Creating Partnerships

Water & Sustainability Research

Sheffield Water Centre
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“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, Environmental Sustainability Knowledge Transfer Network HTechO Tapping the Potential: A fresh vision for UK Water Technology (UKWRIP 2014)

The Opportunity

Working with the right partner

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

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. For example: The Pennine Water Group at the University of Sheffield is unique in winning three consecutive platform grants from EPSRC since 2001 for its industry related research programmes, as well as funding from many other bodies.

By uniting our broad expertise from several disciplines – in water science and technology, applied economics, social sciences and energy sustainability – we deliver high-impact research that is directly market relevant and meets the sector’s objectives going forward into Asset Management Programme 6 – Delivering totex (total expenditure) programmes in the water sector (AMP6).

£15 m+ for water related research since 2000
“...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
“To adapt, the sectors must consider all of the risks of climate change over the coming decades and take action to deal with those which are significant.”


Our social-science led team developed and piloted the Adaptation Planning Process (APP) with the Asset Strategy & 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.

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).
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.

Why collaborate with Sheffield?

Every day, water sector practitioners use tools, techniques and guidelines developed by our researchers.

We have 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 solid research-based solutions to 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 research funding

Our culture of developing partnerships with industry, and efficient and integrated funding bid processes, 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 & 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. The results speak for themselves.

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150m hydraulic transients pipe test facility

Why collaborate with Sheffield?

To access our experts;

Our academics are prominent advisors to many Government departments and agencies. We have more than 100 researchers active in water R&D, including 12 professors, and have excellent connections with universities both here in the UK and around the world.

Advising Government on water and flood infrastructure

University Vice-Chancellor, Professor Sir Keith Burnett is a member of the Council of Science and Technology reporting to the Prime Minister and has been appointed to the Infrastructure Council, which will advise 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

Professor David Lerner was seconded to Defra’s Water Quality Group in 2011 to identify knowledge gaps and develop a research strategy for diffuse urban water pollution. This enabled Defra to make a strong statement on moving towards solutions to these problems in the Water for Life white paper.

Our researchers and students also benefit from direct input by visiting professors from the water industry:

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

Thought leadership

Collaborate with our dynamic and creative research leaders to anticipate problems, innovate, co-create joint research programmes and shape the UK research agenda.
Why collaborate with Sheffield?

To access our world-class facilities

Our large-scale water engineering facilities exceed £3m 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.

Why collaborate with Sheffield?

To work with the UK’s largest urban water research group – The Pennine Water Group (PWG)

Established in 2001, the Pennine Water Group (PWG) 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, TSB) 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 group integrates research expertise across civil, chemical and biological engineering, computer science, environmental microbiology, instrumentation, economics and social and behavioural science. Working with the PWG Industrial Advisory Board and International Steering Committee ensures our research strategy aligns with the immediate and future needs of the water sector.

PWG Industrial Advisory Board

Tony Conway
Strategic Programmes Director – United Utilities

Simon Barnes
Head of Innovation – Yorkshire Water

Jeremy Bann
Consultant – JBA Consulting

Leo Carswell
Principal Consultant – WRG plc

Nick Hawkins
CEO – Acoustic Sensing Technology Ltd

Chris Jones
R&D Manager – Northumbrian Water

Mark Jones
R&D Manager – Severn Trent Water

Steve Kays
Head of Innovation – Anglian Water

Leo Petch
Manager of Business Improvement – Scottish Water

Issy Cador
Consultant

PWG International Steering Committee

Prof Francois Clemens
Head of the Department of Urban Drainage, TU Delft Netherlands

Prof Jenny Dixon
National Institute of Creative Arts and Industries, The University of Auckland, New Zealand

Prof Brian Karney
Chair, Division of Environmental Engineering & Energy Systems, The University of Toronto, Canada

Prof Ana Deletic
Managing Director of the Centre for Water Sensitive Cities, Monash University, Australia
Impact and expertise at Sheffield

The University of Sheffield provides the strong leadership and network expertise needed to draw together academic talent from policy, business management, health, economics, regional planning, sociological sciences and human geography, linking this to world-class expertise in the natural sciences, water technology and engineering.

We have a diverse range of water sector capabilities within the University and recognise that many issues and opportunities are interconnected. By uniting our broad expertise from several disciplines – in water science and technology, applied economics and energy sustainability – we can deliver high-impact research that is relevant to today’s market and meets the sector’s objectives going forward into AMP6.

Exploiting our interdisciplinary expertise to sharpen your competitive edge.

Water supply

Pipe Dreams, is a pioneering multidisciplinary project, led by Professor Joby Boxall from the Pennine Water Group (PWG). 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/recovery of complex organics from clear water, with the specialist targets of pesticides and nitrates, bathing water disinfection, priority substances removal from wastewater and final disinfection.
Our impact and expertise

Waste water & 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 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. A specific example is our research dealing with the fate and transport of faecal indicators from Cloud to Coast.

Reducing treatment volume: The University of Sheffield led the consortium for Project URSULA (Urban River Corridors and Sustainable Living Agendas). This included research into disconnecting surface water from existing buildings and natural water courses from the Combined Sewer System to reduce treatment volumes.

Micro-bubble technology: Awarded a national prize and currently being 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 are working 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: Technology, monitoring and control expertise to manage levels of leakage, including Automated Data Analysis (ADA) – 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.

Water customers and stakeholders

Our urban water governance research seeks to support a transition to more sustainable socially oriented 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 0.5–0.8 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 capturing, 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 managers from the Pennine Water Group are working closely with local authorities in Yorkshire and elsewhere to collaborate across their different services and to work with European partners in planning how to adapt to climate change. Experts in risk management and strategy at the Sheffield University Management School are contributing to projects such as SESAME by studying how businesses and not-for-profit groups prepare for flood events in urban areas.

Drought risk management: At the other end of the scale of extreme weather events, DRY is a multi-stakeholder decision-making tool for drought risk management from a business perspective being developed with the Sheffield University Management School. Previous projects have investigated customer reactions to water efficiency measures.

Stakeholder satisfaction: Experts in the Department of Town & Regional 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 the URSULA project demonstrated how the Five Weirs Walk Trust, a small but tenacious community group, achieved real enhancement in environmental value.
Our impact and expertise

Environment

SuDS and the Green Roof Centre: Our national Green Roof Centre works with partners across the country to research, demonstrate and transfer knowledge about effective greening designs in the UK, impacting on Sustainable Drainage Systems.

Ecology and Ecotoxicology: Sheffield is home to internationally recognised research expertise in ecology, in particular freshwater ecology and ecotoxicology, seeking to address the major challenge of population growth and managing landscapes to provide the food, water, fuel, housing and other resources required, whilst protecting the ecosystems that provide them.

Biofilmology: We take a holistic approach to study 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.

Reducing carbon footprints: Two research intensive centres – Centre for Energy, Environment and Sustainability and the Centre for Low Carbon Futures – 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 Project Sunshine, the Advanced Manufacturing Research Centre with Boeing (AMRC), Nuclear AMRC and Sheffield-Siemens Wind Power Research Centre (S²WP).

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. Current projects include the study of microbial dynamics and biodegradation potential in contaminant plumes in groundwater and managing impacts from agricultural intensification on surface water and groundwater resources.

Water strategy planning and policy

Being involved with research consortia that include industry and government agencies extends our influence on policy and strategy.

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

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

We serve on the Yorkshire and Humber Regional Flood Risk and Coastal Erosion Risk Management Committee, leading activity on communications and engagement (2010–present). We work closely with a number of local councils to build coalitions of stakeholders that can apply for funding to address flooding and water quality issues.

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Recent collaborations with Dwr Cymru Welsh Water have led to a surface water management strategy and the ‘Adaptation Planning Process’ for EU water utilities.

We work with partners in other European countries to influence their perspectives and policy objectives. Members of our team have had input into the 2012 OECD review of flood risk management in the Loire Basin in France and the 2013–2014 OECD review of flood preparedness for the River Seine in Paris.

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.

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

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 in three of the Making Space for Water pilot projects.

Reducing carbon footprints:

1. Degradation stimulant
2. Electrodes
3. Water table
4. Contaminated low permeability material e.g. clay

Using electrokinetic-enhanced bioremediation to stimulate degradation of groundwater contaminants
Recruitment and development

Early engagement with our students attracts the best candidates into graduate recruitment programmes.

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 meet the future needs of industry.

Our PhD study opportunities include the cross-institutional EPSRC Centre for Doctoral Training in Engineering for the Water Sector, STREAM, established specifically for the water industry.

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.

Around half of all quality failures ex-works in most UK water companies are for bacteriological parameters. My work resolved the root causes of two complex non-compliances for my industrial sponsor and improved the understanding of the costs of investigating failures.

Working closely with Severn Trent Water enabled me to gather the data needed for my analyses and gave me frequent opportunities to refine my ideas. Being part of STREAM meant that I was able to engage with researchers from other disciplines and meet people from all areas of the water industry.
Integrated Water Research at The University of Sheffield

This brochure provides a snapshot of our range of research partnership capabilities. Please use the contacts below for the latest information and opportunities as to how our cutting edge research can help your organisation.

For partnership development enquiries, please contact:

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Professor of Water Infrastructure Engineering
Department of Civil and Structural Engineering
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