principles: **environmental responsibility, operational efficiency, and long-term resilience.**

When Manual Systems Hit Their Limits

As the township grew, Pine Harbour's manual meter reading process became a constraint on both accuracy and efficiency. Technicians had to physically visit each property—a time-consuming, error-prone task. Monthly readings based on static data made it nearly impossible to detect leaks or consumption anomalies in real time.



Image - Manual meter reading, the traditional process

"Manual readings offered just a monthly snapshot of the network. We needed continuous, scalable, and accurate data."
— Pine Harbour Water Operations Team

Partnering for Digital Transformation

To modernize its operations, Pine Harbour Water partnered with ADR to design and implement a LoRa-based smart metering solution.

This initiative replaced traditional mechanical meters with advanced ultrasonic versions, capable of recording precise consumption data and transmitting it automatically to the cloud.



Image - Axioma smart water meters installed



Image - Well headworks with master meter

Key Components of the Deployment

- LoRa network coverage through dedicated gateways independent of existing networks.
- Real-time data and online water balance enable early detection and prevention.
- Meter replacements were scheduled mid-month for accurate crossover readings.
- Automated readings eliminate on-site visits, addressing residents' privacy concerns.
- ADR's **Manage My Water** portal enables reporting, visualisation, and big data — ensuring confidence in the solution and service.

Results: Building the Foundation for Growth

Even in its early stages, the transformation is delivering results. Water loss has decreased, data accuracy has improved, and staff time for manual administration has dropped significantly.

The new system positions Pine Harbour to expand to 5,000 households while maintaining high-quality standards and early detection of contaminants such as lead, nitrates, or E. coli.

Sustainability and Community Resilience

While initial cost savings are modest, the long-term strategic benefits are substantial—from reliable data and smarter planning to enhanced community resilience. By investing early in smart technology, Pine Harbour has shifted from manual operation to proactive, sustainable water management. For small communities across New Zealand and beyond, this case affirms a simple principle: **start small, build smart, and scale sustainably.**

Partnership in Action

"ADR have been very good. No matter who we deal with, they have been proactive and responsive. As a small business, we value being able to pick up the phone and get straight through to someone who can help."

Simon Male, Pine Harbour Water

"It was a pleasure working with such an engaging customer—one that truly values the reliability of their data. The new system plays a vital role in identifying abnormal behavior such as network or backflow losses." **Bruce Franks, All Waters Head, ADR**

Scan the QR code to find more about the Smart Meters



Walking together for water

In a keynote address, Yarra Valley Water's Aboriginal partnerships manager, Nina Braid, spoke of how the organisation has been building trust, respect, and shared responsibilities between Traditional Custodians and the water industry in Victoria.

Nina's role is to help connect the organisation with the aspirations of traditional custodians and works with the Wurundjeri Cultural Heritage Aboriginal Corporation on how water is managed on their country.

Nina grew up in the far north of South Australia, the dry state in Australia, during a drought in Kugatha Country. Kugatha Country is part of the Seven Sisters Dreaming Songlines. It consists of red earth, black gibber rocks, lots of saltbush, and not many big trees.

"It's desert country that covers a large part of the Artesian Basin. My Aboriginal father grew up as a ward of the state, and like so many other Aboriginal children around the world, he didn't grow up with the privilege of knowing his language, his mob, nor his ancestors' stories."

Today, she's been in her role at Yarra Valley Water for the past seven years.

"For me it's important to be in a role that enables me to walk in two worlds. One that respects our culture, recognises the importance of our connection to country, and our reciprocal obligations to country and our community."

Yarra Valley Water is a water retailer in the Greater Melbourne area. It is the largest of the three water retailers based in Melbourne's east, covering 4000 square kilometres with a network of over 20,000 kilometres of water and sewers mains and almost \$6.3 billion worth of assets.

Every day more than two million people, around 30 percent of the state's population, and 62,000 businesses rely on Yarra Valley Water for water and sanitation services.

The organisation's activities are overseen by an independent board of directors that's appointed by the state government of Victoria.

For Nina, it's an exciting time to be working in water in Victoria.

"We're currently working towards a treaty framework, that has been through parliament, that will be used to hold institutions to account. In addition to policies



that recognise the rights of rivers and waters to flow, in Victoria there is the Yarra Strategic Plan – what's good for the Yarra is good for all."

Supporting this plan is the Yarra River Protection (Wilip-gin Birrarung murrnong) Act 2017 which gives the river status as a living legal entity and recognises the Wurundjeri people as the traditional custodians of the river and surrounding lands.

These are the only two rivers in Australia that are afforded such protections. The other one is the Martuwarra (Fitzroy) River in Western Australia.

"Respecting the relationship of the Birrung (Yarra) to the Wurundjeri people is a key component to the work that I do."

She stresses her role is not about engaging with communities. But about partnering.

"You have to listen, you have to be patient, you have to move in time, you don't hold one another back and you also don't leave anyone behind."

"Partnering allows us to listen and react to requests. We don't go into conversations or relationships with an end goal. We listen to elders and acknowledge their aspirations."

"We look how we can incorporate the aspirations of the elders into how we manage water on their country. This also means taking into consideration that these aspirations are often in conflict with our compliance requirements."

"That's our dilemma to deal with. It's not the traditional owner's dilemma. How we approach this through partnering requires trust. It's more than just a cup of tea here and there with elders."

"It's about our actions, how we show up."

She says that partnering for an equitable outcome is not just a seat at the table, it also requires resourcing. Most Aboriginal organisations in Australia are not-for-profit organisations and a lack of funding often limits what they can do and how they can do it.

So resourcing organisations helps remove these barriers, enabling not just a seat at the table, but the ability to afford to employ the right people with the right skills to make sure they can partner with impact.

Nina says Yarra Valley Water has some of the safest, best quality drinking water and sanitation services in the world and traditional custodians have been able to directly influence this because of the partnership that gives them an equitable seat at the table.

Water is Life roadmap

In Victoria, the development of the Water is Life roadmap embedded inclusive policy and access to decision-making that all water corporations in the state must follow.

The roadmap includes a nation statement from each of the registered Aboriginal parties that outline how they want to work with government and how they want their land to be managed.

However, these more progressive norms are not followed consistently across the rest of Australia, and particularly when it comes to communities further away from city and regional centres.

Many homelands, depending on where they are, get serviced by municipal services and the type and quality of water varies.

What is also clear is that around many parts of the country, Aboriginal people are not being listened to, there's no partnering and communities lack resourcing to lead on the water issues they're facing.

"Instead, communities are frustrated by

fly-in fly-out consultants that don't live in their communities, and who don't walk in two worlds or understand the complexities our communities face in caring for their country while seeing large areas of their land being mined or leased to farmers and the like."

Living rivers with inherent rights

On two sides the country there is the Martuwarra (Fitzroy river in western Australia) and the Birrarung River

"The first people from both river systems recognise these systems as being alive. They have a heart, a spirit, and are a part of their respective dreaming stories.

"Many first peoples in Australia will talk to the health of water, the health of country. When country is healthy, we are healthy. In Australia and like many other countries around the world first people sit in deficits in so many areas.

"In Australia we refer to these deficits as the gap.

"You'll read a lot of reports in closing the gap in health for first peoples, for education targets and the messaging is about making closing the gap everyone's business."

Recently water has been added to closing the gap targets. The target is that Aboriginal and Torres Strait Islander people maintain a distinctive cultural, spiritual, physical, and economic relationship with their land and waters.

In Australia, all water corporations have a role to play in closing this gap.

"The role requires developing equitable partnerships where we remove barriers to participate in the water industry and listen to the needs of our communities rather than assuming that we know what's best as an industry.

"We can actually start to grow our capability and provide better services to some of the most vulnerable people in our communities."

In closing her presentation, Nina reiterated that partnering with traditional custodians has been a win for Yarra Valley Water.

"It's enabled us as an organisation to lift our capacity to become a better, more culturally competent place to work.

"I'm not for one minute pretending that it's all rainbows, unicorn and glitter at work. There's still a long way to go."

Walking together

A recently formed Citizen's Jury included Aboriginal panel members for the first time.

"They shared the ideology with us that they would like us to take a caring for country approach in all our decision-making. This means we always leave country better than we found it, we travel lightly, we never take more than we need."

The number one recommendation that came out from the jury was around how decisions will impact country.

"How will our design of that pump station, that pipeline, that treatment plant; how would that impact country? That is now central to our decision-making and all that we do in honouring and healing country.

"But taking this approach also means that we have to walk side by side with traditional custodians and we have to take the time to listen."

Nina has been named the 2022 Victorian Water Professional of the Year and serves as deputy chair of Trust for Nature and as director of the Australian Water Association.

THE NEXT GENERATION MACERATOR. THE BÖRGER ORBITGRINDER.

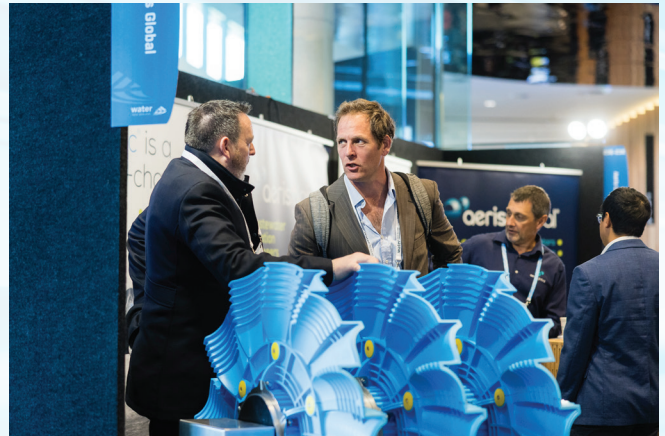
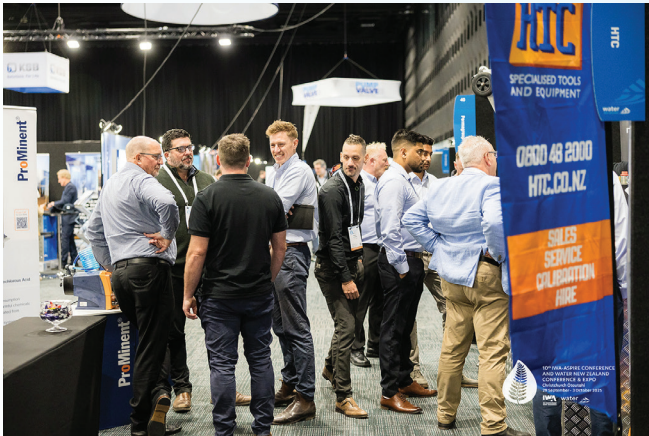
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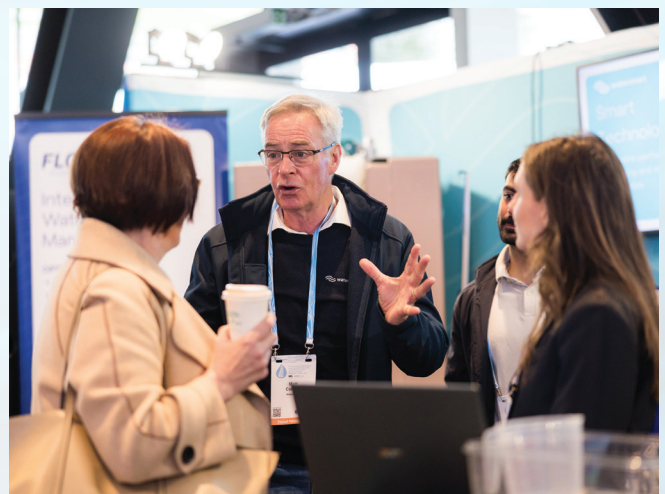
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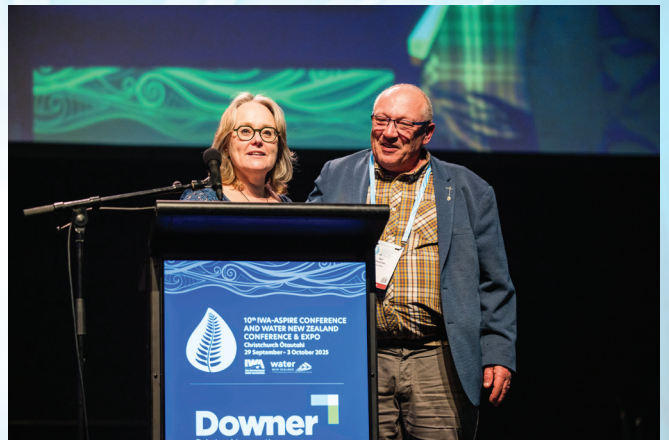


BurrowTech won Best Single Stand.
Pictured are Ben Terris and Jordan Shilton.



Novolabs won Best Double Stand.
Pictured are Simon Ganey and Michael Le Grande.





Taking the lead on water reform – some answers from across the Tasman

Dr Deborah Lind, water industry leader at Aurecon, speaks to her recent chat with Louise Dudley, former CEO of South East Queensland's water operator, Urban Utilities. Louise is now a strategic advisor with Aurecon. They spoke in front of an audience at the Water New Zealand Local Water Done Well preconference symposium.

When Louise Dudley and I sat down in front of the preconference symposium audience to discuss her experiences as CEO of Urban Utilities, I knew we'd get some good questions.

What I didn't anticipate was just how revealing those questions might be about where the water sector reform is right now, and what's keeping leaders up at night as we navigate our transition to Local Water Done Well.

After our initial introduction, we opened up for questions from the floor, which came thick and fast. The audience was keen to hear from Louise about leadership and the beginning days of establishing a new entity.

People wanted to know what an 'early days CEO' should realistically aim to achieve, given they're typically in the role for a relatively short period. There was interesting tension in these questions, an acknowledgement that a transition CEO has a unique window to make bold calls, while grappling with the reality that you can't do everything on Day One.

Louise's view is that it's important to look at the full picture: where are you heading, what is your end goal, and set your priorities from there. Don't get too embedded in individual issues at the expense of the greater outcome. Service continuity must be the priority from day one, along with ensuring good incident management support in the event of an emergency.

People and culture are key

What struck me was how many questions focused on people and culture.

These newly combined organisations will face the challenge of bringing together different workplace cultures, different ways of doing things, and often different employment terms and conditions.

There were pointed questions about whether there would even be roles for everyone in the new entities, and whether to stick with council shared services or build independent teams.

From Louise's experience, it's the people that make the entities work.

Communicating what is happening, how changes are being managed, providing clarity where you can, and being clear when you can't, is essential. This means investing in building the culture of these new entities.

We're fortunate to work in a sector with strong commitment to customers and communities and a strong sense of purpose. This purpose is what will carry new entities through and where you can focus culture development.

Asset management skills

The asset management questions revealed something interesting too. People are anxious about what they're inheriting; the gaps in



Louise Dudley speaking at Local Water Done Well pre conference symposium.

information, the challenges of transferring assets, and how you juggle existing service levels, growth demands, and crisis response all at once.

Louise's experience with the Brisbane floods while still getting Urban Utilities established resonated strongly with our audience.

Again, service continuity was key: getting the best view of your assets and their condition, understanding the risks to service, thinking about scenarios, and ensuring you have good incident management and crisis management capability in place. This also includes having media, communication, and stakeholder management expertise available to support operations.

Pricing

The elephant in the room: pricing and public perception.

Multiple questions circled around Allconnex Water, the South East Queensland entity that didn't survive and was disbanded after community pushback over water pricing. People wanted to know what went wrong and what Urban Utilities did differently.

From Louise's perspective, there are a couple of things we can learn. Firstly, in most cases with new entities, customers will be getting a separate water bill for the first time. Naturally this will lead to questions about cost, value, and service they can expect, given their water cost had been previously 'hidden' in rates payments.

The pricing impact in South East Queensland was significant due to increased drought infrastructure, falling consumption, removal of subsidies, and increasing cost of capital.

The lesson for Aotearoa New Zealand: It's absolutely vital to work with customers on the transition to separate bills, communicate clearly and often about the changes and what these mean for them. This must be a key work stream in your establishment programme.

Don't forget the councils

Our audience was curious about building relationships effectively. How do you maintain productive partnerships with councils when you're now a separate entity but still deeply interconnected through planning, infrastructure, and growth?

While all the focus may be on the changes to individual entities, it's crucial to remember that shareholding councils and stakeholders are also undergoing these same changes. The teams in these councils also need clear and frequent communication.

Louise recommends using both formal governance groups and informal networks to build trust, address concerns promptly, and give genuine input into key decisions.

Louise noted that the connection between water entities in South East Queensland and councils was identified early and is governed by specific legislation. SEQ water entities are required to develop a Netserv Plan outlining each distributor-retailer's 20-year strategy for delivering services to support growth, ensure reliable service, and integrate land-use and infrastructure planning.

However, this wasn't required from day one as councils continued as the planning authority for the first three years. The establishment and communication of this plan is at the foundation of the relationship between council and the new water entity.

Toughest areas

The questions I found most valuable were those asking Louise to distil her hardest lessons for our Aotearoa New Zealand context. What were the two toughest transition areas? What unexpected benefits emerged from amalgamation?

Louise reflected that the two key things she wishes they were able to do earlier were moving to contemporary IT systems from legacy systems and implementing pricing reform, as they inherited over 140 different tariffs. As well as being the toughest nuts to crack, these gave most benefit to consumers and the best outcomes for the entity.

As we discussed at another point in the conference, don't overbuild, start with what matters most. Good systems and pricing will make a huge difference to long-term success.

The new entities in SEQ did drive benefits through consistent service standards, greater integration between land-use planning and utilities infrastructure, and stronger community engagement on water matters.

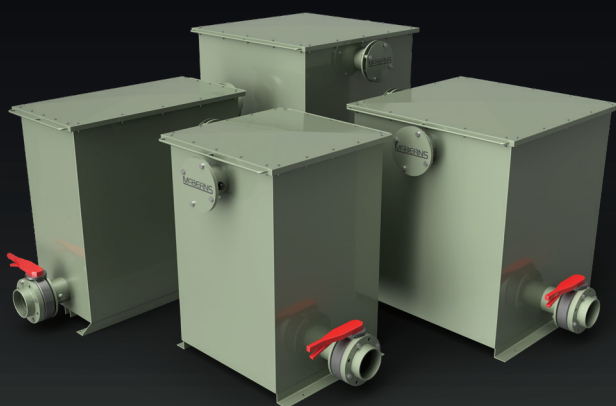
Thinking back on this session, I was struck by how thoughtfully our sector is approaching a huge challenge. People are eager to get started and looking to know where and how to start. They're keen to take the best of international practice and advice on the most efficient and effective model which will deliver what communities need. That's exactly the mindset we need as we write our water reform story.

Both Louise and I would like to thank everyone for participating in the meaningful conversations at this session.

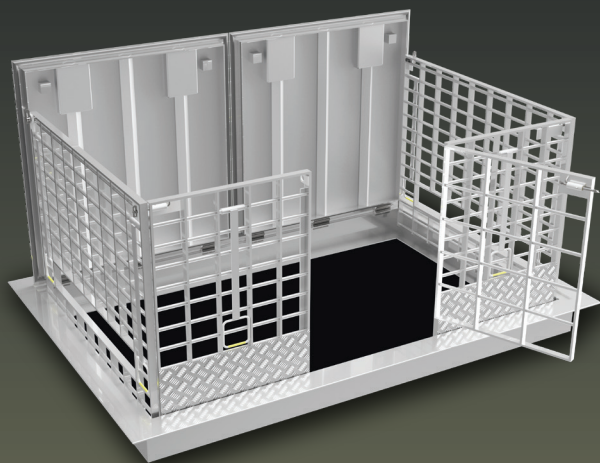
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Catchment if you can – Citizen-science restoring Lyttelton Harbour

By Eliza Cowey, senior water engineer, who presented at the conference on the work she and others, from a wide variety of backgrounds, are undertaking to improve the environment in Canterbury.



We are facing a freshwater quality crisis. Sixty-eight percent of indigenous freshwater bird species and 76 percent of indigenous freshwater fish are either at risk or threatened with extinction. Forty-five percent of rivers (by length) are unsuitable for swimming due to health risks posed by pathogen concentrations.

Solving these crises is complicated by constant changes in water quality legislation, as well as a nation contending with psychosocial resistance to land-use change.

Complexity has come through the implementation, changes, and proposals to repeal key documents. These include the National Policy Statement for Freshwater Management, which outlines desired outcomes (Te Mana o te Wai) alongside methods to achieve them (National Objectives Framework). Furthermore, changes, and proposed future changes, to the Resource Management Act create uncertainty over the responsibility and coordination of remediating freshwater health.

In this complexity, how can we achieve meaningful change?

Living Springs, a charitable trust, found the key to ecological restoration was tapping into intrinsic motivations within the landowner community. Landowners in the catchment (and farmers in particular) are hardworking and independent and have a lot at stake in their land holdings. There is resistance to any external directives of so-called 'idealists'. Yet, a catchment-wide community has demonstrated significant conservation outcomes across 24 landowners, spanning 1100 hectares.

Collaboration has enabled incredible ecological and freshwater quality outcomes through sharing solutions across property boundaries, leveraging of volunteers, and facilitating successful collective funding submissions.

What united farmers, mana whenua, and a campsite of believers?

Living Springs' history began in the 1970s. A number of families from various Canterbury churches had a collective vision to build a non-denominational campsite on a hill, overlooking the ocean.

The desire was for a space for school children to spend time in nature and build relationships.

The name 'Living Springs' reflects the founders' gratitude for freshwater discovered on site, which was viewed as an abundant gift from God. This attitude of valuing water has flowed through the conservation efforts of recent decades.

The charitable trust owns 400 hectares spanning a section from the top of Lyttleton Harbour's volcanic crater to the sea, which encompasses four main freshwater tributaries.

The Living Springs site boasts a range of ecological values. The property spans 'ki uta ki tai' (from the mountains to the sea) hosting a range of geological and ecological systems. Of note, the lower portion of the catchment provides habitat for longfin eel and inanga, which are both at-risk species.

The land was cleared in the 1800s for farmland. When Living Springs began, the trustees continued farming portions of the property to subsidise costs to ensuring no children missed out through lack of affordability. This meant that Living Springs' management were members of the farming community for decades.

They acknowledge now that initially sustainability efforts were viewed as 'red-tape', with negative perceptions stemming from previously strained relations with environmental authorities. However, attitudes shifted when the regional council, Environment Canterbury (ECan), helped install 300 metres of fencing in the Allendale stream to restrict livestock access and improve water quality.

After seeing the improvement in water quality from just 300 metres of fencing, ECan's partnership triggered Living Springs to set a larger goal of fencing every stream in the Allendale catchment.

In the wake of shellfish bed loss in the harbour, goals expanded to further reduce sediment deposition. Targets were set regarding planting, retiring livestock grazing, and predator control.

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Living Springs reached out to neighbouring farmers. ‘Citizen-science’ was demonstrated through practical, technical solutions across property boundaries with a focus on predator control.

Wider solutions included how to install complex fencing on steep terrain requiring helicopter access, local ecological recommendations, and silt-reduction strategies. These are complex problems which are catchment specific, and solutions can be difficult to achieve on an individual basis.

Additionally, administrative burdens, such as data collection and management plans, were shared.

In 2021, Living Springs, Ngāti Wheke, and the Conservation Volunteers New Zealand (CVNZ) collectively applied for a grant through Kaimahi for Nature Whakaraupō and successfully secured funding of \$4.5 million. This enabled hiring of full-time conservation staff, including procurement in partnership with Ngāti Wheke.

What have they accomplished?

Living Springs has installed 8.3 kilometres of livestock fencing, established 72,000 plants, implemented predator control over 1100 hectares, and retired livestock grazing over 150 hectares, including protecting 85 percent of Allandale’s freshwater tributaries.

Freshwater samples in 2025 quantified the effects of their restorative work. The water quality outcomes achieved include reduction in stream erosion, silt deposition into the harbour, and nutrient runoff reduction. DNA analysis of species present yielded an ‘excellent’ stream health rating, supported by turbidity consistently ~2.3 NTU and healthy, high dissolved oxygen concentrations.

The campsite hosts approximately 400 volunteers each year. Living Springs welcomes people of all faiths and religions, thousands of school children, university students, corporate partners, as well as rehabilitative programmes including groups from local prisons.

The campsite chef feeds volunteer groups with delicious catering, intentionally expressing a core value of manaakitanga – extending hospitality.

Organising and facilitating volunteers is a significant investment. But it’s more than just a means to an end; volunteering provides opportunities for people to build relationships and well-being while spending time in nature and working the land.

Looking to the future, Living Springs has engaged Jim Lynch, founder of Zealandia, to undertake a feasibility study for installation of a similar predator-free fence and eco-sanctuary. This would enable a habitat for reintroduction of birds which once inhabited Banks Peninsula such as weka, kaka, tieke/saddleback, kaki/black stilt and many more at-risk species.

In Zealandia, 18 endangered native bird species have been successfully reintroduced in the 225 hectare eco-sanctuary. The potential to achieve similar outcomes in Canterbury, leveraging the existing community and progress made to date, brings hope.

Living Springs is looking to maintain existing community connections throughout future endeavours. These plans are motivated by providing opportunities for people to respond in awe to the beauty of the earth, experience rare wildlife, and reinforce the connection and ownership which comes with giving back to our land.

What can you do?

This is a call to action for the government to set catchment-specific restorative freshwater targets, rather than allowing further degradation of waterways. Catchments are more than just land and water – they hold people too.

Volunteers across the country already spend vast quantities of their personal time and money restoring freshwater and biodiversity, despite the limitations of our governance structures. Living Springs is a demonstration of what can be achieved when a catchment is supported to work together toward ecological restoration.

For readers who are not in a governance role and instead view themselves as an individual – you are not just an individual. You live in a catchment, likely one that needs your help. Engage with the community you inhabit: offer your professional expertise to a community group, adopt a trapline, organise a planting day, donate spare building materials or seedlings if you are able.

Grieve the degradation done. Look for seeds of hope. Dig deep.



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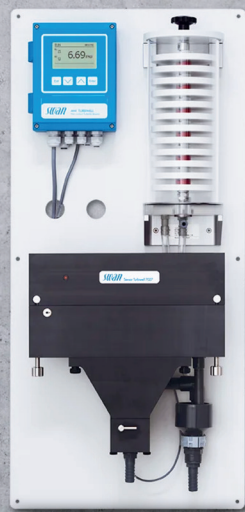
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Celebrating our winners



The Young Water Professional of the Year is Roanna Purcaru. She is pictured with Matt Bismark from award sponsor Beca. Read about Roanna on page 34.



The Ronald Hicks Memorial Award, sponsored by Mott MacDonald, went to Kevan Brian of Watercare (pictured) and Sudhir Murthy of NEWhub Water for their paper "Boosting Activated Sludge Performance with InDense Hydrocyclones".



The Water Trainee of the Year is Jared Esaiah of Citycare Water, pictured here with Ivan Iafeta from sponsor Citycare Water. Read Jared's profile on page 36.



The Project Award was won by McConnell Dowell, Watercare, and Delve Underground for the Warkworth to Snells Transfer Pipeline & Pump Station project. Pictured: Hugh Goddard of award sponsor Pipeline & Civil (left) with Daniel Patten of McConnell Dowell.



The Operations Award, sponsored by IXOM, was won by the Gore District Council three waters team for their Gore Wastewater Treatment Plant 2025 Algal Bloom Response. Pictured from left: Claire Deutsch of IXOM, Aaron Green from Gore District Council, Water New Zealand CEO Gillian Blythe, and Jason Domigan and Toby Johnston from Gore District Council.



The Hynds Paper of the Year was “Achieving compliance – a practical approach for very small supplies,” by Matthew Woodfield, Fulton Hogan.



“Monitoring prostate health in Aotearoa, using wastewater-based epidemiology” by Miriama Wilson from the University of Auckland, was named as the **Runner-up Paper of the Year**. The award was also sponsored by Hynds.



The Environmental Sustainability Award went to the Bay of Plenty Regional Council for the Pongakawa and Te Rere i Maniatutu Constructed Wetland Project. Receiving the trophy are, from left: Chris Tanner, Earth Sciences New Zealand; Pim de Monchy, formerly BoP Regional Council, now Environment Canterbury; and Emily Afoa, Tektus Consultants. Read about the project on page 32.



Jolanta Gussenhoven (pictured) and Andy Shilton of Beca won the **Presentation of the Year Award**, sponsored by Hynds for “Critical Thinking for Supercritical UV Success: Case Study from Ahipara”.



The Health and Safety Innovation Award, sponsored by Site Safe, went to Project Crystal – Fonterra, Fulton Hogan, and Tetra Pak.

Back row: Vanessa Mitchell, Fonterra; John Norris, Tetra Pak; Nikki Zhang, Fonterra; Gillian Blythe, Water New Zealand; Katelyn Goldsmith, Fonterra; Justine Lehmann, Tetra Pak; Vaughan Mace, Fonterra; Chris Hull, Babbage; and Chris Jobson, Site Safe NZ.

Front row: Henry Holdaway, Babbage; Bevan Irving, Fonterra; Rob Gollan, Tetra Pak; and Adam Buckland, Fulton Hogan.



The Select Society of Sanitary Sludge Shovellers welcomes five new members: Brent Gilpin, Becky Macdonald, Clare Feeney, Nick Brown, and Hugh Ratsey (absent).



The 5S Emerging Water Professional Conference Attendance Prize winners were Lexi Clarkson of Pattle Delamore Partners and Simonah Ferreira of AECOM.



Deborah Lind, Allan Leahy, and Andrew Dakers were awarded **Honorary Life Membership of Water New Zealand**. Pictured from left, Allan Leahy, Water New Zealand CEO Gillian Blythe, and Deborah Lind.



The **WSP Innovation Award** was won by Syrinx Environmental for The EnPhytoBox. Phoebe Tinning of Syrinx Environmental and Aleisha Mitchell from Te Komiti Nui o Ngāti Whakaue received the award on behalf of the project partners.



The **Young Author of the Year Award**, sponsored by Trility, went to Emma Cross and Sela Maka (pictured) of Watercare for "A Year in Action – Hybrid MABR-MBR WWTP".



The award for **Poster of the Year**, sponsored by Tonkin+Taylor, went to Chris Bishop of Bactosure for "Community Hubs: Increasing Accessibility for Accredited Drinking Water Testing". See the poster on page 31.



Bactosure

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Community Hubs: Increasing Accessibility for Accredited Drinking Water Testing



Objective

To make accredited microbiological testing accessible to all communities.



Problem

Many rural and remote communities face barriers to accredited microbiological testing – long travel distances, high costs, slow results.



Method

Leveraging Bactosure assets located at customer premises under ISO 17025 accreditation.



Deployment

50 accredited testing hubs in 6 months, including remote areas like the Chatham Islands.

Accredited testing facilities: January 2025



Accredited testing facilities: Sept 2025



	Pre-2025	Now
Mean distance	57 km	24 km
Max distance	272 km	112 km
Mean price	\$68	\$20



Impact

- **Accessibility gains:** Driving distance halved on average.
- **Affordability gains:** Price per test more than halved.
- **Community use:** Multi-chamber units allow wider access beyond initial customers.



Challenges

- Low uptake in high-deprivation regions (Northland, East Coast).
- Even where testing is fully funded (schools), awareness/ knowledge is a barrier.



Future use & direction

- **Awareness campaigns:** Targeted education and community engagement in high-need regions.
- **Integration:** Expanding hubs to include marae, sports clubs, and rural health clinics.
- **Equity focus:** Tailoring solutions for socio-economic deprivation areas where affordability isn't the only barrier.
- **Scalability:** Potential model for developing nations.



bactosure.com

Author: C Bishop



Wetlands win proves power of partnership to improve water quality

Converting farmland to wetlands in Bay of Plenty's Waihi estuary catchment, the Pongakawa and Te Rere I Maniatutu Constructed Wetland Project won the Environmental Sustainability Project Award at the 2025 Water New Zealand Excellence Awards.

The prize highlights how combined efforts can establish wetlands to reduce pollutants and improve the health of ecosystems, say Chris Tanner and Brandon Goeller of Earth Sciences New Zealand (formerly NIWA). The pair worked on the project as part of a nationwide programme, Sustainable Land Management and Climate Change Project, funded by the Ministry for Primary Industries.

"In winning the award, I hope it will inspire other catchments and regions throughout the country to consider constructing wetlands, not just to reduce rural run-off and improve water quality but for other benefits," says Brandon, who is a riparian and wetland scientist.

Chris, a principal scientist at Earth Sciences New Zealand, says wetlands are often dubbed the 'kidneys of the landscape' because they remove sediment, nutrients and bacteria before they reach our estuaries.

"These Bay of Plenty examples show that wetlands also restore biodiversity by boosting indigenous wetland habitat, enhance cultural values, and contribute to climate change mitigation by storing carbon."

What was once a soggy paddock beside a fertiliser depot has been transformed over the four years of the project, says Paul Hickson, whose family own Hickson (Pongakawa) Wetland, one of the wetlands nominated for the award.

He credits his brother Andre for coming up with the idea, as well as input from Earth Sciences NZ, the regional council, and Naturally Native NZ Plants.

"We are really proud of it, and it is fantastic that the project has received the award. It is very satisfying. It proves that the science works, and it shows the importance of science in agriculture."

The project is a powerful example of what can be achieved when landowners,



local government, government agencies, researchers, and iwi come together with a shared vision, says Jackson Efford, Bay of Plenty Regional Council principal advisor, land and water.

"We couldn't do this without the skills, experience and enthusiasm of many groups and individuals, but particular thanks must go to the landowners. They had the foresight and commitment to find solutions that would help achieve sustainable land management – not just for them, but the wider catchment.

"Bay of Plenty Regional Council sees projects like this as essential to striking the balance between primary production and environmental health. We know that improving water quality in places like the Waihi Estuary will take time, sustained effort and a mix of solutions.

"Constructed wetlands are one of the most promising tools we have and, as we continue to learn from projects like this, we'll be better equipped to scale up our efforts and deliver lasting change for our waterways."

Jack Turner, director at engineering, environmental and planning firm Tektus, says it has been a great honour to be associated with the projects.

"It is a fantastic award to celebrate the vision, process and wide-ranging outcomes achieved through these wetlands. It's been hugely exciting to see the aesthetic, ecological and environmental outcomes come to life over the last few years – validated through ongoing water quality monitoring to gauge their effectiveness, which is currently off the charts! A fantastic proof of practice, demonstrating the appropriateness of Earth Science NZ's recent guideline document, and realising the vision led by BoPRC."

At Te Rere I Maniatutu wetland, kiwifruit grower Baygold is proud to be part of the initiative, says Olivia Manusauloa, relationship and sustainability manager.

"For me, it's about continuing the culture our company was built on: delivering world-class orchards that consider the site as a whole, not because it's required, but because that's who we are."



Earth Sciences New Zealand
principal scientist Dr Chris Tanner.

“This award reinforces our commitment to environmental stewardship. Our involvement reflects a genuine desire to protect and enhance the environment. From maintaining and growing Iwi relationships to planting natives that give back to the whenua, we’re focused on creating long-term value for both the land and the community.”

Olivia says winning the award gives Baygold a platform to share their sustainability goals and learn from others in the industry.

“We aspire to lead not for self-promotion, but to help the kiwifruit sector grow stronger together. If our journey – including the mistakes and wins – can help others, then it’s been worthwhile.”

Earth Sciences New Zealand has been leading initiatives with rural industries, councils and farmers to support the uptake of constructed wetlands as a practical mitigation tool to reduce diffuse contaminant losses from productive land use. This includes publication of a Constructed Wetland Practitioner Guide and training courses to demonstrate the appropriate design and performance of constructed wetlands.

Over the past six years, comprehensive wetland monitoring case studies have been undertaken in Tasman, Taranaki, Hawke’s Bay, and Canterbury to showcase the benefits. These wetlands were supported by MPI, MfE, DairyNZ, Fonterra, and landowners.

Case studies show that as constructed

wetlands increase in size from one percent to five percent of their contributing catchment, they can reduce more of the nutrient and sediment loads they intercept.

In warmer areas of New Zealand, nitrate removal ranges up to 50 percent. Wetlands up to five percent of the catchment area can also remove up to 48 percent of total phosphorus. Sediment load reductions from 50 to 90 percent can also be achieved.

The results from the case studies contribute important information to an ongoing programme focusing on improving design, quantifying performance, refining guidelines and providing regulatory confidence.

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Recognising passion and dedication

Roanna Purcaru joined the water industry as a way to help people and communities. Her dedication to this cause is one of the reasons she was named as 2025 Young Water Professional of the Year. By Mary Searle Bell.

“What sets her apart is the way she gives back – both to the water industry and the communities she serves,” writes Siobhan Hartwell in her peer support statement for the award nomination.

Roanna says a career in water engineering appealed to her because water is vital to life – to healthy people, healthy communities, and a healthy environment.

“Water is a human right. Proper stewardship of water resources is crucial for sustainability and fundamental to our future.”

Based in Ōtautahi Christchurch, Roanna was business group leader for GHD’s southern New Zealand team from early 2022. Late last year, she’s took up a strategic lead role for GHD New Zealand’s storm and surface water service, and in July this year, she was appointed to the role of service line leader. However, she does even more.

“I’m also the lead for GHD New Zealand Pacific’s community programme, overseeing the volunteer and philanthropic work we do in our region. We’re focusing on initiatives supporting the advancement of STEM education and promotion of environmental stewardship, supporting local organisations and charities, and providing opportunities for our teams to contribute to the cause.”

Siobhan says she has watched Roanna lead ‘GHD in the Community’.

“Her passion for environmental stewardship and STEM education made her a standout for this role. She’s cultivating a culture of awareness around purposeful giving by actively engaging with community groups, and internal leaders to further embed giving as a core part of GHD’s business operations.

Siobhan says Roanna is a consistent contributor to industry conferences both locally and internationally. For example, she represented Aotearoa New Zealand at GHD’s global technical conference in the USA.



“Her presentation about trust and success in multi-stakeholder delivery in New Zealand stood out for its emphasis on collaboration, inclusive decision-making, and agile delivery with a major client.”

And her clients agree: “I have worked with Roanna over the past three years on the Featherston Wastewater Treatment Plant Consent project for South Wairarapa District Council, to improve water quality, the environment, and social outcomes for the Featherston community,” writes Linda Fairbrother, major projects director at Wellington Water.

“Roanna joined the project team at a time where the project needed a reset. Her ability to understand the issues, focus on moving forward and deliver on programme and budget have been instrumental in the success of the project.

“I have found that she balances the unique demands of her role with a high level of integrity.”

Roanna says she applies a purpose-driven approach to her career, and often speaks on her ‘threefold purpose’.

She is committed to advocating for equitable access to clean water, which was her motivation when working in the Pacific Islands through Volunteer Service Abroad, and in the United States to examine water supply solutions for remote and underserved communities.

“I grew up in a part of the Middle East where running water wasn’t always

available and we had to store it, for weeks and sometimes up to a month at a time. Equitable access to water is something I deeply value – it’s a basic right, not a privilege.

“My second focus is to protect the environment. Upholding the integrity of water systems and the ecosystems that depend on them, aligned with the principles of Te Mana o te Wai. This focus extends to safeguarding communities from the impacts of floods, and to be more resilient and connected with nature.

“Here in Christchurch, I volunteer in initiatives that focus on keeping our urban waterways healthy. Having developed a strong connection to the Avon River helped me fall in love with this beautiful city, so I want to do my part in looking after it.

“Among other passionate professionals, I am contributing to the thought leadership conversation around the need to develop a national framework for how we manage and fund our stopbanks around the country – what I call the ‘silent guardians’ during floods – so that communities receive the same level of care protection from their stopbanks.

“And my third purpose is to lead with kindness – promoting inclusivity, diversity, and fostering collaboration and positive change in every space I work in.

“I believe that there is a place for everyone, and everyone has a place. Leadership is about empowering others – creating a space where everyone has a role and is valued.

When she was named as Young Water Professional of the Year at the awards dinner, “surrounded by a huge crowd of passionate people”, it dawned on Roanna that she has found her place: “I’m where I’m meant to be – the industry sees the value I bring, and this reinforces my ultimate commitment as a water professional to creating, restoring, and making a meaningful impact on people’s lives.”

Capital Delivery for Local Water Done Well:

Lessons Learned from the UK

Martin Hennessey, Executive Technical Director at Stantec in Cardiff, recently joined us to present at this year's Water New Zealand Conference. Sharing strategic insights from 35 years in the UK water sector, Martin offered guidance for how Local Water Done Well in New Zealand can deliver exceptional outcomes—read a snapshot of his recommendations below.

Prioritise affordability and value for money

Affordability is a foundational principle that directly affects customer bills and public trust. Martin urged New Zealand's water entities to embed cost control and performance management into every stage of their capital programmes. Benchmarking tools such as 'should cost' and 'should take' measures help clients set realistic expectations for project budgets and timelines. As water bills increase, Martin emphasised that customers and regulators would become more focused on the timely and cost-efficient delivery of the outcomes promised.

Martin also highlighted the 'dollars in the ground' metric, a simple but impactful way to measure how much of each dollar invested goes directly into physical infrastructure versus overheads and fees. By minimising unnecessary layers and focusing on asset delivery, entities can ensure that public investment translates into tangible outcomes.

Build a sustainable and collaborative supply chain

As our water sector expands, Martin cautioned against relying too heavily

on competitive tendering. In the UK, this approach often falters when workloads surge and suppliers become selective. Instead, entities should allocate pipelines of work to trusted suppliers, providing stability to invest in capacity and skills. He also advocated for a performance-based approach to ensure excellent outcomes and value for money.

Good collaboration and governance are crucial. As client-supplier relationships strengthen, entities must establish clear codes of conduct and separation of duties to maintain fairness and avoid perceptions of favouritism. A healthy supply chain, Martin noted, depends on trust, transparency, and shared goals.

Optimise project delivery structures and processes

Efficiency begins with structured processes and early decision-making. Martin recommended that our entities adopt gateway decision points to control project progression and enable benchmarking across programmes.

At the feasibility stage, he urged teams to explore no- or low-build options, leveraging global best

practices to identify the most cost-effective solutions. Early contractor involvement was another way to improve early cost estimation via buildability risk reviews and reduce delivery timelines. Martin proposed a 'runways' approach: categorising projects by complexity and tailoring delivery strategies accordingly. Simple projects should be fast-tracked with minimal design input, while complex ones require full gateway processes and deeper planning.

A roadmap for New Zealand's water future

Martin Hennessey's UK-based insights underscored the importance of strategic planning, collaborative relationships, and disciplined execution. As New Zealand builds its water infrastructure in the Local Water Done Well Environment, these lessons provide a valuable foundation for creating systems that are efficient, equitable, and resilient, with customers and communities at the heart of every decision.



A quick study

Jared Esaiah was named as Trainee of the Year for 2025, although he's quick to point out he's no youngster; he's actually 42. He is, however, fairly new to the industry, having joined less than three years ago after a varied career. By Mary Searle Bell.



Jared Esaiah – Trainee of the Year

“I’ve done a few things, I’ve been a baker, in my 30s I studied graphic design while doing sign writing on the side,” says Jared. “During Covid I worked in the sawmills, but I found that depressing so, two and a half years ago, I decided to apply to Citycare Water for a job.

“There wasn’t really a job advertised but I knew a couple of people who had worked there and they had enjoyed it, so I called in and said I was keen to work.”

As it turned out, Citycare happened to have a vacancy for a CCTV operator, something that appealed to Jared.

“I like the investigation – figuring out what wrong in the pipe; figuring out where the pipe actually is – 80 percent of the time it’s in the wrong place!”

Jared took to the role rapidly, impressing his managers with his eagerness to learn and dedication to the job. He quickly moved up from CCTV operator to a Level 5 senior operator.

“Jared recently completed his Level 4 Connexis water qualification. He also serves as a health and safety committee member for Citycare Water and is also a union representative,” writes Citycare Water Taranaki operations manager Henrique Nunes in the award nomination.

“Jared consistently goes above and beyond. He trains new employees on the use of CCTV equipment, including health and safety requirements. He is also on the team’s standby roster to ensure we meet the response times and requirements of our customer, the New Plymouth District Council.

“Jared will always offer to help if someone is unavailable for standby – a key

characteristic of his work ethic and team focus.

“He supports other teams during callouts and has also contributed to a project for Stratford District Council, helping with the installation of new manifolds.”

Jared says he is lucky in that he picks things up quickly: “I learnt to install a manifold in just two weeks.”

He says he has been fortunate that his graphic design studies set him up to learn: “A lot of the people who do this kind of work weren’t necessarily good at school so can struggle with the coursework, but I’ve been able to finish it quite quickly.”

The job has physical challenges too, especially when looking at stormwater pipes as they have a larger diameter and the camera therefore needs a bigger rig.

“For the big-big ones, we can’t get the camera setup through the manhole so we have to lower it into the pipe in pieces and then assemble it in the tunnel.”

But that’s just another challenge for Jared to figure out, and it’s the figuring out he enjoys.

Jared is also responsible for updating the water quality signs for the Taranaki Region after a sewer overflow, says Henrique. “He takes pride in ensuring that the signs are updated quickly and to the correct standard.

“He had the transformational idea to create a digital folder containing all our water quality signs and their specific locations for the New Plymouth District Council. This has had a huge impact on ensuring that whoever is on standby has the correct information itemised to a specific location.”

Henrique says this idea has been key in providing council with the confidence that Citycare Water completes the work correctly, giving clear instructions for the community to stay safe around the waterways.

He says Jared’s system is a more efficient way of undertaking the process, delivering time-saving benefits to the business, and ensuring consistency in the way this critical task is delivered, which is now done correctly no matter who is on standby.

“It’s provided a better outcome for the community we serve.”

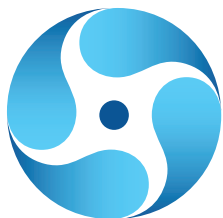
Henrique says Jared is very determined in his career progression.

“I clearly enjoy the work given the amount of effort I put in,” says Jared. “I wasn’t expecting to enjoy it so much but it’s good, and I’m keen to see where I end up – I’m always looking to move forward.”

It is no surprise that his efforts and eagerness have been acknowledged with the Trainee of the Year award, a gong that Jared was “kinda shocked, kinda excited” to receive.

“Having no prior experience in the water industry, Jared has learnt a lot in such a short time and as a result has become one of our most valuable employees,” says Henrique. “He is a multi-task technician, helping and making a difference for all the teams: water, CCTV, and drainage.

“He is a versatile and reliable team member, always ready to help. He has become an essential part of our team, and I’m truly glad to have him with us.”



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Saving the world through stormwater design

Peter Christensen's passion for the environment has led him to a career in stormwater engineering, where he has embraced nature-based solutions and multi-value water management, integrating community, cultural, and environmental benefits into infrastructure design. By Mary Searle Bell.

Ever since he was a young boy, Peter has been interested in the environment. One of his early memories of exploring nature was when he and a friend crawled up a pipe in Christchurch for a kilometre or so just to see what was there.

"I'm horrified at the thought, but I guess it was my first taste of stormwater engineering," he says.

Peter had an interesting childhood, living first in Henderson in Auckland's west before moving to Papua New Guinea for a few years, then returning to live in Christchurch. As a teen, his plans were to be a vet.

"A week before I was due to start vet school, I decided to do engineering instead. I didn't actually have any idea what an engineer did, but I figured I could make more impact as an engineer."

He chose to do his degree in natural resource engineering with the University of Canterbury as he simply liked the look of the course.

"It used to be called agricultural engineering, and I now think it's been merged back into civil engineering, but it was more applied and had a bit more from the natural environment – water and the farm space. It ticked the boxes for me for environment-focused engineering."

Thanks to his good grades at school, Peter joined at the second-year level.

"We had quite a small class, maybe 13 or 14 of us, and we spent most of our time together. I really enjoyed being with a bunch of like-minded people, and our lecturers seemed to be in touch with nature."

From there, Peter went on to complete a master's in natural resource engineering and arranged to do some of his research in China.

"I've always had an interest in China and wanted to explore the country. I met up with a professor from the US and we did research together.

"I was there for eight months and took several trips to the Tibetan Plateau, where we were looking at how to treat soil water for nomadic groups – these were the days before you could buy water filtering drinking straws, of course.

"It was a fascinating time. I remember having to walk 20 kilometres in a blizzard because our car broke down, carrying stones with which to ward off the massive dogs that roamed around, and sitting and talking in nomads' tents."

After returning to Lincoln to complete his degree, Peter and his wife Kerryn moved to Whangarei in 1997, where he joined civil engineering firm Cook Costello.

"Back then, it was a small, local consultancy. I did a range of very general engineering work and got lots of practical hands-



Peter Christensen.

on experience, but there was not a lot of water engineering or stormwater. At that time, stormwater wasn't really on my radar – and other than it involved pipes, I didn't really know anything about it."

But in 2000, the couple travelled to the UK for 18 months and Peter moved into the stormwater space while working in England and Scotland.

"I came across water-sensitive design for the first time."

After returning to Whangarei, they then moved to China for three years. This time was spent mainly studying Mandarin, but Peter also did some work for an NGO in the development space, something he describes as "a bit of a break from engineering".

In 2006, they came home, this time to Christchurch and Peter began working for Tonkin + Taylor before the pull of international travel saw the family on the move once again, this time to the north of Thailand.

"I went to work for a Christian NGO, this one did counselling, mentoring, and debriefing of people working in Asia, mostly in high-stress NGO roles."

At the end of 2012, they returned to Christchurch, where Peter joined Aurecon as a water engineer, "doing a little modelling but moving more into the stormwater space".

"This was post-earthquake, and I was seconded to the Christchurch

City Council. Then the major floods in 2014 kicked off the Mayoral Flood Taskforce which kept us busy for quite a while.”

Peter led the \$100 million Heathcote Flood Recovery Programme, which provided benefits to 150 houses, and was a core part of the post-earthquake Land Drainage Recovery Programme.

“I have been working with council on various projects since that time.”

Peter has been solely dedicated to the surface water management space since 2013.

“Some of the old-timers at the council were inspirational. They led the way with multi-value approaches to water – in 1999 they brought out their natural asset management strategy and we still follow it today. They were really instrumental in embedding nature-based solutions into the Christchurch psyche.

“It was groundbreaking at the time, and still is, in many ways.”

In 2015, Peter set up his own consultancy, later merging with a few like-minded people at Storm Environmental, where he is a director and specialist in stormwater and flood management.

“Being part of a small consultancy gives me greater independence when working with councils – I’m not trying to ‘upsell a package’ and instead can act as a trusted advisor to help them find the right solutions.

“It also gives me the freedom to work on what I like and allows time to give back to the industry – I was on the Water New Zealand Stormwater Special Interest Group Committee for 10 years, serving as chair from 2022-24.”

Peter says he’s an advocate for multi-value water management and

strives to integrate community, cultural, and environmental benefits into infrastructure design. He relishes any opportunity he can to interact with community groups and find creative ways to work together.

He is particularly proud of his work on the multi-award-winning Te Kuru wetland in Ōtautahi Christchurch’s southwest, which is a showcase of nature-based solutions.

“It covers 100 hectares and incorporates 14 kilometres of walking and cycling tracks, and has expansive wetland areas, stormwater storage, and filtration basins.”

Officially opened in October 2024, the wetland’s basins can hold over one million cubic metres of floodwater during major rain events, significantly reducing the risk of downstream flooding and treating stormwater runoff. The wetland has large areas of native planting, including 150,000 trees and 650,000 other plants.

“We picked up a couple of awards at the IPWEA New Zealand Public Works Awards in May, which was exciting.”

In Sydney in August, Te Kuru Wetland was named as the Best Public Works Project and the IPWEA Australasia Public Works Project of the Year 2025.

“It was a great celebration for the council and showcases exactly what those early stormwater engineers were advocating for – and it really shows people what can be done.”

He says Te Kuru is an inspiring example of how innovative urban planning, from an initial idea and a group of champions, can turn adversity into an opportunity to create a more sustainable, resilient, and liveable city.

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How the numbers stack up

The business case for digital water metering



Taggle explores how digital water meters are stacking up the savings, improving sustainability and transforming customer service for utilities.

Across New Zealand, Australia and around the world, water utilities face pressure to use resources more efficiently, cut operating costs, and deliver better customer outcomes.

Digital water meters have become a vital tool in achieving these goals. They offer near-real-time data on water use, helping utilities detect leaks, minimise water loss, and engage customers more actively.

But before adopting this technology, the first step is to build a strong business case for rolling out digital water meters. Utilities and councils are always concerned about whether the financials add up.

The answer is usually affirmative, but with caveats. A robust business case hinges on quantifying both the hard economic benefits and the softer social, customer, and environmental benefits.

Building the business case

A compelling business case for digital water meters typically considers two types of benefits. Firstly, it must show measurable savings and revenue gains that directly affect the utility's financial outcomes. These include avoided costs (such as manual meter reading), revenue protection (by reducing under-registration), and capital efficiency (postponing investments in water network infrastructure).

There are also softer or strategic benefits that are harder to quantify in dollar terms but offer long-term value. These include customer goodwill, enhanced regulatory compliance, sustainability outcomes, and better decision-making enabled by data.

The economic model typically compares upfront costs (such as meters, communications, systems, and installation) with the ongoing benefits. If utilities have reliable baseline data on leaks, meter reading costs, and network capacity, they can confidently quantify benefits and implement at scale.

Reduced Water Losses

Water that is produced but does not reach the end user or is not billed due to leaks, theft, or metering inaccuracies is costing utilities to treat and pump. Globally, this loss averages about 25–30 per cent, and for some utilities, it is even higher.

Digital meters help reduce water losses by providing high-resolution data that detects leaks at both network and household levels. Continuous monitoring enables utilities to identify bursts early, respond more swiftly, and reduce the duration of leaks. Even a modest reduction in water losses of two to three per cent can lead to significant savings in production costs and better sustainability.

In the business case, the extent of water loss reduction is often a key factor. Utilities with high existing water losses stand to benefit the most financially.

Deferring capital expenditure

Water utilities face large capital costs to expand treatment plants, reservoirs, and pipelines as populations grow. However, not all growth needs immediate new infrastructure.

By using digital meters to reduce leaks, optimise pressure management, and smooth demand peaks through consumer awareness, utilities can get more value from their existing networks. This delays or skips costly capital works, effectively “sweating the assets” longer.

Mackay Regional Council, an early adopter of digital metering, used technology from Taggle, which cut peak demand by 14 per cent. This decrease allowed them to defer building a \$100 million water treatment plant by 10 years and counting. The plant still isn't needed. While that capital expenditure (CAPEX) may be spent someday, the council is currently saving 10 years of operational costs, which provides a significant benefit.

Rollout strategy: Data-driven decisions

The key lesson in building the business case is that numbers are important. Utilities with solid baseline data can confidently model benefits and justify a full rollout.

For instance, if wasted water is known to be 25 per cent and leak rebate costs are well documented, the financial upside of digital meters becomes evident.

Trials confirm assumptions, test technology, and boost confidence, both internally and externally. These pilot programs don't need to be large; even a few hundred or a thousand meters can provide statistically meaningful insights.

Trials should be carried out in one or more District Metered Areas to create a "microcosm" of future digital utility operations. Once the data backs the business case and lessons are learned from a small trial, the utility can then scale up with confidence.

Future state considerations

As New Zealand moves into a future where billing for water usage is going to be more common, the following will need to be taken into consideration when comparing digital metering versus manual metering.

Manual meter reads

Traditional meter reading is labour-intensive, requiring staff to drive or walk routes, access yards, and manage occupational health and safety risks. Costs include wages, vehicles, fuel, and related administration.

Digital meters remove or greatly reduce the need for manual readings by automatically transmitting consumption data. Utilities can redeploy meter readers into higher-value roles, lower vehicle expenses, and improve billing accuracy.

For many utilities, this alone justifies a significant share of the investment. A regional utility might spend over \$10 per read

total cost on manual metering, removing that cost across tens of thousands of meters presents a compelling business case.

Customer leak rebates

As you move into billing for water, customers who unknowingly lose water due to concealed leaks may request rebates. While these programs are designed to protect customers, they pose a financial burden to the utility.

Digital meters enable the near real-time detection of leaks, allowing utilities to alert customers and resolve queries with data before leaks result in large bills and rebate claims. Resolving most claims for rebate payouts can save hundreds of thousands of dollars annually.

Soft benefits beyond the economics

The implementation of digital meters, paired with a strong While hard financial metrics influence boardroom decisions, soft benefits should not be overlooked. These include customer engagement, sustainability, operational efficiency, regulatory compliance, and reputation. These advantages often enhance the case in intangible yet convincing ways, particularly with community stakeholders.

The business case for digital water meters is compelling, but it depends on quantifying benefits through data. The five key drivers form the economic backbone. When utilities have data to model these benefits, deciding to roll out the initiative is straightforward.

Ultimately, digital water meters are more than just a technology upgrade; they are a strategic investment in efficiency, sustainability, and customer service. For utilities willing to embrace data, the figures add up, and the long-term benefits flow to both the organisation and the communities it serves.

For more information visit www.taggle.co.nz

Saving Water...

for a sustainable future





Rising above the tide

Wellington, Melbourne, and Sydney are among the top contenders for a new global wave of urban innovation: floating modular neighbourhoods. Designed to adapt to rising sea levels, floating communities could also offer unexpected advantages, including greater resilience during heatwaves and earthquakes, and even the potential to serve as emergency shelter zones, strengthening the overall safety and sustainability of the city. By Arnoud Molenaar, global director partnerships and resilience at Square Floating City, and former chief resilience officer in Rotterdam, and Lieke Bikker, advisor at Square Floating City.



European style version, designed by Baca Architects.

Climate change is expected to increase coastal flooding, accelerate sea level rise, and bring more frequent and severe extreme weather events. At the same time, cities continue to expand, and it is precisely in the areas most severely affected by climate change that the greatest urban growth is expected: the coastal areas.

This is where floating solutions can help cities to adapt to rising waters, boosting both climate and community resilience.

Era of change

With wide-ranging impacts on human health, ecosystems, and economies, the effects of climate change are no longer a distant threat – they're happening now. IPCC reports confirm that climate change is accelerating and that more people are experiencing them first hand.

Globally cities and urbanised regions are facing more extreme weather events, including heavy rainfall that drives flooding, and rising sea levels that threaten coastlines and waterways.

At the same time the world is facing exponential population growth. According to the World Bank 70 percent of humanity

across the globe will live in cities by 2050. This creates an urgent need for new affordable houses, while many cities are already facing a lack of space.

In this era of change, cities are on the frontline; they face multiple, interconnected challenges that amplify each other, creating physical and social impacts. Yet it is also in cities that innovative solutions can emerge – solutions that not only tackle climate challenges but simultaneously enhance urban quality and make cities more liveable.

This explains the existence and growth of city networks like C40, Resilient Cities Network (RCN), and Global Covenant of Mayors (G-Com), all of which have made climate adaptation one of their top priorities.

Doing nothing is not an option

Coastal cities need to rethink how they manage water and urban space. Doing nothing is not an option; it is not without reason that the Global Center on Adaptation (GCA) developed multiple adaptation acceleration programmes.



It is equally no coincidence that, in 2018, the GCA opened its headquarters in the city of Rotterdam. As a port city and delta city in the low-lying Netherlands, Rotterdam launched the world's first adaptation programme, Rotterdam Climate Proof, in 2008.

In the years that followed, Rotterdam continued to refine its climate adaptation strategies while simultaneously implementing adaptation measures. The philosophy of the city has been, and continues to be, to use adaptation measures to not only make the city more climate resilient but also to enhance urban quality and attractiveness.

"In Rotterdam, urban quality improved significantly through the introduction of new measures such as raingardens, depaving programs, green roofs, more green spaces on the ground including in school yards. These interventions slow down stormwater run-off, moderate urban temperatures, boost biodiversity and make districts more attractive."

One notable innovation in Rotterdam has been the redesign of squares into so-called water squares, a concept since adopted by several other Dutch cities as well as Copenhagen.

Innovations like these not only require pilot spaces, but also strong leadership. Political and administrative leadership contributed to the vision that creating visible showcases is essential to stimulate the market and inspire stakeholders to develop additional ideas and interventions.

Another example is the Rooftop programme. This resulted in approximately 600,000 square metres of green rooftops. Water squares and green rooftops acted as a catalyst for further innovations in the city.

A third category of innovation that the city of Rotterdam focuses on is the implementation of floating solutions. As a delta city with 85 percent of its area below sea level and facing accelerating sea

level rise while continuing to grow, Rotterdam explored options to develop on water.

The first step in this journey was the development of an iconic floating pavilion in one of the old port areas adjacent to the city centre.

Living with and on water

People have always been attracted to water. Rotterdam began reinventing itself as a delta city, realising that water creates both prosperity and urban quality. Thanks to its water, Rotterdam became one of world's largest ports, and waterfront houses are among the most expensive; water literally has an urban value.

Adapting to climate change means embracing this value and learning to live with water rather than constantly fighting against it. Rotterdam took this approach literally with the launch of its floating development programme, which began with the floating pavilion in the Rijnhaven port area. This is not about new houseboats on calm inland waters. These old port areas are directly connected to the open sea, experiencing tidal differences of up to two metres.

Rotterdam's philosophy is clear: 'When large-scale floating constructions like The Pavilion can be developed, the window of opportunity opens for a new, resilient, and flexible way of urban development.

Floating structures are resilient in many ways: they not only move with the tides but can also cope with sea level rise.

There will be less impact of the urban heat island, and it's a flexible solution. Literally, currently the pavilion has been moved to another dock to serve as an education centre for the University of Applied Sciences, leaving space for the biggest floating office in the world, where the headquarters of the GCA is located.

Right now, one can visit multiple examples of floating solutions



Three floating city blocks connected to the mainland.

in Rotterdam. Besides the floating Pavilion and the Floating Office there are floating villas, hotel rooms, a restaurant, and even a floating farm. And there is more to come. Rotterdam recently launched the Water Atlas including potential locations for floating urban development as part of its city development planning and policy.

In the near future, floating neighbourhoods and districts will become more common and an accepted and very resilient part of Rotterdam's urban fabric.

Next level and next step: Floating urbanism on coastal waters

The increasing urgency within coastal cities to find ways to expand in a resilient way is activating a related worldwide growing market for floating solutions. The company BLUE21, that designed the Floating Pavilion in Rotterdam, has set up a new entity called Square Floating City (SFC). This introduces the world's first design and engineered concept for large scale floating real estate, going beyond the single villa concepts.

The modular concept is scalable from floating neighbourhoods, to floating districts, even up to a floating city for 30,000 residents. This is not just a concept; it is a designed and engineered product ready to be implemented anywhere in the world.

Size and design of the city blocks are based on technical criteria related to the physical conditions such as wave heights and water depths. Modularity and scalability are pivotal in the design as well as community resilience. The scale, for example, of the floating neighbourhoods are derived from the optimal size of social resilient communities. One module can host 110-130 residents, the optimal size for community resilience and social coherence. Furthermore,



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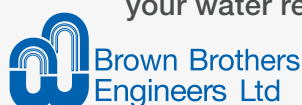


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The Floating Pavillion
in Rotterdam.

walkability and sustainability are important design criteria of floating neighbourhoods.

Finally, the mission of the SFC-company is to work towards a high level of self-sufficiency. The floating platform is very robust and functional. For example, it can host (shared) cars and neighbourhood batteries. All utilities and related infrastructure needed for a liveable neighbourhood are fully integrated inside the floating platform.

Soon floating districts will also be suitable for including oceanic food systems in their urban ecosystem.

Floating urbanism also provides cities with a new and flexible way of urban planning and development. The modules are flexible in multiple ways; they go along with tidal movements and can cope with sea level rise.

Additionally, the floating modules can be towed from, for example, a construction site to a final destination, providing cities with more flexibility in their planning process.

Inspirational ideas for down under

A global GIS tool taking into account various relevant criteria has been developed to identify areas and cities that are most promising for floating urban development. This so-called Global City Scan focuses on coastal cities with substantial waterfront

areas, sometimes including port areas that are transitioning towards residential areas.

Factors such as water depth, wave climate, urban growth, land scarcity and real estate prices are part of the analyses.

The result of the study provides novel insights that can be used to help coastal cities to become more (climate) resilient by implementing floating solutions.

As a result of the city scan analysis coastal cities like Melbourne, Sydney, and Wellington ended up in the top ranking of cities that are highly suitable for robust modular floating neighbourhoods.

We think the floating neighbourhoods also will be more resilient when it comes to heatwaves and earthquakes. In fact, they also could serve as shelter areas, adding resilience value to the entire city.

New window of opportunity

More than 10 years of research and engineering have now resulted in a detailed opportunity for coastal cities to develop and expand waterfront areas in a climate and socially resilient way.

These future floating solutions could contribute to climate adaptation and resilience strategies while at the same time, increase affordable housing stock in coastal communities.

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People, place and the power of design.

An interview on flood resilience and human-centred design with Reiko Baugham and Molly Quirke.

Can you tell us a bit about your roles?

As a Senior Water Engineer based in Palmerston North, much of Reiko's work is split between technical delivery and client management. "I help to find the right people to deliver to our clients in the region, while also mixing in design, hydraulic modelling and infrastructure planning support for projects."

Molly, a Senior Consultant for Digital Strategy & Transformation based in Auckland, spends her time running design-thinking engagements with diverse groups of stakeholders, and blending strategy, technical design and human-centricity into useful tools. "Problem-solving at the nexus of people, business and technical delivery is always new and exciting."

How does human-centred design influence the way you approach flooding projects?

Human-centred design is all about keeping people at the heart of the solution. "Technical data is crucial, of course," Reiko explains, "but some of the most valuable insights come from the people living through flood events themselves. Even little stories about what happens in a storm can completely shift how we understand the problem."

For Molly, it's about co-designing with communities, not just for them. "Involving the community all the way through a project is really a no-brainer. You learn unexpected things, adapt your worldview, and the solution becomes stronger and more well-suited to the community's needs. They feel heard, and the process allows them to uplift their knowledge as well."

What are councils, iwi and community groups prioritising most when it comes to flood resilience today?

For Reiko, adaptability is always front and centre. "Communities are thinking about growth, climate change and the long-term future. They need solutions that can bend and flex with whatever comes next."

Molly sees holistic planning and working with nature as priorities. "I can't speak for all of those groups! But what we've found with this work is that people are curious about their land and how floods happen, and they want resilient solutions that incorporate traditional knowledge, innovation, and prioritise kaitiakitanga and a deep care for nature."

How do you balance technical requirements with cultural values and lived experiences?

Molly and Reiko agree that blending technical requirements with cultural values is more natural than people might expect. "The challenge is listening with empathy, then translating what you've heard into technical language. Once those cultural priorities are expressed as technical requirements, it becomes straightforward to weave them into the design."

Respecting the mauri of the water (its life force) helps us design in a way that honours both people and place. Sometimes that means trade-offs. You might forgo a technically superior flood mitigation option because it would impact the mauri of the water. It might not look 'optimised' on paper, but it's often the right outcome, one the community connects with and sees themselves reflected in."

Looking ahead, what trends or innovations are shaping community resilience and climate adaptation in New Zealand?

"Nature-based solutions are leading the way!" says Reiko "Stormwater management, restoring floodplains, and letting waterways breathe are examples from around the world. We're looking for solutions to live with water, not just control it."

Molly sees human-centred design as the real driver of innovation. "But capturing data about your assets and waterways is just as important, building that foundation will enable machine learning and smarter decision-making in the future."

Any advice for engineers wanting to embed more human-centred or Te Ao Māori approaches?

Start by listening, and don't automatically assume you know what's best, even if you are an expert in your field! Build your deliverables to be accessible to members of the public, and to lift up the knowledge of the community. Communication is key. Building trust takes time, but the outcomes – resilient, culturally grounded solutions that communities genuinely own – are worth it. The results aren't just infrastructure, they're solutions that connect people to place.



Reiko Baugham
Senior Water
Engineer



Molly Quirke
Senior Consultant,
Digital Strategy &
Transformation

Nanobubbles: A new era of sustainable water treatment

Proponents of an emerging technology say it could be a key driver in mitigating the effects of pollution and climate change, not only in water treatment systems but across the industry. By Ben Lunjevich, general manager, and Gemma Dowsett, environmental and sustainability advisor, Northwater.

We face a growing water crisis driven by pollution, aging infrastructure, and ecosystem decline. Many rivers, lakes, and groundwater sources are contaminated by runoff from intensive farming, fertilisers, and waste, making them unsafe for swimming or drinking.

At the same time, hundreds of thousands of people lack access to reliably safe drinking water due to outdated or poorly maintained infrastructure.

Diffuse pollution from widespread land use and urban runoff is difficult to control, while water systems struggle under pressure from population growth and climate warming increasing extreme events such as floods and droughts.

Over-extraction for agriculture and irrigation depletes aquifers and reduces river flows, increasing ecosystem stress. As a result, wetlands have been drained, biodiversity is collapsing, and many native freshwater species are now threatened, highlighting the urgent need for sustainable water management and restoration across the country.

The challenge and the opportunity

The new regulatory environment has brought new urgency to how water is managed, monitored, and safeguarded.

The question now is, how do we achieve cleaner water using methods that align with our values of sustainability, innovation, and kaitiakitanga (guardianship).

The convergence of regulatory pressure, environmental responsibility, and demand for innovation has opened the door to a quiet revolution in water technology: nanobubble systems.

Nanobubble technology has the potential to transform the way we manage and disinfect water systems and repair and sustain ecological systems. By enhancing natural processes, nanobubbles bridge innovation with regeneration, empowering industries and communities to restore the waterways that sustain life.

Nanobubbles are ultra-fine gas bubbles, less than 200 nanometres in diameter.

Unlike regular bubbles, which quickly rise and burst at the surface, nanobubbles remain suspended in water for extended periods. They

carry a natural surface charge that prevents them from coalescing, and their minute size gives them unique physical and chemical properties.

These features provide enhanced oxygen transfer efficiency, powerful oxidation and disinfection, and improved water clarity and quality. They are eco-friendly and chemical-free, enhance biological activity in natural systems, reduce energy and maintenance costs, and have diverse applications across industries.

When nanobubbles collapse, they generate localised energy and reactive oxygen species that help oxidise contaminants, reduce pathogens, and improve water clarity – all without the use of harsh chemicals.

“Nanobubbles are proving that you don’t need more chemicals to achieve better water,” says Geoff Parish of Trident Nanobubble Australia. “They’re showing us that physics, not chemistry, can often be the cleaner answer.”

Applications across water management

For small-town and rural water supplies, nanobubbles provide low-maintenance, chemical-light upgrades. They oxygenate raw water, suppress algae, and gently oxidise iron, manganese, and ammonia, improving filtration, reducing sludge, and stabilising treatment.

In lakes, ponds, and source water restoration, they boost natural oxidation to break down nitrogen and phosphorus, cutting algal bloom nutrients.

Water quality and clarity is improved by limiting algae and turbidity for clearer, cleaner, more pleasant recreational water.

Nanobubbles provide higher oxygen and ecosystem health. They raise dissolved oxygen to support fish, plants, and microbes, increasing resilience to stress.

They also provide faster organic breakdown, accelerating the decomposition of algae and detritus, reducing sludge and odour.

As such, they are ideal for odour, scum, and sediment control, preventing surface scum and foul smells while disrupting nutrient-rich sediment buildup.

The result is healthier fish and lower mortality. Nanobubbles



maintain oxygen during heatwaves or high-demand periods, preventing fish kills.

They provide long-lasting, chemical-free treatment, giving ongoing, gentle oxidation without repeated chemicals or toxicity.

Nanobubbles naturally rebalance ecosystems, sustaining cleaner, oxygen-rich water.

Smarter water management

This convergence of nanobubble technology and policy creates a powerful pathway for meeting regulatory standards, while advancing environmental restoration.

- **Chemical-free disinfection:** Replacing chlorine-based treatment with ozone or oxygen nanobubbles eliminates harmful by-products like trihalomethanes (THMs), improving safety for people and ecosystems.
- **Energy efficiency:** Nanobubble systems improve oxygen transfer by up to 10 times compared to traditional aeration, significantly reducing electricity use.
- **Water conservation:** By enhancing treatment performance, they enable greater reuse and recycling of water within facilities, lowering demand for potable supply.
- **Ecosystem support:** Increased dissolved oxygen improves the health of aquatic life and accelerates natural remediation processes in lakes, ponds, and rivers.

Nanobubbles offer a science-backed, scalable tool to allow councils, farms, and industries to minimise their environmental impact by adopting eco-friendly, innovative controls that reduce contaminants in soil, water, air, and vegetation.

In wastewater, they enhance aerobic microbial activity, accelerating the breakdown of organic waste.

- In aquaculture, they stabilise oxygen levels, improving fish health and reducing disease.
- In agriculture, they improve soil aeration and nutrient uptake, supporting regenerative practices.
- In stormwater management, they help restore the oxygen balance in urban ponds and estuaries, mitigating algal blooms and odours.

At a community level, these outcomes foster cleaner waterways, more resilient ecosystems, and a stronger sense of guardianship over our shared environment.

Rethinking climate resilience

Tackling climate change is much more than reducing one's carbon footprint. It's about understanding how environmental, social, economic, and political systems interact and impact one another. Understanding key drivers of environmental degradation such as pollution, the different types, and how it cycles is critical for environmental resilience.

The pollution transport cycle is an interconnected system of how contaminants move and transform between air, water, soil and

biota. Pollutants circulate through evaporation, rainfall, runoff, sedimentation, and bioaccumulation, eventually impacting ecosystems far from their source.

Understanding this cycle is essential because it shows how pollution in one part of the environment can end up in waterways, food chains, and living organisms.

Recognising these interconnections helps scientists, policymakers, and industries design better solutions – not just treating the symptoms of pollution in water, but addressing its causes across the entire environmental system.

Nanobubble technology could be a key driver in mitigating the effects of pollution at different stages of this cycle and therefore the effects climate change is having on not only our water systems but the water industry as a whole.

Ozone vs oxygen nanobubbles – finding the balance

Not all nanobubbles are the same. While ozone nanobubbles are highly effective at oxidation and pathogen removal, they must be used with caution in natural ecosystems – excessive oxidation can disrupt microbial balance and harm aquatic organisms.

In contrast, oxygen nanobubbles work gently, enhancing oxygenation and supporting biological processes without introducing reactive chemicals.

The system and purpose of use will determine whether to use oxygen or ozone. However for natural eco-systems, oxygen is the main focus for long-term restoration strategy.

For a more resilient system, and in extreme cases such as the emergency leak when wastewater was entering Waitemata Harbour, then a balanced approach, using ozone for disinfection and oxygen for restoration, may be considered.

Future-focused approach to water

The path toward sustainable water management will depend on both innovation and integration of scientific and industry knowledge with Māori principles of kaitiakitanga, and aligning with regulatory leadership from the Water Services Authority – Taumata Arowai.

In conclusion, there is nothing more important than protecting the lifeblood of our planet – our waterways. As everyday toxins and aging infrastructure continue to put pressure on our environment, a sustainable future will depend on how effectively we can align policy and compliance with integrated knowledge.

By embracing smart, chemical-free water solutions such as nanobubbles and working collaboratively across communities, industries, and government, we can restore the health of ecosystems, empower communities, and ensure that the wai ora (living water) sustaining this land continues to flow clean and strong for generations to come.



Raising the bar for environmental data management

The Bay of Plenty region has a diverse landscape, from pristine coastlines and geothermal wonders to native forests and fertile plains. As caretakers of this ecosystem, Bay of Plenty Regional Council (BOPRC) faces the complex task of monitoring and collecting data on environmental aspects across land, air, and water ecosystems. By Thalia Kouts.



Whakatane River.

With more than 9000 monitoring stations, and counting, the council's environmental data collection has expanded significantly. BOPRC team leader for environmental data and information, Angela Perks, says the organisation's mandate continues to grow to include broader environmental, social, and cultural interests of the community.

"This has pushed our team to expand the capabilities of our data management system."

From hydrology to holistic environmental monitoring

In 2014, BOPRC implemented Aquarius as its data management platform, initially focusing solely on hydrological data, i.e., rainfall, groundwater, river levels, and flow measurements. The success of this implementation quickly revealed expansion opportunities.

"What began as a hydrology-focused deployment evolved into our central environmental data hub. We've methodically expanded our use of the platform to integrate discrete water quality data from our LabWare system, air quality monitoring data from the Mount Maunganui area, coastal ecology datasets, water use data, geothermal information, and so much more."

This evolution has transformed how the council approaches environmental monitoring.

By consolidating diverse datasets in one system, BOPRC can now identify correlations and patterns that would potentially have previously gone unnoticed. For instance, when air quality sensors in the Mount Maunganui area detected elevated levels of particulate matter less than 10 microns (PM10) in 2018, the council could correlate these readings with industrial activities, weather conditions, and other environmental factors.

The Mount Maunganui airshed was gazetted in 2019 and designated as polluted that year due to breaches of New Zealand's National Environmental Standards for Air Quality for particulate matter (PM10), primarily from industrial discharges.

This designation has enabled the council to impose stricter rules and resource consent decisions, and along with changes by key industries, there have been measured improvements since.

The airshed will remain classified as polluted until there are no breaches of the standard for five consecutive years.

The gold standard in data quality

By adopting the NEMS quality coding framework in Aquarius, BOPRC has elevated its environmental data to nationally consistent, high quality, and high-confidence data.

“Adopting NEMS standards has been a great achievement. These represent rigorous standards for data collection, accuracy, validation, and reliability, making our environmental data more trustworthy for high-stakes decisions and public reporting.”

This improvement has been aided by the platform’s metadata capabilities, which link critical details, such as field visit measurements, photographs, comments, and measurement method metadata to each dataset. The system maintains comprehensive audit logs of all corrections and metadata changes, supporting data integrity and defensibility.

“The data review toolbox is my all-time favourite feature. It allows for simultaneous raw and corrected data viewing with a comprehensive audit trail, which is invaluable for maintaining data quality and transparency.”

Innovation in field collection and qualitative data

The council implemented Survey123 for field data capture in December 2020. Automating the collection process ensures information is available immediately after collection, rather than being delayed until field staff return to the office.

This approach minimises input errors from transcribing handwritten notes and allows field crews to enhance datasets with supporting images and contextual information in the field visit sections.

For geothermal monitoring, which includes bore temperature profiles, surface feature monitoring, and fluid chemistry, BOPRC developed a method to convert qualitative observational data

into numerical data. This enables a more comprehensive view of geothermal resources and supports BOPRC in delivering key functions under the Resource Management Act and other statutory or non-statutory requirements.

“We’ve found creative ways to represent qualitative information through qualifiers, notes, and legends. For example, observational data, such as odour and water colour of geothermal surface features, can indicate changes in chemical composition and activity. This data, previously hidden in attached Excel files, is now visible as time series alongside measured data, which also enables trend analysis.”

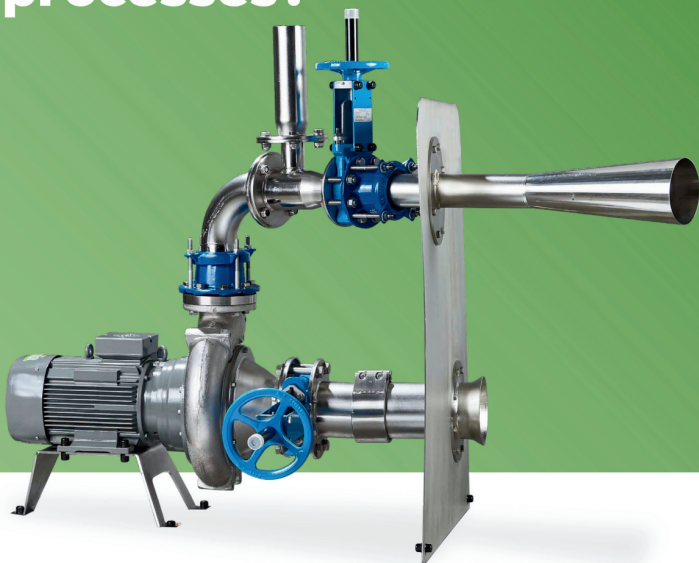
Blending cultural knowledge with data science

A new forward-thinking initiative involves exploring ways to incorporate mātauranga Māori – traditional Māori knowledge – into data management practices. Mātauranga Māori is a holistic, place-based, and intergenerational perspective that often complements scientific approaches.

In Māori culture, descriptions of the environment go beyond data. BOPRC is looking for a richer understanding of environmental phenomena by bringing both qualitative and quantitative aspects to data. By embedding values such as kaitiakitanga (guardianship), whanaungatanga (relationships), and tikanga (customs), the council is hoping to make data collection more culturally relevant and locally informed.

“Indigenous knowledge systems provide insights that conventional monitoring might miss. By creating space for mātauranga Māori within our data frameworks, we’re

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Tauranga River flow gauging with Q boat.

acknowledging that effective environmental stewardship requires more than just scientific measurements.”

Empowering stakeholders through data access

The Aquaries WebPortal enables the council to provide public access to quality-assured environmental data. This self-service approach has reduced the time staff spend fulfilling manual data requests, while empowering diverse stakeholders, such as consultants, universities, farmers, and community members, to engage with environmental information.

BOPRC has developed custom reports for specific user groups. Farmers, for instance, can access specialised reports on soil moisture and other agricultural indicators to make informed irrigation decisions. Universities and research institutions use the data portal to support environmental studies.

“Our data portal has democratised access to environmental data. When people can easily access and visualise information about their local environment, they become more engaged and can make better decisions about protecting our resources.”

Looking ahead: The future of environmental data management

As BOPRC continues to expand its monitoring networks, the council continues to push the boundaries of what is possible in its data management systems.

The Rating Review toolbox has become increasingly valuable as climate change affects rainfall in the region. Having centralised



Lake Tarawera level.

storage of all environmental data, metadata, and supporting documents in one system enables the council to respond more effectively to these emerging environmental challenges.

“What began as a solution for hydrology data has evolved into the backbone of our environmental monitoring and management programme.

By raising the bar for data confidence, integration, and accessibility, we’re better positioned to fulfill our mandate as caretakers of the Bay of Plenty’s natural resources for current and future generations.”

Article provided by Bay of Plenty Regional Council

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Dry gardens and ugly lawns

Why do some councils impose annoying summer water restrictions when large rivers or lakes are our sources? By Julie Clarke, water services administrator, community connector and educator in water resource management and sustainability, Central Otago District Council.

Managing domestic water sources involves considering both supply and demand. On the supply side we think of increasing storage capacity, finding additional sources, or recycling used water (generally in that order). On the demand side we attempt to educate our consumers to install water-efficient appliances, turn off taps when brushing teeth, check for leaks and so forth – mostly small actions which we hope will collectively accumulate into a reduction in demand. Then if water use outstrips the pace at which we can deliver it, we impose restrictions.

For some councils, like Central Otago District Council, there are additional, seasonal pressures, on our water supplies, such as hot summers which attract an influx of thousands of holidaymakers.

Educating the public about the need to conserve water during times when restrictions are in place can be challenging when they live on the banks of the country's most voluminous river or a large lake, and perceive the supply to be plentiful.

Volumetric price increases per unit of water are a powerful incentive to use less, and these are effective to a degree. But in addition to public education and price increases, there needs some kind of social engineering (for want of a better term). We need to encourage and support (both structurally and socially) a culture-change, a paradigm shift in people's minds about how they use water.

How do we achieve this? We target what really matters to people in their everyday lives. We target the emotions which are associated with their everyday water-use habits.

Outdoor water use accounts for the largest proportion of the increase in summer demand in Central Otago. More people are in the district who need to shower and use toilets, but those who own holiday homes here come and water their lawns and gardens, as do our permanent population during a hot summer.

So, how can we encourage a reduction in garden and lawn irrigation? Restrictions? Yes. Higher prices? Yes. But to make a significant and lasting change we must change the lawn and garden culture.

Over the summer of 2023-2024, the Central Otago District Council ran a district-wide dry garden competition. It was supported by local businesses, garden clubs, and the council's water services, libraries, and parks and recreation teams. There were beautiful, practical, and generous prizes on offer (native plants, landscaping supplies, a book on dry gardens and so forth).

Among the entries, xeriscapes (gardens which rely solely on rainwater) were rare. So, the volunteer judges quickly decided to broaden the criteria to 'water-efficient' gardens, but we kept the name 'dry gardens' in order to normalise the concept of using no, or less, water for irrigation.

There were such a variety of gardens, due to property size and the duration of time establishing them, that we created several categories – six in all. But the enthusiasm and lengths to which some of the gardeners went to conserve water was inspiring.

We used local newspapers, The Central App, and Facebook to promote the competition and the subsequent prize-giving. Our libraries created displays to promote it, including a poster, a list of drought-resilient plants, appropriate gardening books, and contacts for garden clubs and a local (but internationally renowned) dry garden expert.

This was also supported by a series of short articles in the district-

wide newspaper on domestic water use which were designed to encourage reflection on, and the questioning of, our everyday water-use habits.

At the same time, some parts of our district were under water restrictions. So, while we did notice a drop in demand, it's impossible to know how much of an impact the competition actually had. But the purpose was the long game – to normalise the concept of dry gardens, or xeriscapes, and cause people to question their irrigation habits.

Another water conservation initiative (with global reach) which aims to change the norm of green lawns is the 'World's Ugliest Lawn', which in 2024 was won by a New Zealander. This competition seeks entries who can show how brown, dead, or 'ugly', their lawn can look over summer without irrigation. Let's face it, grass does grow back even after dying off over summer, but this competition challenges the norm of trying to keep it green.

What both the Dry Garden Competition and World's Ugliest Lawn have in common is the objective to change the garden/lawn culture in a positive and fun way.

People don't respond well to negative messaging and can feel helpless in the face of it (especially around climate change). But making water conservation fun and providing prizes gets attention and motivates.

Repetition of the message normalises the concept. In addition to water restrictions, water-efficient appliances, messages about turning the tap off while brushing teeth, and increasing volumetric charging – having a fun and light-hearted competition can round off the tool-set and provide a carrot instead of the stick.

Our council is keen to share ideas or team up with other councils to come up with other novel approaches to water conservation education.



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Real-time detection of sewer water levels and blockages using UHF-RFID sensors

A novel, robust, and cost-effective solution for detecting sewer blockages and inflow and infiltration events has been developed. The UHF-RFID water depth ruler has demonstrated a near-identical accuracy to conventional point gauges in various flow conditions.

Sewer blockages and inflow-and-infiltration (I/I) pose significant challenges to aging urban infrastructure, often leading to sewage overflows and environmental contamination with human pathogens.

Sewer systems are critical infrastructure assets that play a vital role in the protection of public health and the urban water environment. However, aging infrastructure and increased rainfall events linked to climate change have significantly heightened risks to these systems, intensifying sewer overflows (SOs) due to inflow and infiltration (I/I).

SOs are categorised based on sewer conveyance into two types: combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs).

CSOs occur when combined sewer systems, which carry both wastewater and stormwater, become overwhelmed, typically during heavy rainfall events. SSOs, on the other hand, occur when wastewater escapes from utility holes due to blockages or structural failures.

SOs events can release raw sewage into the environment, posing severe risks to ecological and public health while incurring significant financial costs. I/I exacerbate these issues by reducing the hydraulic efficiency of sewer infrastructure, with infiltration alone potentially increasing utility costs by 25 to 50 percent. For instance, between 23,000 and 75,000 SOs occurred annually in the USA, representing a loss of 3-10 billion gallons of raw wastewater to the environment.

SOs caused by sewer blockages are also on the rise due to increased solids concentrations, increased levels of fat, oil, and greases (FOGs) in diet, and reduced per-capita water usage.

Ensuring the effective management of sewer pipe infrastructure is contingent upon the timely acquisition and reliability of condition-specific data.

Conventional detection methods, including ultrasonic sensors, CCTV, infra-red cameras, and fiber-optic distributed temperature sensing systems, are costly, labour-intensive, and limited in scalability.

This study introduces the use of ultra-high frequency radio frequency identification (UHF-RFID)-based sensors for real-time monitoring of water levels and surface flow velocities in simulated sewer systems, offering a novel, robust, and cost-effective solution for detecting sewer blockages and I/I events.

In addition to cost savings, low-cost technologies such as RFID offer advantages such as improved reliability, lower power requirements, enhanced performance, and flexible communication protocols such as being accessible to open-source or open-hardware solutions.

These sensors enable high-resolution monitoring of stormwater and wastewater systems over broader spatial and temporal scales without substantial financial or resource investments.

To achieve this, we developed a UHF-RFID water depth ruler that demonstrated a near-identical accuracy to conventional point gauges ($R^2 > 0.998$) in various flow conditions. Additionally, our custom-designed UHF-RFID-based floating sensors accurately quantify a wide range of surface velocities under turbulent conditions (up to 72 L/s) in a controlled flume environment.

This ruler was subsequently assessed in laboratory hydraulic flume settings to determine the impact of various water flow conditions and sewage objects, such as toilet paper.

Furthermore, we embarked on an exploration of flow patterns in the immediate upstream and downstream vicinities of assorted artificial blockages, utilising flotation passive UHF-RFID sensors within the same flume setup.

By correlating surface flow velocity and water depth profiles, we could accurately identify blockage severity and detect point source I/I events in real-time within an open channel flume.

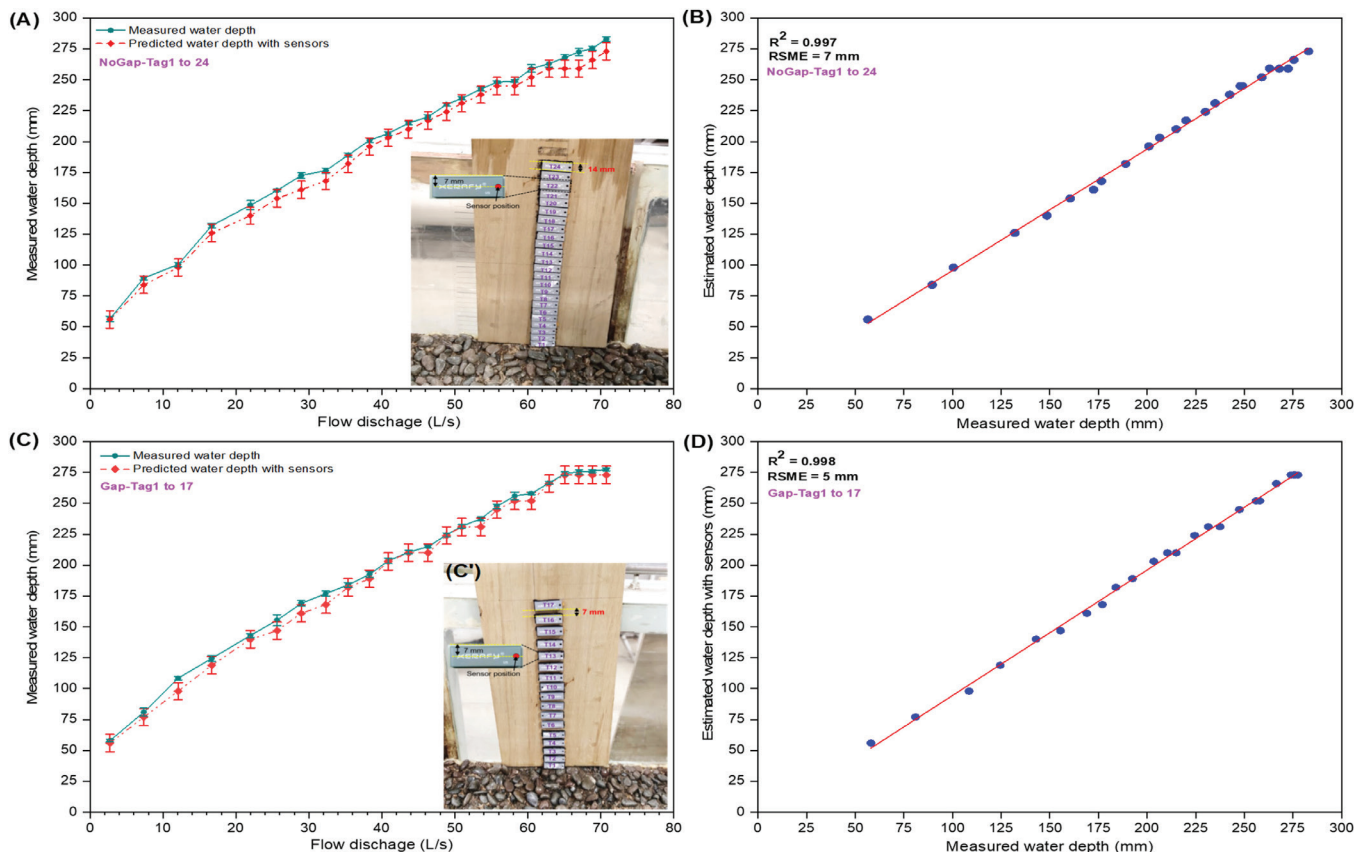
This study presents an innovative approach in real-time sewer monitoring and prediction, offering municipalities an affordable, expandable, and robust solution to develop smart urban sewer networks to minimise the risks of overflows and environmental pollution.

Evaluation of water depth measurements

Measuring the wastewater level at utility hole junctions in the sewer system is essential for predicting abnormalities, such as solids deposits and wastewater overflows.

Therefore, we developed a novel type of water level sensor using UHF-RFID technology. It can be clearly seen in Fig. 4 that UHF-RFID sensors showed robust performance in water level deduction under both steady and unsteady flow conditions, ranging from 2.5 to 73.0 L/s.

Comparatively, other sensing technologies for water-level measurements have different accuracies. UHF-RFID has shown a



Water depths were measured with a point gauge and with ultra high-frequency radio-frequency identification (UHF-RFID)-based sensors as predicted. (A) Measured water depth with a gauge scale and predicted water depths in flume using RFID sensors NoGap-Tag1 to 24 under varying flow conditions from 2.5 to 73.0 L/s. 7 mm (RMSE) error bar was added to the estimated values. (A') The inset image is the sensor setup in the flume. (B) Statistical analysis and the performance metrics of the predicted and measured values, NoGap-Tag1 to 24, which is $R^2 = 0.997$. (C) Measured and estimated water depths in flume using RFID sensors Gap-Tag1 to 17 under varying flow conditions from 2.5 to 73.0 L/s. 7 mm (RMSE) error bar was added to the estimated values. (C') The inset image is the sensor setup in the flume. (D) Statistical analysis and the performance metrics of the predicted and observed values, Gap-Tag1 to 17, which is $R^2 = 0.998$. Note: A' & C' Figures are not drawn to scale.

good level of accuracy of 5-7 mm RMSE based on the UHF-RFID modules in this study, which is comparable to other methods on the market for buried pipe applications.

Additionally, the cost of the RFID ruler is only about US\$140 for a 450mm diameter pipe, providing sensors along the perimeter of the pipe, whereas other sensors would cost in the range of \$1500-\$3000.

Quantification of surface flow velocities

Predicting the areas where solids deposition occurs and ultimately leads to fatberg formation is challenging. Previous studies have found that the self-cleaning velocities designed for sewer networks may not meet the first flush requirements mandated by water authorities, as flows in networks are often non-uniform.

Determining mean velocities in sewers is also complicated by the presence of solid matter.

However, measuring surface flow velocity using RFID sensors is relatively straightforward and provides real-time data, enabling the direct identification of solid deposition hotspot zones in sewer networks.

Thus, we hypothesised that sewer surface flow velocity variations and anomalies could be correlated to and used to determine concerning events in the sewer systems, such as blockages and inflow/infiltration.

To test our hypothesis, we first tested if the RFID sensors had the resolution to accurately quantify surface flow velocity under sewer-relevant flow rate ranges. The UHF-RFID sensors showed robust performance in various flow conditions.

The next step was to use observed surface flow velocity to

estimate average water velocity because the observed surface flow velocity could be easily and robustly obtained using our UHF-RFID modules.

The results of this study indicate a good linear correlation ($R^2 = 0.95$) between the average velocity and observed surface flow velocity, with a mean velocity-to-observed surface flow velocity ratio of approximately 0.607. This ratio falls within the range reported in previous studies, which also show variations depending on the method and conditions of measurement.

Detection of blockages using UHF-RFID sensors

The conventional methods available on the market to evaluate the hydraulic failure of pipes due to blockages are both expensive and time-consuming. However, the RFID sensor approach can help overcome these challenges by narrowing down blockages across a large network to a specific pipe segment between two utility holes.

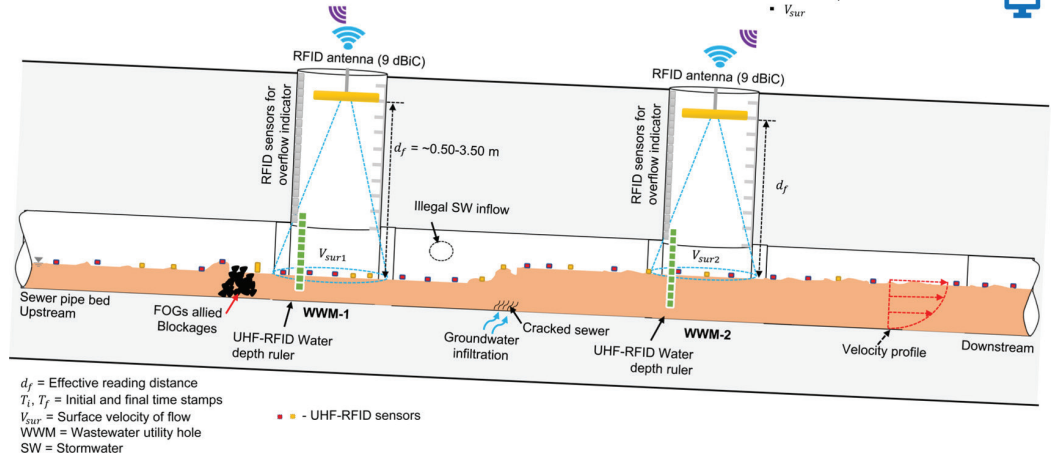
During blockage events, substantial differences in upstream and downstream surface velocities are expected, facilitating the isolation of the affected segment.

Additionally, a conspicuous reduction in average surface flow velocity compared to baseline conditions, alongside fluctuations in water depths between utility holes, contributes to the efficient identification and localisation of blockages.

The integration of these observations enhances the effectiveness of RFID sensor-based approaches in addressing hydraulic issues and optimising maintenance activities within sewer networks.

By utilising the observed surface flow velocity findings, RFID sensors can assist in predicting blockages in real-time. The sensors

This study introduces the use of ultra-high frequency radio frequency identification (UHF-RFID)-based sensors for real-time monitoring of water levels and surface flow velocities in simulated sewer systems, offering a novel, robust, and cost-effective solution for detecting sewer blockages and I/I events.



can quickly detect upstream and downstream flow behaviours, locate the spatial blockage size, and determine its possible location.

This provides a significant advantage over conventional methods such as CCTV, dye, and smoking, which make it challenging to assess the network's performance before hydraulic failures or blockages occur.

Notably, a decline in average flow velocities was observed upstream of the blockages, while an increase was noted downstream due to diminished flow depth reductions. Consequently, this led to elevated flow velocities at the downstream.

As compared with the average velocities, the observed surface velocities from sensors were different. This variation was due to the formation of the hydraulic jump downstream of the blockage.

Hydraulic jump is associated with strong turbulence, and the air/water bubbly flow traps the sensors, significantly increasing the sensors' time of travel. Hence, reduced observed surface velocities were showing up due to the trapping event of sensors.

Based on the findings, the severity of the blockage is indicated:

1. By significant changes in water levels between the various locations in sewer segments in the upstream and downstream utility holes;
2. If the average surface flow velocity at the downstream location is larger than the average surface flow velocity between the two antennae, this is a strong indication of the blockage;
3. Variations in flow depths between that measured from sensors indicating a potential blockage; and
4. Also if variations between average flow velocities (and observed surface flow velocities) from the UHF-RFID sensor is less than the average velocity, indicating potential blockages.

Flow velocity variation detection during dry and wet weather

In Auckland, the sewer and stormwater systems are designed to accommodate a peak wastewater flow of 7.5–10 L/s and a peak wet weather flow of 60–80 L/s. The peaking fractions between the wet and dry weather flows depend on several factors, such as population density of catchment, pipe sizes, I/I flow ingress, and safety factor considerations.

Given this, the experimental studies were designed to achieve a dry weather flow (DWF) ratio of approximately 5.0 ± 0.2 in order to replicate the flow variation accurately.

The observed surface flow velocities from the sensors increased as the inflow discharge in the flume increased. Under DWF conditions with a flow rate of 3.0 L/s, the observed surface flow velocity was approximately 0.23 m/s.

However, in WWF conditions where the flow rate was five times higher than DWF, the observed surface flow velocity significantly

increased to approximately 0.46 m/s.

Moreover, concurrent with the rise in observed surface velocities, fluctuations in water level measurements were also documented, correlating with alterations in flow rates.

To augment predictive precision, the integration of water level sensors alongside velocity measurements facilitates a holistic evaluation of flow dynamics.

According to the results shown in the previous sections, the observed surface flow velocity can be determined using UHF-RFID tags. Meanwhile, water levels can also be used to predict flow variation.

The results demonstrate that an increase in water depths was observed as the WWF/DWF ratio increased. UHF-RFID sensors can accurately predict this increase in water depth with greater precision.

Currently, dye testing, infra-red camera, fiber-optic distributed temperature sensing, and CCTV-based sewer survey technologies are commonly used to assess I/I events and locate intrusion points. However, the experimental findings demonstrated that UHF-RFID sensors could be used to quantify flow variations and predict rainfall-derived inflow and infiltration (RDII) in sewer pipes as a first screening method.

Assessing I/I sources in sewer pipe segments during site surveys can be challenging, particularly with the current practices adopted by water authorities. The RFID sensor approach, as evidenced by the findings, provides a clear distinction in flow behaviours without relying on additional data, such as sewer network flow, rain intensity, or temperature measurements, to identify DWF and WWF in real-time.

Furthermore, the conceptual approaches used for infiltration modelling often do not integrate pipe characteristics and typical site conditions. Therefore, incorporating the RFID sensor approach can maximise I/I detection rates in networks, especially in cases where the traditional approaches are limited.

Conclusion

The findings highlight UHF-RFID sensors as a low-cost, robust, and high-throughput tool for continuous sewer monitoring. Their scalability and ease of deployment make them ideal for integration into complex smart sewer infrastructure, significantly enhancing buried asset management.

This is an abridged version of the paper 'Real-time detection of sewer water levels and blockages using UHF-RFID sensors', by Sundra R. Tatiparthi, Yashika G. De Costa, David Wyllie, Ray Y. Zhong, Shihu Hu, Zhiguo Yuan, Colin N. Whittaker, and Wei-Qin Zhuang. To read the full version, go to doi.org/10.1016/j.watres.2025.123380

Plant condition monitoring

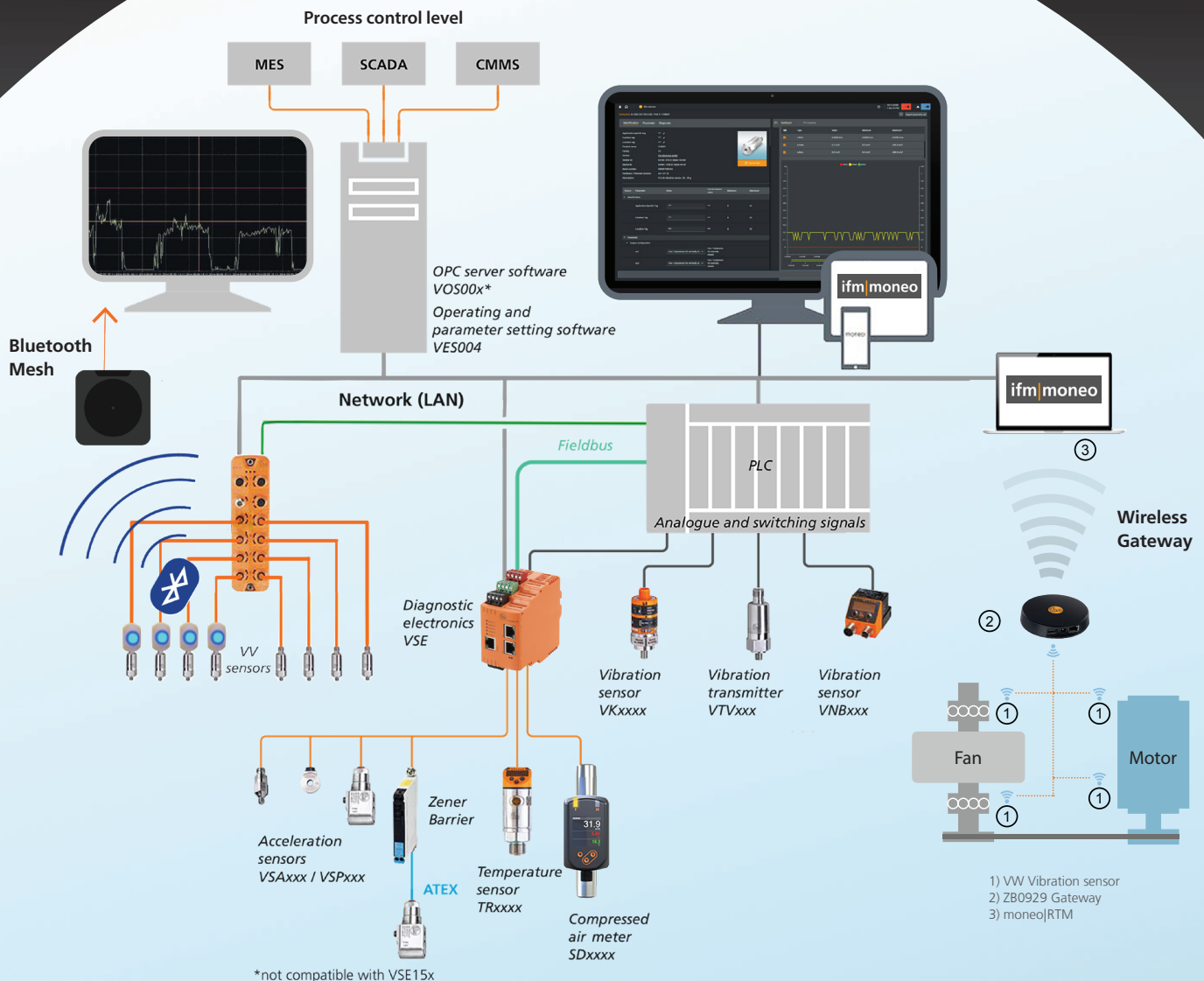
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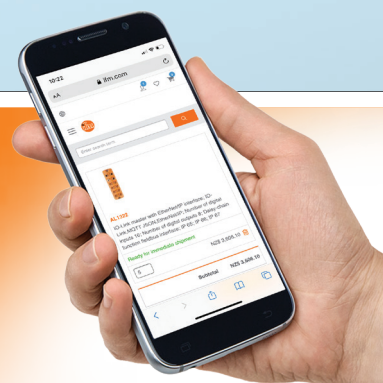
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Researcher testing
murky waters in Alaska's
Brooks Range.

In Alaska's Brooks Range, rivers once clear enough to drink from now run orange and hazy with toxic metals, poisoning fish and wreaking havoc on ecosystems.

As the planet warms, a layer of permafrost is beginning to thaw. Water and oxygen creep into the newly exposed soil, triggering the breakdown of sulfide-rich rocks, and creating sulfuric acid that leaches naturally occurring metals like iron, cadmium, and aluminium from rocks into the river.

Often times, geochemical reactions like these are triggered by mining operations. But that is not the case this time.

"This is what acid mine drainage looks like," says Tim Lyons, a biogeochemist at the University of California, Riverside. "But here, there's no mine. The permafrost is thawing and changing the chemistry of the landscape."

A new paper detailing the severity of the contamination has been published in the Proceedings of the National Academy of Sciences. Though the study focuses on the Salmon River, researchers warn that similar transformations are already underway across dozens of other Arctic watersheds.

"I have worked and travelled in the Brooks Range since 1976, and the recent changes in landforms and water chemistry are truly astounding," says David Cooper, Colorado State University research scientist and study co-author.

Ecologist Paddy Sullivan of the University of Alaska first noticed the dramatic changes in 2019 while conducting fieldwork on Arctic forests shifting northward – another consequence of climate change. A pilot flying Paddy into the field warned him the Salmon River hadn't cleared up after the snowmelt and looked "like sewage". Alarmed by what he saw, Paddy joined forces with Tim, Roman Dial from Alaska Pacific University, and others to investigate the causes and ecological consequences.

Their analysis confirmed that thawing permafrost was unleashing geochemical reactions that oxidise sulfide-rich rocks like pyrite, generating acidity and mobilising a wide suite of metals, including cadmium, which accumulates in fish organs and could affect animals like bears and birds that eat fish.

In small amounts, metals aren't necessarily toxic. However, the study shows that levels of metals in the river's waters exceed U.S. Environmental Protection Agency toxicity thresholds for aquatic life. In addition, the iron-clouded waters reduce the amount of light reaching the bottom of the river and smother insect larvae eaten by the salmon and other fish.

While current metal concentrations in edible fish tissue are not considered hazardous to humans, the changes to the rivers pose indirect but serious threats.

Chum salmon, a key subsistence species for many Indigenous communities, might struggle to spawn in gravel beds choked with fine sediment. Other species, such as grayling and Dolly Varden, may also be affected.

"It's not just a Salmon River story," Tim says. "This is happening across the Arctic. Wherever you have the right kind of rock and thawing permafrost, this process can start."

Unlike mine sites, where acid drainage can be mitigated with buffers or containment systems, these remote watersheds



The Salmon River in Alaska now runs a rusty orange thanks to metal contaminants unleashed by thawing permafrost.

Photo courtesy of: Taylor Rhoades

might have hundreds of contamination sources and no such infrastructure. Once the chemical process begins, the only thing that can stop it is recovery of the permafrost.

“There’s no fixing this once it starts. It’s another irreversible shift driven by a warming planet.

“There are few places left on Earth as untouched as these rivers. But even here, far from cities and highways, the fingerprint of global warming is unmistakable. No place is spared.”

Ice dissolves iron faster than liquid water

Ice can dissolve iron minerals more effectively than liquid water, according to a new study from Umeå University. The discovery could help explain why many Arctic rivers are now turning rusty orange as permafrost thaws in a warming climate.

The recently-published study shows that ice at minus 10 degrees Celsius releases more iron from common minerals than liquid water at four degrees Celsius. This challenges the long-held belief that frozen environments slow down chemical reactions.

“It may sound counterintuitive, but ice is not a passive frozen block,” says Jean-François Boily, Professor at Umeå University, Sweden, and co-author of the study. “Freezing creates microscopic pockets of liquid water between ice crystals. These act like chemical reactors, where compounds become concentrated and extremely acidic. This means they can react with iron minerals even at temperatures as low as minus 30 degrees Celsius.”

To understand the process, the researchers studied goethite – a widespread iron oxide mineral – together with a naturally occurring organic acid, using advanced microscopy and experiments.

They discovered that repeated freeze-thaw cycles make iron dissolve more efficiently. As the ice freezes and thaws, organic compounds that were previously trapped in the ice are released, fuelling further chemical reactions. Salinity also plays a crucial role: fresh and brackish water increase dissolution, while seawater can suppress it.

The findings apply mainly to acidic environments, such as mine drainage sites, frozen dust in the atmosphere, acid sulfate soils along the Baltic Sea coast, or in any acidic frozen environment where iron minerals interact with organics.

The next step is to find out if the same is true for all iron-bearing ice. This is what ongoing research in the Boily laboratory will soon reveal.



Photo courtesy of: Taylor Rhoades

Hoof prints serve as reminders that river contamination affects more than fish. There are implications for whole ecosystems

“As the climate warms, freeze-thaw cycles become more frequent,” says Angelo Pio Sebaaly, doctoral student and first author of the study. “Each cycle releases iron from soils and permafrost into the water. This can affect water quality and aquatic ecosystems across vast areas.”

The findings show that ice is not a passive storage medium, but an active player. As freezing and thawing increase in polar and mountain regions, the impact on ecosystems, and the natural cycling of elements could be significant.

Read the paper, ‘Wild, scenic, and toxic: Recent degradation of an iconic Arctic watershed with permafrost thaw’, pnas.org/doi/10.1073/pnas.2425644122

Read the paper, ‘Ice as a kinetic and mechanistic driver of oxalate-promoted iron oxyhydroxide dissolution’, pnas.org/doi/10.1073/pnas.2507588122

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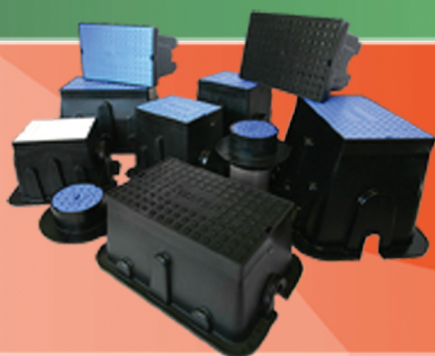


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Lakeshore shallows can be biodiversity hotspots – but warming is changing their complex ecology

The 19th-century American naturalist Henry David Thoreau described the small freshwater lake at Walden as ‘Earth’s eye’ – a measure of the complexity of ecological interactions. Our new research at Lake Taupō, Aotearoa New Zealand’s largest body of freshwater renowned for its clarity, reiterates this notion of lake ecology. By Simon Stewart, freshwater scientist, Cawthron Institute

In lakes, ecological effects can often be obscured by multiple interactions. In this case, the effect of the wind on the mussels had five degrees of separation.

1. The wind blowing across the lake pushed warm, buoyant surface water to the down-wind shore.
2. The down-wind movement of all the warm water displaced cool bottom water, squeezing it upwind where it was pushed up to the surface.
3. Because nutrients accumulate in bottom water, this cool water brings fresh nutrients with it as it is pushed up.
4. These nutrients are quickly absorbed by plants growing on the lake bed. Even though the water brought up from the depths is rapidly mixed across the lake, the nutrients it carries remain where they first arrived along the shore.
5. Once absorbed by the plants and algae on the lake bed, these nutrients support healthy growth and provide a long-term food supply for kākahi, a threatened species of freshwater mussel.

The mussels and other organisms living along the shoreline of Lake Taupō absorb and recycle the nutrients received from the upwelling.

Because the prevailing south-westerly winds across the lake result in more upwelling along the lee shore, kākahi in the southwestern bays retain the signature of a diet supplemented by deep-water nutrients throughout the year. They turn a sporadic event into a hotspot for biodiversity.

We have known for some time that the shallow margins around lakes (the littoral zones) punch well above their weight when it comes to supporting fish and native biodiversity.

Our study adds to this knowledge by showing how these littoral zones are able to support biodiversity. It helps us identify areas that may be disproportionately important for freshwater conservation – including regions of local upwelling.

Our work also provides a framework for considering how climate change will affect threatened taonga species in lake habitats.

One of the most important physical characteristics in lakes is stratification – the seasonal layering of water into distinct temperature and density bands as the sun warms the surface.

Climate change is making lake stratification longer and stronger, which could result in fewer and weaker upwelling events. We know that even subtle variations in the timing of stratification onset and break-up can have major ecological effects, mainly by changing the availability of light, nutrients, carbon and oxygen to organisms.

Sensitive lake margins

Climate change is also making deep water in lakes more prone to low dissolved oxygen levels as prolonged stratification prevents the remixing of oxygen from the air and warmer water holds less oxygen.

There is a risk these upwelling events, which currently provide nutrients to support organisms, could in the future inject water that suffocates these biodiversity hotspots.

Littoral zones appear to be far more sensitive to climate change than offshore habitats. While we are good at monitoring lake water quality in the centre of lakes, we need more tools to



The mussels and other organisms living along the shoreline of Lake Taupō (pictured left) absorb and recycle the nutrients received from the upwelling. Sampling at a bay on the western shoreline of Lake Taupō, where deep-water upwelling was shown to support kākahi growth. Warrick Powrie, CC BY-SA.

enable littoral monitoring at the same scale.

The Our Lakes Our Future research team is currently working on tools to better monitor important littoral habitats to enable better protection and restoration. It has traditionally been time-consuming and expensive to count biodiversity in lakes but new molecular tools such as environmental DNA allow us to see what lives there, and even what organisms are doing.

You may ask why it is important to have data to understand how

the margins of lakes work. Effective protection of biodiversity at risk is only possible if we have a robust understanding of cause and effect – from the catchment to the species living along the shoreline – even if ecological interactions go through multiple steps and take a long time to play out.

This article first appeared in The Conversation: theconversation.com/lakeshore-shallows-can-be-biodiversity-hotspots-but-warming-is-changing-their-complex-ecology-264762





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Let's learn from electricity and calm troubled waters from day one

By Neil Mallon, commissioner, Utilities Disputes

Pensioner Lynda Addis got the shock of her life when her July water bill jumped from \$300 to \$5927 in August. Long story short, there was a leak on her side of the network that she was responsible for. In Lynda's case the shock of the huge back bill was softened by a leak allowance – initially a modest discount, which was increased when the media got involved.

It's a telling example of problems that are likely to be repeated over the coming few years as more than 40 council-controlled water providers begin navigating the complex world of managing customers, many for the first time. Some kick off as early as July next year.

Many Kiwis (outside Auckland, Christchurch, and some other centres) unused to volumetric billing need to brace themselves for the shock of water bills that are tipped to be anywhere from \$1000 to \$7000. The increases are needed to finance operations and turn around decades of underinvestment in infrastructure, but household budgets are already stretched, and many will find it hard to manage.

Water bills will be scrutinised, and there will be issues for providers and customers as they get to grips with the new reality of billing and paying for the water we consume. A flood of complaints is coming, and we need to be prepared.

At Utilities Disputes, we know from our experience in electricity that changes in billing and pricing spark complaints. There will be headlines like Lynda's fueled by confusion from customers and service issues from providers who are dealing with these problems for the first time.

The problem as we see it is there is currently a large gap in consumer protection. We think Utilities Disputes can plug that gap and play a key role in sorting out these disputes – and avoid many consumer pain points from the get-go.

Consider other examples that could trigger headaches for customers. Water meters will, in the main, be smart meters, digitally enabled to allow providers to know exactly the volume of water being consumed. Smart meters are excellent, but not perfect. They sometimes don't connect or communicate with providers' billing systems, and they have to rely on estimates, with the real bill mounting up for the next billing cycle.

Perhaps the smart meter doesn't work at all for many months, compounded by a leak on the customer's side of the network, that no one knew about. A huge back bill arrives – a catch-up bill which makes you sick in the stomach.

How do you manage that in a way that is fair? Shouldn't you be told about a leak well in advance of a bill? Shouldn't you have

time to pay it off? Should it all depend on where you live and what an individual provider decides? It should be consistent and fair no matter where you are based.

This is what is happening for electricity and why the Electricity Authority has recently proposed limiting back bills to six months for electricity retailers. We think the same approach will help build trust and confidence in water billing.

If consumers are unhappy with their water provider, unlike electricity they can't switch; they have very little leverage. Meanwhile a dispute over a bill could trigger the provider to lower water pressure, creating real issues for any family.

But unlike electricity, there are currently no agreed rules around how providers need to deal with this situation nor any non-payment – for example how long and what steps they need to take in engaging with the customer before lowering their water pressure.

What if there is a case of hardship and the customer needs some breathing room to manage their water bill amongst others? What are the obligations on the provider to manage this situation before taking the drastic action of reducing water pressure? Should that not be standardised?

We don't think there has been sufficient thought to creating a fair framework of regulation that clarifies and standardises obligations to customers.

Regulations can allow the Commerce Commission to scrutinise the activities of providers. It can collect data – such as the number and nature of complaints, how they are resolved, and all this could be publicised so consumers can see how their provider compares to others around the country. That could help improve outcomes over time.

The Minister also has the power to impose changes to how providers manage obligations to customers.

All well and good on one level, but all that will take time and won't deal with the immediate problems that will emerge as bills hit your inbox.

We believe there is an urgent need to sort these issues out before problems emerge. And we think there is huge value in learning from how the electricity industry has developed an admirable framework that clarifies how retailers must manage obligations to consumers.

One of the keys to this are the Consumer Care Obligations that all retailers must abide by. These are obligations like the support they need to provide for customers facing hardship, a commitment to reasonable fees that reflect actual costs, and

obligations around not disconnecting a medically dependent consumer. These must be spelt out in an easy-to-find consumer care policy.

We believe water customers, no matter who their provider is, should be able to rely on the same set of service obligations. Water providers should not fear this. In fact by clarifying obligations, it should make the job of engaging with customers easier.

Another worthy innovation which the electricity industry is still grappling with is a standardised bill. While water customers can't switch providers, being able to compare your bill to that of another provider is another way of exposing whether your bill fairly reflects the cost of providing the service. It would mean customers can ask the hard questions of their provider based on what other providers are doing.

In addition, an easy-to-understand bill is simply good customer relations, particularly as we enter this new world of charging for water. A standardised bill should have some basic information clearly visible, like the account number, an 0800 number or email for complaints and faults, and being clear whether the bill is an actual or estimate.

They should also tell you what to do when you can't resolve issues with your provider. That's what every energy bill does and that's where we come in. Utilities Disputes is the mandated independent disputes resolution service that all electricity retailers must join, which is funded by a small industry levy. Our

role is made clear on your electricity bill.

Right now, water customers have no easy place to go if they can't get satisfaction from their provider. Unlike energy and telecommunications, the Government has yet to provide a mandatory, dispute resolution service for water customers.

Electricity retailers like what we do because it helps build trust and maintaining community trust is essential. Poor complaint handling doesn't just create frustrated customers; it erodes the social licence to operate.

When consumers have nowhere else to go, and where water service providers can't pick and choose their customers, they should be doing all they can to ensure they have the support of their community. It's how they build a sustainable business model.

Without community support, the provider will face difficulties down the track, for example when it needs community buy-in for a major infrastructure upgrade which impacts facilities like roads.

It's a win-win. We can reduce stress and cost for consumers, and we can give companies feedback to improve their service and prevent minor disputes blowing out into major costly disputes.

We have 25 years' experience of settling disputes, so we know what it takes. So, let's learn from the electricity experience and get ahead of the problems coming down the pipeline so we can build confidence in the new water world from day one.



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Flood resilience reimagined through people and place

Bringing together design, culture, and community insight to create sustainable, future-proof flood solutions for marae and rural Aotearoa New Zealand. By Reiko Baugham, senior water engineer, and Molly Quirke, senior consultant – digital strategy & transformation, GHD

Flooding is becoming a bigger challenge for many rural communities, and particularly for marae, the ancestral meeting grounds at the heart of Māori communities.

GHD has taken a fresh, human-centred approach to flood resilience, guided by Māori principles and grounded in community insights. Drawing on insights from multiple engagements and research, it shows how select deliverables like a high-level options assessment are suited to helping communities navigate multiple flood risks, boost long-term resilience, and support future development.

Why marae flood resilience demands a new approach

Flooding is a growing risk for rural communities, and marae are disproportionately affected. Traditionally built near waterways for resource access, trade, and defence, one-third of all marae are now vulnerable to flooding, according to recent research by University of Auckland PhD student Haukapuanui Vercoe.

Solving the problem has hurdles too, such as Māori trustees having deep local knowledge but limited technical or engineering expertise. Also, funding is often limited – and applying for grants can be complex and time-consuming for volunteer-led groups. There are also problems around accessing advice, as navigating the professional services sector can be daunting, with uncertainty about who to contact and what services are available.

For asset owners, trustees and industry professionals, the challenge goes far beyond the technical. Marae are more than sites and buildings – they're vibrant cultural hubs, safe havens in times of need, and a legacy passed between generations.

Solutions need to look beyond just the physical and integrate the unique cultural, social, and operational realities of the community into their design.

The case for human-centred design in flood resilience

Traditional engineering approaches often fall short when applied to the marae context. Design-thinking practices and the human-centred design (HCD) philosophy offer a proven alternative, placing people, culture, and context at the heart of every decision.

Key benefits of HCD for marae flood resilience include:

- Indigenous knowledge: Centres mātauranga Māori (Māori knowledge) in the discovery phase, so that cultural priorities and lived experiences are captured and integrated into delivery.
- Trust and cultural values: Builds kotahitanga (unity, cohesion, and collaboration) and whanaungatanga (kinship) through empathetic engagement and genuine inclusion.



Reiko Baugham



Molly Quirke

- Suitability: Solutions are co-designed with trustees and community members, resulting in actions that are feasible, maintainable, and supported, and communication that is suitable for the audience.
- Capability building: Brings local decision-makers on the journey of solution development and equips them with knowledge and frameworks they can continue to use.
- Sustainability: Prioritises options that work with, not against, the natural environment and kaitiakitanga (guardianship).

A practical framework

Delivering an options assessment as part of flood resilience planning is one example of how multiple community needs can be addressed with your choice of deliverable. It can serve as a roadmap and enable people to plan for implementing multiple solutions on their own timeframe (even inter-generationally).

The breadth of information builds understanding of a range of interventions, from drainage improvements and building modifications to temporary barriers and bunding – something they can share to uplift the knowledge of the whole community.

The assessment process and framework can flexibly include cultural priorities as parameters in a multi-criteria analysis (MCA) and can be replicated or built upon for informed decision-making down the track.

It contains a mass of content that can inform the scope of what they ask for in future funding applications, and it can be kept as high level as needed, to adapt to the budget they have available.

Cultural priorities as MCA parameters could include the volunteer time and internal capability required; access to funding and overall cost-effectiveness; alignment with Māori values and community priorities; environmental impact and adaptability to a changing climate; and maintenance requirements and long-term sustainability.

The best outcome from an engineering perspective may overlook the best outcome for the community. When considering typical flood mitigation solutions, diverting, or confining the waterway with stopbanks may offer strong protection, but could have significant barriers in this context because it often needs specialist design, significant funding, and can affect the mauri (life force) of the river.

Drainage improvements, on the other hand, are often low-cost, easy to implement and have minimal environmental impact. Temporary flood barriers provide flexibility and rapid deployment; they don't require specialists but do rely on community readiness.

By carrying out a human-centred design approach, this collaborative assessment process not only identifies the best-fit solutions but also builds local capability and ownership, which is a critical ingredient for long-term resilience.

The long-term advantage

Effective flood resilience isn't a one-off project – it's an ongoing journey. Human-centred design and empathy-driven engagement emphasise mōhiotanga (understanding and insight), by helping

trustees and community members understand risks, options, and the reasoning behind decisions.

It strengthens kaitiakitanga (custodianship), empowering communities to care for and maintain their assets for future generations. And it creates ongoing engagement, building trust and strong relationships between industry professionals, clients, and communities for sustained impact.

For clients and industry professionals navigating the scoping and implementation stages, partnering with a team experienced in human-centred design brings clear, practical benefits. It delivers culturally respectful, future-proof solutions that go beyond compliance and technical minimums. It helps you to determine what services or advice, such as options assessments and MCAs, are most useful in the context.

It also builds capability for trustees and asset owners, reducing long-term reliance on external consultants, and supports clear, community-aligned business cases for further work.

Looking after a marae, community assets, or rural infrastructure? It's time to move beyond traditional approaches and solutions. Human-centred design unlocks smarter, stronger, and more culturally grounded flood resilience for communities.



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Market Brochure



The hidden arteries of urban resilience: Why overland flow path management matters

By Ajay Desai, Zealandia Consulting, and Ian McComb, Tasman District Council

Most of the country's urban stormwater systems were designed for a gentler climate with less intense development. Today, extreme rainfall is no longer exceptional; it is now expected. When stormwater networks reach capacity, overland flow paths (OLFPs) take over.

These shallow routes convey surface runoff across land when the pipes and culverts can no longer cope. OLFPs are a backup, either by intention or neglect. While they are mainly invisible in fair weather, they often become critical during storms.

Yet in many towns and cities, they've been filled, fenced, or built over, leaving water nowhere to go but through homes and down roads. The result: avoidable flood damage, higher recovery costs, and a cycle of reactive expenditure that's neither sustainable nor climate-resilient.

In a long-overdue shift, councils are beginning to treat OLFPs not as incidental drainage lines, but as essential public infrastructure. The new Local Government (Water Services) Act 2025 will further drive this change.

Why overland flow paths matter

The role of OLFPs goes far beyond emergency flood relief. Managed properly, they are multifunctional systems that link hydrology, ecology, and urban liveability. OLFP functions include the following:

- **Flood risk management:** Provide predictable, safe pathways for runoff during heavy rain, preventing (or reducing) ponding and damage.
- **Secondary network:** Act as the secondary (major) drainage system when the primary pipe network is full or blocked.
- **Climate adaptation:** Offer flexibility to accommodate more intense rainfall events without expensive infrastructure upgrades.
- **Ecological value:** Support natural infiltration, vegetated corridors, and connections between streams and wetlands.
- **Urban design and amenity:** Create opportunities for blue-green spaces, linear parks, and cycle corridors that double as flood routes.

When mapped, protected, and integrated into planning frameworks, OLFPs become multi-benefit corridors that deliver both hydraulic and community value.

The national picture: A patchwork of practice

Flooding is our most frequent natural hazard and is responsible for the highest number of declared civil defence emergencies. Between them, urban stormwater and river control schemes

underpin the integrity of public and private assets, provide resilience and security to communities and their investments.

Local councils own and manage the primary and secondary stormwater systems. In contrast, regional councils manage the flood protection systems and typically the rural stormwater schemes, with different funding and regulation arrangements. There are some exceptions, where Unitary Authorities manage both stormwater and flood protection.

Currently, there are significant gaps in flood risk information and its development, as well as variations in the levels of service, design standards, and policies related to flooding and protection among councils.

A consistent national approach to flood hazard modelling, definitions, and terms, as well as smarter land-use planning controls and design standards, is needed. This variability in approaches to OLFPs is evident across Aotearoa New Zealand:

- Some councils (e.g. Auckland, Wellington, Christchurch, Kāpiti Coast, Tasman) have citywide OLFP mapping derived from LiDAR and hydrological modelling.
- Others rely on coarse-scale floodplain data or ad hoc assessments during consenting.
- In smaller centres, many OLFPs remain unmapped, unregulated, or poorly understood.

This variability affects not just planning certainty but also insurance risk, infrastructure investment, and public safety.

Without national consistency, the same storm event can have vastly different consequences depending on which council boundary it crosses.

Tamaki Makaurau Auckland example: Scaling up overland flow management

Auckland Council's Making Space for Water (MS4W) programme demonstrates what proactive OLFP management looks like in practice.

Under MS4W, the council's Overland Flow Path Management Programme combines high-resolution data with on-the-ground engineering. Over half a million properties are being assessed using mobile GIS tools, real-time dashboards, and a standardised QA framework.

Where flow paths are blocked or constricted, targeted interventions range from owner-led maintenance to coordinated council works integrated with road and park upgrades.

The result: faster identification of hazards, better-informed communities, and measurable reductions in flood risk.

More importantly, the data generated provides a replicable national model, one that could be scaled across other regions.



Blocked culvert inlet generated overflow flow, August 2022

What needs to change nationally

To make OLFP management a cornerstone of national flood resilience, Aotearoa New Zealand needs three system-level shifts:

National standards and guidance

The 2025 Act defines OLFP for management in urban areas by Water Service Providers as –

- a) A low point in terrain (other than a watercourse) –
 - (i) Where surface runoff flows; and
 - (ii) That receives water from an upstream contributing catchment larger than 4000 square metres; or
- b) Any other location identified as an overland flow path in a stormwater network risk management plan.

However, there is currently no unified national standard for delineating OLFP, mapping accuracy, or design treatment. A ‘National Stormwater Modelling and OLFP Guidance’, TP108 or GD01, if nationally endorsed, would help align datasets, tolerances, and assessment criteria across councils.

Regulatory clarity under RMA reform

The upcoming replacement of the Resource Management Act (RMA) will place a stronger emphasis on natural hazard management. OLFPs will increasingly be recognised as protected hydrological features, requiring more rigorous justification for modification or infill.

Future planning frameworks should embed OLFP corridors as strategic infrastructure assets, rather than merely mapping hazards.

Investment and monitoring

Long-term management demands more than mapping; it requires ongoing funding, regular monitoring, and consistent policy. Simple telemetry (rainfall, level sensors) and post-storm inspections can identify failures early, preventing larger losses later.

National funding models, possibly through climate adaptation funds or infrastructure partnerships, could support smaller councils lacking resources.

The cost of inaction

The Insurance Council of NZ reports billions in storm-related claims since 2023. Much of that damage, particularly in urban settings, originates from blocked or altered overland flow paths caused by landscaping or fencing that often never require resource or building consent.

Every metre of filled or fenced OLFP reduces hydraulic energy elsewhere. Every unrecognised flow route compounds risk.

Proactive management isn’t optional anymore – it’s the price of living in a changing climate.

Looking forward: From maps to movement

As climate change accelerates, OLFPs represent one of the most cost-effective resilience levers. They do not require massive new assets; only better recognition, planning, and maintenance are needed.

Auckland’s citywide programme demonstrates what’s possible when data, fieldwork, and community engagement are aligned. Scaling that success nationally could deliver a generational uplift in flood preparedness.

The next frontier for Aotearoa New Zealand stormwater management isn’t bigger pipes, it’s smarter landscapes. Overland flow paths are the blueprint for the future: a quiet network of blue-green corridors that allow the land to breathe, absorb, and protect.

The value of OLFPs lies in their invisibility during dry weather and their indispensability when it rains. Recognising, mapping, and maintaining them nationally is one of the simplest ways we can make our cities safer, greener, and more climate-ready.

New lab facilities accelerate environmental protection and groundwater management

CSIRO, Australia's national science agency, has unveiled a \$6.5 million investment in new research infrastructure that will deliver unprecedented analytical capability used in environmental and groundwater assessment and management.

The new facilities at CSIRO's Waite Campus in Adelaide include two analytical labs that will support Australia's critical water needs and help manage pollution and waste in the environment:

- The Ion Cyclotron Resonance (ICR) facility provides the gold standard for chemical analysis, capable of detecting up to tens of thousands of chemicals in a sample to manage contamination.
- The Tritium Facility via INgrowth (TRIFIN) can determine how quickly groundwater is replenished to help manage water resources and prevent communities running out of water.

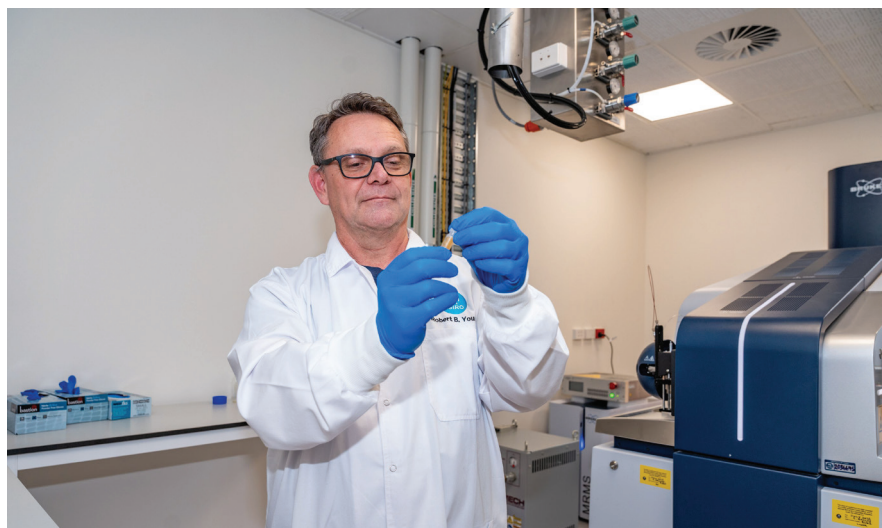
Dr Dan Metcalfe, CSIRO environment research director, says the technologies were the first of their kind in the Southern Hemisphere, focused on environmental research.

"Australia is one of the driest continents on Earth, and we are facing increasing challenges from climate change, drought and environmental contamination," Dan says.

"These new lab facilities are a significant investment in research and analytical capabilities that will accelerate Australia's ability to safeguard water security, manage resources sustainability, and protect the environment from forever chemicals."

ICR: For generating chemical 'fingerprints'

The \$4 million ICR facility houses one of the most powerful mass spectrometry instruments in the world to analyse complex samples like PFAS, natural organic matter and environmental samples from water, soil, waste and food.



CSIRO's Ion Cyclotron Resonance Facility can conduct unprecedented chemical analysis, detecting chemicals previously unseen, such as PFAS and microplastics.

The ICR facility advances chemical detection and management for national benefit including:

- Early warning system for pollution detection, such as PFAS and pharmaceuticals;
- Identifying the source of contamination, such as where chemical spills have come from;
- Managing pollutants and their impacts in the environment, such as plastic waste and ash from bushfires; and
- Remediation solutions for the protection of human and environmental health.

Dr Robert Young, CSIRO senior research scientist, likened the findings to a chemical 'fingerprint' that can provide incredibly detailed chemical profiles for the early discovery of contaminants and pollutants, carbon storage and carbon cycling.

"Our technology can reveal the fate

and transport of contaminants in the environment, to inform remediation solutions," he says.

"This can significantly help with identifying and managing environmental issues, such as chemical spills, toxins and waste management.

"Understanding carbon in soils can also help us better understand climate change and mitigation solutions to prevent impacts to the environment."

TRIFIN: For determining groundwater age

The \$2.5 million TRIFIN facility is a ground-breaking analytical capability that will play a critical role in supporting Australia's water needs:

- TRIFIN can detect tiny traces of tritium in groundwater, a rare and naturally occurring radioactive isotope of hydrogen. This tells us the age of

groundwater and how quickly it is being replenished.

- Water samples can be ‘fingerprinted’ faster than conventional techniques using an automated process, providing reliable data on whether groundwater has been replenished in the past 50 years.
- This informs sustainable groundwater use for irrigation, town water supplies, mining and energy resources.

Dr Dirk Mallants, CSIRO senior principal research scientist, says groundwater provides about 30 percent of Australia’s total water consumption and is a vital resource for regional communities, industries and the environment.

“Groundwater can take years, decades, or even centuries to millennia to replenish. However, groundwater contained in aquifers that contains tritium is likely only years or decades old.

“Our technology can detect very low levels of tritium in groundwater to tell us how quickly it is being replenished.



TRIFIN can measure tritium in groundwater, revealing how quickly it is being replenished.

“This new technology means Australia’s groundwater resources can be managed to build resilience against climate impacts, while supporting a net zero future for Australia across agriculture, hydrogen and critical minerals, through better management of groundwater resources.

CSIRO says this investment in

technology will deliver critical science for Australia. It increases capabilities across environmental assessment and management, ensuring sustainable and responsible industries, prevents contamination legacies, and helps to protect human and environmental health.

Article provided by CSIRO.



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New findings on nitrates in rural drinking water

Many rural communities rely on private water supplies for their drinking water, but that means their water isn't tested for the presence of contaminants, including nitrates. Now, new research into rural groundwater is giving people valuable information about the level of nitrate contamination in different parts of the country.

Aotearoa New Zealand's largest ever drinking water investigation has found Waikato, Canterbury, and Southland to be regions of 'significant' concern for nitrate contamination of groundwater supplies. Seven other regions were identified to be of 'emerging' concern.

While public drinking water ('town supply') must meet Government standards and regulations, there are no requirements to test drinking water from private groundwater bores and springs that supply 25 or fewer people. Most of these are found in rural areas and are vulnerable to nitrate contamination.

A new study led by Earth Sciences NZ (formerly GNS Science) analysed data from more than 2400 rural drinking water samples tested nationally between 2022 and 2024. The data was collected from several citizen-science community testing programmes including Earth Sciences NZ's Nitrate Watch project, and programmes run by Greenpeace Aotearoa, University of Canterbury, and Victoria University of Wellington.

The programmes sourced samples through mail-in and town hall testing events, becoming an important vehicle to raise awareness of, and screen for, the presence of nitrate.

Dr Karyne Rogers, lead author of the study, says people from across the country helped to build a national picture of nitrate contamination hot spots and in return received vital information about the nitrate levels of their own drinking water supply.

"This was a grassroots effort, and the first sampling campaign of this scale for Aotearoa New Zealand," she says.

The researchers found 5.1 percent of samples exceeded the highest acceptable level of nitrate allowed in publicly registered drinking water (Maximum Acceptable Value – MAV). A further 30.9 percent had more than half the MAV.

Canterbury, Waikato and Southland had the most samples that exceeded the MAV. Seven other regions had 'emerging' nitrate issues.

"The results signal a widespread and concerning threat to freshwater quality across multiple regions."

Conny Tschritter, Earth Sciences NZ groundwater scientist and co-



5.1% of samples exceeded the highest acceptable level of nitrate allowed in publicly registered drinking water

author of the study, says it is important for rural bore owners to make informed decisions about monitoring their bores, especially in regions not widely known to have challenges with nitrate in groundwater.

"Once we see a drinking water source approaching half the MAV, it's a clear warning that there is nitrate contamination in the groundwater catchment, whether that's due to increased land-use intensification or soils that are more vulnerable to excess nitrate leaching."

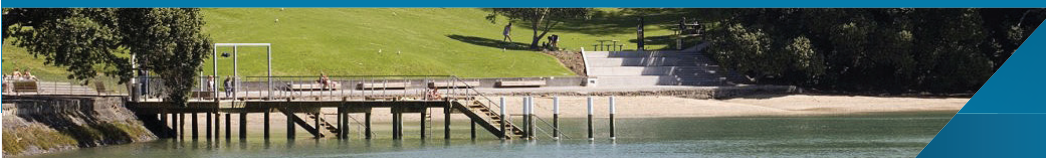
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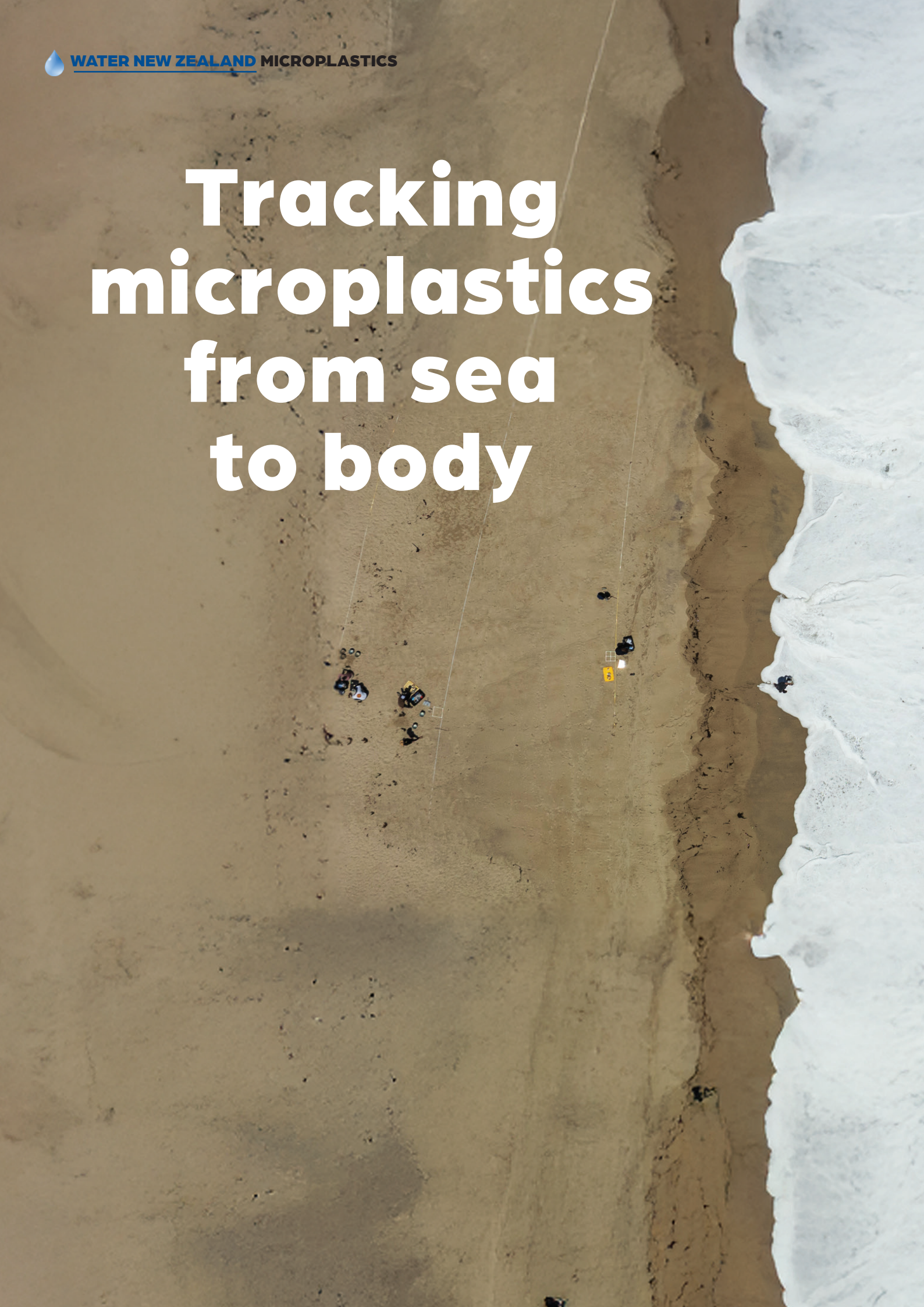
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Tracking microplastics from sea to body





Researchers collect samples at California's Carmel River State Beach.

Stanford researchers are uncovering the journey of microplastics in our environment and their effects on human health, while developing practical solutions to mitigate their impact. By Josie Garthwaite.

On the edge of California's Monterey Bay, ecologist Matthew Savoca and a team of volunteers sift through sand and seawater for microplastics, one of the planet's most pervasive forms of pollution.

Originating in everyday items, these bits of plastic smaller than a sesame seed turn up just about everywhere researchers have looked – including in our own bodies and in habitats from alpine mountains to the deep ocean. Along the high-tide line of Carmel River State Beach, Matthew's team finds them washed up by the bay's lapping waves.

"We know there are hundreds of trillions of microplastic particles in the world," says Matthew, a research scientist at the Stanford Doerr School of Sustainability's Hopkins Marine Station, about 13 kilometres north of the field site. But questions about how microplastics disperse, for how long, and where they come to rest remain unresolved.

Matthew is among a growing cadre of researchers at Stanford and beyond – from Earth system scientists, marine biologists, and oceanographers to physicians and engineers – who are working to answer them.

"Knowing where microplastics end up is vital to understand the risk they pose to species and the ecosystem at large."

Searching for clues in the 'blue Serengeti'

Monterey Bay offers an ideal setting to understand how plastic pollution flows through the marine environment. Just beyond the break in the continental shelf, where krill and blue whales congregate, deep sea zones abut kelp forests and intertidal zones. Across this rich habitat, sometimes compared to the Serengeti for its biological diversity, decades of monitoring data provide context to understand microplastics that show up in surveys.

Matthew and collaborators have collected samples not only from beaches but also coastal waters, four rivers that feed into the Monterey Bay, and wildlife, including krill and blue whales. Using seawater and fine mesh filters, they separate the buoyant plastic from sand. These fragments of plastic polymers, such as polyethylene and polyvinyl chloride, will later be further isolated and chemically identified in a lab.

The collaboration extends across academia, government, and NGOs.

"We're adding all these different skills together to study microplastics along the central California region." More than 100 local volunteers have helped with sampling, says Matthew. "We have so many people wanting to help with this issue. That's been really inspiring."

Where and how microplastics hide

The buoyancy of most plastics, which makes many of the microplastics at Matthew's field site float in saltwater, is at the



Photo courtesy of Andrew Brodhead.

Researchers Steve Lonhart and Libby Mohn filter sand and ocean water samples to search for microplastics in the ocean.

core of a mystery that other Stanford researchers are trying to crack about where plastics end up and how they get there.

“There’s a gap between how much plastic waste ends up in the ocean, and the relatively small amount of microplastics found floating on the ocean surface,” explains Jinliang Liu, a former researcher in Earth system science with Professor Leif Thomas’s group at the Doerr School of Sustainability.

Jinliang and Leif have set out to explain why so few microplastics remain at the surface. By integrating state-of-the-art ocean models with a microplastic transport model pioneered by Nan Wu at the British Antarctic Survey, they are simulating the physical and biological processes that bring microplastics to the deep ocean, especially in areas where converging ocean currents may cause plastics to accumulate.

The work could lead to insights about how microplastics affect marine life, ocean food webs and health, and even Earth’s carbon cycle. Some particles join with clusters of debris and microbes known as marine snow, which remove carbon dioxide from the atmosphere as they sink to the ocean floor or get eaten by deep-sea creatures.

“Without any other influence, microplastics will just hang out on the ocean surface,” explains Jinliang. “Uncovering the reasons why it disappears from the surface is a crucial part of addressing this global environmental challenge.”

Over the past decade, Stanford bioengineering Professor Manu Prakash and his research team have been systematically sampling columns of ocean water around the world to measure carbon flux and sequestration.

“More and more, in deeper water columns, we started seeing a lot more microplastics,” Manu says.

Out of that creeping awareness grew an effort to map out the distribution of microplastic types and densities at depths down to a kilometre below the surface.

“The biggest surprise for me has been the abundance. Every single drop I look at – every sample from an aquatic environment – has microplastic in it. The colours pop out under a scope unlike anything else.”

The team now cryopreserves microplastic samples collected at sea so that, back in the lab, they can genetically identify which microbial organisms are growing on the particles and begin to decipher how microbial communities, plastic type, and particle density correlate with sinking speed.

“This is baseline work that we do, primarily to assess whether there are patterns.”

From sea to self

For Matthew, the fieldwork collecting microplastics from rivers and beaches is part of broader efforts to understand pollution and its consequences, and better ways forward.

“I’m really interested in how ecosystems work, how they break, and if and how we should put them back together,” he explains.

Working in the lab of oceans associate professor Jeremy Goldbogen, Matthew has helped to quantify the staggering amount of plastic – up to 10 million pieces a day – that blue, fin, and humpback whales on the California coast ingest through their prey.

Other researchers have found that some microplastic particles make their way out of whales’ digestive system and into fat and liver tissue, where, as in our own bodies, scientists are

only beginning to understand the risks.

“This is not just an environmental health issue. It’s not just a wildlife health issue. It is most certainly a human health issue.”

Microplastics have been found across a variety of foods popular on American plates, including not only seafood but also poultry, beef, pork, and plant-based meat alternatives.

“We already have warning flags about mercury in seafood and limiting intake because of that,” says Stephen Palumbi, a professor in marine sciences. “Will such warnings be needed about microplastics, too?”

Measuring (and reducing) the burden

In Stanford’s medical and engineering labs, Kara Meister, Manu, and colleagues are pioneering a faster, easier way to detect and measure microplastics and even smaller nanoplastics in food, water, and human tissues and fluids. The group aims to use this innovation to monitor micro- and nanoplastic levels in populations across California and around the world – and then correlate exposure with health data.

“We want to be able to really understand the current burden, and measure it over time,” says Kara, a pediatric otolaryngologist at Stanford Medicine whose lab studies how microplastics may influence children’s immune systems.

Existing techniques give doctors and researchers a fragmented view of microplastics, which come in a wide range of shapes and sizes, and often get bound up with proteins in human cells and other compounds such as dyes or plasticisers. Some methods

identify polymer types, while others measure particle size or location in tissue.

The new method being developed sacrifices some precision for potentially broader reach, making it possible to find hidden patterns in massive datasets.

“There is a lot of power in that kind of data, even if each individual measurement is not as precise,” Kara says.

The team is using a technique called Raman spectroscopy to identify polymer types. Commonly used to check for purity in drug manufacturing, the technique involves shining a laser beam onto a sample and then measuring shifts in the scattered light caused by molecular vibrations. Because it’s non-invasive – beams can harmlessly shine directly through the skin – some researchers see promise in the technique for a range of clinical applications, from measuring glucose to early cancer diagnosis.

“If we are talking about tackling a problem in every corner of the world, we have to think about tools that scale to every corner of the world. Accessibility builds in scale,” Manu says.

For microplastics, the Stanford team is studying the use of this technique for identifying and quantifying polymers alongside a range of methods for locating microplastics in tissue. Early progress includes confirming the presence of microplastics in paediatric tonsil samples and identifying plastic types in tonsil tissues artificially spiked with polymers in the lab.

The health risks posed by microplastics may vary widely and depend on factors such as individual genetics and exposure to other materials in the environment.



The advertisement features a background image of several large, industrial pipes with colorful bands (blue, red, yellow, green, black) around them. The ASOE logo is prominently displayed in the center, with the tagline 'COMPLETE TRENCHLESS SOLUTIONS' below it. Below the logo, the text 'TRENCHLESS REHABILITATION ON PRESSURE PIPES' is written in bold. Underneath this text are six colored water drop icons, each labeled with a different fluid: WATER (blue), HOT WATER (red), GAS (yellow), SEWER (green), OIL (grey), and FOLD & FORM (white). At the bottom of the advertisement, the PipeTech logo is shown on the left, with the text 'Trenchless Technology' and contact information: 'T. 06 755 0309 E. office@pipetech.net.nz'. On the right, it states 'PIPETECH IS PROUD TO BE NEW ZEALAND'S APPROVED DISTRIBUTOR FOR ASOE' and provides the websites 'www.pipetech.net.nz' and 'www.asoe.co.nz'.

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“But if we want to understand the biological implications of microplastics and their associated chemicals, we need precise measurements, ideally with human tissue,” Kara says.

For people looking to minimise their own exposure to microplastics, even as scientists work to understand how they move through and affect our bodies and world, experts say the most impactful step at an individual level is to reduce use of plastic packaging – especially single-use plastics that touch food and drinks.

Microplastics FAQs

Are microplastics harmful?

Growing evidence suggests microplastics are harmful, says environmental scientist Amelia Meyer, co-lead of the Plastics and Health Working Group at the Stanford Center for Human and Planetary Health. “Human studies are still emerging, but microplastics have already been found in blood, lungs, placenta, and breast milk, suggesting real exposure pathways.” Laboratory studies suggest exposure to nano- and microplastics can lead to inflammation, oxidative stress, and damage to cells.

Ingesting microplastics may also expose people to known toxic pollutants that microplastics attract and absorb, and to additives such as phthalates commonly used to make plastics softer or more flexible. “We know they can carry toxic chemicals, pathogens, heavy metals, and even bacteria, and they’re small enough to be inhaled or ingested.”

How do microplastics affect the ocean and marine life?

Evidence from lab experiments suggests microplastics can be transferred from prey to predator and accumulated through the ocean food web. But scientists are still working to understand how these processes might affect populations or marine ecosystem functions over time, explains Boongho Cho, a visiting postdoctoral scholar.

“Addressing these questions – particularly the impacts of trophic transfer and accumulation on ecosystem services such as fisheries and carbon cycling – is an urgent research priority,

as the consequences extend beyond marine ecosystems to human society.”

“Evidence in lab studies shows that microplastics can act as a potential stressor, leading to reduced feeding activity, growth retardation, increased energy expenditure, and oxidative stress in organisms such as bivalves, crustaceans, and fish,” says Boongho.

Matthew adds that lab experiments have also pointed to ‘risk thresholds’, meaning the point where higher concentrations of microplastics would carry risks. More research is needed to understand how effects observed at the individual level in labs may scale up to populations or ecosystems.

Abundant evidence shows larger pieces of plastic in the ocean, known as macroplastics, hurt marine life.

“But harms that can be definitively linked back to microplastics are mostly speculation or extrapolation from lab work at this time. This does not mean they’re not happening, but rather they are hard to detect in natural systems.”

Are microplastics in tap water?

Yes. More than 100 studies to date have documented microplastics in drinking water in the United States and around the world. “Levels vary depending on the water source, treatment methods, and even the pipes delivering it,” Amelia says. Bottled water typically contains far more microplastics than water from a faucet.

Can microplastics be removed from water?

Drinking water treatment plants are designed to remove particles from water, but nano- and microplastics represent a new challenge, said civil and environmental engineering professor Richard Luthy. “Research is underway to assess performance of treatment units and how best to measure microplastics,” he says, with California taking a lead in evaluating methods to routinely monitor microplastics in drinking water.

This article was first published in the Stanford Review, <https://tinyurl.com/mrer3n29>

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Aotearoa New Zealand waters teeming with **undiscovered seaweed species**

Scientists believe they're only seeing a snapshot of what could be living in our subantarctic islands and deep waters. This comes after Earth Sciences New Zealand researcher Dr Roberta D'Archino discovered a dozen new native red seaweed in just one family of red algae, and described four new genera – the level above species.

"Aotearoa is extremely diverse, stretching from the subtropical waters of the Rangitāhua/Kermadec Islands to the colder waters of the subantarctic islands. Lots of these locations, particularly the subantarctic islands, are only rarely and opportunistically explored, meaning we don't have many samples of the seaweed and invertebrates that live in the coastal water there," says Roberta.

Seaweed provides essential habitat for fisheries and plays a vital role in carbon capture – assisting the oceans to produce about 50 percent of the Earth's oxygen.

Roberta has been studying Aotearoa New Zealand seaweed for 20 years, collecting and identifying specimens to fill knowledge gaps and document the native flora. So far, she has described 27 new species and 13 new genera.

"The process of describing new species of macroalgae takes significant work to ensure the specimen hasn't already been named elsewhere. This includes comparing morphology with other known species, which relies on having fertile samples, extensive knowledge, and undertaking DNA analysis."

This is made even more difficult when there are so few samples with reproductive structures needed to formally describe new genera.

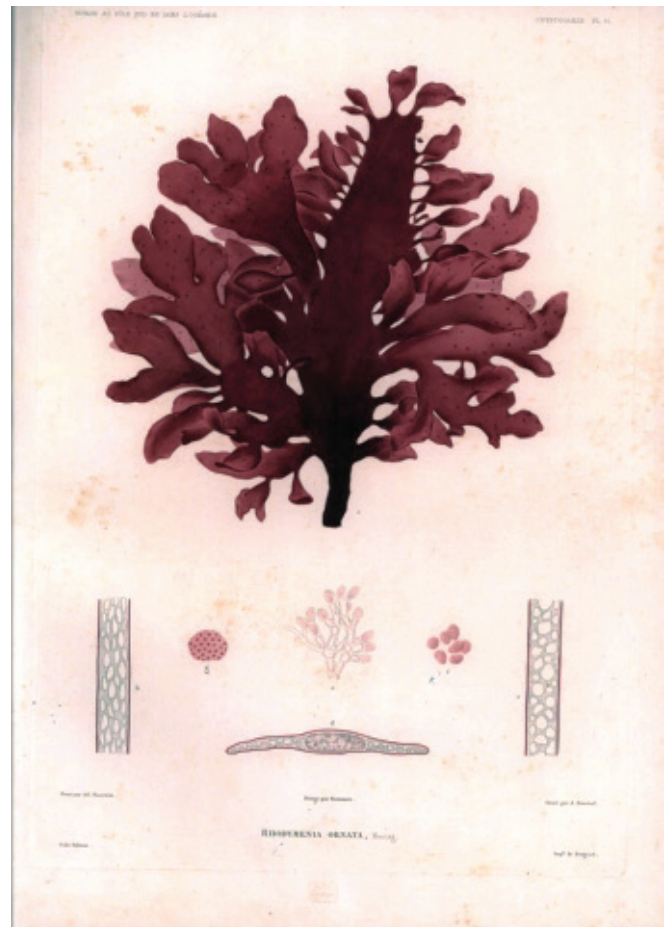
One of the new seaweeds that Roberta described, came from just a single collection made by European explorers in the 19th century at the Auckland Islands and identified as *Callophyllis ornata*.

It puzzled her for years.

"A box full of specimens in the herbarium Te Papa included red foliose algae collected in the subantarctic islands tentatively identified as *C. ornata*, but were morphologically different one to another, suggesting it included more species unknown to science.

"There was a lot of detective work to link recent collections with the specimen collected in 1842; I had to borrow a little fragment of the holotype stored in the Muséum National d'Histoire Naturelle, Paris (France), and compare it to specimens collected recently. It took years, but I eventually concluded that it belongs to an endemic new genus, *Motumaha* and I was able to describe another two genera, *Alseida* and *Thetisia*, from the mystery box."

Roberta believes there could still be hundreds of species of native seaweed alone that are yet to be described, especially from remote places such as the subantarctic islands and the mesophotic zone, a habitat still poorly known. Some of the taxa discovered were collected at about 100 metres depth.



Original plate drawn by Montagne in 1845 of *Rhodymenia ornata*, known later as *Callophyllis ornata* and now as the new genus *Motumaha ornata*.

"The fact that we discover new species from a few opportunistic collections hints that we've only scratched the surface of finding out what's living in our oceans. It would be amazing to do a targeted expedition to these places to find what else is out there – there's still so much to be discovered.

"If we don't know what there is, how do we know what to protect from environmental degradation, climate change, and biosecurity threats? And given how important these organisms are, it seems like these are knowledge gaps we should be filling."

Article provided by Earth Sciences New Zealand

Securing the Future of Water: Building Cyber Resilience in New Zealand's Water and Wastewater Sector

BY NHP ELECTRICAL ENGINEERING PRODUCTS

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Water and wastewater networks are becoming smarter, using connected sensors and automation to drive safer, more efficient operations – but greater connectivity can also open new channels for risk. When Operational Technology (OT) systems such as treatment plants and pumping stations connect with IT networks, cloud platforms, or third-party services, they create new entry points for potential threats. A cyber incident could disrupt essential services, compromise water quality, or cause environmental harm – with costly regulatory and reputational consequences.

Around the world, recent breaches have shown how quickly threats can escalate, underscoring the need for built-in security. By embedding cybersecurity into every stage – from system design to daily operation – utilities can modernise with confidence, ensuring digital transformation delivers both progress and protection.

A NIST-Inspired Framework for Cyber Resilience

Developed by the U.S. National Institute of Standards and Technology, the NIST Cybersecurity Framework offers a globally recognised roadmap for building resilience. Its structured, outcome-focused approach helps critical infrastructure operators manage cyber risk through clear guidance and actionable steps tailored to operational environments.

Govern	Start by setting the direction. Define roles, responsibilities, and policies so everyone knows how cybersecurity fits into operations. Governance ensures that decisions, priorities, and risk management are consistent across the organisation.
Identify	Start by knowing what you have. Make a list of systems, devices, and processes, and understand how they connect. This helps prioritise what's most critical and shows where to focus your initial efforts.
Protect	Put measures in place to keep systems secure. Separate networks, control access, use firewalls, and harden devices. Secure remote connections, apply least-privilege access, and embed simple cyber hygiene practices so security becomes part of daily operations.
Detect	Keep an eye on your systems. Even basic monitoring can help spot unusual activity early, giving you time to respond before issues escalate.
Respond	Be ready to act. Have a simple plan that defines who does what if something goes wrong, and how to contain and resolve issues quickly. Practising these steps helps build confidence and reduces disruption.
Recover	Prepare to bounce back. Keep secure backups and test recovery processes so systems can be restored safely and quickly. Learning from incidents helps improve future resilience.



By framing cyber resilience through these six functions, organisations can take practical, achievable actions without overcomplicating operations. Each NIST function naturally incorporates the steps that build a robust, secure environment, from protecting legacy systems to training staff and sharing lessons across networks.

Looking Ahead

Ideally, cybersecurity is built in from the start, giving new systems the strongest protection. But existing water and wastewater networks can also be strengthened without a full overhaul. Solutions like the Anybus Defender™ from HMS Networks (available through NHP) add network segmentation and firewall protection for operational technology, helping secure legacy systems and connected devices while keeping operations running smoothly.

Working with global partners such as Rockwell Automation and HMS Networks, NHP helps organisations turn the NIST Cybersecurity Framework into practical action – assessing risk, strengthening defences, and improving connectivity across existing systems.

Cybersecurity is a journey, and with NHP's local expertise and trusted support, every step builds a smarter, safer, and more resilient future.

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Legal update

By Helen Atkins

This article provides a brief update on where applications are up to under the Fast-Track Approvals Act 2024. It begins with a focus on one aspect of the recently passed Local Government (Water Services) Act 2025, which relates to access arrangements on private land. It also provides a quick wrap up on the policy world and where we have landed post local government elections.

Changes to access arrangements on private land for water services organisations

On 27 August 2025, the Water Services Act 2025 came into effect. Among the myriad of changes made (which have and will be the subject of other articles in this journal) the Act replaces section 181 of the Local Government Act 2002 (section 181 process) for water services providers. This is a significant change to the processes that providers need to follow with regard to obtaining access to private land for new works, and for inspections, operation and maintenance of existing works.

Water New Zealand held a very well attended webinar on 10 September to hear from Shaun McAuley, from the Auckland Council's Healthy Waters & Flood Resilience team, about what that council was doing to make changes to its processes to meet the Act's requirements.

In short, the Act requires all water services providers (which is all aspects of water services) to consider how they currently use the s181 process and consider what they need to change.

The Act is well and truly in force now so the changes must be happening now. The key change is in relation to inspections, operation and maintenance of existing works where notices of work requiring access to private land must be served on all owners and occupiers.

In addition, there is important changes for Māori land. The changes for new works are not so major as these works



Helen Atkins

always needed notices under the s181 process.

As always, each water services provider will need to consider what are the appropriate process changes they need to make for their communities. Large providers like Healthy Waters and Watercare are looking at making the processes more streamlined and more digital where this is appropriate.

A major change is to the review process. The s181 process always had a review but under this Act the review applies to more activities (i.e. it includes inspections, operation, and maintenance, not just new work).

Councils will have review processes in place (some use council committees, some use internal managers, and some use external providers such as commissioners) and these will need to be looked at to ensure they are still fit for purpose.

The take out from this is that all water service providers must review their processes for arranging access to private property. The s181 process still exists just not for matters covered under the new Act.

Fast-Track Approvals Act 2024

Since the previous edition of *Water* there has been some progress with applications under the Fast-track Approvals Act, which

are listed here to provide a snap-shot of what is happening in this space and to demonstrate how much has changed since my September-October article.

Of note, the first four applications noted (Bledisloe North Wharf and Ferguson North Berth Extension (Auckland Port), Delmore (residential development in Auckland), Maitahi (Nelson mixed use development) and Milldale (residential development in Auckland) have all been completed with three approvals and one decline (Delmore).

Of the remaining matters, where they are at is set out below.

- Sunfield (mixed use development in Auckland): This application is at the panel stage and its decision was due 12 November 2025 (as noted in the September-October article the application is currently suspended at the applicant's request so the dates will shift).
- Drury Metropolitan Centre (mixed use development in Auckland): This application is at the panel stage and the decision is now due 7 November 2025.
- Waihi North (expansion of the existing gold and silver mining operations, including establishing new open pit and underground mines, and extending the life of the mine from expiry in 2030 to 2040): This application is now at the panel stage with the decision due 18 December 2025. There have been no suspensions, and the next step is expert conferencing on economics.
- Tekapo Power Scheme (renewal of consents to continue to use, operate, and maintain the power scheme of Tekapo A and B power stations and substations): This application is now at the panel stage with the decision due 4 November 2025. The draft decision and conditions is currently out for comment.
- Ryans Road Industrial (industrial activity in Christchurch): This application is at the panel stage

with the decision due 16 December 2025. However, it is currently under suspension with no timeframe set. The suspension can only last until early December before a decision needs to be made which could include returning the application to the applicant.

- Drury Quarry expansion (Auckland): This application is at the panel stage with the decision due 27 November 2025 but as the application is currently suspended this date will shift.
- Kings Quarry expansion (Auckland): This application is at the panel stage with the decision due 19 December 2025.
- Rangitootuni (mixed use development Auckland): This application is at the panel stage with the decision due 27 November 2025. The panel have indicated that there may be a specific hearing to address conditions.
- Taranaki VTM (Trans-Tasman Resources (iron sands mining in the EEZ): The application is at the panel

stage with a decision due 18 March 2026. The panel are holding a three day overview conference in Taranaki in the week of 20th October.

- Homestead Bay (residential development in Queenstown): The application is at the panel stage with the decision due 18 February 2026.
- Port of Tauranga (Stella Passage Development): The application is on-hold pending the outcome of a High Court process.
- Green Steel (a steel manufacturing plant in Waikato): The application is at the panel stage with the decision due 4 March 2026.
- Pound Road (industrial subdivision in Canterbury): The application is at the panel stage with the decision due 30 January 2026.
- Ashbourne (a residential and retirement development in Matamata): The application is at the panel stage with the decision due 25 February 2026.
- Arataki (a residential development in

Hawke's Bay): The application is at the panel stage with the decision due 20 February 2026.

In addition to these projects, there are a number of other projects where panels will be set up by the end of October/early November. Here are also some referred projects that have been approved by the Minister for consideration under the FTAA. As noted at the outset, in future this article will look a little different.

The policy world

There are many moving parts in the central government policy world and what is front and centre in the environment policy world is the changes to the Resource Management Act.

There is significant work being done behind the scenes of a number of matters that will not see the light of day until later this year or even the new year. Once we have more daylight on these matters it will be easier to write them into an article for the March-April edition of *Water*.

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Beyond the headlines – the science behind atmospheric rivers

Big rain events are often sensationally connected to 'atmospheric rivers'. It's an evocative term, but what does it actually mean? And are we seeing more of them as the climate heats up? Here, Lexi Henny of the Department of Earth, Marine and Environmental Sciences at University of North Carolina discusses atmospheric rivers, how they are defined, why they are important and what might be happening to them with climate change. And while the media has only recently splashed the term around in headlines, atmospheric rivers is a term that meteorologists have been using for decades.

Over the past decade or so, you may have noticed the arrival of a new weather buzzword: 'atmospheric river'. In the United States, atmospheric rivers often grace headlines about west-coast rainstorms fuelled by tropical moisture from the Pacific. Elsewhere, they are also a growing topic of research and public interest. But what are atmospheric rivers, and why are they sensitive to a changing climate?

What are they?

Broadly speaking, atmospheric rivers are elongated regions of moist air that can lead to heavy precipitation if the conditions are right. However, there is no single definition of what constitutes an atmospheric river. This is because, as often happens in science, various researchers have constructed similar but distinct definitions that are tailored to their particular research application or geographic area.

Many papers have defined atmospheric rivers as connected regions of high Integrated Water Vapour (IWV) or Integrated Vapour Transport (IVT) – the total water vapour and horizontal water vapour transport intensity of the atmosphere, respectively. The exact thresholds and shape parameters that qualify for consideration as an atmospheric river vary from study to study, but output agreement improves for the strongest atmospheric rivers, which are likely to have the most severe impacts.

Atmospheric rivers are a key ingredient in heavy precipitation. When their moist air converges in a storm system or over mountain slopes, copious amounts of water vapour are condensed into rain drops, supplied by a steady feed of moisture from low-latitude oceans which allows intense precipitation to continue beyond what the local atmosphere would normally be capable of.

Atmospheric rivers in a changing climate

The theory regarding atmospheric river responses to warming conditions is relatively direct: as the air warms, it can hold more moisture, which should lead to more water vapour in atmospheric rivers. These expectations are largely borne out by computer simulations of the atmosphere; in the future, atmospheric rivers are likely to be spatially larger and contain more water vapour.

Yet, this is not just a future phenomenon; as of 2025, the global surface temperature has already warmed almost 1.3 degrees Celsius from pre-industrial and close to one degree from 1980 levels. How has this translated to changes in atmospheric rivers? Over the past decade, some studies have

looked at global changes in atmospheric river frequency, latitude, and moisture transport intensity on a global scale, but these have not typically included multiple detection methods, which represent significantly different sets of atmospheric rivers and so might have different trends.

In our study, we looked at basic characteristics of atmospheric rivers – size; frequency; water vapour content, transport, and convergence; and winds – across a wide range of atmospheric river definitions. Some of these were based on my own atmospheric river detection method, while others were provided by the Atmospheric River Tracking Method Intercomparison Project (ARTMIP), a grassroots international collaboration of atmospheric scientists to standardise and compare existing atmospheric river detection algorithms.

What did we find? That since 1980, there is moderately strong evidence that atmospheric rivers have become larger, more numerous, and moister (more water vapour), on average. Furthermore, averaging the characteristics of atmospheric rivers over the entire atmospheric-river area globally each year can actually underestimate the rate of change in a given locale. That is, atmospheric river water vapour content might be increasing faster than you would think just from looking at global averages.

Atmospheric River hype: Fad or fact?

Because of the media hype around atmospheric rivers, results concerning them may be misrepresented in several ways:

1. **Extremeness:** Atmospheric rivers are portrayed as dangerous atmospheric paroxysms that lash, scour, strike, and pummel, or as rare extremes. While some may argue they should be defined as such, many studies use relatively low extreme thresholds that identify many atmospheric rivers each year in coastal and humid areas. Think of atmospheric rivers instead like the warm 'moist conveyor belt' associated with storm systems. They are not always rare, but they are still important. Additionally, while strong atmospheric rivers are primarily hazardous, weak atmospheric rivers can be beneficial for the environment by bringing much-needed rain with a lower risk of flooding.
2. **Novelty:** Atmospheric rivers are seen as a new phenomenon, or discredited as simply another ploy by the mainstream media to terrify an unwitting public. In reality, 'atmospheric river' is a new-ish scientific term (about 30 years old) for a pre-existing, normal part of the weather and climate system.

3. Regional: Atmospheric rivers are assumed to take place only in a specific small region. While they can be particularly impactful near mountainous coastlines, they occur over much of the global midlatitudes, even extending into polar regions in certain seasons or with certain atmospheric river definitions.
4. Scope: Atmospheric rivers are conflated with precipitation. Atmospheric rivers refer only to water vapour in the atmosphere, not to the associated precipitation. Although this seems pedantic, it is actually a crucial distinction. Rainstorms can be facilitated by atmospheric rivers, but you can also have an atmospheric river over a certain area and have it not be raining. Atmospheric rivers are but one ingredient in heavy precipitation; to get the full picture of trends, you have to consider how all the ingredients are changing.
5. Attributional: More generally, trend studies can be misrepresented as identifying causes where they do not. We did not run simulations to establish what proportion of the trends we saw were due to anthropogenic climate change. One recent study showed that the poleward latitude shift of atmospheric rivers may actually be due to changes in ENSO, rather than atmospheric warming. Is the moistening and expansion of atmospheric rivers that we saw an effect of climate change? Very likely. Did our study actually determine that? No. Our results were broadly consistent with warming-driven changes in modelling studies, but were not themselves attributed in detail.

Our study and the media response to it also provide a useful illustration of regional and scope biases: in the days following its release, articles were published implying that the results were relevant to rainstorms in California. In reality, we did not see robust (statistically significant) increases in atmospheric river frequency or intensity over California,

although there were some changes in atmospheric river water vapor and winds over the ocean to the northwest. This doesn't mean that there aren't any long-term trends in this region, but rather that we did not detect any using our very general, zoomed-out methodology over the 1980-2023 time period.

The big picture

Atmospheric rivers are a crucial component of the weather and climate system, affecting a majority of poleward water vapor transport and generating, by some measures, a majority of midlatitude extreme precipitation. Though they have occurred since time immemorial as a normal part of the climate system, they, like many types of weather, stand to become more intense in a warmer atmosphere.

Model projections suggest that future atmospheric rivers will produce more extreme precipitation and cover a larger percentage of Earth's surface than they did historically. Against the backdrop of an already-vast literature concerning atmospheric rivers and their variations, our study is just one more data point suggesting that some of these changes – namely, atmospheric river expansion and water vapour increases – are already underway. This does not mean they have got worse everywhere; many factors contribute to atmospheric river placement and intensity. But it shows that enhanced storm water vapour supply is something that should be carefully monitored not just for the future, but also in the present.

Read the full paper: Henny L & K Kim (2025). The Changing Nature of Atmospheric Rivers. Journal of Climate. <https://tinyurl.com/2ratscvd>

This article first appeared in Global Water Forum, globalwaterforum.org/2025/07/03/atmospheric-rivers-are-strengthening-but-are-they-the-scary-monster-that-mainstream-media-makes-out/

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WaterAid Australia is proud to connect with a wide network of partners and supporters who share our mission, ensuring access to clean water, sanitation, and hygiene for everyone, everywhere.

One of the most dynamic ways we bring our partners into this mission is through Winnovators, our flagship employee development programme. Winnovators empowers corporate teams to apply their professional skills, creativity, and energy to solving real-world water, sanitation and hygiene challenges, all while fundraising to support WaterAid Australia's work globally.

Winnovators is about creating meaningful impact. Participants step outside of their day-to-day roles, working collaboratively to tackle pressing water, sanitation, and hygiene issues, while also gaining professional development experience.

The programme fosters innovation, teamwork, and leadership skills, and offers employees the chance to make a difference that extends beyond their workplace and out into the real world, to vulnerable communities in need.

This year's Winnovators programme was one of the most

engaging yet, with teams from across Australia and New Zealand coming together to rise to the challenge.

Over the course of several months, participants developed innovative ideas to address two topics based in Cambodia:

- Sustainable wastewater solutions for healthcare facilities;
- The management of sludge from water treatment plants.

Together, the teams organised dozens of fundraising activities including sporting events, quiz nights, auctions, and sales, raising an impressive \$47,000 for WaterAid's projects. Their combined efforts will help transform communities by improving access to clean water, decent toilets, and good hygiene.

This year's overall winner was Sequana, which stood out for its work on developing a practical wastewater solution alongside tools to support its use in healthcare facilities. Their innovative approach made smart use of local resources, was cost-



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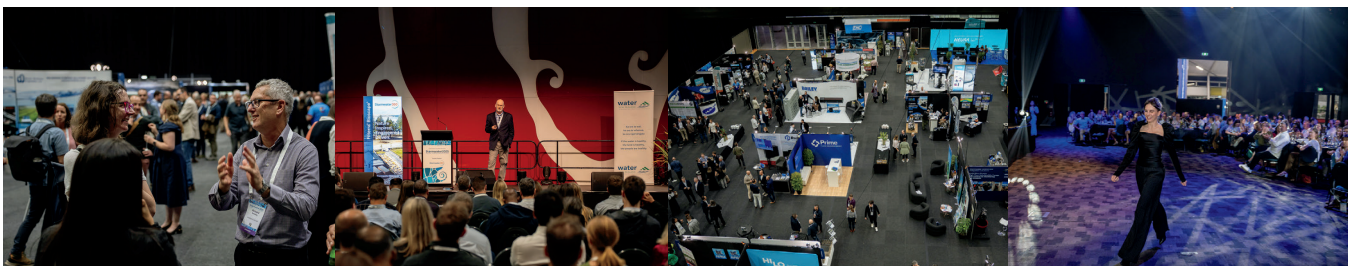
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- Wai Ora: Water Quality
- Wildcard

Stay tuned for key dates and submission details coming soon.





effective and easy to manage and delivered clear health and environmental benefits for rural communities with limited budgets and capacity.

The success of Winnovators 2025 is a testament to the power of collaboration. By uniting corporate expertise with WaterAid's mission, the programme continues to deliver outcomes that change lives, while also equipping participants with new skills and perspectives.

As we celebrate the achievements of this year's programme, we are already looking ahead to Winnovators 2026. If your organisation is looking for an opportunity to empower staff, strengthen collaboration and make a tangible impact on the global water crisis, we'd love to have you join us.

To learn more about how your company can be part of Winnovators 2026, contact WaterAid Australia's Water Sector Partnerships Lead, Margaret Temelkovski, at margaret.temelkovski@wateraid.org.au.

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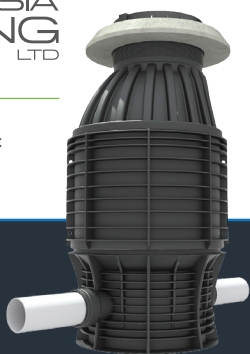
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