

A local partnership for global innovation

Newcastle University and Northumbrian Water Group have an award-winning relationship.* From student projects to world leading, at-scale research, the relationship supports the interests and ambitions of both organisations.

* Business/Industry Collaboration of the Year Educate North Awards 2017



Prof Nick Wright (left) and Dr Russell Davenport (right) with NWG CEO Heidi Mottram at the opening of BE:WISE.



Advanced biology for water engineering

We are at the forefront of efforts to speed up the transition from energy-intensive treatment processes to low-carbon alternatives, and believe that advances in biological systems lead to more sustainable technologies.



We are developing a series of universal scientific principles that support the design of open, engineered biological systems such as water purification plants.

The Biological Engineering: Wastewater Innovation at Scale (BE:WISE) facility at NWG's Birtley treatment plant is the largest of its kind in Europe.

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Funded by a £1.2 million grant from EPSRC, BE:WISE is an international centre of research excellence and demonstration for wastewater management technology.



Sir James Bevan from the Environment Agency (left), with NWG CEO Heidi Mottram and Dr Russell Davenport (right).

We are helping
to accelerate
the translation
and uptake of
new innovations
by the water sector



BE:WISE facility located in Birtley, Gateshead, UK. The facility is made available to researchers worldwide.

Some of the wastewater treatment experiments part of BE:WISE are facilitated by the Newcastle University Frontiers in Engineering Biology (NUFEB) project.

NUFEB aims to gain a new understanding of the rules that determine the growth and dynamics of complex biological communities in engineered applications.

The NUFEB project simulates 'open biological systems' to generate 21st century technologies to sustainably address challenges in waste, energy, water, healthcare, new chemicals and materials, and agriculture.

Engineering biology research at Newcastle University seeks to reduce barriers to innovation by sharing the costs, offering control at scale, and accounting for uncertainty by allowing variation to be studied.

BE:WISE is developing a new suite of beneficial sustainable technologies simulated at the computer, trialled in the lab and translated to real world application.



Circular Economy

Newcastle University is leading in the development of wastewater fuel cell technology, that harvests energy from sewage and cleans wastewater. In collaboration with Northumbrian Water Group, researchers are making possible the future of converting waste into an energy resource using bio-electro-chemical systems — fuel cells powered by microbes and electrolysis cells that use microbes to produce hydrogen.



Prof Tom Curtis with a Microbial Electrolysis Cell. Trialled with NWG, the cell produces valuable hydrogen gas, a source of clean energy, from raw sewage at ambient temperature.

We have built
the world's first
pilot scale
**Bio-electro -
chemical
System** to
produce hydrogen
from **water
technologies**

Together with NWG, we have built and operated the world's first pilot scale bio-electro-chemical system to produce hydrogen from waste.

A major benefit of this type of wastewater reactor is its ability to acclimate to wastewater temperatures, and sustain wastewater treatment through periods of cold.

Installed at a sewage treatment works in Newcastle, it is the first working microbial electrolysis cell in the world to be fed on wastewater.

Blue-Green Cities

Our work shows
that Blue-Green
Infrastructure
has benefits
beyond reducing
flood risk



Blue-Green infrastructure (BGI) reduces flooding in urban areas. Our work shows BGI not only reduces flood risk, but may improve community health by reducing air and water pollution; enhancing ecosystems by restoring rivers, streams and wetlands; sequester carbon; reduce water scarcity; and make cities more resilient to environmental change.

We are founding members of UKCRIC – the UK Collaboratorium for Research on Infrastructure and Cities – and host the National Green Infrastructure Laboratory

and Demonstrators, and the Urban Observatory at our new £59m Urban Sciences Building at Science Central in Newcastle.

The University Estate is a laboratory for the University and NWG. At-scale Sustainable Drainage Systems (SuDS), coupled with advanced sensing networks are allowing us to study long-term performance and wider interactions of infrastructure within the greater urban system.



Digital

We have a strong track record in modelling, simulation and sensing, from urban flooding and monitoring to climate projections and weather radar. Researchers are developing the frontline modelling and forecasting techniques for understanding how our changing climate will affect us in the future, and monitoring the urban environment around us.

We have new
modelling
systems to predict
urban flooding
in the context of
infrastructure
interdependancies

Through our work as part of the UK Infrastructure Transitions Research Consortium (ITRC), we are at the forefront of data and analytics for infrastructure planning.



Artist's impression of the new building for the National Innovation Centre for Data and the National Innovation Centre for Ageing at Newcastle Science Central.

In the MISTRAL (Multi-scale Infrastructure Systems Analytics) project we are analysing infrastructure at multiple scales to provide decision makers with the necessary tools to understand the impact of their investments and explore the effects of future uncertainties.

An example of our work in flood modelling is the CityCAT (City Catchment Analysis) software tool for modelling, analysis and visualisation of surface water flooding. CityCAT makes possible rapid assessment of combined pluvial and fluvial flood risk.

We are demonstrating highly integrated analytics for infrastructure to inform decision making across scales

We have new modelling systems that predict flooding of large scale urban areas in the context of infrastructure interdependencies across energy, digital, communications, solid waste, transport, waste water, and water supply.



We aim to take this work further through digital observation and simulation of water catchments, combined with our expertise in urban water resources and infrastructure.

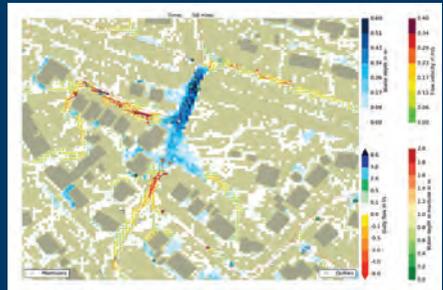


Image from the CityCAT (City Catchment Analysis Tool) showing urban flood risk in the city of Newcastle.

With NWG we are applying the knowledge and tools to innovate the future of the water sector by joining together business, academic research in cities and infrastructure and ICT. This will be done in collaboration with the National Innovation Centre for Data (NIC-D) to maximise the impact of digital data for water and wastewater services.



Newcastle University

Inspired by our unique industrial and technological heritage, we aim to build upon a 150-year tradition of world changing innovation. We aim to breakdown scientific and engineering boundaries, bridging between the actual and the aspirational. By considering both disciplinary excellence whilst also considering the bigger picture, we aim to develop the knowledge and innovation that will change people's lives for the better.



Northumbrian Water Group

Innovation and world class partnerships are a crucial part of how Northumbrian Water Group (NWG) will achieve its vision of becoming the national leader in the provision of water and waste water services. NWG innovates with a purpose to achieve its priorities: unrivalled customer experience and services that are affordable, resilient and sustainable.

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