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COLLABORATIVE, IMPARTIAL RESEARCH

The Big Questions facing the Water Industry

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27th March - 2019

TWENTY65
Tailored Water Solutions for Positive Impact

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

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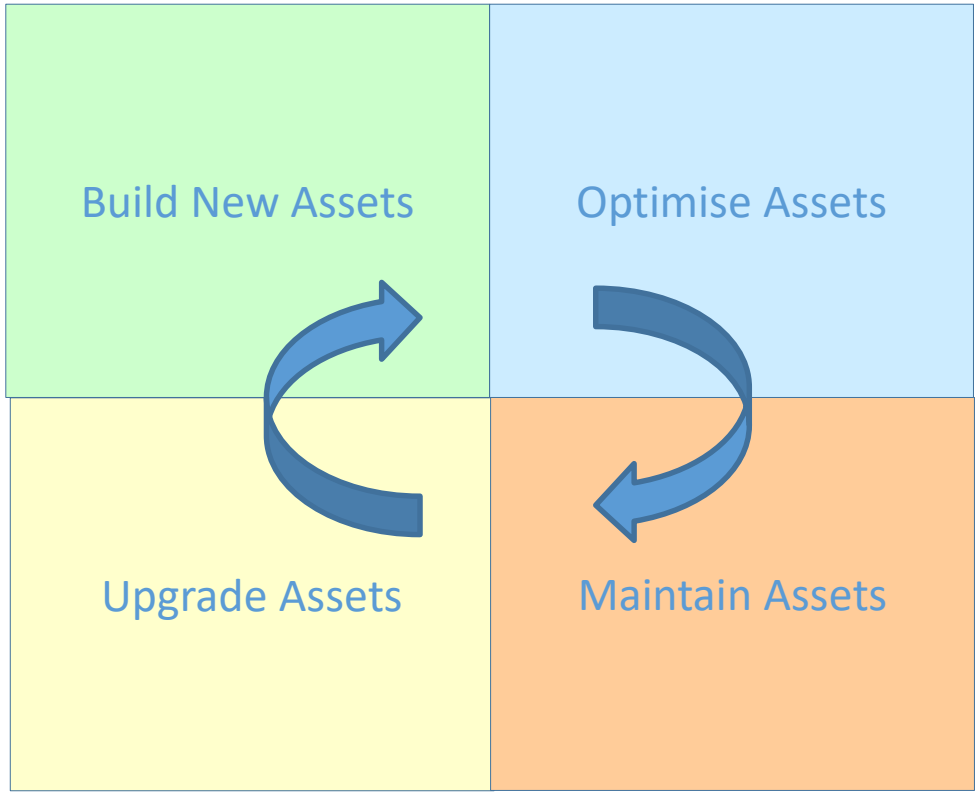
Totex – What does it mean ?

A shift to the right



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

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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 ?

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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

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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

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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

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UKWIR Community

Our Research Programme

- Research Topic areas

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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

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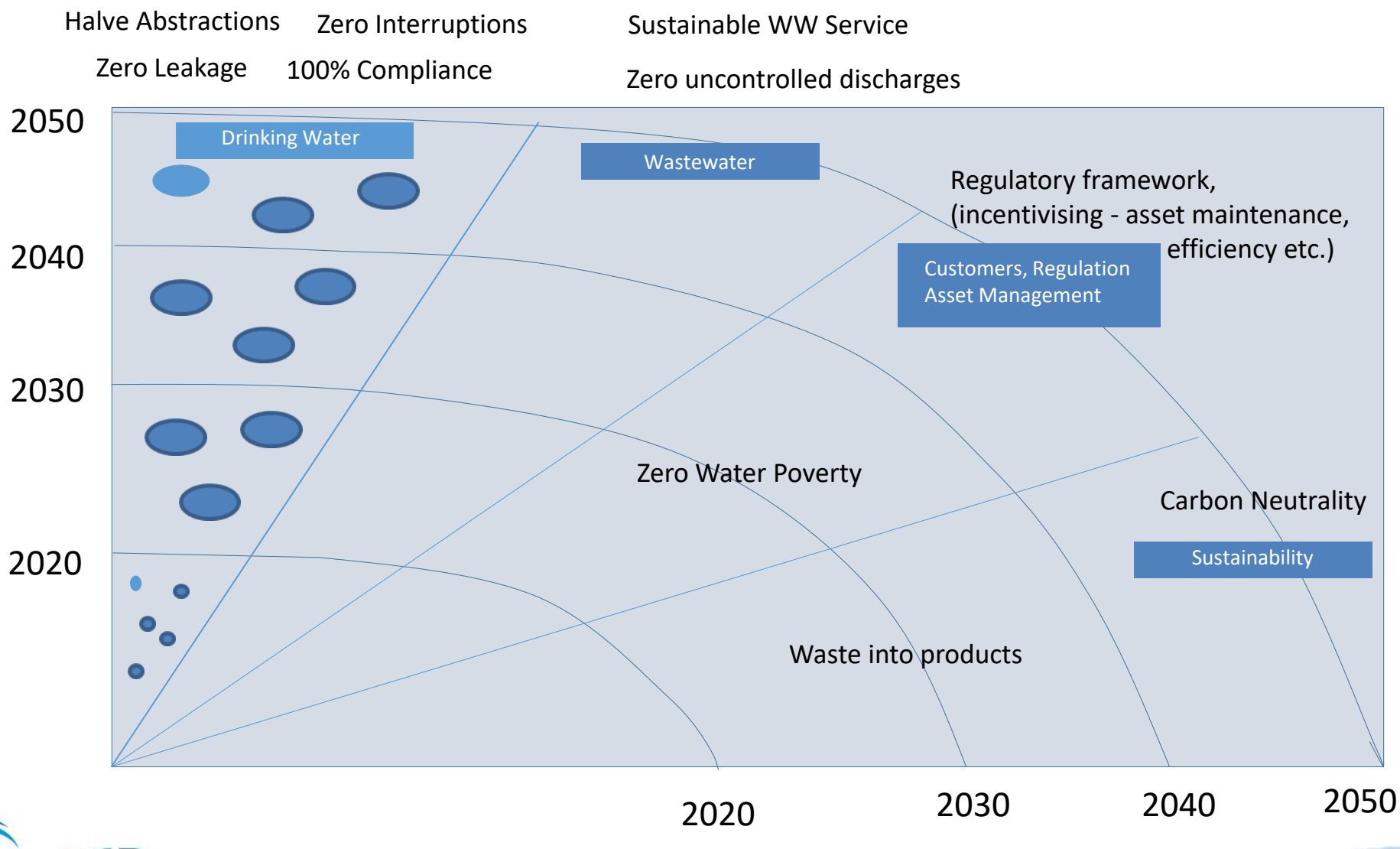
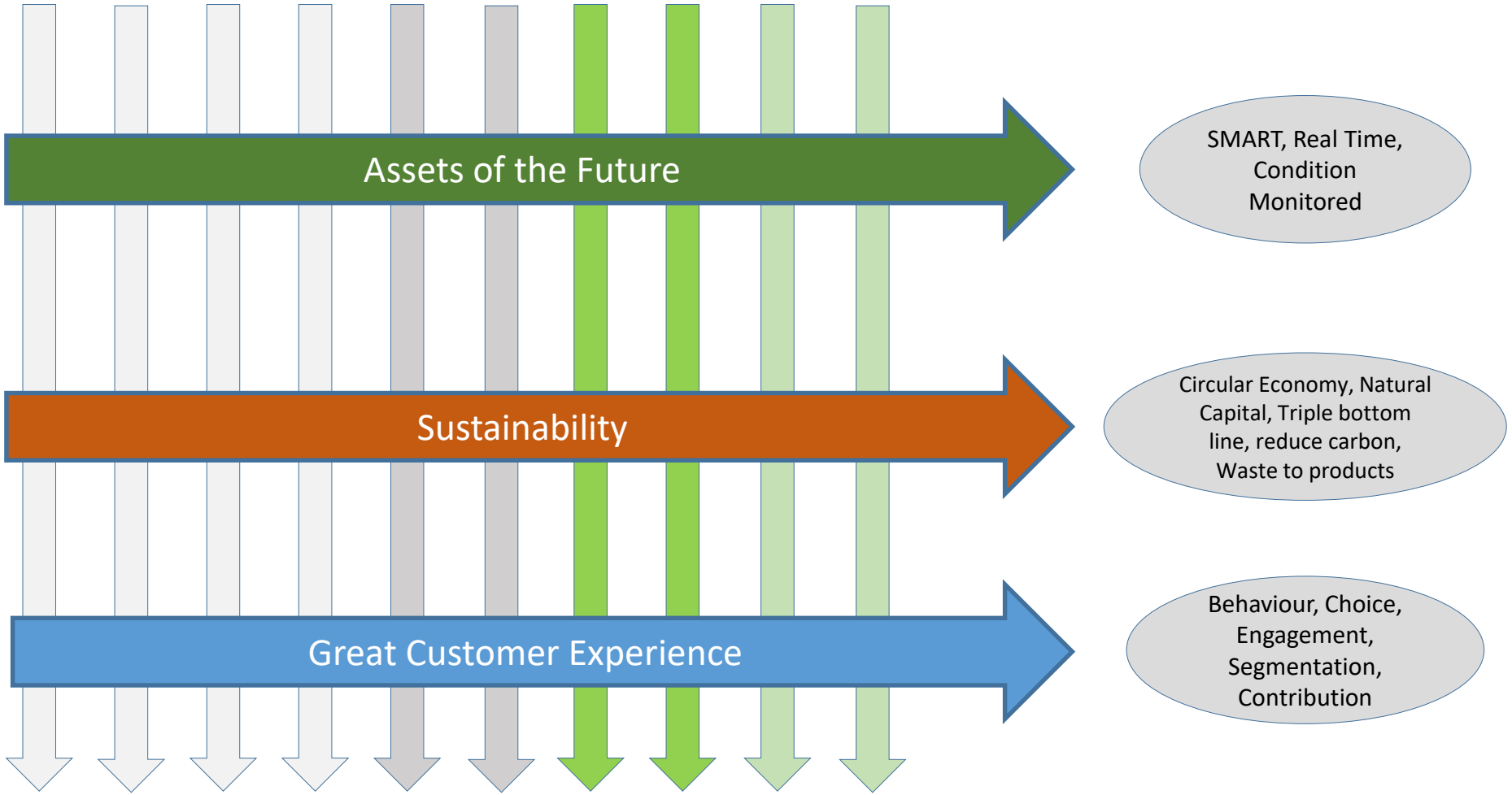
A Strategic Approach – Asking the Big Questions



Areas for further development

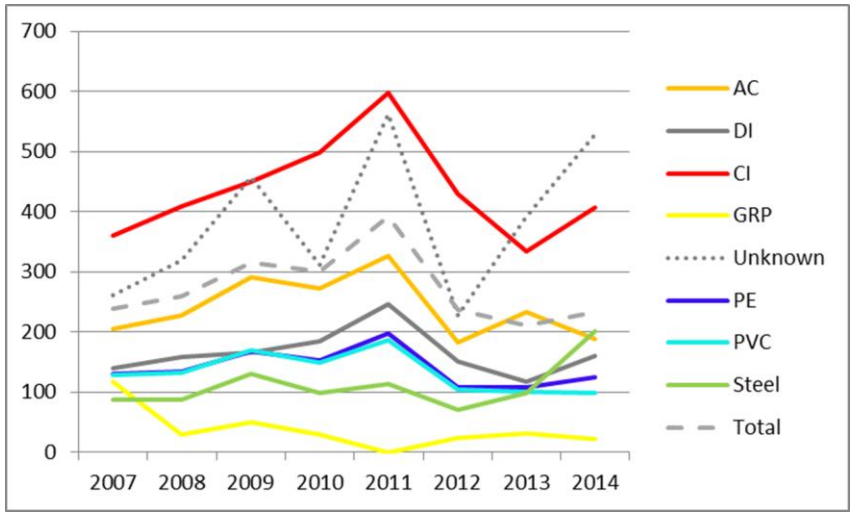


Opportunities to Collaborate

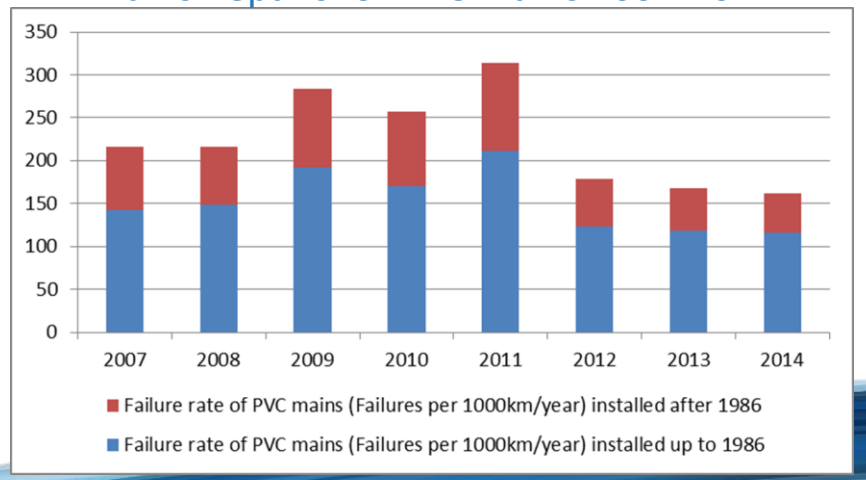
Project: National Sewer and Water Mains Failure Database

- 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



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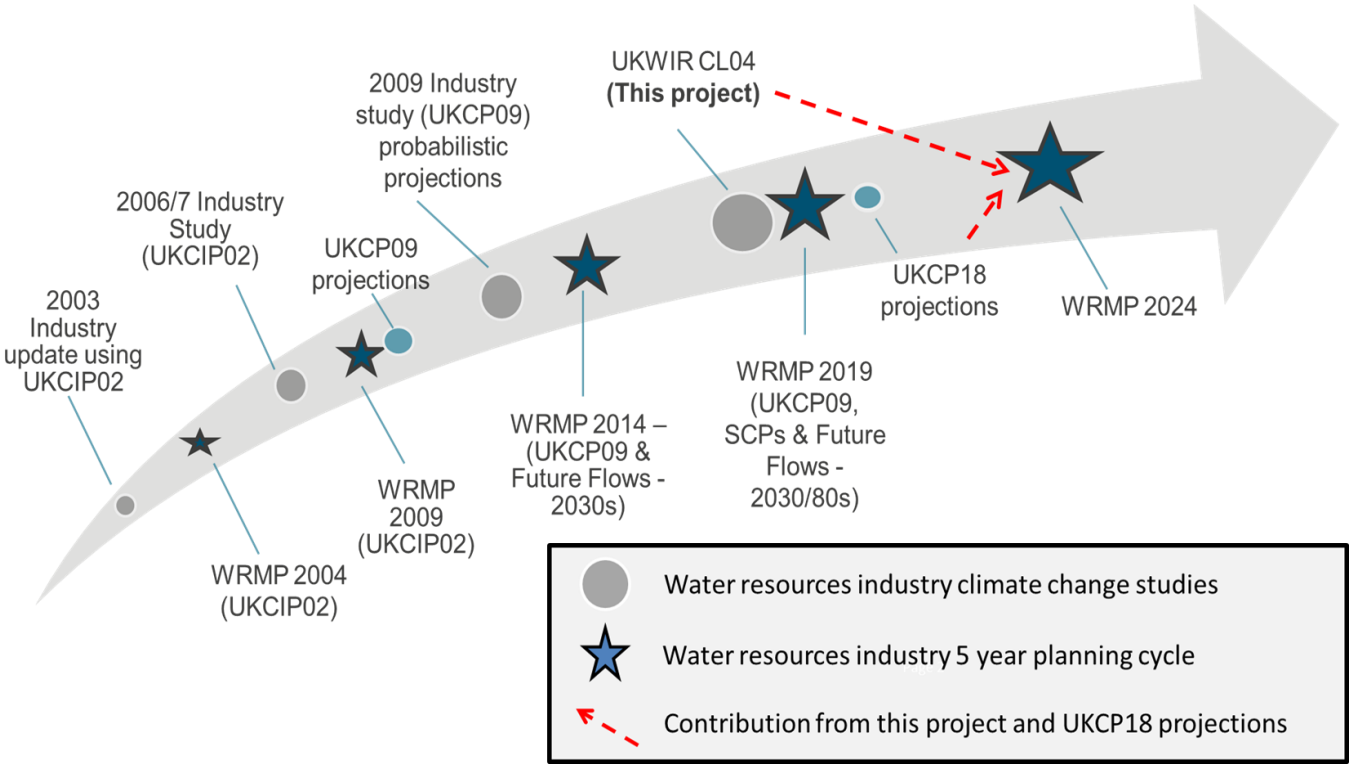
Project: Climate Change Modelling and the WRMP

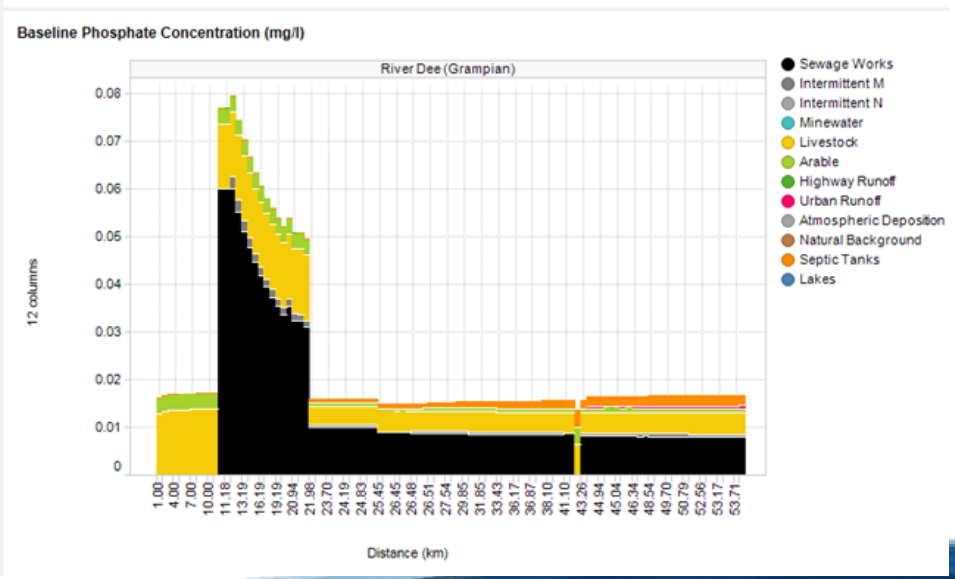
- Project Objectives
  - **Strategic:** Strategically plan for **UKCP18** and **WRMP 2024**
  - **Efficient:** Provide a less labour intensive approach to assessing climate change impacts on water supply than WRMP 2014 / 2019……
  - **Communicate:** Support effective communication of climate risks and 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

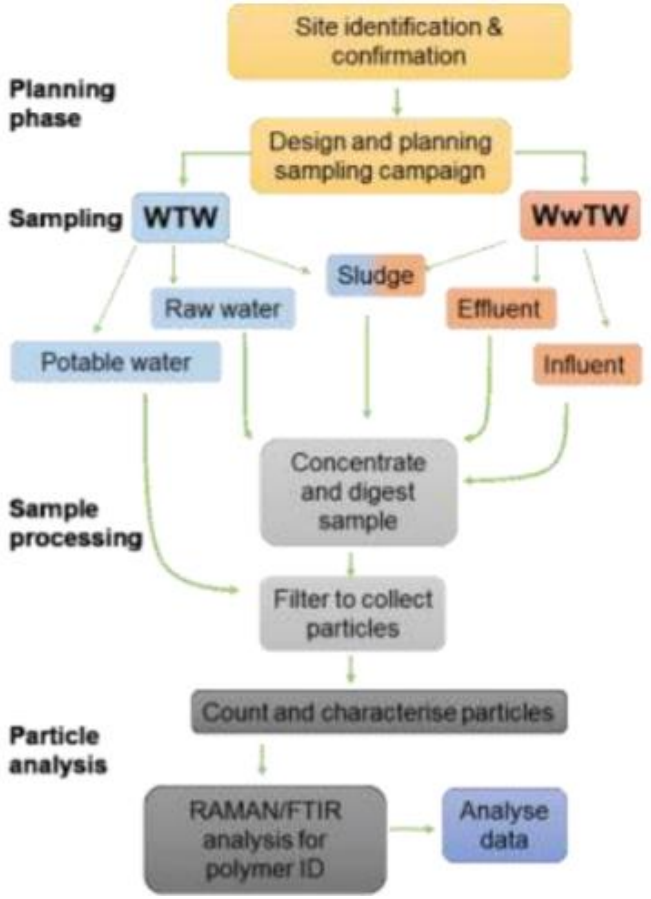
Project: Source Apportionment GIS (SAGIS)

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


Big Question
Outcome
Outcome
Outcome
2050
2020
Research
Research
Research
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HOW DO WE ACHIEVE ZERO LEAKAGE IN A SUSTAINABLE WAY BY 2050?

What we need to acheive to get there

NEW LEAKS ON EXISTING NETWORKS ARE MINIMISED

ALL NEW LEAKS ARE FOUND QUICKLY AFTER THEY BREAK OUT

REPAIRS ARE QUICK, ECONOMIC WITH MINIMUM DISTRUPTION

BACKGROUND LEAKAGE IS ELIMINATED

REPAIRS ARE QUICK, ECONOMIC WITH MINIMUM DISTRUPTION

ALL NEW PIPEWORK IS LEAK FREE WHEN LAID, AND REMAINS SO THROUGHOUT ITS ECONOMIC LIFE

CREATING A SUSTAINABLE WATER INUSTRY FOR THE FUTURE

Read more at ukwir.org

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HOW DO WE ACHIEVE 100% COMPLIANCE WITH DRINKING WATER STANDARDS BY 2050?

What we need to acheive to get there

CUSTOMERS ARE SATISFIED WITH THEIR DRINKING WATER

AN APPROPRIATE BALANCE OF RISK FOR SUBSTANCES OF CONCERN, THEIR PUBLIC HEALTH & MITIGATION

OWNERSHIP & RESPONSIBILITY FOR WATER QUALITY IS CLEAR AND ALL PLAY THEIR PART IN ITS PROTECTION

REGULATE THE RIGHT THINGS

ZERO CHEMICAL & LOW ENERGY TREATMENT PROCESSES

CREATING A SUSTAINABLE WATER INUSTRY FOR THE FUTURE

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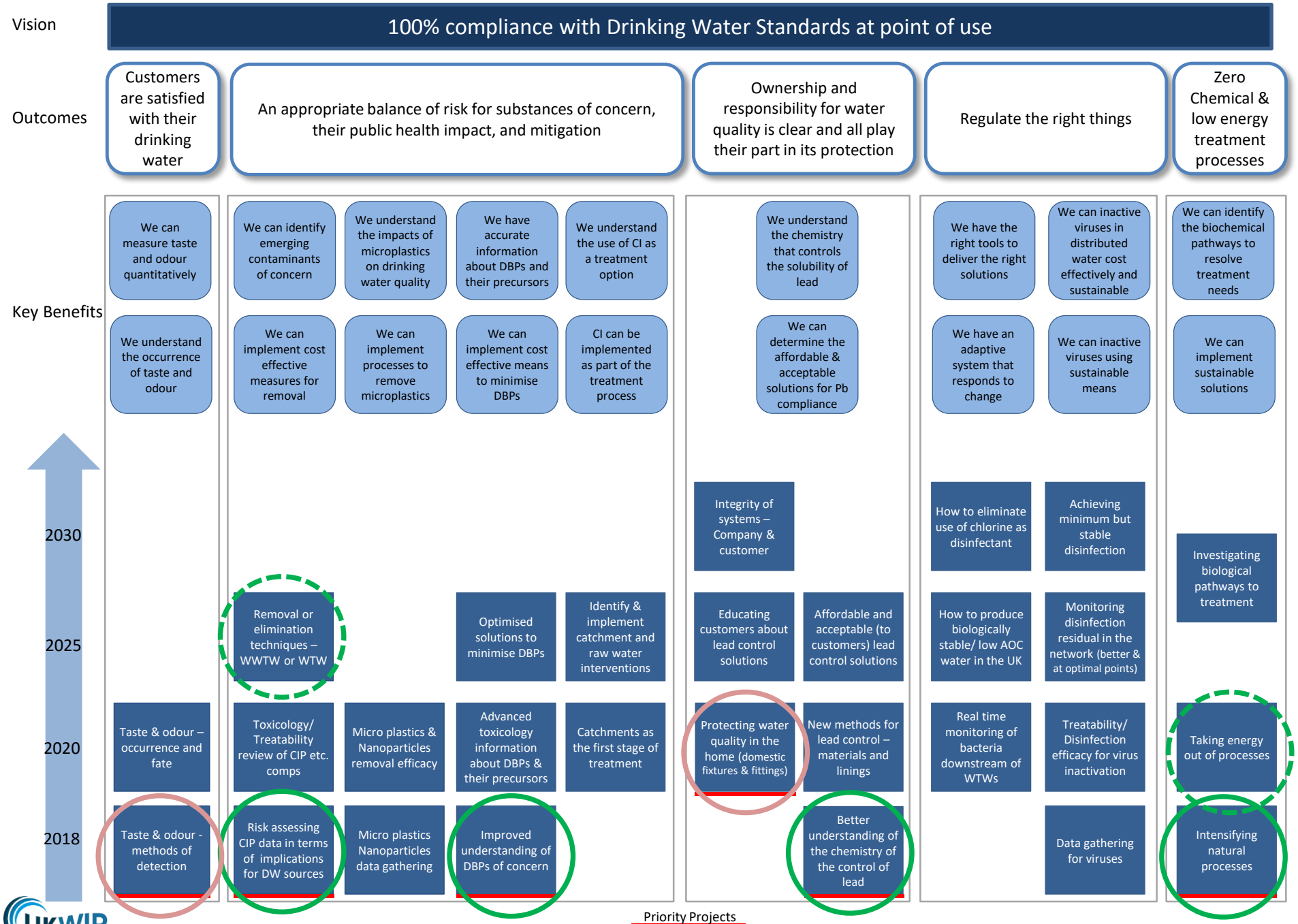
Vision
100% compliance with Drinking Water Standards at point of use
Outcomes
Customers are satisfied with their drinking water
An appropriate balance of risk for substances of concern, their public health impact, and mitigation
Ownership and responsibility for water quality is clear and all play their part in its protection
Regulate the right things
Zero Chemical & low energy treatment processes
Key Benefits
We can measure taste and odour quantitatively
We understand the occurrence of taste and odour
We can identify emerging contaminants of concern
We can implement cost effective measures for removal
We understand the impacts of microplastics on drinking water quality
We can implement processes to remove microplastics
We have accurate information about DBPs and their precursors
We can implement cost effective means to minimise DBPs
We understand the use of CI as a treatment option
CI can be implemented as part of the treatment process
We understand the chemistry that controls the solubility of lead
We can determine the affordable & acceptable solutions for Pb compliance
We have the right tools to deliver the right solutions
We have an adaptive system that responds to change
We can inactive viruses in distributed water cost effectively and sustainable
We can inactive viruses using sustainable means
We can identify the biochemical pathways to resolve treatment needs
We can implement sustainable solutions
2030
2025
2020
2018
Taste & odour – occurrence and fate
Taste & odour - methods of detection
Toxicology/ Treatability review of CIP etc. comps
Removal or elimination techniques – WWTW or WTW
Risk assessing CIP data in terms of implications for DW sources
Micro plastics & Nanoparticles removal efficacy
Micro plastics Nanoparticles data gathering
Advanced toxicology information about DBPs & their precursors
Optimised solutions to minimise DBPs
Improved understanding of DBPs of concern
Catchments as the first stage of treatment
Identify & implement catchment and raw water interventions
Integrity of systems – Company & customer
Protecting water quality in the home (domestic fixtures & fittings)
Educating customers about lead control solutions
Affordable and acceptable (to customers) lead control solutions
New methods for lead control – materials and linings
Better understanding of the chemistry of the control of lead
How to eliminate use of chlorine as disinfectant
Real time monitoring of bacteria downstream of WTWs
How to produce biologically stable/ low AOC water in the UK
Achieving minimum but stable disinfection
Treatability/ Disinfection efficacy for virus inactivation
Data gathering for viruses
Monitoring disinfection residual in the network (better & at optimal points)
Investigating biological pathways to treatment
Taking energy out of processes
Intensifying natural processes
Priority Projects

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

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