CHANGING HOW WE MANAGE OUR WATER ASSETS

The water industry is entering a period of change. Thirty years ago, the newly privatised water companies in England and Wales inherited an insufficient, neglected water and wastewater treatment capability.

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Since then, over £150 billion of capital has been invested in building new assets and replacing old ones to achieve environmental standards required by the Water Framework Directive.

The focus is now shifting away from big new-build capital programmes and towards the performance driven operation, maintenance and refurbishment of existing assets focussing on outcomes instead of outputs.

Additionally, and as set out at the recent British Water Gather Together reception, there are other factors driving change in our water industry. The scale of this change is significant—from navigating climate change effects to reaching net zero, delivering for water customers and the environment, while making sure bills are affordable.

End-of-pipe consents have achieved considerable environmental improvements since privatisation, with water companies given clear targets and control over how they are achieved without reference to other stakeholders. At the same time, this has come at cost to the environment in terms of the power and chemicals used to achieve end-of-pipe consents in addition to the embedded and operational carbon.

Working with the environment

Historically, we have placed less emphasis on the contribution that the environment itself, together with a range of other stakeholders, can make in achieving the same outcomes and this has been to the detriment of biodiversity and the aquatic environment. We now need to increase the industry's focus on working with the environment to balance the construction of new assets, consumption of power, chemicals and other consumables with the desired environmental outcomes.

Within the context of mature asset infrastructure across the UK water industry, care of existing assets through good operation and maintenance aligned with policies defined by risk appetite, will ensure the thresholds for intervention (repair, refurbish, replace, rebuild or repurpose) are set to drive optimal operation and maintenance practice. This will prolong asset life and minimise replacement and renewal. This is particularly true of mechanical and electrical equipment that have shorter asset lives, but it is also true of the civil assets which, with regular inspection and maintenance, can last well beyond their notional design life. This is also important when considering the ever-increasing pace of innovation with a traditional desire for long asset lives (i.e., hedging on the fact that the solution will not change over the next 50+ years). Are long asset lives a path to long term obsolescence and inefficiency?

However, the breadth and depth of the challenge is growing, with the impacts of climate change now upon us and a growing public demand for cleaner rivers, particularly following high-profile coverage of spillage of sewage contaminated storm waters from our historic combined sewerage systems.

The answer is not to try to 'tame' nature through simply building more infrastructure but to work with it and involve other stakeholders to improve the overall environmental system performance. For example, removing pollution and contaminants at source and slowing run-off with nature-based catchment-wide solutions such as leaky dams, the restoration of moorlands, the reintroduction of beavers, the use of SuDs and surface water separation. By considering the whole system we can develop solutions that not only improve the quality of water entering a water treatment works, minimising the treatment needed and consumption of power and chemicals, but we can also reduce the peak flows in storms minimising spillage from our combined sewers.

Totex hierarchy as applied to P removal

Solution Category		Example - River Quality (P)	CAPEX	OPEX	Certainty
	Eliminate	Work with landowners to reduce P run-off into watercourses, use of interceptor switched, timings, slow release P fertilisers (Struvite?)	-	L	L/M
	Collaborate	Work with the stakeholders to re-asign the issue or co-fund	-	L	L/M
	Operate	Improved sludge stream management to enhance existing capability	-	M	H
	Invigorate	Enhanced dynamic control. Tighter f:m and DO control to enhance sludge settlement. Partial Biological Nutrient Removal (BNR)?	L	M	H
	Fabricate	New assets. P recovery recycle to farmland adjacent to watercourse.	H	-	H

Applying a Totex hierarchy

In AMP7 we are learning that we can achieve considerable benefits and minimise the carbon impact of our activities by applying a Totex hierarchy (eliminate, operate, invigorate, fabricate) approach which encourages the consideration of the whole environmental system to, for example, improve water quality before it is treated (eliminate), making the most from existing assets (operate and invigorate) and minimising the potential water quality deterioration in distribution (operate). Construction of new assets (fabricate) is a last resort.

For example, Yorkshire Water and its strategic planning partner Stantec have taken a Totex hierarchy approach to delivering the water company's £700m Water Industry National Environment Programme with phosphorous (P) reduction permits across 80 regionally dispersed wastewater treatment works making up the bulk of the undertaking. All 80 sites were evaluated on a catchment basis (built asset and natural system) to evaluate the best overall beneficial solution. Applying a risk-based approach, the lowest carbon and Totex hierarchy-based solutions were deployed (i.e., with the option to enhance in the future should the risk reduction level not meet requirements), rather than traditional, high carbon, "belt-and braces" solutions. Over 40 projects were taken forward as having low carbon opportunities and the cumulative carbon emissions for the business plan baseline were compared to low carbon opportunities. Driving this approach early in the programme allowed strategic asset management decisions to be made earlier regarding cost, carbon, programme and risk. The total estimated carbon for the schemes following this approach is yielding reduction in embodied carbon of 65% and a reduction in operational carbon of 53%.

Adaptive interventions for future demand

Looking towards AMP8 and beyond, there are significant benefits to relating investment demand to the known condition, criticality and operational risk of each asset and system. Whilst intervention plans need to be based upon solutions that have worked historically, as options are developed a Totex hierarchy and carbon focus needs to be applied to minimise construction and maximise the part that nature can play in achieving the best outcomes. This is a significant change in the end-of-pipe output mind-set that has prevailed. Empowering asset managers and designers to think differently will need strong leadership and, at times present uncomfortable challenges.

Significant construction will still be needed to deliver the broad range of solutions required, but where this is the case, interventions need to be adaptive and, whilst meeting immediate needs, should provide flexibility for future demand, advances in technology and changes in customer behaviour.

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