Around the world, water resources are already under pressure. Innovative approaches are needed to manage the challenges of ageing infrastructure, climate change, increasing population and increasingly demanding customers. The water sector must also manage sustainability challenges such as rising resource costs, attracting investment and skills shortages.

We want to partner with you to tackle these challenges together.

Vision: To act as a key global hub for identifying, researching, developing and implementing internationally leading high-impact water innovation, that enables positive economic, social and environmental impact.
The University of Sheffield

Research leadership – our major strategic water grants stem from several funding bodies including:

£3.9m TWENTY65, the UK’s flagship water research project (EPSRC)
£1m Pipe Dreams (EPSRC)
£1.4m Cloud to Coast (NERC)
£2.5m Urban River Corridors & Sustainable Living Agendas (URSULA) (EPSRC)
€4m Quantifying Uncertainty In Catchments (QUICS) (EU)
€113m Urban Water Systems for a Changing World (EPSRC Platform Grant #3)

“We need earlier, closer links between business and academia to ensure we capitalise on our world-beating capabilities in linking water systems with other services. Stakeholders have yet to appreciate fully the benefits of innovation through collaboration.”

Professor Carolyn Roberts

The opportunity
Working with the right partner

For the UK water sector to lead innovation and sustainability in a rapidly evolving international arena, it is essential to have the right partner enabling scientific innovation, supporting implementation and enhancing international links.

With a focus on resilience and sustainability, water expertise at the University of Sheffield provides scientific excellence, a thorough understanding of the water sector, strong international collaborations as well as a track record of effective partnership working. The Pennine Water Group at the University of Sheffield is unique in winning three consecutive platform grants from the Engineering and Physical Sciences Research Council (EPSRC) since 2001 for its industry related research programmes, as well as funding from many other bodies.

We unite broad expertise from several disciplines – in water science and technology, engineering, social sciences and energy sustainability. We deliver high-impact research that is directly market relevant, based on decades of experience working in close partnership with key players in the water sector.

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€113m Urban Water Systems for a Changing World (EPSRC Platform Grant #3)

£20m+
...the conceptual approach and resulting tools and techniques from the discolouration research from the University of Sheffield have contributed to a step change in culture and practice in the English and Welsh water companies.”

Mark Worsfold
Director and Chief Engineer, OFWAT (Regulator for Water and Sewerage Providers in England and Wales).

The opportunity

Innovative technological solutions

Our collaborative research has led to innovative practical solutions which are in use across the water sector, both here in the UK and overseas. We fully support the UK Water Partnership’s vision for exploiting innovations developed in water technology innovation clusters, bringing our advanced manufacturing expertise to bear at all technology readiness levels.

A demonstration of our ability to provide practical solutions for the sector is our Prediction of Discolouration in Distribution Systems (PODDS) project. Funding from the University, the Engineering and Physical Sciences Research Council (EPSRC) and nine UK water companies over the last decade has led to cost savings and huge advances in the quality of water delivered to customers.

The impact of our PODDS research is recognised as making a step change in water quality improvement through its widespread inclusion in water company Distribution Operation and Maintenance Strategies, and Asset Management Plan (AMP) documents.

PODDS is showing clear results for Scottish Water as it looks to make a £15m saving through its introduction. Similarly, Northumbrian Water’s £6m investment in PODDS has resulted in a 35% reduction in reports of discolouration over a two-year period.

1/3 reduction in consumers reporting a problem with drinking water quality.
“Too much, too little or too polluted: more and more, this characterises the key water challenges facing cities... by 2050 water demand will increase by 55% globally, and about 4 billion people will be living in water-stressed areas.”

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The opportunity

Innovations in water management and governance

Collaborate with our research leaders to improve your resilience to uncertainty.

PREPARED: Enabling Change through the Adaptation Planning Process

Tasked to explore how the water industry could meet the challenges presented by climate change, this multidisciplinary EU funded project collaborated with water utilities across Europe to develop adaptation technologies and decision-support tools. The resulting tools are enabling faster responses to extreme events, while preventing and limiting damage, risks and disturbance in the urban water cycle.

DRY: Drought Risk and You

The four year inter-disciplinary DRY project is working with stakeholders to co-produce an easy-to-use resource for drought risk management. This Natural Environment Research Council (NERC) sponsored research spans catchments across the UK which have diverse hydrological, economic and demographic characteristics. Integrating drought science and scenario-modelling with stakeholder engagement and narrative research, the team is developing a multi-stakeholder resource of drought narratives.

APP: Adaptation Planning Process

Our social-science led team developed and piloted the Adaptation Planning Process with the Asset Strategy and Planning team at Dwr Cymru Welsh Water. The APP draws on the knowledge and skills of water company staff to plan their activities in the context of uncertainty, such as that arising from climate change.

SESAME: Finding ways of promoting SME adaptation to flood risk

Engineering and Physical Sciences Research Council (EPSRC) funded, SESAME investigated the impact of flooding on UK small and medium sized enterprises (SMEs) and the knock-on effects to the wider economy. The team produced tools for SMEs based upon their research findings. These included practical guidance to help small businesses become more resilient to flooding.

CLEAR IDEAS: Collaboration for Innovation

The CLEAR IDEAS approach developed in the Management School at the University of Sheffield is facilitating understanding of the factors influencing collaboration between water sector stakeholders to overcome barriers and develop practical tools to accelerate innovation.

Annual damages from flooding events could increase to €23.5 billion and the number of people affected by flooding each year will double over the next 70 years to 0.5–0.8 m.
Every day, water sector practitioners use tools, techniques and guidelines developed by our researchers.

The Sheffield Water Centre has a broad range of tried and tested partnership and engagement models to translate research into better business results across all parts of the water supply chain.

We facilitate benchmarking and knowledge transfer from other industries into the water sector.

With our expertise and enthusiasm, all parts of the water supply chain can successfully apply robust research-based solutions to your complex challenges.

From remediation of groundwater pollution to surface water management, our research has contributed to industry guidelines.

This is all possible because of the close partnerships we seek, build and maintain with industry, and the interdisciplinary nature of our research groups.
Why collaborate with Sheffield?

To leverage your research funding

We have a successful track record of helping organisations increase their research budgets. Our culture of developing partnerships makes doing business with us easy.

Faculty Gateways and department based Business Development Managers fast-track and support University–industry partnerships.

Centrally coordinated, flexible contracting models and framework agreements are in place.

A central Research and Innovation Services team coordinates major bids and scans for opportunities.

Our membership of EU and UK Funding Council panels gives us an in-depth understanding of criteria as well as notification of future calls.

"Sheffield Water Centre is playing a crucial role in challenging the water industry to think about the way it is working with people and communities."

Jacob Tompkins
Managing Director, Waterwise

Access to our experts

Our academics are prominent advisers to many Government departments and agencies. We have more than 150 researchers active in water R&D across 15 research groups with excellent connections with universities both here in the UK and around the world.

Thought Leadership Clubs

These multi-disciplinary consortia bring together innovators from academia and a variety of industries to find novel solutions for water challenges to anticipate problems, co-create joint research programmes and shape the UK’s strategic research agenda for water.

Working with our Thought Leadership Clubs (TLCs) we have identified Buried Infrastructure Performance, Zero Failures and Resource Recovery and Efficiency as key challenges facing the water sector. We are collaborating with partners in the private, public and voluntary sectors to develop novel solutions.

Advising Government on water and flood infrastructure

University Vice-Chancellor, Professor Sir Keith Burnett is President of the Science Council and serves on the Advisory Council for Science and Technology and is a member of the Council of Science and Technology, reporting to the Prime Minister. He has also been appointed to the Infrastructure UK Advisory Council, which advises the Treasury on major investments totalling up to £200 billion over five years, including on energy, transport, waste, flood, science, water and telecoms.

Influencing White Papers

Building on previous work for DEFRA, we continue to develop white papers, policy briefings and advice to government departments. Professor Lorraine Maltby from the Department of Animal and Plant Sciences now advises the Scottish Government on science strategy to inform environmental policy.

Connected with Industry

Our researchers and students also benefit from direct input by Visiting Professors from the water industry:

Professor Issy Caffoor previously served as our Knowledge Transfer Chair in Water Sustainability. Prior to that he was R&D Manager at Yorkshire Water.

Professor Tony Conway is a former Executive Director of United Utilities where he focused on identifying world-leading water utility innovation, engaging with innovation hubs around the globe and introducing these new approaches into the organisation.

Professor Mirjam Blokker from Dutch company, KWR Watercycle Research Institute, where she is Principal Scientist in the field of drinking water distribution.

Professor Christopher J Digman is a member of the TWENTY65 Leadership Board and Technical Director for Urban Drainage at civil and environmental consulting and contracting engineers, MWH. His interests include managing storm water using sustainable solutions, integrated urban drainage, sewer solid management and sewer blockage reduction.

150m hydraulic transients pipe test facility at Sheffield

sheffield.ac.uk/water
Why collaborate with Sheffield?

Work with the UK’s largest urban water research group

Established in 2001 as the Pennine Water Group, the Sheffield Water Centre (SWC) has evolved to become the largest UK research group focused on the interdisciplinary management of urban water infrastructure. We attract consistent funding from many external sources including UK Research Councils (EPSRC, NERC, Innovate UK) Environment Agency, European Union and industrial partners. The wide portfolio of research topics focuses on integrated and sustainable urban water systems and developing tools and techniques used every day by water practitioners.

The Sheffield Water Centre integrates research expertise across civil, chemical and biological engineering, computer science, environmental microbiology, instrumentation, economics and social and behavioural science. Working with UK and international advisers from industry and academia ensures our research strategy aligns with the immediate and future needs of the water sector to provide sustainable water for all.

New Facilities

The University will host the ‘Distributed Water Infrastructure Laboratory Facilities’ as part of the UK Collaboratorium for Research in Infrastructure & Cities (UKCRIC). This new, world leading facility will enable full scale experimentation of water and sewer pipes and ancillary structures to study deterioration and failure mechanisms, in-pipe biological/chemical and physical processes, flooding and corrosion processes and the assessment of asset condition under realistic full-scale environments.

It will be a major part of the Integrated Civil and Infrastructure Research Centre (ICAI’s) and will complement our new large scale structural dynamics Laboratory for Verification and Validation (LVV) - both funded by the European Regional Development Fund (ERDF) and the Engineering and Physical Sciences Research Council (EPSRC). This will also be complemented by our activities in the Urban Observatories component of UKCRIC. Research at these facilities will be integrated with our Urban Institute which aims to address some of the major social, economic and environmental challenges facing our cities today.

To access our world-class facilities

Our large-scale water engineering facilities currently exceed £5m in value, providing access to independent testing, validation and demonstration services. They are internationally unique with real-time monitoring and computer control.

- 600m temperature-controlled drinking water quality pipe facility
- 150m-long hydraulic transients pipe facility with leakage section
- 1/6th scale urban drainage/flood facility
- Syphonic roof drainage facility
- Range of open channel flumes, including tilting and flooding facilities
- Temperature-controlled in-sewer processes annular flume and waste water facility

World-class analytical testing facilities include a wide range of engineering, chemical, environmental and microbiological laboratories equipped with specialist testing equipment.

Research groups here are leaders in imaging and analysis techniques, operating some of the world’s most powerful microscopes and high-capacity data modelling and computational systems.

Our internationally recognised laboratories and research teams allow research to be conducted from the molecular scale to the catchment scale, enabling cutting edge research to be explored and validated against current industry practice.
Our impact and expertise

We have world class capabilities in:

- Policy
- Business management
- Health
- Economics
- Regional planning
- Sociological sciences
- Human geography
- Natural Sciences
- Water technology
- Engineering

We have a diverse range of water sector capabilities within the Sheffield Water Centre and recognise that many issues and opportunities are interconnected. By uniting our broad expertise from several disciplines, we can deliver high-impact research that is relevant to today’s market and meets the sector’s objectives going forward.

We collaborate with over 250 water sector partners to prioritise research and innovation globally.

Water supply

Pipe Dreams, is a pioneering multidisciplinary project led by Professor Joby Boxall. This research tackles problems of ageing UK water infrastructure and makes a major contribution to improved operation, control and management of existing buried pipe infrastructure maximising its performance and helping guarantee the quality and safety of drinking water.

Prediction of Discolouration in Distribution Systems (PODDS): Discolouration is an issue common to many utilities. This project provides a framework and toolset to optimise the maintenance strategies for distribution pipes and trunk mains to reduce the risk and likelihood of discoloured water.

Now in its fifth phase, the PODDS group research programme is collectively funded and steered by its water industry members. The results have changed culture, planning and practice in water utilities in the UK and internationally. Linking the PODDS approach to the US Environmental Protection Agency industry standard EPANET has been key to wider uptake.

Plasma micro reactors: Sheffield researchers have adapted the reactors for use in the removal or recovery of complex organics from clear water, with the specialist targets of pesticides and nitrates, balancing water disinfection, priority substances removal from waste water, final disinfection and application to laundry cleaning and sterilisation.

250 water sector partners

Waste water and storm water

SewerBatt™: This acoustic sensing technology for locating pipe connections, cracks and blockages has been recognised with several industry awards and is now in use by UK and international water utilities.

Integrated catchment modelling: Radar and rainfall forecasting down to individual street level allows detailed sewer network modelling. This provides an essential tool for the forecasting of flow and quality to enable efficient asset management, automation to minimise spills and prevent sewer flooding.

Specific examples are our research projects dealing with the fate and transport of faecal indicators – From Cloud to Coast and Quantifying Uncertainty in Integrated Catchment Studies (QUICS).

Sewer flooding: CENTAUR is a Horizon 2020 Innovation Action project aiming to provide a cost effective, local autonomous sewer flow control system to reduce urban flood risk. CENTAUR will be developed and tested using computer models and laboratory test facility, before pilot deployment for field testing and development.

Micro-bubble technology: Awarded a national prize and adapted to the water sector, our innovative micro-bubble technology can achieve wastewater aeration, dissolved air flotation, algal bloom harvesting and remediation of eutrophic waterways, algal mass production, biogas sweetening and intensification of anaerobic digesters and anammox removal of ammonia.

Water economics

Water pricing: Academics from the Sheffield University Management School worked with water utility staff to prepare for AMP6, drawing on research expertise in environmental economics and factor efficiencies to examine choices and preferences for water, water footprints in supply chains and efficient water pricing.

Bursts and leakage: We combined technology to develop monitoring and control expertise to manage levels of leakage, including Automated Data Analysis (ADA) using fuzzy logic computing approaches for turning data into information. By generating leakage or high usage alerts ADA software can help utilities manage resources more efficiently and economically. It was awarded the IWEX University Challenge Water Industry Achievement Award in 2010.

Asset performance improvements: SEAMS Ltd, a spin-out from the universities of Sheffield and Exeter provides analytics software and services to water and energy utilities to identify, plan for, and implement asset performance improvements, enabling companies to generate business plans at lower costs and saving time in the process. Clients include Northumbrian Water and Severn Trent.
Our impact and expertise

Water citizenship

Our urban water governance research seeks to support a transition to more sustainable socially orientated water systems through investigating and supporting closer working between water utilities and their stakeholders. Within the Faculty of Social Science, projects have investigated sustainable infrastructures, probed influences on customer behaviours, examined the socio-political consequences of depleting natural resources and the opportunities for innovative economies.

Within the Faculty of Engineering, computer science researchers study and develop how to empower citizens and communities to collect and process data in the environment, and become active stakeholders in capturing, evaluating and communicating information about flood events and other water related issues.

Harnessing citizen observatories: Indications are that the number of people affected by flooding each year will double over the next 70 years to between 0.5 and 0.8 million and annual damages from flooding events could increase to £23.5 billion. WeSenseIt is a project aiming to mitigate these problems by developing a citizen-based observatory of water, allowing people and their communities to become active stakeholders in information capture, evaluation and communication.

The project takes advantage of the power of social media, data gathering from the web, and techniques developed from collaboration between the Department of Computer Science and Department of Landscape for big data analysis and 3D visualisation.

Flooding, businesses and resilience: Flood risk researchers from the Sheffield Water Centre are working closely with the local authorities in Yorkshire and beyond, as well as with European partners in planning how to adapt to climate change through, for example, cross service collaborations. Colleagues at Sheffield University Management School contribute to projects such as SESAME which investigated how business organisations prepare for flood events in urban areas.

Drought risk management: At the other end of the scale of extreme weather events, Management School researchers are working on the DRY project to develop a decision making tool for drought risk management. Other projects have investigated customer reactions to water efficiency measures.

Stakeholder satisfaction: Experts in the Department of Urban Studies and Planning drew on their knowledge of public trust to investigate stakeholder views on a water utility’s services, involving:

- Mapping stakeholders across all functions and activities
- Identifying those commonly overlooked
- How values of stakeholders aligned with the utilities’ values
- What the relations were with key stakeholders
- How trust is built with stakeholders

A further project studies how water companies have incorporated customer views into their Asset Management Programmes.

Community action: Research within Project URSULA (Urban River Corridors and Sustainable Living Agendas) demonstrated how the Five Weirs Walk Trust, a small but tenacious community group, achieved real enhancement in environmental value.

Environment

Improving sustainability by reducing carbon footprints: Our research intensive centres are developing innovative understanding of energy, environment and sustainability needs for a low carbon future. These platforms link research from University-wide initiatives such as the Grantham Centre for Sustainable Futures, the Advanced Manufacturing Research Centre with Boeing (AMRC), Nuclear AMRC and Sheffield-Siemens Wind Power Research Centre (S²WP).

SuDS and Green Infrastructure: Our SuDS (Sustainable Drainage Systems) and Green Infrastructure research focuses on understanding how naturally-inspired devices such as ponds and green roofs can help to manage urban storm water runoff. This work is interdisciplinary, involving engineers, soil and plant scientists, landscape architects and urban planners. We work with national partners including CIRIA, the water utilities and local authorities.

Ecology and Ecotoxicology: Sheffield is home to internationally recognised research expertise in ecology, in particular freshwater ecology and ecotoxicology, seeking to address aspects of groundwater pollution, integrated management strategies and investigation, assessment and development of innovative remediation concepts for contaminated land and groundwater. Projects include the study of microbial dynamics and biodegradation potential in contaminated plumes in groundwater and managing impacts from agricultural intensification on surface water and groundwater resources.

Algal Research Network: Our academics are exploiting breakthroughs in micro-bubble technology to enhance algae cultivation, harvesting and product extraction. We are bioengineering algae to improve yields of biofuels and industrial products; and through synthetic ecology research, improving understanding of algae-bacteria interactions.

Biofilology: We take a holistic approach to studying biofilms within urban water systems to understand and ultimately engineer and control their impact on the system performance. Using our unique facilities and collaborations we are able to study biofilms from their development at the fundamental cellular level through to growth and maturity at pilot and field scale.

Groundwater Protection and Restoration Group: This is an international centre of excellence for applied research on groundwater, focusing on fundamental aspects of groundwater pollution, integrated management strategies and investigation, assessment and development of innovative remediation concepts for contaminated land and groundwater. Projects include the study of microbial dynamics and biodegradation potential in contaminated plumes in groundwater and managing impacts from agricultural intensification on surface water and groundwater resources.

Using electrokinetic enhanced bioremediation to stimulate degradation of groundwater contaminants

1. Degradation stimulant
2. Electrodes
3. Water table
4. Contaminated low permeability material e.g. clay
Global water strategy planning and policy

Our impact and expertise

Global water strategy planning and policy

Our influence on water policy and strategy is extended by our research collaborations with organisations along the whole water supply chain, as well as governments and their agencies. We are continually expanding our global links and activities.

From transnational water insecurity in High Asia to rural water governance in the Global South, and from understanding the cultural significance of rivers to controlling diffuse water pollution in rapidly urbanising cities, our research provides an evidence base for government policy, industry regulations and NGO action.

Research in our School of East Asian Studies addresses the domestic and international motivations behind China’s changing role in the world with a particular focus upon Chinese responses to transnational security challenges such as water security, environmental degradation, food security, and maritime conflicts.

Academics in our departments of Geography, Landscape and Urban Studies and Planning are actively studying how to ensure equality of access to water, scrutinising the nature of policies, how they travel across different scales and their impacts for communities and institutions in the Global South.

Through our leadership of the UK’s Nexus Network we link research and policy across food, energy, water and the environment.

In the developed world, in collaboration with international experts from Europe, North America, the Environment Agency and industry, we have developed best practice guidance for the assessment and management of liquid pollutants in the subsurface.

We work with partners in other European countries to influence their perspectives and policy objectives. For example, members of our team have input to the OECD reviews of flood risk management and flood preparedness in France.

Our research has explored the potential of retrofitting sustainable drainage to influence water quality and flooding problems in London and Scotland, informing work for the Thames Tideway Tunnel, the Scottish Government and Scottish Environment Protection Agency.

At a regional level, we serve on the Yorkshire and Humber Flood Risk and Coastal Erosion Risk Management Committee, leading activity on communications and engagement. We work closely with a number of local councils and water utilities to build coalitions of stakeholders that can apply for funding to address flooding and water quality issues.

In partnership with the Environment Agency our catchment science experts provided important evidence to support the implementation of the EU Water Framework Directive in the UK.

Secondees from Sheffield to Defra’s Water Quality Group identified knowledge gaps and developed a research strategy for diffuse urban water pollution, contributing to the Water for Life White Paper: we also worked with Defra on the Making Space for Water pilot projects.

Tailored Water Solutions for Positive Impact

TWENTY65

Our Thought Leadership Clubs told us what they needed and this led to TWENTY65, which is the UK’s flagship water research project funded by the EPSRC. TWENTY65 brings together over 35 experts from six of the UK’s leading universities. Working collaboratively with the water sector in interdisciplinary teams, they are developing practical solutions to address the grand challenge of providing sustainable water for all by 2065.

TWENTY65 aims to achieve this by:

– Undertaking exciting and ambitious scientific and engineering research to develop transformative socio-technical solutions to deliver sustainable clean water for all

– Revolutionising the way innovation is delivered in the water sector, generating and implementing transformative research

– Driving re-visualisation of water service provision to achieve flexible, resilient and adaptive systems that combine measures to suit specific circumstances

Supported by more than 40 partners across the international water industry supply chain, TWENTY65 is a consortium of the University of Sheffield, University of Exeter, University of Manchester, Imperial College London, Newcastle University and University of Reading.

It is the UK’s flagship water research project funded by the Engineering and Physical Sciences Research Council (EPSRC).

Sources: shutterstock

Images: Eleven Design

The Hub: Enables collaborative, responsible innovation through roadmapping for the water sector, knowledge capture and dissemination, and facilitation of coproduction across the water supply chain.
Early engagement with our students attracts the best candidates into graduate recruitment programmes.

We are not just about today’s expertise but also about developing future leaders for the water sector. Our wide-ranging, water industry-relevant BSc, BEng, MSc and MEng programmes attract the best people and produce excellent graduates. The close relationship we have with the water sector ensures that the content of our programmes meets the future needs of industry.

Our PhD study opportunities include the cross-institutional Engineering and Physical Sciences Research Council (EPSRC) Centre for Doctoral Training in Engineering for the Water Sector, STREAM, established specifically for the water industry.

stream-idc.net

Continuing Professional Development (CPD) for water professionals: We have a programme of modular Engineering masters courses tailored to water industry needs. Our existing research-led teaching modules can be adapted as bespoke CPD courses for specific organisations and include wider, broader skills such as computing and communications skills. Because we integrate input from water research leaders and industry practitioners, our CPD programmes stay relevant and develop valuable skills.

Name Lucy Irons
Qualifications Physics BSc, Water Engineering MSc
STREAM project sponsors EPSRC, The University of Sheffield, Anglian Water
Academic supervisors Professor Joby Bosall, Dr Vanessa Speight
Industrial supervisor Dr Adam Brookes, Anglian Water
Project title Future Water Networks

“Advances in customer water metering present an opportunity to increase the density of data available for water distribution and can potentially be integrated into a wider smart water network. This project aims to explore how that high density data, describing both the spatial and temporal scale, could provide an insight into how the network is actually operating under changing conditions, and develop tools for hydraulic event location.

Being a part of STREAM provides many opportunities, but one of the most important has been placement within industry. Primary placement within Anglian Water has allowed me to work closely with a number of different teams, who have helped steer my project, provided me with access to different data sets and enabled field work to take place.”
Sheffield Water Centre

This brochure provides a snapshot of our research partnership capabilities. Contact us to discuss collaboration opportunities.

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sheffield.ac.uk/water  
#sheffieldwatercentre

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