

Thinking in the whole

[Find out more](#)

How to evolutionise your water engineering strategy

Introduction

This document provides an insight into the innovative thinking and new ideas that Sweco can offer to help meet current challenges and future needs.

The regulatory driver of “Resilience in the round” was one of the key themes for AMP7 set by Ofwat. Sweco believe this needs to remain central to AMP8 methodologies and investment, and be tackled by **“thinking in the whole”** as opposed to the “thinking in the hole” approach driven across the industry by commercial models that primarily focus on delivery efficiencies.

We have a combined knowledge base of 20,000 experts across Northern Europe, which brings more technologies, more skills, and more inventive solutions. More importantly we have a proven record of transferring innovation from other countries and sectors into the UK water industry.

Sweco’s combined Water and Asset Management capability makes us think differently to our competitors. We provide front-end thinking, innovative digital delivery and optimised operation and maintenance, together with industry leading carbon expertise as we drive the sector towards net zero.

The diagram on the next page summarises our **“thinking in the whole”** approach and highlights initiatives aligned to the asset lifecycle that we can implement for universal benefit.

INTERACTIVE DOCUMENT

Some features of this document are interactive. Move the cursor over the buttons and linked text to reveal additional information or navigate to another section.

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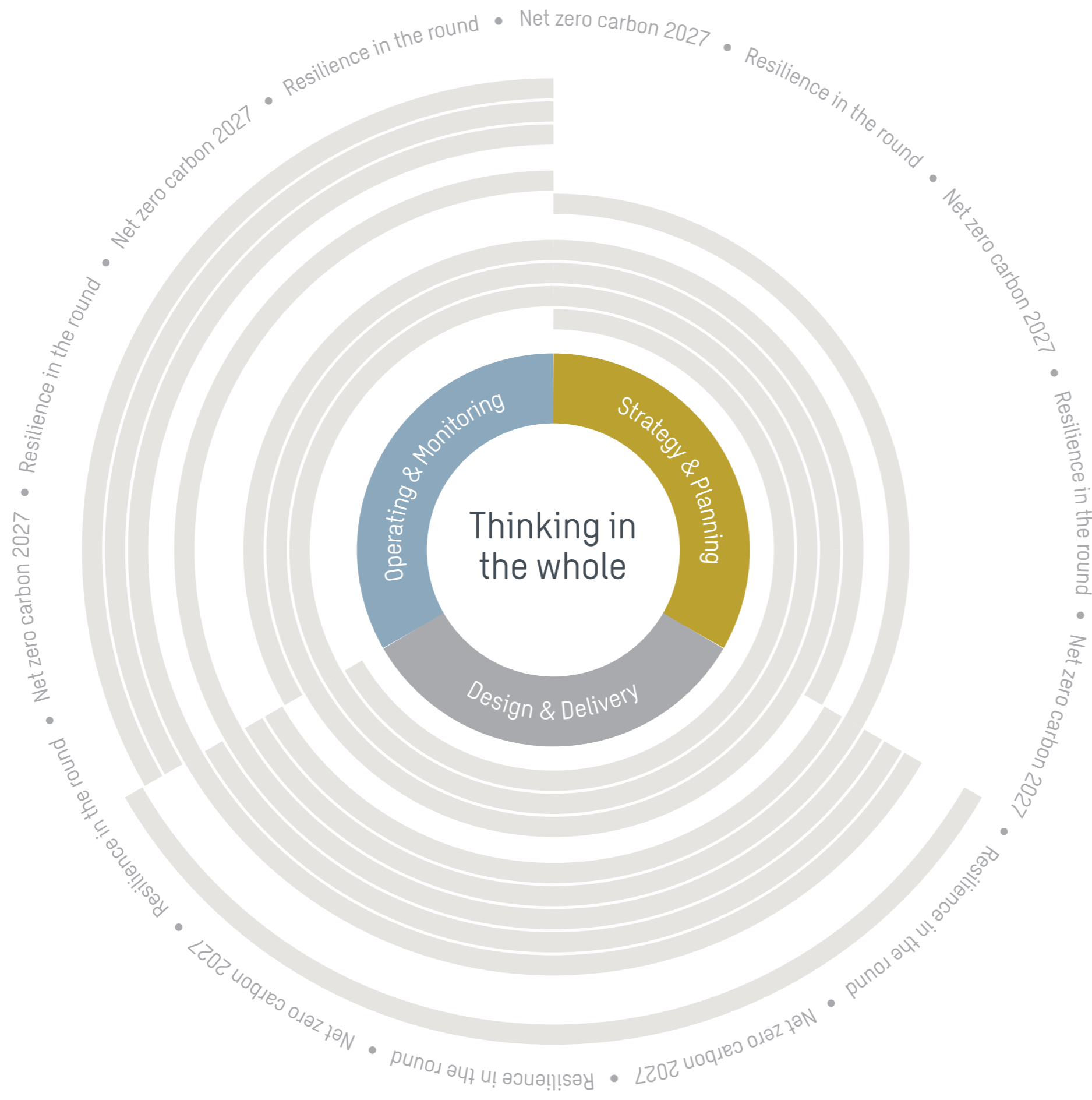
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Initiatives

Move the cursor over the buttons to highlight where the initiatives sit within the "Thinking in the whole" asset lifecycle.



Digital carbon cost management

Reduce carbon and cost

Sweco has a detailed understanding of the relationship between carbon and cost. While efficient design can reduce both carbon and cost to a certain point, alternative low carbon materials often cost more than traditional fossil-fuel based options. Sweco strive to help our clients navigate this 'carbon cost tipping point' and select the most efficient and cost-effective reduction options.

To support the move from carbon accounting to carbon cost management, Sweco's Swedish Urban Development Team have developed innovative parametric design tools. These enable our teams to automatically optimise structures from a carbon and cost perspective through machine learning.

The team have also created digital tools that allow for carbon to be represented via a colour spectrum within BIM models. This facilitates the rapid identification of carbon hotspots and enables teams to focus on priority areas.

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Asset information

Reduce asset care operating budget by **18%**

Sweco guided Dublin Airport Authority on their Asset Management journey, which included development of their Asset Information Management Strategy.

The Leadership at the airport realised that asset data is fundamental to the quality of information, which in turn is crucial to good asset decision making in everything from customer satisfaction data, systems health and financials to BIM, GIS, real time status and social media.

Outcomes:

- Asset Care operating budget reduced by 18% – from €35M to €28.8M pa over 5 years
- Enabled passenger numbers increase - 18.7M to 31.5M PAX without significant new infrastructure
- Passengers per Asset Care FTE increase from 116,254 to 123,767 in 3 years = 6% efficiency
- Main Runway outages during operating hours reduced from 6 events pa average to 0
- Asset replacement value €4B

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Digital twins

Reduce operation expenditure

Sweco's explanation of a Digital Twin is "a representation of a thing, a process, a system or series of connected things and systems to form a system of systems. The key to what distinguishes a digital twin from any other model is its connection to its physical twin".

In water supply, a digital twin can represent a single pump, a pump set, pumping station, treatment works, a system of supply and distribution pipes, valves, flow meters etc. It can also be an entire network linking all attributes above.

Sweco designed and configured Irish Water's National Telemetry System that is aligned with other Enterprise Systems to achieve an enterprise level Digital Twin of the entire Irish Water Network. The target outcomes are:

- **Operational Efficiencies:** Reduction in frequency and duration of site visits. Saving €32M
 - **Maintenance Optimisation:** Condition based maintenance. RPA on trigger values/events. Saving €20M
 - **Investment Planning:** Inform the capital investment plan with condition and performance data to enable evidence-based targeting of investment. Saving €17.4M
 - **Leakage Reduction:** Reduced leakage and avoidance of capital investment in treatment capacity. Saving €3.3M
 - **Compliance Reporting:** Lean data collection and reporting. Saving €10.6M
-

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System resilience

Improve customer service performance

Sweco is challenging Yorkshire Water's traditional thinking to define a new operating system for the Hull water supply network that is sustainable, focused on customers, offers service resilience and calm network operation. The system is pressure controlled to meet normal diurnal patterns of demand as well as highly variable production needs for large process plants and food suppliers. Key considerations are continuation of control in the event of loss of communication between node points and resilience in the event of cyberattack.

Sweco applied a systems resilience model tested and proven in the aviation sector to great effect. The new operating system will maximise the life span of the network, lead to fewer leaks, fewer operational and maintenance callouts, reduce energy demand and chemical consumption, provide better water quality, and satisfy customer demands.

Sweco worked with Yorkshire Water staff to evaluate what could go wrong, the probability of such, how failures would impact the business, domestic and commercial customers, and the cost impacts to determine the best approach to achieve a calm system that will be self-healing in real time using fallback edge controls, backed up by regional diagnostic and central oversight to assure supply and demand balance.

Target Outcomes: Reduce failures with customer or moderate business impact to 1 in 11yrs (currently 8 p.a.).

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Nature-based solutions

Unlock natural capital

Nature based solutions are at the heart of Sweco's vision to plan and design the sustainable communities and cities of the future. We prioritise nature-based solutions, bringing innovation from the Nordics to the UK and have significant experience of delivering blue-green solutions in both urban and rural environments.

Sweco's [Urban Insight report](#) highlights our Blue-Green infrastructure approach and innovation from around Europe.

In the UK, Sweco helped deliver a net zero carbon project at Marston WRC. The team discounted traditional solutions, instead refurbishing grass plots to accommodate the increase in treatment capacity. Benefits included:

- 90% capital carbon reduction versus initial traditional solution
- Net Zero Carbon - trees planted to offset residual carbon
- Biodiversity net gain with site supporting an abundance of wildlife
- 43% cost saving against the notional solution

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Sustainability Sun™

Deliver long-term sustainable solutions

Developed in Sweden, Sweco's Sustainability Sun™ is a tool that enables clear visualisation of a sustainability assessment undertaken at any stage within the project's lifecycle.

Aligned to the UN Sustainable Development Goals it facilitates a systematic review of the social, economic, and environmental aspects of a project, exposing trade-offs and identifying opportunities that will deliver longer term value.

The tool delivers the following benefits:

- Encourages innovation and solutions with wider value beyond just cost savings
- Demonstrates the water industries green recovery
- Demonstrates to customers that organisations are responsible and thinking sustainably

Sweco has used the Sustainability Sun™ extensively in the Nordics, including assessments within the steel manufacturing and civil construction sectors.

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Process technologies

Reduce TOTEX by
20%

Sweco has worked with Innsbruck University to develop process technologies that successfully reduce operational costs and provide lower carbon footprint solutions for our clients.

We currently hold the European License for the following Technologies:

- SHARON®
- DEMON®
- EssDE®
- InDENSE®
- BIOCOS®
- Triple A Technology®

DEMON®, that has successfully been delivered in UK at Knostrop, Basingstoke and Poole, uses only **40% of energy** compared to conventional biological treatment systems and does not require an external carbon source.

BIOCOS®, a proven technology with over 100 systems in full scale operation worldwide, offers a **20% reduction in both CAPEX and OPEX** when compared to optimised Sequencing Batch Reactor processes like NEREDA.

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Zero drawings projects

Reduce project time by
15%

Zero drawings is a new way of developing/presenting model views bespoke to the user's requirements. The process provides the following benefits:

- Reduces the number of drawings on projects by 90%
- Reduces site queries by 50%
- Speeds up design revisions
- Provides one version of the truth

Developed by Sweco Transportation Teams in Denmark and Norway, the use of zero drawings on the Randselva Bridge (Norway) won the World's Best BIM Project at the 2020 Tekla Global BIM Awards.

The Zero Drawings initiative, successfully utilised at Whittlingham Water Recycling Centre, a £23m wastewater project delivered for Anglian Water, speeds up design revisions, reduces the number of drawings being produced from 3D models and minimises site-based queries. The approach has been shown to reduce project time by up to 15%.

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Process safety

Ensure legislative compliance

Sweco's Process Safety Experts are trained to facilitate the IChemE's 7-stage Hazard Study Process and, where required, undertake LOPA Studies and ALARP Assessments. This to confirm that the project design has the sufficient layers of protection required to meet the agreed Tolerable Risk Target.

Sweco further supports clients in developing bespoke design processes to ensure compliance with all Statutory Regulations including design COSHH Assessments, DSEAR/HAC Assessments and Explosion Studies.

We worked in collaboration with Yorkshire Water in AMP6 to develop a Process Safety procedure and continue to work closely with their Principal Engineers to support and promote the AMP7 Process Safety requirements, developing and improving the systems and techniques in line with industry best practice.

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Remote asset management

Reduce operating costs

The Sweco team used their operational experience apply the "in the whole" thinking, combining real life experience and industry best practice to deliver benefits that are both significant and sustainable.

Anglian Water undertook a project to apply Sweco's Remote Asset Management method to the 4300 wastewater pumping station portfolio. The application of our "in the whole", risk-based methodology led to a significant improvement in efficiency in the field and control centre.

- Reducing unwanted alarms by 30%
- Reducing interruptions and overtime
- Making the control room a better place to work

These benefits were immediate with an increase in staff availability equivalent to 15 FTE or £1.2m p.a. There was no reduction in pumping station compliance or increase in service failures.

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Reliability & maintenance

Asset cost saving of
15%

Sweco has supported Dublin Airport in the development of Lean Maintenance practices with a Systems Engineering approach. The approach, born from NASA, being used extensively in the Aviation sector.

The approach requires strong vision, leadership, and time to achieve the cultural transformation in moving from reactive to proactive responses. Proactive maintenance being on average four times more cost effective than reactive with asset reliability and customer service performance improving significantly.

Sweco work with clients to develop processes that result in business outcomes driving the use of Computerised Maintenance Systems. This results in System Engineers owning Asset Health and Systems Performance, Maintenance Planners having plans for almost all eventualities and Maintenance Schedulers assigning the right people to undertake work at the right time.

Outcomes:

- Improved customer service performance – best performing airport worldwide ACI rating
- Asset performance, costs & risks quantified and controlled
- Maintenance plans aligned with investment plan
- 15% asset cost saving – note this is not the cost of maintenance, it is cost of ownership

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Virtual room

Manage stakeholder engagement

Sweco worked with Barry and WSP to develop a virtual consultation room for the N/M20 Cork to Limerick Road. The virtual consultation, that included interactive boards, 3D route maps and a booking facility for 1-2-1 consultation, was a huge success with 39,000 people visiting the site and 2,500 follow up communications.

Sweco is currently working with Anglian Water to develop a virtual consultation room for use on the S101A and flooding programmes.

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Transforming society together