



Ofwat   
Innovation  
Fund

# Annual report

July 2023

# Purpose of this report

This report seeks to reflect on the progress of the Ofwat Innovation Fund since its launch in 2021, with case studies and analysis showing where the fund has made an impact and changes in the water sector.

It also seeks to highlight where further improvements could be made in innovation performance in the water sector and outlines our next steps to continue enabling a culture of innovation through the fund.



Ofwat, the Water Services Regulation Authority for England and Wales, has established the Water Innovation Fund. Ofwat is a non-ministerial government department established in 1989, when the water and sewerage industry in England and Wales was privatised. Ofwat regulates the water sector in England and Wales.

The Ofwat Innovation Fund is delivered in partnership with Challenge Works, Arup and Isle Utilities:



**Challenge Works has established itself as a global leader in designing and delivering high-impact challenge prizes that incentivise cutting-edge innovation for social good.**

We are a social enterprise founded by the UK's innovation agency Nesta. For more than a decade, we have run more than 80 prizes, distributed £84 million in funding and engaged with 12,000 innovators.

Visit us at [challengeworks.org](http://challengeworks.org)



**Dedicated to sustainable development, Arup is a collective of designers, consultants and experts working globally. Founded to be humane and excellent, we collaborate with our clients and partners using imagination, technology, and rigour to shape a better world.**

Together we help our clients solve their most complex challenges – turning exciting ideas into tangible reality as we strive to find a better way and shape a better world. With a community of over 1700 water professionals, Arup is leading global thinking across key areas like innovation, resilience, net zero carbon and sustainable water management.

Find out more [www.arup.com](http://www.arup.com)



**Isle is a global team of independent scientists, engineers, business and regulatory experts with a common drive to make a positive environmental, social and economic impact through the advancement of innovative technologies, solutions and practices.**

Our passion and expertise in technology and innovation enables us to connect expertise, investment and inspired ideas across the globe. At the core of all our activities is our ambition to make the world a better place.

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# Ofwat Innovation Fund

## Annual report

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# Introduction



**Innovation is a vital component of economic growth, and investment in innovative ideas and technologies has the potential to transform entire industries. Innovation is essential to address the major challenges the water sector faces; from climate change, to growing customer expectations, to concerns about affordability.**

We want the water sector to be at the vanguard of efforts to meet these challenges and it is for this purpose that Ofwat launched the £200 million **Ofwat Innovation Fund** (“the Fund”) to grow the water sector’s capacity to innovate to better meet the evolving needs of customers, society and the environment.

Through a series of innovation competitions, the Fund aims to unleash a wave of innovation in the water sector, and tackle some of the major challenges of our time. We want to see value delivered for all customers through the benefits delivered by innovation, and to see companies sharing learning to ensure these benefits spread throughout England and Wales.

Since launching the Fund in October 2020, Ofwat have run five competitions – the **Innovation in Water Challenge**, three rounds of the **Water Breakthrough Challenge**; and the Water Discovery Challenge. Through the Innovation in Water Challenge and the Water Breakthrough Challenge we have awarded a combined total of over £104 million to 57 water company-led innovations. Through the **Water Discovery Challenge**, we have made £5 million and a package of non-financial support available to help new innovations to launch and succeed in the water sector.



**169** entries to Innovation in Water Challenge or Water Breakthrough Challenge, with more than 500 organisations collaborating on these.







**100%** of water companies\* taking part



**57** winners sharing in **£104m**

**20** Water Discovery Challenge finalists sharing in **£1m**  
(with a further £4m to be awarded to up to 10 winners in early 2024)

### Breakdown of winning and finalist projects by Innovation Theme

	Indirectly supporting
 <b>Responding and adapting to climate change</b>	22%
 <b>Protecting and enhancing the natural environment</b>	16%
 <b>Delivering long-term operational resilience</b>	31%
 <b>Testing new ways of conducting core activities</b>	31%

\* Further to this, three of the small water and sewerage undertakers, under New Appointments and Variations (known collectively as “NAVs”) have had successful entries as partners. These are Albion Water, Independent Water Networks and Leep Water.



As the competitions enter the next phase, it is time to reflect on the progress of the Fund so far and showcase the funded projects that have recently concluded, highlighting their potential for impact on the sector and for customers, society and the environment.

As we head towards the end of the current regulatory cycle and with a commitment for the Fund to grow to at least £300m and run until 2030, we also take the opportunity in this report

to consider where the focus of the Fund and wider sector innovation activity should be in the future.

Finally, we hope to celebrate the achievements of the Fund so far and ensure learnings from projects are disseminated widely. We hope that this will stimulate further innovation and progress in the water sector in England and Wales, and that the benefits of this initiative will continue to grow and be felt for years to come.

## Objectives of the Fund

Ofwat established a £200 million Innovation Fund as part of the 2019 Price Review with the goal of supporting the sector to better meet the needs of, and create long-term value for, customers, society and the environment

through innovation. Through a series of innovation competitions, the Fund aims to achieve this objective by driving impact in three key areas.



**Accelerating  
the creation  
and roll-out of  
innovative products,  
services and  
concepts**



**Growing the  
capacity and  
capability  
of the sector  
to innovate**



**Embedding  
a culture  
that values,  
encourages and  
supports  
innovation**



In all the competitions, entries have had to meet one or more of our entry themes to ensure that projects deliver for customers, society and the environment.

1



**Responding and adapting to climate change including achieving the sector ambitions of net zero carbon, zero waste and zero leakage**

The water sector is critical to ensuring the sustainability of human and ecological systems, and it is also highly vulnerable to the impacts of climate change. Adapting to climate change and achieving net-zero are important to the water sector to ensure water availability and quality, with infrastructure resilience and to reduce energy use.

2



**Protecting and enhancing the environment and natural systems, to protect current and future customers from the impacts of extreme weather and pollution**

Protecting and enhancing the environment is critically important to the water sector in England and Wales because the sector relies heavily on natural resources to provide clean and safe drinking water and to treat wastewater. These can fall across water quality, biodiversity, natural flood management, public health and beyond.

3



**Delivering long-term operational resilience and understanding infrastructure risks to customers and the environment, finding solutions to mitigate these in sustainable and efficient ways**

Delivering long-term operational resilience is crucial to the water sector in England and Wales because it ensures that water services can continue to be provided even in the face of unexpected disruptions or challenges. Better resilience can protect against issues such as population growth, aging infrastructure, and emerging risks to the security of our supplies.

4

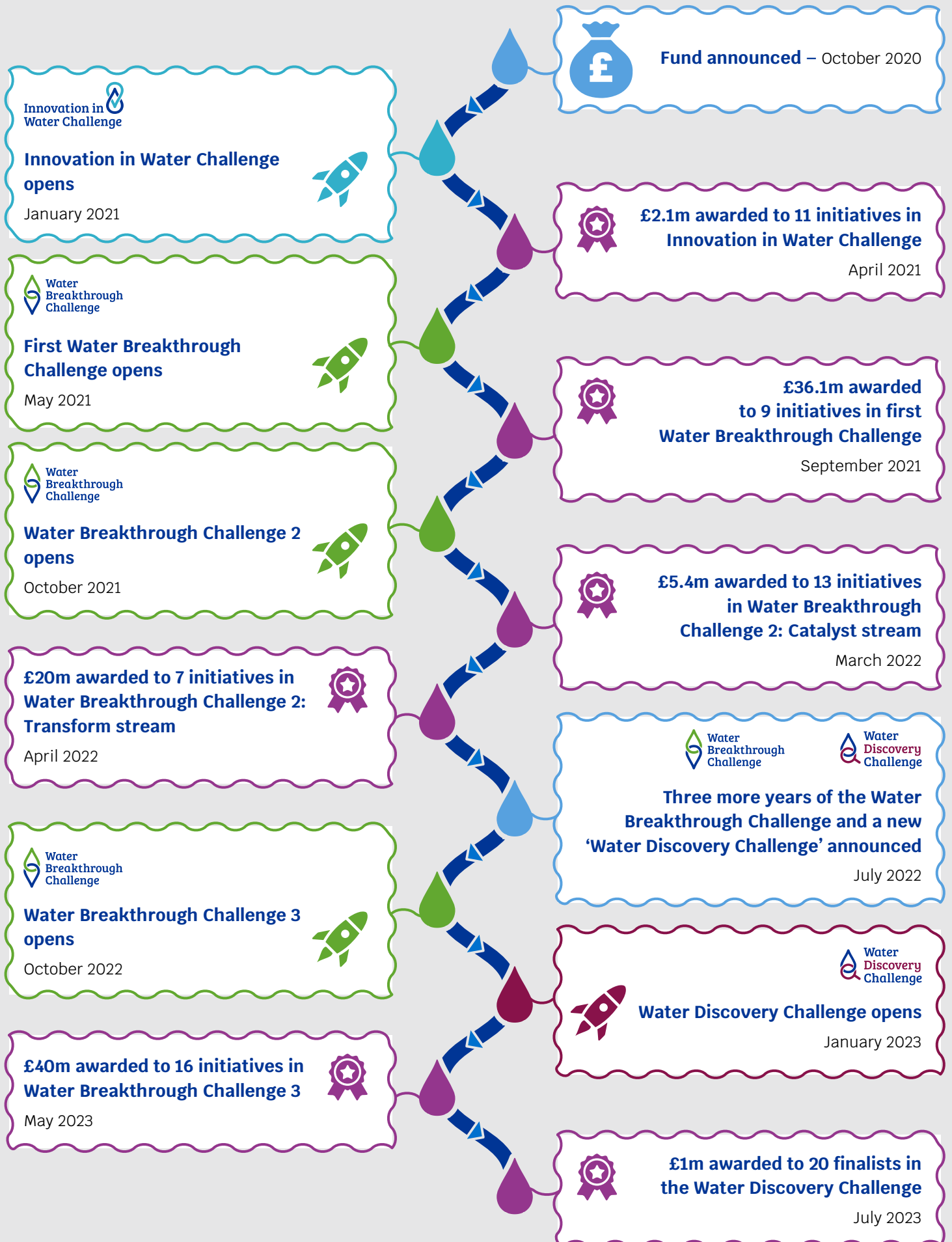


**Testing new ways of conducting core activities to deliver the services customers and society need, expect and value both now and in the future**

Improving the delivery of services for customers and society is essential to the water sector in England and Wales for several reasons to meet customer expectations, address societal needs and to reduce costs and ensure sustainability.



# The journey so far



# Highlight report



## Ofwat Innovation Fund

£200 million of funding has been unlocked through to 2024, to unleash a wave of innovation in the water sector – plus at least a further £300 million through to 2030



416

416 entries across all competitions, with more than

> 700

organisations involved collaboratively in these entries



Over £100 million has been awarded to 77 initiatives, all pursuing innovation solutions to some of the most pressing challenges facing the water sector

100%

of water companies have taken part in at least one entry

Most active (as partners or lead entrants) water companies:

1. Dwr Cymru – involved in 56 entries including 27 winning entries
2. United Utilities – involved in 56 entries including 27 winning entries
3. Anglian Water – involved in 50 entries including 28 winning entries



Innovation in Water Challenge

Water companies have led 169 entries to the Innovation in Water Challenge and Water Breakthrough Challenge, with 496 organisations taking part

Water Breakthrough Challenge

Over £100 million awarded to 77 initiatives, including:



Using fibre optic cables to detect leaks



Cultivating seagrass to capture carbon and restore ecosystems



Building the world's first 'water neutral' housing development

## Winners by Innovation Theme

New ways of working



39%

Operational resilience



Responding to climate change



19%

Protecting the environment



14%

28%

# Ofwat reflections on the past year



**It has been just over two years since we opened our first competition, the Innovation in Water Challenge. Those early projects are now concluding and case studies for the completed projects can be found in the Winners and case studies section.**

The only exception is Spring (the Centre of Excellence for innovation in the sector), which was funded to develop its minimal viable product. Since that initial stage it has developed significantly and it was felt a case study of the original project would be of little value now. More information on Spring can be found at its [website](#).



## Ambition

There have been a wide variety of innovation projects put forward for funding across our four innovation themes. We have seen technology and non-technology solutions and enabling activities awarded funding. We have also seen water companies step into areas where the

sector has been less mature traditionally. We continue to encourage a wide variety of projects in future rounds and want to see the sector be even more ambitious in bringing forward new ideas that could be transformational for the sector.

## Collaboration

Significant levels of collaboration between water companies and with other partners have been a highlight of the Fund. All 17 water companies are involved in Innovation Fund projects as either a project lead or project partner (see appendix 1 for participation statistics) with some projects having more than 10 water company partners. It is hoped that the significant number of water company partners on board will help to facilitate the scale up and adoption of successful innovations.

The breadth and diversity of non-water company partners is also very encouraging and demonstrates the careful thought and planning that has gone into the entries. Over 700 different organisations have taken part as a lead or partner so far.

There is more for the sector to do in growing their networks, particularly in engaging expertise from other sectors, but the direction of travel on this is positive and efforts to diversify and increase collaboration represents a visible step-change from how the sector operated prior to the Fund.

This collaborative spirit extends into the relationship between Ofwat and water companies, where we've seen a growing openness and transparency in our interactions as we work together to maximise the opportunities the Fund brings to deliver benefits for customers, the environment and society.



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## Innovation culture in companies

Embedding a culture which values, encourages and supports innovation is a key objective of the fund. We are keen to explore how we can support water companies to better embed innovation thinking and practices into all aspects of their day-to-day businesses. There are good examples of this embedded

innovation culture already evident across the sector, but it varies significantly between companies. We encourage water companies to work with one another and Ofwat to support the sector as a whole to develop its culture and innovation maturity across the next seven years of the fund.

## Complementary activities

Our engagement has extended beyond the sector and we are talking to Ofgem, the Environment Agency, and other organisations that operate innovation funds to share learning and explore cross-fund and cross-sector working. We are also working closely with internal colleagues to ensure the innovation fund is complementary to larger infrastructure activity such as water resource management plans and RAPID.\*

It is pleasing to see that some projects that were not awarded funding have found enough support across the sector to continue to be progressed independently of the Fund. This has shown that the act of developing projects for the fund has generated ideas that deliver value for water companies. Furthermore, it indicates that water companies have buy-in to the difference these ideas can make, and it is very promising to see water companies put their own resources into pushing new ideas forward.



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\* The Regulators' Alliance for Progressing Infrastructure Development, a partnership made up of the three water regulators – Ofwat, the Environment Agency and the Drinking Water Inspectorate, set up to identify and address issues relevant to the development of joint infrastructure projects.

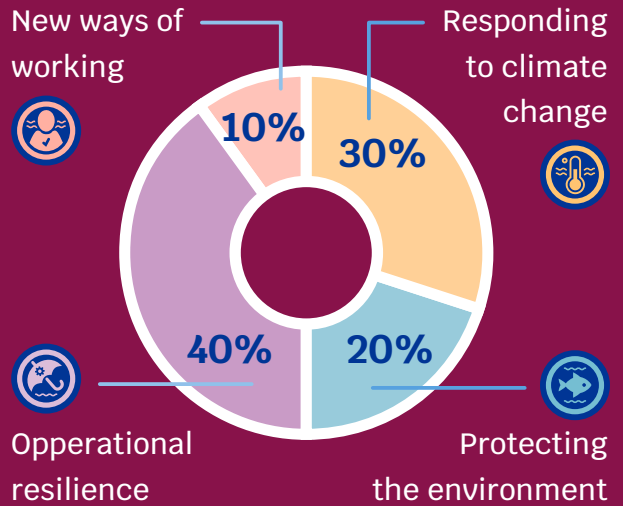
# New this year – Water Discovery Challenge



## Water Discovery Challenge

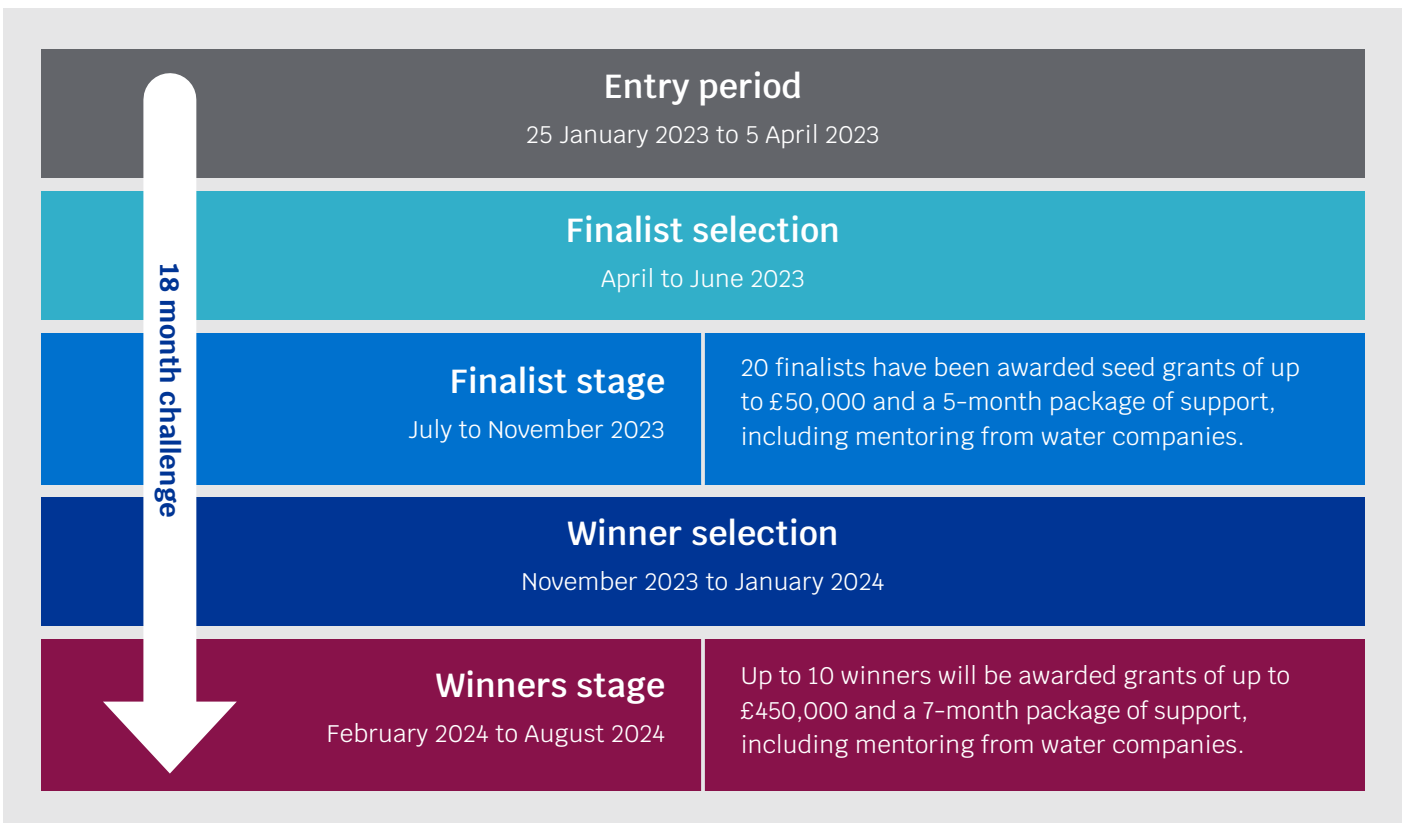
**247 entries** to our first Water Discovery Challenge, competing for a share of **£5 million** and a package of mentoring and support to help them bring their bold innovations into the water sector.

### Finalists by Innovation Theme



In January 2023 we launched a brand-new competition called the Water Discovery Challenge. It was designed to accelerate the discovery, development and adoption of promising innovations by the water sector. It aimed to achieve this by directly supporting

organisations with innovative propositions and facilitating their engagement with water companies. It was aimed at attracting early-stage innovations to come forward from inside, but especially the water sector.



This new competition represented a significant evolution of the Ofwat Innovation Fund. To bring new ideas and organisations into the water sector, we stripped back rules around match funding and IP and planned to work with (and financially support) non-regulated entities for the first time. It was an open access competition with few barriers to entry to attract new thinking and ideas into the sector. We worked with the water companies to co-design aspects of the competition and excluded water companies from entering as they were to play a key role in the delivery of the competition.

Discovery aims to support the sector's needs and facilitate the development of solutions that have a genuine chance of being adopted by the sector (or which require further development and testing and can seek follow-on funding arrangements or more directly work in partnership with water companies).

In April 2023 Discovery closed for entry. It attracted 247 entries from a wide variety of organisations. 20 have been selected as Finalists (see below) and for the remainder of 2023 they will receive a blend of financial and non-financial support, including mentoring from water companies, to help develop their ideas further.

In early 2024, the 10 best Finalists will advance to the Winners stage and will receive further financial and non-financial support and mentoring. By the time the competition has concluded in mid-2024 our 10 winners will have received up to £500k in funding, business development support and over 12 months of water company mentoring and guidance to give their innovations the best possible chance of succeeding in the water sector in England and Wales.

## Meet the 20 Finalists of the Water Discovery Challenge

### **ACQUIRE (Artificial intelligence and Case based reasoning to improve water QQuality Incident REsponse)**

#### **Mounce Hydrosmart Ltd**

The ACQUIRE Project will analyse drinking water quality incident report data from water companies using the latest AI techniques to develop an interactive management tool and online open source portal benefitting the industry and its customers.

### **Active Pulse Leak Detection**

#### **Seal Water Technology Ltd**

A new signal transmission technology that doesn't attenuate, travels at constant sonic velocity and can identify and range leaks as well as pipe features, such as tees and elbows, up to 7.5km in all pipe materials.

### **An innovative membrane technology for brackish and sea water desalination powered by low-grade waste heat**

#### **Waterwhelm Ltd**

Waterwhelm will further develop its technology for brackish and sea water desalination powered by low-grade waste heat, enabling energy-efficient and sustainable water supply.

### **Application of Asset Risk Based Common Methodology to Water Industry Assets**

#### **EA Technology**

This project will deliver a common framework to evaluate assets and their needs, enabling managers and engineers to maintain the assets in a safe, reliable condition at the lowest possible cost.

## **Destruction of high impact greenhouse gases and generation of green electricity at wastewater treatment sites using fuel cell technology**

### **Water Research Centre Limited**

Our project will develop a low-cost water sensing platform to monitor the quantity and quality of discharges from water company wastewater assets into receiving waters, providing an improved understanding of the impact of these discharges on the environment.

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## **Development of verifiable freshwater analytics framework,**

### **Ecosulis Limited**

The development of a verifiable framework of analytical metrics, for the aquatic environment, that will allow the end user to quantify the ecosystem uplift of investment activities.

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## **Energy harvesting micro-turbine for powering remote equipment**

### **Vysion Technologies LTD**

To power pipeline monitoring equipment, the sector relies on a stopgap solution, using short life, single use, unrecycled, batteries. The project aims to develop an advanced micro-turbine designed for long-term value, that overcomes previous barriers to pipeline energy harvesting.

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## **Fully Structural Spray in Place Pipe (SIPP) lining providing burst protection for high-risk sewage rising mains**

### **Resimac Limited**

Our entry focuses on the development of an innovative and highly cost-effective hybrid sewer rehabilitation solution which will combine existing spray lining techniques with cured-in-place pipe (CIPP) technology to deliver a fully structural, spray-in-place rehabilitation solution for existing deteriorating rising sewer mains to reduce bursts and improve network resilience.

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### **Guerrilla Tech**

#### **GUERRILLA TECHNOLOGIES LTD**

Guerrilla is a retrofittable device for membrane-less removal of pollutants from surface water runoff.

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## **Innovative coagulant free phosphorus removal technology**

### **Cranfield University**

The phosphorus (P) challenge in the UK remains unsolved and alternatives need to be explored, Cranfield University and Microvi propose the new Bio-mineral P removal (BMPR) technology that offers the benefits of no coagulant use, high effluent quality through operation of an intensified reactor and with convenient P recovery.

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## **Low-cost sensing to improve understanding of storm water discharges**

### **School of Chemistry, University of St Andrews**

Our project will develop a low-cost water sensing platform to monitor the quantity and quality of discharges from water company wastewater assets into receiving waters, providing an improved understanding of the impact of these discharges on the environment.

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## **Magnetic nanocomposites for DOC removal from drinking water**

### **Lancaster University**

The project addresses an urgent industry need for the removal of steeply increasing concentrations of DOC from peatland-fed raw waters using a sustainable technology based on linearly-scalable oscillatory baffle flow process and innovative nanomagneto-composite sorbents.

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## **Nonthermal 3D plasma - a novel Advanced Oxidation Process for water treatment**

### **ANAMAD Ltd**

ANAMAD Ltd. will develop a new kind of advanced oxidative process simultaneously generating UV and reactive oxygen species within a water column, requiring no additional chemicals and consumables and efficiently removing persistent and emerging contaminants in a sustainable way.

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## **Optimising Sustainable Design of Solar PV Systems for Water Pumping Stations: AI-based Package (SolarAI)**

### **Riventa Ltd.**

Maximising the net present value over a user defined life of solar photo-voltaic designs at pump station locations through an AI based load-shifting computation of the hydraulic network in which the electricity will be consumed.

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## **Reducing sewage overflows through storage in sustainable precast permeable pavements (StoragePave)**

### **Imperial College London**

Our project StoragePave will develop and test a new sustainable and low carbon pavement system that can capture and gradually release stormwater into the sewer network to decrease the frequency and severity of combined sewer overflow events.

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## **Renewable Energy Via Aqueous-phase Reforming**

### **REVAR , ICMEA-UK Ltd**

Renewable Energy Via Aqueous-phase Reforming (REVAR) is a highly efficient process taking contaminated wastewater and extracting significant energy content from the organic matter while co-producing clean water that can be recycled into the water industry.

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## **Replacement of chlorination using H2O2 synthesis; for the removal of pathogens and residual disinfection of potable water**

### **Cardiff University**

To meet the safe water challenges of tomorrow and contribute to chlorine elimination, we are developing green catalytically generated hydrogen peroxide for potable water disinfection.

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## **senSiteUQ: Sensible Sensor Siting**

### **digiLab Solutions Ltd**

digiLab is a pioneer in machine learning, using Uncertainty Quantification and optimisation techniques to create a platform for sensor and water data to drive efficiency in the next wave of sensor deployment and monitoring in the wastewater network, ensuring value for water companies and customers.

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## **Novel direct nanofiltration for water purification**

### **INFINITE WATER R&D LIMITED**

Development of novel, ultra-low energy, chemical free direct nanofiltration treatment for cost effective and safe water and wastewater purification, targeting the removal of organic matter, micropollutants, PFAS and contaminants of emerging concern (CEC's).

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## **The Pico-Stream Turbine - Hydropower without the Hassle**

### **The Fish Friendly Hydropower Company Ltd**

The Fish Friendly Hydropower Company Ltd is developing the PicoStream Turbine for installation at wastewater treatment plants to further efforts to pave a greener and more sustainable future for the UK Water Sector.

## New this year – **StreamLine**

In May 2022 DWI, the Environment Agency and Ofwat launched StreamLine – the regulatory advice service for innovators and businesses in England and Wales.

Since the launch of StreamLine we have provided answers to a wide range of questions covering:

- Fats, oils and grease disposal management
- Grit removal
- Automated Sewer Cleansing
- Sludge Destruction
- Lead pipe lining
- Mobile testing for water analysis
- Water detection technology
- Customer benefit entitlement
- Certification for products
- Accessing data and information

Questions are usually answered within 10 days and each regulator contributes to a comprehensive response that should help innovators and businesses understand and navigate through water sector regulations.

If you need advice about water sector regulations please contact the StreamLine team on: [www.ofwat.gov.uk/streamline](http://www.ofwat.gov.uk/streamline)



# Winners and case studies



To date, 57 initiatives have shared in over £100 million, through four competitions:

## Innovation in Water Challenge winners

[Spring](#)

[Supporting customers in vulnerable circumstances](#)

[Smarter Tanks to build a resilient network](#)

[Seagrass Seeds of Recovery](#)

[Reservoir water community monitoring for algal associate risk assessment](#)

[Organics ammonia recovery](#)

[Leak detection using dark fibre](#)

[Industrial symbiosis](#)

[Enabling whole life carbon design](#)

[CatchmentLIFE](#)

[AI & Sewer Defect Analysis](#)

## Water Breakthrough Challenge 1

[Alternative approaches to phosphorus removal on rural wastewater treatment works](#)

[Artificial Intelligence of Things enabling autonomous waste catchments](#)

[Catchment Systems Thinking Cooperative \(CaSTCo\)](#)

[Flexible local water supply schemes pilot](#)

[Safe Smart Systems](#)

[FAIR WATER](#)

[Transforming the energy balance of wastewater treatment](#)

[Triple carbon reduction](#)

[Project Zero](#)

## Water Breakthrough Challenge 2: Catalyst stream

[A HERU for screenings](#)

[Catalysing a NET-ZERO future](#)

[Support for All](#)

[Defusing the nitrate timebomb](#)

[Designer Liner](#)

[Pipebots for rising mains](#)

[SuPR Loofah \(Sustainable Phosphorus Recovery\)](#)

[Tap Water Forensics](#)

[Sub-seasonal forecasting to improve operational decision making](#)

[Towards incentivisation for community-centric rainwater management](#)

[Unlocking bioresource market growth](#)

[Unlocking digital twins](#)

[Water quality as a service – Treatment 2 Tap](#)

## Water Breakthrough Challenge 2: Transform

[CECCU \(CHP exhaust carbon capture and utilisation\)](#)

[Enabling water smart communities](#)

[Managing background leakage](#)

[Hyvalue – Hydrogen from Biogas](#)

[National Leakage Research Test Centre](#)

[Stream](#)

[Water4All](#)

## Water Breakthrough Challenge 3: Catalyst stream

[Artificial Intelligence for algal monitoring](#)

[Climate Resilience Demonstrator \(CRDo\) – Extreme heat scenario](#)

[Dark Fibre 2](#)

[Hydro powered concentric smart meter](#)

[Universal access point for water \(UAP4W\)](#)

[Using science and nature to end sewer misery](#)

[Water efficiency in faith and diverse communities](#)

[Water industry printrastructure \(WIP\)](#)

[Water net gain](#)

[Water literacy](#)

[World's first ecological digital twin](#)

## Water Breakthrough Challenge 3: Transform stream

[Biopolymers in the circular economy \(BICE\)](#)

[Designer Liner 2](#)

[Mainstreaming nature-based solutions to deliver greater value](#)

[Net Zero Hub](#)

[Stream 2](#)



Last summer, temperatures reached over 40 degrees Celsius for the first time in the UK, affecting customers as well as the environment. As we face increasing risk of drought due to climate change, tech to anticipate extreme weather patterns and prevent water shortages due to droughts will become more and more important.

The 'Smarter tanks' project explored how to best monitor drinking water and rainwater storage tanks using real-time control solutions, to see if more water can be stored when needed most, such as during extended dry periods or drought, ultimately contributing to a more resilient water network and reduced disruption to customers.

The idea was to try to understand the benefits of retrofitting existing assets, such as water tanks, with these new real-time monitoring solutions. The project, funded by the Ofwat Innovation Fund, encountered a huge challenge with the beginning of the Covid-19 pandemic, which ultimately meant that engineers were often prevented from accessing the sites to install these solutions, monitor the progress and capture data.

Despite initial set-backs due to the pandemic, the project was a success in terms of understanding what was happening at the assets, and the value of having real-time prompts for better decision making – for example, to know

when more water supply was needed, or locate where water was being lost (when sensors identified the levels were decreasing). These benefits then led to others – for example by flagging decreasing water levels, leaks could be identified and repaired more quickly, saving water, preventing supply issues, and making it more cost-efficient for both customers and water companies.

However, the pandemic did mean the project was only completed on a much smaller scale. Additionally, the project would have benefitted from management by a dedicated innovation employee, or team.

The initial success of the small-scale project has provided learnings for a much larger endeavour called Safe Smart Systems which is now underway. This will explore automation from source to tap within the whole water network, rather than just with retrofitting existing assets – working with 19 partners to do so.

The Safe Smart Systems project has immense long-term potential, however, the nature of the work will mean that for some of the larger water companies, it could take up to four years to implement findings, and for some of the smaller ones it might be more like ten years to move to a Safe Smart System.

**Richard Beardsley, Innovation Programme Manager, Affinity Water Limited, said:**

*“While the impact of Covid-19 on the Smarter Tanks project was undeniable, the success of it on a much smaller scale has allowed us to actively support a much bigger project, Safe Smart Systems led by Anglian Water. It’s a significantly larger project with multiple agencies and sectors involved and we have been able to bring in really specialist expertise to help support us. With 19 partners onboard to explore its potential already, we’re really excited to see what impact it can have on the sector.”*

## Dark Fibre



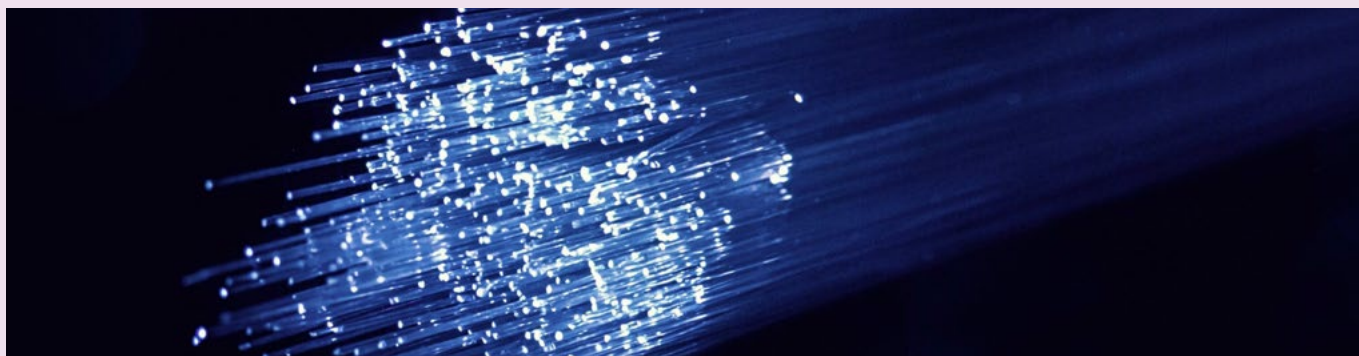
Operational  
Resilience

Competition: **Innovation in Water Challenge**

Funding awarded: **£206,385**

Led by: **Hafren Dyfrdwy**

Partners: **Costain Ltd, Dŵr Cymru (Welsh Water) and Focus Sensors**



The UK faces a significant water supply–demand problem – with a forecasted deficit of four billion litres a day by 2050, driven by climate change and population growth. To ensure that all customers have a reliable and sustainable water supply, the water industry has committed to reduce leakage by a third by 2032.

One way of protecting the increasingly precious supply of water is to reduce leakage from the network through better leak detection. This is a vast challenge given the 350,000km of water mains in England and Wales that need to be monitored.

Traditional leak detection tools analyse water flow and pressure data to highlight areas for investigation. In recent years, this has been enhanced using permanently-installed acoustic loggers- sensors that listen for leaks and raise concerns.

The introduction of acoustic loggers has improved how water companies detect leaks, but the scale of investment and speed of deployment is a significant challenge. Acoustic loggers need to be placed 100m–200m apart; and currently, leak alarms require human confirmation. The number of false alarms can be as high as 60%. This represents a vast investment, ongoing cost and logistical challenge to install and maintain these assets. To fulfil leak reduction targets and maintain water supplies into the future, the industry urgently needs a quick, easy, reliable, and cost-effective way to detect leaks.

The Dark Fibre project, funded by the Ofwat Innovation Fund, investigated the possibility of using existing optical fibre networks for leak detection.

The system uses a laser to detect noise along 'dark fibres' (unused fibre optic cables) that can be deployed inside or alongside a water main. If new fibre was required to be installed for this method, it would be expensive and disruptive to introduce, but significant fibre networks already exist across the country for systems such as broadband and railway signalling. Much of this is already close to water industry assets.

The project undertook experiments which proved that the currently dormant 'dark fibre' could be used for water leakage detection, lowering the cost and environmental impact of the technique. It demonstrated that leak noise could be detected by a fibre up to 5m away and that the impact of leaks on ground stability could be detected up to 20m from the leak.

The project has now entered a second phase, Dark Fibre 2, which will look at scaling the technology and deploying it in a real-life scenario. It will also explore the extent to which the fibre and water pipe networks overlap to work out what portion of the English and Welsh water network can be monitored by the dark fibre solution.

**Richard Powell, Innovation Relationship & Commercial Lead, at Severn Trent Water, said:**

*“The success of the first phase of this project is a hugely exciting development for the sector and we’re thrilled to be embarking on a second phase to scale up the findings and explore the level of impact it could have on leakage across the UK, and the speed at which it might be implemented.”*

# Supporting vulnerable customers



New ways  
of working

Competition: **Innovation in Water Challenge**

Funding awarded: **£214,901**

Led by: **Severn Trent Water**

Partners: **Consumer Council for Water (CCW), South East Water Ltd, Thames Water Ltd and United Utilities**



Customers are a vital part of the water sector, but currently not all customers' needs are met by traditional communication methods. The aftermath of Covid-19 rising energy and fuel prices, and the cost-of-living crisis, are resulting in increasing numbers of vulnerable customers – someone who requires a more tailored experience in their customer communications. Hard-to-reach customers are a subset of vulnerable customers. These are people who, due to individual circumstances such as disabilities, would benefit from alternative communication methods.

Extreme weather events such as long summer droughts highlight the need to improve water company interactions with these vulnerable customers. Without adequate insight of their needs, the water sector risk delivering the wrong level of support.

The Vulnerable Customers project, led by Severn Trent Water, used behavioural science to understand more about the water sector's consumers in order to deliver tailored communication. The project, funded by the Ofwat Innovation Fund, aimed to understand consumer engagement needs and re-engage consumers as trusted sources of information. The project involved conducting research to test how campaigns can be directed to those most in need.

The project ran in four phases:

- 1. Discover** – Looking at trends based on analysis of vulnerable customer reports from other utility companies, interviewing colleagues and working with partners to interview vulnerable customers in the pilot area.
- 2. Define** – developing insights and identifying key themes in reaching the most vulnerable customers and creating problem statements and agreed ambitions.
- 3. Develop** – hosting workshops that explored what could change and agreeing key ideas for each problem.
- 4. Deliver** – testing the project in the community to see if better engagement could be established.

The project found that in the case of communications that needed immediate action, for example, issuing notices about risk of water contamination, standard communication channels such as social media weren't reaching vulnerable customers. In these instances, other communication channels need to be adopted, such as sharing information via community leaders or non-English language radio stations.

The project led to the creation of a Playbook in which the team shared all insights, so that other water companies can benefit in future.

**Richard Powell, Innovation Relationship & Commercial Lead, at Severn Trent Water, said:**

*“Through this human-centred, iterative approach to innovation, we have a better understanding of the needs of hard-to-reach, vulnerable customers, their circumstances, and the most effective ways to communicate with them. With this, we can build greater connections and trust, so that fewer customers are hard to reach.*

*It meant that we were able to have a laser focus on the people we are designing the solutions for, ultimately leading to better products, services, processes and outcomes for vulnerable customers.”*

Severn Trent is now hoping to develop the project with more partners and experiment with the best ways to contact a diverse range of hard-to-reach, vulnerable customers. A new project, Innovation in the Community, will take learnings from the Vulnerable Customers project,

engaging with mobility cold spots and deprived areas in order to offer people in those areas the opportunity to learn new skills, while inviting them to solve challenges using their creativity and local knowledge.

## Industrial symbiosis



New ways  
of working

Competition: **Innovation in Water Challenge**

Funding awarded: **£199,504**

Led by: **United Utilities**

Partners: **International Synergies Ltd, Dŵr Cymru (Welsh Water), Jacobs, and Severn Trent Water plc.**



The Industrial Symbiosis project explored and realised new ways to reduce water sector waste and by-products by repurposing them for other processes and projects. With a focus on the Built Environment, the project team worked collaboratively to find, test and adopt new ways to keep construction materials such as aggregates and concrete in use for longer. In addition, they have created and shared an implementation 'blueprint' for the UK water sector – so that more organisations can benefit and accelerate their own circular economy plans.

This approach keeps resources in use for longer, reducing the need for new materials, a key principle of the circular economy. The method improves resource-efficiency within the water sector, and, in turn, enhances operating margins and environmental benefits from reduced waste and lower carbon emissions (including those involved in building and maintenance of structures).

The project worked with various partners to identify potential waste savings from the industrial symbiosis approach for United Utilities' capital delivery projects. Data gathered was analysed through a resource-matching database provided by International Synergies.

By connecting different activities in different projects, the team were able to match the waste from one process with the needs for resource in another process. In some

cases, this meant an exact substitution – what one process disposed of, another process needed, for example, a pipe. In other cases, there are good alternatives available to match a need, so less obvious matches can be made that still reduce the need for new resources.

Once additional historical data was also captured and added to the resource-matching data software, it was used to optimise the approach across the organisation and to plan for the future.

This resulted in the diversion of materials otherwise destined for landfill, reduced purchases of new resources and lowered levels of carbon emissions, proving the success of the industrial symbiosis approach and its potential role in an innovative and collaborative water sector.

United Utilities offered to be the 'sector canary' to test and prove the new concepts within their own capital programme and supply chain partners. They identified 60 opportunities and 24,000 tonnes of material available for resource matching, converting 20 opportunities realising over £55k financial saving and 200 tonnes of carbon. Trying these new methods also unearthed current industry practices which can block industrial symbiosis. Recommendations for new procedures, based on these findings, have been incorporated and shared in the sector blueprint.

**Kieran Brocklebank, Head of Innovation at United Utilities said:**

***"We are proud to have led this symbiosis project alongside and with strong contribution from the project partners. Combining the resource-matching expertise of International Synergies with the water company partners' experience of their own in-house operations, we have tackled 'head-on' the traditional blockers that have held us back. And our adoption plan sets a clear path for others to follow. At our dissemination events we can already see other water companies showing interest in adopting the new method; we have delivered a truly sector-changing opportunity."***

## Reservoir water community monitoring



Protecting the Environment

Competition: **Innovation in Water Challenge**

Funding awarded: **£167,416**

Led by: **Dŵr Cymru (Welsh Water)**

Partners: **Bristol Water plc, Cardiff University, United Utilities, and Yorkshire Water Services Ltd.**



The Reservoir Monitoring project uses environmental DNA (eDNA) monitoring to detect blue green algae responsible for producing certain harmless chemicals in drinking water that can lead to a musty smell. The hope is that by identifying and predicting the presence of these algae, water companies can improve the taste and smell and ultimately create better-quality drinking water.

Currently, these algae are detected manually, by humans analysing samples under the microscope and counting and identifying the algae. The eDNA process leads to faster and more accurate detection of these algae. The project, funded through the Ofwat Innovation Fund, aimed to make this technique more robust so it could be used outside of academic research (where it is currently practised), to become useful to the industry on a much bigger scale.

The project found the technique was able to predict when the chemicals, that lead to a musty smells, would be present allowing water companies to add additional appropriate treatment leading to better quality water and a more sustainable supply. The technique also reduced costs by treating the issue before it became a problem. The project proved that this detection tool could be useful to the industry at large and created a useful visualisation tool for prediction of incidents.

The team were able to establish, refine and optimise the methodology and share it with other water companies. Through these secondary projects, Reservoir Monitoring has been able to expand to multiple different reservoirs, gathering more datasets and sampling them more regularly.

As a result, they have now built a number of mathematical models for prediction, creating live dashboards to share the data generated with water companies in a dynamic fashion, so that they can better manage their workforce.

**Paul Gaskin, Research and Innovation Manager, Dŵr Cymru (Welsh Water), said:**

*“The Reservoir Monitoring project has been invaluable in providing water companies with a more holistic view of what’s going on in their reservoirs at any given point. In ecology we’re always looking at who is interacting with who because it’s an ecosystem. What we have learnt is that it’s not necessarily the ‘problem species’ alone, it’s who they are interacting with. So if the species they rely on aren’t present, you’re not likely to see growth from those ‘problem species’ and therefore the water quality issues. It’s a useful early indicator tool, which has the potential to massively improve water quality for customers, as well as cost-saving benefits.”*



## Designer Liner



Protecting the  
Environment

Competition: **Water Breakthrough Challenge 2**

Funding awarded: **£173,880**

Led by: **Yorkshire Water**

Partners: **Affinity Water, Thames Water Utilities, Northumbrian Water, Scottish Water, Cymru Welsh Water, SES Water**



The UK relies on a system of around 350,000km of clean water distribution pipes to meet its drinking, washing and cleaning needs. However, changing environmental circumstances due to climate change and increasing demand is affecting the integrity of water networks.

Yorkshire Water estimates that the cost to replace just 1% of the pipe network is at least £600 million, but that much more than that needs replacing each year to prevent leaks. In addition, the associated construction work required causes disruption for customers and suppliers, as well as potential water quality and environmental issues.

Yorkshire Water's Designer Liner project explored new or existing pipe linings that could address this challenge and reinvigorate the UK lining market, which has become stagnant in recent years.

The first phase of the Designer Liner project, supported by the Ofwat Innovation Fund, scoped out products from around the world to identify existing solutions with potential for adaptation or implementation in the UK. Finding that there was no suitable solution in existence, the team set out to design a specification for a liner fit to meet the challenges of a 21st century water network.

The second phase of the project, which will be supported by funding from the Transform Stream of Water Breakthrough Challenge 3, will develop this specification into a product – due to be reported on towards the end of 2026. The project will overcome the current technical, regulatory, financial and market confidence barriers and deliver a liner solution which is ready to be taken forward by the supply chain for UK water industry.

**Dr Katrina Flavell, Innovation Technical Specialist at Yorkshire Water, said:**

*“The water sector, lining industry and regulators have seen the potential benefits of the Designer Liner project during phase one, and we’re thrilled to have secured funding for phase two, which will see the development of a lining solution fit for a 21st century water network. Adoption of this solution will lead to a more resilient network, resulting in better service for our customers and measurable carbon savings. We were delighted to work with fantastic partners during phase one, and look forward to collaborating even more widely during phase two.”*

# Completing by March 2024

More than two years into the Fund, we are starting to see projects complete with a number concluding over the coming year. Rather than waiting until our next

annual report, we will regularly update the Fund's website with information on completed projects.

The following projects are expected to complete by March 2024:

Projects completing by March 2024	
Innovation in Water Challenge	Industrial symbiosis (Complete) ✓
	Leak detection using dark fibre (Complete) ✓
	Reservoir Water Community Monitoring for Algal Associated Risk Assessment (Complete) ✓
	Smarter Tanks to Build a Resilient Network (Complete) ✓
	Supporting Customers in Vulnerable Circumstances (Complete) ✓
	AI & Sewer Defect Analysis
	Enabling Whole Life Carbon Design
	Organics Ammonia Recovery
Breakthrough 1	Triple Carbon Reduction
Breakthrough 2	HyValue – Hydrogen from Biogas (Complete) ✓
	Water4All (Complete) ✓
	Designer Liner
	Unlocking bioresource market growth
	Pipebots for rising mains
	Unlocking digital twins
	Support for All
	SuPR Loofah (Sustainable Phosphorus Recovery)
	Towards incentivisation for community-centric rainwater management
	Unlocking digital twins

# Common project delivery challenges

To support the Innovation Fund projects we have set up a programme of monitoring. This begins with a baseline report that all projects complete. They then submit quarterly reports

setting out progress and identifying any risks or issues with project delivery and any lessons learnt. This has helped us identify common project delivery challenges, as follows:

## Inflation

Projects that received funding in the early rounds of the Fund did not anticipate the levels of inflation that we have seen over 2022-2023. Project teams affected have found savings by rescoping plans, by using contingency funds and in some cases by identifying additional sources of funding. In addition, we introduced an inflation top-up mechanism which enabled projects to proceed as planned in pursuit of the original intended outcomes. Entries to more recent rounds of the Breakthrough Challenge have better reflected inflation pressures.

## Collaboration agreements

One of the successes of the fund has been the number of water companies, supply chain, academia and other organisations who have been working in partnership to submit and deliver Innovation Fund projects. This has also brought about challenges in ensuring all partners are able to sign collaboration agreements, resulting in delays to projects commencing. To address this, water companies have produced a common collaboration agreement template that can be used between water companies and other partners which should speed up project implementation.

## International shipping

A few of the projects have been affected by the delays in international shipping caused by the coronavirus pandemic and war in Ukraine. In most cases projects have used the delay to progress other areas, however, the long lead times have meant some projects have experienced delays.

## Quality of monitoring reports

The monitoring system has been developing and adapting as we and project teams become familiar with the process. Whilst the monitoring reports provide a helpful update we have found they often

lack detail with, in some cases, only a high-level statement being made without any supporting explanation or reason given. In most cases project leads are also reluctant to provide detail of lessons learnt (both positive and negative) and where present tend to only cover technical information rather than any learning about how the project was undertaken and challenges faced.

## Learning and information sharing

While we have seen some learning being shared from projects, only one finished project has produced a public facing document so far. Several have appeared at conferences and provided sector facing workshops including showcases organised through Spring, but there appears to be a lack of any lasting permanent record of learning for others to gain from in future. The sharing of this information is essential to allow for decisions around adoption to be made, to prevent duplication of effort, and to provide a base of learning for future projects. Our expectations go beyond what has been done so far and we would like to see companies do more to capture and share critical learning. For example, this could include looking to Spring to provide advice and support to optimise knowledge transfer opportunities.

## Changes to project design

Some entries to our early funding rounds identified problems in the early stages of project delivery. These problems could have been addressed if more research had been undertaken before the project commenced. This may have, at least in part, been the result of the speed at which our early competitions were timetabled, leaving shorter lead-in times for entry preparation. We have not seen this level of change in entries for our more recent competitions where competition timings have been published far in advance of entry submission deadlines, thus enabling companies and partners to plan their entries more thoroughly.



# Ofwat forward look and next steps

**As outlined in the previous section, the innovation fund has started to make an impact in accelerating innovation efforts across the sector.**

It has funded projects that may not have otherwise been able to move forward. Importantly, it has enabled water companies to collaborate with each other, resulting in a better coordination of innovation activities, increased efficiencies, and reductions in duplication. And this is just the start.

Further work is required in the coming years to ensure the long-lasting impact of the fund, and that it makes a significant contribution to the sector's efforts to address the key challenges around net zero, asset resilience, water scarcity, population changes and so on.

## **The big challenges the Fund and sector need to rise to in the future include:**

- Ensuring we are equipped to embed proven, demonstrable innovations across the sector, breaking the 'death by a thousand trials' experiences of many trying to bring their solutions into the water sector and ensuring we are extracting every ounce of value the fund has to offer. This includes understanding the role Ofwat should play in supporting the widescale roll out of proven projects and the sharing of learning and insights;
- Continuing to provide an appropriate range of opportunities (whether through competitions or not) to ensure the best innovative ideas can come forward and flourish;
- Continuing to seek inspiration and innovation from outside of the water sector, encouraging a diversity of inputs, including how we work more closely with other innovation funds;
- Ensuring insights from the fund feed into policy discussions about how regulation can better support innovation in the sector;
- Finding ways to better engage smaller water companies, NAVs and water retailers to ensure they can engage with the fund on an equitable basis. Each of these key players in water can offer unique perspectives and abilities, but can struggle to access the same resources as larger water companies; and
- Considering how the water sector can ensure better equality, diversity and inclusion ("EDI") practices. This would include ensuring diverse voices and ideas proliferate in innovation teams, and influence the rest of the sector into improvements in EDI.

# Next steps

## Breakthrough Challenge 3

Concluded in Spring 2023. A full list of winners can be found [here](#).

## Breakthrough Challenge 4

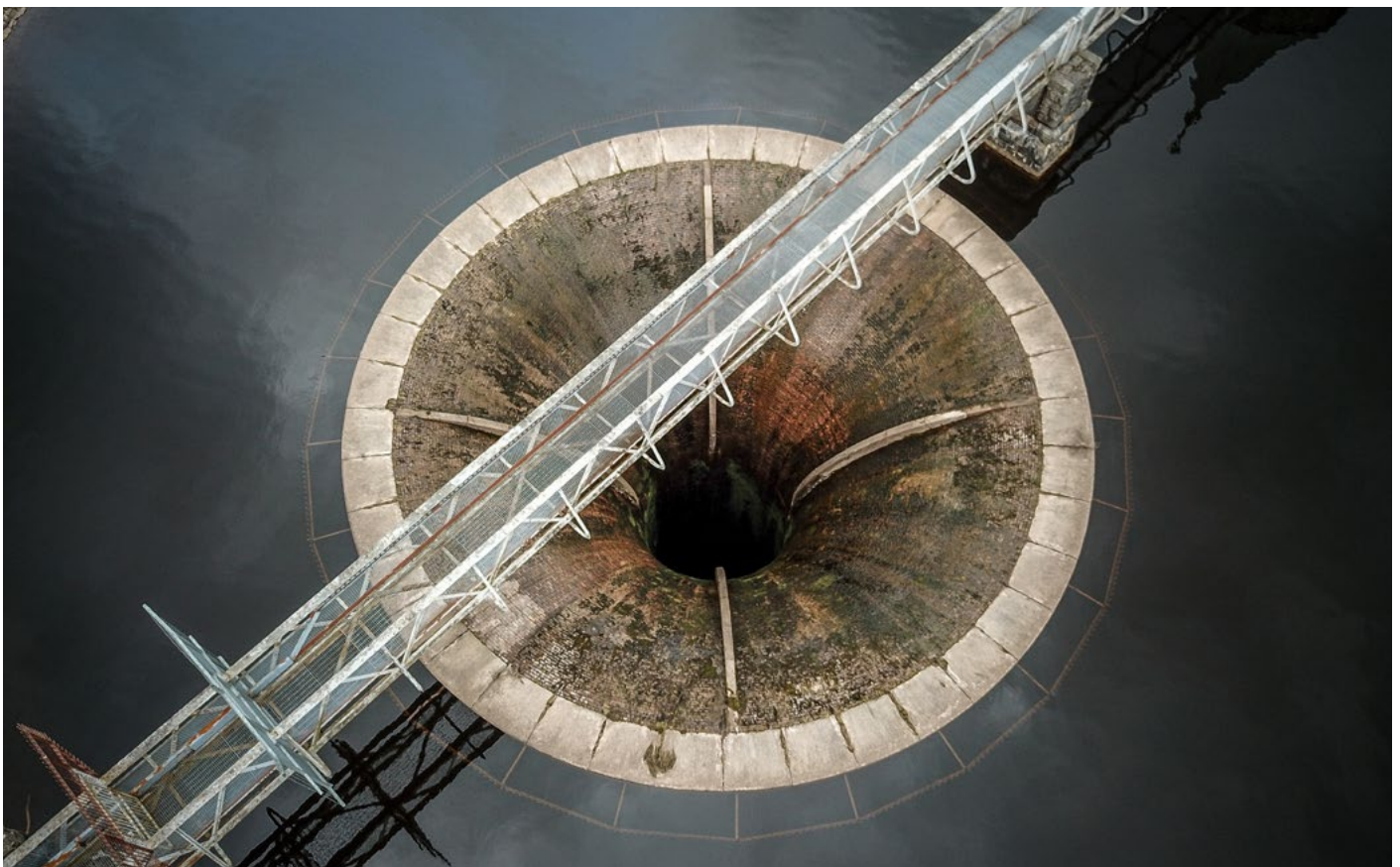
We will be launching the fourth round of our innovation competitions in September 2023. We will be publishing more updates, including the competition timetable, over the summer.

## Water Discovery Challenge progress

We announced our 20 finalists on 4 July 2023 and will be announcing the 10 Winners in early 2024.

## The future of the Fund

The [Price Review 2024 Final Methodology](#) confirmed the fund will continue for the period 2025-2030 and will be worth at least £300m. We will be engaging with the sector and other stakeholders during 2023 and will be publishing our proposals in early 2024.



# Appendices



## Appendix A: Competition participation statistics

Water Company	Total winning entries	Total awarded (£M)	% of total winning entries	% of total ££ awarded
Northumbrian Water	12	18.905	21.1	17.9
Severn Trent Water	8	18.066	14.0	17.1
Anglian Water	7	19.455	12.3	18.5
United Utilities	7	26.122	12.3	24.8
Thames Water	5	7.729	8.8	7.3
Dwr Cymru/Welsh Water	4	3.184	7.0	3.0
Affinity Water*	3	3.242	5.3	3.1
Yorkshire Water	3	5.458	5.3	5.2
Bristol Water	1	0.622	1.8	0.6
Hafren Dyfrdwy	1	0.206	1.8	0.2
Portsmouth Water*	1	0.155	1.8	0.1
SES Water*	1	0.224	1.8	0.2
South East Water*	1	0.178	1.8	0.2
South Staffs Water*	1	0.270	1.8	0.3
South West Water	1	1.000	1.8	0.9
Southern Water	1	0.617	1.8	0.6
Wessex Water	0	0.000	0.0	0.0
<b>TOTAL</b>	<b>57</b>	<b>105.433</b>	<b>100.0</b>	<b>100.0</b>

\* Water-only companies

Northumbrian have been awarded funding for 12 of their entries (accounting for over 21% of all winning entries)

78.3% of funding has been awarded to 4 lead entrants (Northumbrian, Severn Trent, Anglian and United Utilities).

United Utilities has been awarded almost a quarter of all funds so far (24.8%).

Water only companies have contributed 7 winning entries drawing down 3.9% of the awarded funding so far.

Water Company	Total involvements as lead or partner (across 169 entries)	Total involvements in winning entries (across 57 winning entries)
Dwr Cymru/Welsh Water	56	27
United Utilities	56	27
Anglian Water	50	28
Severn Trent Water	46	24
Northumbrian Water	43	22
Southern Water	41	25
Thames Water	39	25
South West Water	38	16
Wessex Water	25	14
Affinity Water*	21	13
Portsmouth Water*	21	10
SES Water*	21	9
Yorkshire Water	21	14
South East Water*	20	11
Bristol Water	17	5
South Staffs Water*	13	3
Hafren Dyfrdwy	7	4
<b>TOTAL</b>	<b>535</b>	<b>277</b>

\* Water-only companies

Welsh Water and United Utilities have recorded the highest number of involvements (named as a lead or partner on a submitted entry) in our competitions thus far, involved in 56 of 169 (33%) entries each.

All but one water company into double figures for involvements (with only Hafren in single digits) suggesting widescale engagement in the competitions to date.

Of the 535 water company involvements in entries thus far, water only companies account for almost a fifth of these, 96/535 (18%).

Three small water and sewerage undertakers, under New Appointment's and Variations (known collectively as "NAVs") have had successful entries as partners. These are Albion Water, Independent Water Networks and Leep Water.