

Eadaoin Joyce - Innovation and Technology Specialist

Galway girl's fascination with water goes far beyond the Salthill Prom



For most children their fascination with water derives from beach days or fishing expeditions but it went much deeper for Galway's Eadaoin Joyce.

She admits she's been obsessed with water for as long as she can remember. "I recall being small during the drought and famine in Ethiopia and seeing images on the TV that highlighted the importance of water."

Living by the sea and a love for nature only added to the fascination and lead on to years of study and research. So, it's only natural that as Irish Water's Innovation and Technology Specialist Eadaoin has worked on some of the country's most innovative projects to deliver the best water and wastewater services.

Fine Chemicals Pharmaceuticals was the first third level course she undertook but she "couldn't understand why there was such a strong focus on producing pharmaceuticals when the World Health Organisation (WHO) estimates that 80% of human disease worldwide are waterborne and 95% are preventable."

The course only served to intensify her fascination with water and she went on to complete a BSc (Hons) in Biological Sciences which covered anatomy and human disease linked to various biological sciences.

Then came a MSc and PhD funded via an EU INCO Copernicus grant resulting in collaboration across member states to develop novel technologies to address global environmental challenges. The group was probably ahead of its time with the research focusing on green technologies for water and wastewater treatment.

Eadaoin's PhD looked at the use of advanced oxidation processes (AOPs) like UV, ozone, electrolysis and ultrasound alone and in combination to address chemical and biological contaminants in water for potable supply.

She had a doctorate under her arm but the connection between public health and water was still at the forefront of her mind. So, when she was offered a job in Surrey University in the Robins Centre for Public and Environmental Health (RCPEH) researching the migration of human viruses in groundwater she jumped at it. She also worked alongside the World Health Organisation (WHO), assessing the cost-effectiveness and cost-benefit analysis applied to water, sanitation and hygiene interventions. She undertook surveillance, risk assessment, monitoring and source tracking (from water sources to consumers) to investigate disease outbreaks; and delivered water and sanitation training courses to non-profit organisations in different jurisdictions where the WHO and Concern had a footprint.

Seven years later she took on the Head of Environmental role at the Sonochemistry Centre where she managed a team of researchers from science and engineering disciplines. She undertook research/consultancy projects to address current and future environmental challenges aligned to environmental remediation (water, land and air), sustainability and bioeconomy.

When the formation of Irish Water was underway, Eadaoin was keen to return to Irish soil and saw an opportunity to bring back knowledge and experience garnered overseas. Her 16 years in the UK came to an end and in 2014 when she moved home to take up the Innovation and Technology Specialist role in Irish Water. "My job seeks to address the short, medium and long term challenges in a different way and involves of outside of the box thinking and working with every function in the business. For me the best thing about Irish Water is the people are top of their game and want to make a difference and things better for the country."

Since then, she has collaborated with cross functional teams in Irish Water, the local authorities and delivery partners to deliver the most innovative water and wastewater projects including the upgrade of the country's largest wastewater plant in Ringsend and the introduction of acoustic loggers to significantly reduce the amount of time it takes to detect leaks.

"When I see sites come off the Remedial Action List (RAL), new wastewater treatment plants commissioned which have impacted on bathing waters and, and as much as we all dislike the traffic disruption, when I see roadworks in place for the Leakage Reduction Programme, I'm proud of be part of the fantastic work being done right across the country."

Eadaoin is also the Irish Water link with the Irish research and innovation sectors. The organisation engages with all of Ireland's Universities to support national and EU funded research and innovative technology development projects.

"Research and innovation are so important, and we should always stop, lift our heads and think is this right and the most sustainable solution for 20 years down the road. We are tasked with providing water and wastewater services for the now and

into the future, which is challenging, so we have to keep doing the job we're doing but we also need to continuously look to improve on how we deliver the solutions."

Eadaoin has been involved in a number of innovative Irish Water projects including:

- The Ringsend Wastewater Treatment Plant (Ireland's largest wastewater treatment plant providing 40% of Ireland's wastewater treatment capacity) Upgrade Project objectives are to provide capacity to treat wastewater for a population equivalent of 2.1 million PE by 2023 and 2.4 million PE by 2025. This involves using (1) Nereda® and Hybrid Nereda® (developed by Royal HaskoningDHV (RHDHV)) activated granular sludge (AGS) innovation whereby biopolymer-based granules are formed by the natural bacteria found in wastewater treatment and these granules provide greater treatment capacity; (2) Providing a new phosphorous recovery process (Pearl® developed by Ostara) to transform recovered nutrients into granular fertilizer(struvite) that improve crop yields and reduce runoff, closing the loop on phosphorous supporting our circular economy and sustainability agendas; and (3) Expanding the plant's sludge treatment facilities to enhance anaerobic digestion, utilising a plug flow innovation Ephyra® (developed by RHDHV), improving performance and optimally produces biogas energy for reuse on site to generate electricity/heat and further facilitate the recovery of resources such as fertilizers, biopolymers and fatty acids from wastewater and sludge.
- Irish Water is further collaborating with RHDHV on two research projects funded via the Water Services Innovation Fund to enable full utilisation of the Nereda AGS , namely (1) Hybrid at a Distance (enabling the use of AGS and surplus AGS in flow through in other WwTPs to increase performance) and (2) Kaumera (a bio-based, alginate like, raw material extracted from the AGS granules) to assess the application for the Irish Water sector and understand potential applications of alginate for other sectors (agriculture, horticulture
- Employing innovative technologies for wastewater networks asset condition assessment including Electroscan (focused electrode leak location technology to assess the location and quantification of groundwater infiltration entering the wastewater network where traditional survey methods would not be viable) and SmartBall (remote free-swimming inspection tool to assess the condition of rising main pipelines where access is typically very limited).
- Deploying Acoustic Loggers in the Greater Dublin Area (GDA) in collaboration with the Local Authorities funded via the Water Services Innovation Fund, which demonstrated a significant reduction in leak detection times via identifying Points of Interest and minimising disruptions to customer supplies (i.e., service is maintained during active leak detection and bursts are rapidly located) to support achieving leakage targets.
- Developing innovative solutions for potable water, Plug & Play Granular Activated Carbon (GAC) Capsules for treating Trihalomethanes (THMs) on the islands and at small water treatment sites (<500M3/day). Due to the success, this technology has been installed on over 15 locations nationally

resulting in several plants being removed from the Remedial Action Lists (RAL).

- Initiating a trial of reed beds to dewater Aluminium Sulphate (Alum) funded via the Water Services Innovation Fund allowing Irish Water to move away from the high carbon/energy traditional sludge thickening and dewatering methods to a low opex nature-based solution (NBS) treating liquid residual to a much higher standard than traditional methods and will potentially dewater the sludge to a much higher concentration of dry solids possibly resulting in creating a new habitat with biodiversity gains.
- Identifying the need to enhance collaboration through the integration of design and construction teams as early as possible in projects providing more opportunities for digital construction and innovation to drive improved quality, safety and time efficiencies. The Early Contractor Involvement (ECI) model has been employed to effectively deliver innovative solutions for a range of water and wastewater infrastructure across Ireland, including safety-focused construction, improved buildability standard designs, products and opportunities for innovative construction methodologies (off-site prefabrication and modularisation).