The Big Questions facing the Water Industry

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Key challenges facing the water sector

- Climate change
- Population Growth
- Water availability (resilience)
- Ageing assets
- Environmental
- Culture
- Industry complexity
- Regulation that drives/stimulates innovation
- Aligning & engaging academia, supply chain and end users
Totex – What does it mean?

A shift to the right

- Build New Assets
- Optimise Assets
- Upgrade Assets
- Maintain Assets

Capex bias
Opex bias
Other Opportunities

• **Totex**
  - Making more of our ageing assets
  - Low or No build solutions
  - More asset maintenance and optimisation (less pouring concrete and laying pipes)
  - Natural capital

• **Digital Transformation**
  - Real time control
  - Developing sensors
  - Connecting the OT to the IT
  - Artificial Intelligence

• **New Skills - People of the Future**
  - Customer engagement
  - Data and Information Management
  - Managing Complex Systems
  - Modelling
  - Analytical Skills
Stimulating Innovation

• Open Innovation or Ivory Tower?

• Short or Long Term?

• Incremental or Step Change?

• Risk Management or Risk Taking?

• Innovator or Fast Follower?

• Large central budgets or collaborative funding?

• Market led or Technology led?
UKWIR Members

- Affinity Water
- Anglian Water
- Bristol Water
- Dwr Cymru Welsh Water
- Irish Water
- Northern Ireland Water
- Northumbrian Water
- Portsmouth Water
- Scottish Water
- Severn Trent Water
- SES Water
- South East Water
- South Staffs Water
- South West Water
- Southern Water
- Thames Water
- United Utilities
- Wessex Water
- Yorkshire Water
UK Water Industry Research

- Not for Profit organisation set up in 1993 by UK water companies
- Funded and wholly owned by its 20 current members
- Common interest research themes
- Research on ‘one voice’ issues
- Annual subscription revenue for research £3.2 M
- Over 1,000 projects commissioned over past 25 years
Our aims

To shape the future water research agenda

To deliver real outcomes to The water sector

Create a platform for research and innovation for the UK Water Industry
UKWIR Community

Programme Leads (12)

R&D Managers (20)

Consultants Contractors & Universities

UKWIR Staff (6)

Board (19)

Project Managers (15-25 part time contractors)

Project Steering groups
Our Research Programme

• Research Topic areas

- Climate Change
- Customers
- Drinking Water Quality & Health
- Engineering & Operations
- Environmental Quality
- Materials & Standards
- Process Control
- Programme Management
- Regulation
- Sewerage
- Sludge & Waste Management
- Toxicology
- Wastewater treatment & Sewerage
- Water Mains, Service & Leakage
- Water Resources
Why create a platform for Research and Innovation in the UK Water Sector?

• Leverage funding for projects
• Bring stakeholders together, (including other industrial sectors
• Support from and involvement of regulators, lateral endorsement and partnerships
• Reduces the problem of fragmentation in the water industry
• Do research collaboratively & deliver outcomes locally
• A platform for Open Innovation
• Develop short, medium and long term projects
A Strategic Approach – Asking the Big Questions

Halve Abstractions
Zero Leakage
100% Compliance

Sustainable WW Service
Zero uncontrolled discharges

Drinking Water
Wastewater

Regulatory framework,
(incentivising - asset maintenance,
efficiency etc.)

Customers, Regulation
Asset Management

Zero Water Poverty
Carbon Neutrality

Sustainability
Waste into products
Areas for further development

Assets of the Future

Sustainability

Great Customer Experience

SMART, Real Time, Condition Monitored

Circular Economy, Natural Capital, Triple bottom line, reduce carbon, Waste to products

Behaviour, Choice, Engagement, Segmentation, Contribution
Opportunities to Collaborate

Investing in the highest quality research and innovation across the UK and fostering a collaborative environment for universities, researchers and businesses.
Project: National Sewer and Water Mains Failure Database

- Enables industry to compare and analyse sewer and water mains failure data with anonymised data
  - “State of the Nation reporting”
  - Improved benchmarking of failure rates for different pipe sizes, material, environments...
  - Better understanding of failure behaviour against different criteria
  - Source of data for validating models and business cases
  - Helps ongoing research and model development
  - International collaborative research

UK Water Mains failure rate by material

Mains Repairs for PVC mains 2007-2014
Project: Climate Change Modelling and the WRMP

- Project Objectives
  - **Strategic**: Strategically plan for UKCP18 and WRMP 2024
  - **Efficient**: Provide a less labour intensive approach to assessing climate change impacts on water supply than WRMP 2014 / 2019......
  - **Communicate**: Support effective communication of climate risks and uncertainties to stakeholders
  - **Resilience**: Redefine the climate change methodology in terms of system drought resilience and exploit the richer understanding being developed by water companies

Evolution of climate change projections and methods in WRMPs
Project: Source Apportionment GIS (SAGIS)

- Apportion loads and concentrations of chemicals to WFD water bodies to identify effective programme measures (supported by EA and SEPA)
  - SAGIS is the product of a series of UKWIR research projects
  - Looks at both national and river catchment spatial scales
  - Identifies sources of pollution and contributing sectors
  - Enables scenario testing and the simulation of measures and policy.
  - Complete coverage for England, Wales and Scotland
  - In E&W SAGIS is estimated to have avoided up to £4bn in investment
Project: Sink to River – River to Tap A review of potential risks from nanoparticles and microplastics (2018/19)

• Objectives
  o Review current knowledge regarding risks posed by NP
  o Establish what is known, and to provide empirical evidence on MP entering and leaving UK WTW and WwTW.
  o Identify whether the fate of MP are influenced by different treatment processes

• Benefits
  o Most comprehensive study yet on prevalence of MP in drinking water and wastewater treatment

• Sink to River – River to Tap 2 (2019/20)
Big Questions

Our Ambition: To Create a Sustainable Water Industry for the Future

**Theme 1**
Drinking water production & distribution

1. How do we halve our abstractions by 2050?
2. How will we achieve zero leakage in a sustainable way by 2050?
3. How do we achieve zero interruptions to water supplies by 2050?
4. How do we achieve 100% compliance with drinking water standards by 2050?

**Theme 2**
Wastewater collection & Recycling

5. How will we deliver an environmentally sustainable wastewater service that meets customer and regulator expectations by 2050?
6. How do we achieve zero uncontrolled discharges from sewers by 2050?

**Theme 3**
Cross cutting

7. How do we achieve zero customers in water poverty by 2030?
8. What is the true cost of maintaining assets & how do we get this better reflected in the regulatory decision making process?
9. How do we ensure that the regulatory framework incentivises efficient delivery of the right outcomes for customers & the environment?

**Theme 4**
Operating Sustainably

10. How do we remove more carbon than we emit by 2050?
11. How do we maximise recovery of useful resources and achieve zero waste by 2050?
12. How do we achieve zero harmful plastics in the water environment by 2050?
**Vision**

100% compliance with Drinking Water Standards at point of use

**Outcomes**

- Customers are satisfied with their drinking water
- An appropriate balance of risk for substances of concern, their public health impact, and mitigation
- Ownership and responsibility for water quality is clear and all play their part in its protection
- Regulate the right things

**Key Benefits**

- Zero Chemical & low energy treatment processes

**2018**

- Taste & odour methods of detection
- Risk assessing CIP data in terms of implications for DW sources
- Micro plastics Nanoparticles data gathering
- Improved understanding of DBPs of concern

**2020**

- Taste & odour – occurrence and fate
- Toxicology/ Treatability review of CIP etc. comps
- Micro plastics & Nanoparticles removal efficacy
- Advanced toxicology information about DBPs & their precursors
- Catchments as the first stage of treatment

**2025**

- Core methodologies – AWWT or WTW
- Optimised solutions to minimise DBPs
- Identify & implement catchment and raw water interventions
- Educating customers about lead control solutions
- Affordable and acceptable (to customers) lead control solutions

**2030**

- We can identify emerging contaminants of concern
- We understand the impacts of microplastics on drinking water quality
- We have accurate information about DBPs and their precursors
- We understand the use of Cl as a treatment option
- We can implement cost effective processes to remove microplastics
- Cl can be implemented as part of the treatment process

**2020**

- Integrity of systems – Company & customer
- Evaluating customers about lead control solutions
- Protecting water quality in the home (domestic fixtures & fittings)
- New methods for lead control – materials and linings
- Better understanding of the chemistry of the control of lead

**Priority Projects**

- We can identify the biochemical pathways to resolve treatment needs
- How to eliminate use of chlorine as disinfectant
- Achieving minimum but stable disinfection
- How to produce biologically stable/ low AOC water in the UK
- Monitoring disinfection residual in the network (better & at optimal points)
- Real time monitoring of bacteria downstream of WTWs
- Treatability/ Disinfection efficacy for virus inactivation
- Data gathering for viruses

- Taking energy out of processes
- Intensifying natural processes
- Investigating biological pathways to treatment
Next Steps

• Accelerate BQ Route maps
• Develop a balanced programme of short, medium and long term projects
• More industry support to deliver strategic research programmes
• Engage other organisations – more collaboration
• Increase external funding
• Benefits realisation
• Increase communication – our successes and future strategy
• Collaboration through GWRC (Global Water Research Coalition)
• Links with TWENTY65