

love every drop
anglianwater 

Anglian Water's five-point plan for innovation acceleration

How we're addressing
tomorrow's challenges today



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Our commitment

We are committed to reaching net zero carbon emissions by 2030, working with our supply chain and the whole water sector to achieve this together.

The future we want to see

- Holistic support from government on net zero and a range of low carbon policies.
- Increased public awareness of the carbon impact of treating and transporting water, and heating it in the home.
- Heat produced by the water recycling process adopted more widely as a low carbon heat source.
- Our whole industry tackling capital carbon emissions alongside operational emissions.

02 Delivering healthy rivers p18

We will bring new ways of thinking to improve the ecological quality of our region's rivers, streams, prioritising nature-led solutions and collaborative approaches to safeguard and enhance our environment.

- Rivers across our region brought back to 'good ecological health', or 'good ecological potential' where heavily modified.
- A new deal for rivers nationally, as set out in Water UK's '21st Century Rivers Action Plan'.
- Access to the right levels of funding to remove the remaining 'Reasons for Not Achieving Good' associated with the water sector by 2030.

03 Futureproofing our water resources p22

We will deliver new solutions to rise to the challenge of diminishing water resources in the East of England in the face of climate change, population growth and the needs of the environment.

- An ambitious national target on water consumption, based on distribution input, being set under the Environment Act.
- Tighter building regulations for water use in new homes and an ambition to introduce water neutrality so total water demand is the same after a new development as it was before.
- Water resources planning broadened to consider the interaction with water quality.

04 Innovating on leakage and infrastructure optimisation p26

We will continue to push frontiers on leakage reduction, creating smart networks and using insight from smart metering to help our networks perform better than ever.

- Continuing our world-class performance, and reaching well below 10 per cent of treated water lost from networks.
- Full smart meter coverage by 2030.
- An end to leaky loos, which typically waste 200-400 litres of water a day. We want to see mandatory water efficiency labelling on white goods and linked to minimum standards for building regulations.

05 Adapting to climate change and delivering resilience p30

We are committed to driving resilience to the risks of drought and flooding in our region, with collaboration and systems thinking at the heart of our planning and investment.

- Strong public awareness of the challenges we face from climate change, with customers using water wisely.
- Continued momentum building on the raised profile for adaptation at COP26.
- Greater collaboration between organisations in developing approaches to resilience in the face of climate change.

Foreword



“ All too often innovation is regarded as a buzz word for shiny new technology - but for us, at Anglian Water, it’s central to the way we work: a mindset, not an output. ”

Keeping our minds open to the possibility of doing things differently and better is fundamental to the way we run our business. So much so that we’ve embedded innovation as one of the values which supports us in striving towards our purpose - to bring environmental and social prosperity to our region through our commitment to love every drop. In pursuit of that purpose, alongside ‘doing the right thing’ and ‘building trust’, crucially, we are ‘always exploring’.

Driving an innovation culture means getting the whole organisation - and our supply chain - on board. Innovation is for everyone. It’s a mindset we’ve fostered over many years, as we set out in this plan.

And innovative approaches have never been needed more. The escalating pace of climate change brings both mitigation and adaptation right to the forefront of our planning. As one of the biggest energy users in our region, we have an enormous job to do to meet our hugely ambitious sector-wide net zero goals. And as part of critical national infrastructure, we have a public duty to make sure our

infrastructure and our systems are resilient to the increased risk of drought and flood.

In the East of England alone we’re expecting to see 175,000 new homes built by 2025. That vast growth, combined with the need to safeguard and enhance the quality of our rivers and waterways and to reduce the amount of water we abstract from them - requires us to think in new ways about how to meet our region’s needs.

At Anglian Water, we’re taking a multitude of new approaches. They range from the creation of hundreds of kilometres of pipelines to better connect our region’s water supply in an unprecedented strategic grid, mirrored by a digital twin (see SPA, page 24), to the adoption of a bold, holistic plan to elevate the prospects of an entire region (see Future Fens: Integrated Adaptation, page 32). Through the pages of this plan you can see us innovating on carbon reduction, on leakage, on smart networks and behavioural change, to name just a few areas.

And it’s fantastic to see the whole water sector, and our regulators,

getting behind the power of innovation. Initiatives such as Ofwat’s hugely exciting £200 million Innovation Fund, and the UK 2050 Water Innovation Strategy, which we and many other water companies have had a role in creating, are driving unprecedented levels of collaboration and new thinking. The creation of Spring, the national centre of excellence for innovation, is another game changer, and we’re right at the heart of it with Anglian Water’s own Shaunna Berendsen heading its development.

Water companies are working together for the public good in ways we’ve never seen before.

I have total faith that as a sector, and as individual companies, we can and will address all of the big challenges we face.

So if what you read in these pages excites you, if you’ve got an idea to share with us or if you just want to hear more about our ambitious plans, please do get in touch.

Peter Simpson
Chief Executive Officer,
Anglian Water Group

“

We innovate so tomorrow’s customers don’t pay the price for actions we didn’t take today.

”

Peter Simpson,
Future of Utilities: Water, 2 September 2021



Our approach to innovation

Innovation in context

Globally, we face a perfect storm; against the backdrop of climate change, demand for water, food and energy will continue to grow. At Anglian Water we feel this pressure particularly acutely. Our region is one of the driest and lowest lying in the UK, and one of the fastest growing outside London, with new homes and businesses all needing to be supplied with water and have it recycled safely.

This means we'll increasingly face challenges to ensure water supply meets demand, that our infrastructure is resilient to the increasing risk of drought and flooding, and that we can protect and enhance our much-loved environment. And as one of the biggest energy users in the UK, the water sector as a whole has made an ambitious commitment to reach net zero by 2030, 20 years ahead of the UK government's target.

With such huge challenges facing the sector, we cannot afford for innovation to be a 'nice to have'. We are mindfully balancing sustainability challenges with the innovation opportunities these challenges bring, and are committed to transforming the environment in which we serve.



“**To drive transformational change we need to be bold - so we're not afraid to set big, hairy, audacious goals which demand a step change in the way we work.**”

Our innovation journey

We recognise that to make real, transformational change within our organisation and the broader water sector we need to be bold and show true leadership; so we're not afraid to set big, hairy, audacious goals (BHAGs), which demand a step change in the way we work.

For example, in 2010 we set ourselves a target to cut our capital carbon emissions by half and to reduce our operational carbon emissions by 10 per cent, alongside driving a 20 per cent saving on costs. At the time these targets were so daunting they felt almost insurmountable. The only way we could possibly meet them was through innovation at an unprecedented scale. Incremental change, and going it alone, wasn't going to cut it.

Working together with our supply chain, we introduced techniques and technologies that we still use today - reusing assets, deploying low carbon materials, introducing low carbon standardised products and utilising advanced virtual reality design tools. And by 2015, through this transformational approach, we'd beaten both carbon targets and saved £20 million pounds (and thus our 'reduce carbon, reduce cost' mantra was born!).

To unlock the pace and scale of innovation needed we've always recognised that our value chain is a fundamental part of this journey. We know that we can only make the shift required to really transform the way we work through partnerships and collaboration. In 2005 we set up our revolutionary @one Alliance to deliver capital programmes. A new collaborative partnership model designed to accelerate delivery and drive outperformance, it rapidly became a benchmark for best practice in the infrastructure sector.

The @one Alliance has been joined by several others over the years: IOS, delivering integrated operational solutions; IMR, delivering integrated maintenance and repair; IMDS, delivering metering developer services and IS, delivering information services. Our most recent Alliance, the Strategic Pipeline Alliance, was set up in 2020 (see page 24). All of them bring together contractors, designers and Anglian Water in collaborative structures which truly have innovation at their heart. With shared objectives and an outcomes-focused commercial model that spans 15 years, our partners have the breathing space to innovate and the desire and incentives to do it justice.



Our approach to innovation

Fostering an innovation culture

We recognise that to truly drive transformational change we need 'Explorers' in every corner of our organisation and value chain. For us, creating an innovation culture means creating empowered teams - innovation isn't something that only happens in dedicated pockets of the business; it's a mindset, and everyone needs to have innovation as part of their role.

Combining this forward-thinking philosophy with innovation platforms that support and empower our people is where we have found most value. The culture we've created has enabled, supported and stimulated innovation, both within Anglian Water and with our supply chain, and driven powerful collaboration both within and beyond our sector.

Applying innovation

We have an active community of innovation practitioners who work to adopt and apply innovations that address our challenges and realise opportunities. This work from delivery teams right across our business is essential: they ensure we develop and deploy innovations at pace and scale and realise maximum value for customers, society and the environment.

As well as delivering value from innovation through implementation, our innovation community plays a vital role in informing our priorities and areas of focus for future innovation activity, based on opportunities identified within our business streams.

Innovation Engagement

The creation of our Innovation Engagement Team has been crucial to embedding an innovation culture right across the organisation. The team works cross functionally to support our staff, value chain, partners and networks to unlock innovation opportunities through platforms, processes, partnerships and products. Its members support the delivery of world class innovation and, crucially, ensure those learnings are shared widely both inside and outside Anglian Water.

Innovation Discovery

The Innovation Discovery team uses research and development to inform evidence-based decision making. The team focuses on unlocking new opportunities and reducing uncertainty to mitigate risk from current and future challenges, finding and delivering better solutions for our customers and environment. Innovation Discovery drives a collaborative portfolio, working alongside stakeholders within and outside Anglian Water and leading engagement with UK Water Industry Research (UKWIR), the research platform for water companies in the UK and Ireland. In addition, two strategic research partnerships have been established; one with Imperial College London, the second with Cranfield University. The team is also actively working with the universities of Sheffield, East Anglia, Newcastle, Essex, York, and Manchester, has live projects with over 50 suppliers and works closely with Water UK and the industry's regulators.

International learning and collaboration

We're always keen to learn from other sectors and other geographies. Among what might seem unlikely inspirations for innovation, we've taken learnings from Red Bull's Formula 1 team, Jaguar Landrover's early use of virtual reality and even nitrate reduction technology from a Belgian orange juice factory.

International collaboration, partnerships and learnings have been key to the development of our innovation programme. We have close links with the International Water Association and are long-standing members of the Leading Utilities of the World network, which brings together global utilities leaders. Its objective is to help drive performance across the sector by recognising achievement, providing a network for sharing ideas, and inspiring others to improve.

Through our membership of Leading Utilities of the World, we have developed a closer alignment, the Leading Coalition, with fellow water companies and smart water network pioneers Vitens in the Netherlands and Global Omnium in Valencia. Championed by the CEOs of all three companies, the coalition enables international sharing of best practice.

Through the partnership we've carried out learning exchanges at every level from CEO to front-line manager. Pre-Covid, a group of colleagues from Vitens visited Grafham Water, one of our biggest sites, to take part in training on a cutting edge transient rig. The rig enables us to monitor and optimise flow through the network.



We're also heavily involved in the SWAN (Smart Water Networks Forum) European Utilities Alliance, through which companies in Spain, Finland, Denmark, Italy and Portugal come together to accelerate smart water and water recycling development.

Our most recent international partnership is our membership of the Nevada-based not-for-profit organisation WaterStart. Its mission is to accelerate and de-risk the adoption and deployment of innovative technologies in the global water industry. We became the first European water company to become a member, joining other members in America and Australia (see page 11).



SWAN (Smart Water Networks Forum) European Utilities Alliance

The Smart Water Networks Forum (SWAN) is a global alliance of organisations working on smart water networks, bringing together partners from across the water sector to find data-driven solutions to challenges across water and wastewater networks. We've been a member of SWAN for around a decade, and in 2019 we joined the newly-formed European Utility Alliance (EUA), which brings together regional utilities to drive forward the adoption of smart technologies at a more local level. The EUA comprises partners from 18 cross-European water utilities from several countries, including Spain, Finland, Denmark, Italy and Portugal.

Smart water solutions allow us to build a more resilient future as we adapt to the impacts of climate change, and maintain our networks in the face of significant population growth (see pages 28-9). Our membership of SWAN and the EUA helps us ensure that we're keeping up with the pace of change across the global water sector, and maximising the opportunities smart technologies offer.

Colleagues from Vitens in the Netherlands undertook training at Grafham Water.

Our innovation platforms

Shop Window

Anglian Water's Shop Window is a real location in our region; a platform where we can accelerate innovation for our business, customers and the environment. It's a place where we consider innovation not just in terms of technology, but across our processes, people and information, with the aim to create an incubator of Anglian Water's future operating model, today. Within the Shop Window we have a clear route to trial, implement and scale ideas.

This world-leading approach provides a physical and virtual space for Anglian Water, our partners, our supply chain and academia to explore new ways of working. Using this constant focus on scaling successes across the organisation we can learn quickly and collectively how to face our current and future challenges, develop our people and ultimately achieve our strategic priorities.

Within the Shop Window we've engaged 16,000 customers through our behavioural change campaign - with smart metered customers achieving record low averages of just 104 litres of water per person per day (compared with the national average of 142 litres).

We've collaborated on a wide range of projects focused on developing and applying the latest innovative technologies to design, build, operate and maintain our assets more intelligently.

Why is it known as the Shop Window?

The term Shop Window harks from the traditional greengrocer, who would put all his or her best products in their physical shop window.

At Anglian Water, it refers to the fact we're trialling all the best technologies, approaches and ways of working in the Shop Window area. When the Shop Window started in 2015, it was purely focused on technology and products, but following a recent evolution, it now takes a much more holistic approach.



WaterStart

In 2020 Anglian Water became the first water company in Europe to join US-based water innovation organisation WaterStart, a not-for-profit organisation which co-funds innovation projects, connects water companies with international suppliers and provides a global forum to share knowledge and best practice.

Partnering with WaterStart has given us the opportunity to widen our innovation network internationally to access global solutions, as well as providing us with a back catalogue of trials and case studies delivered by other members across the globe so that we can adopt the latest innovations at pace.

WaterStart runs requests for proposals (RFPs) against our identified business priorities, and together we have delivered six RFPs. This has resulted in 45 solutions from suppliers and four co-funded trials, adding a total of £160,000 to our innovation trial budgets.



Water Innovation Network

Just over 10 years ago we created the Water Innovation Network (WIN). This is a not-for-profit platform that allows us to share our challenges openly and invite answers from our supply chain and SMEs to fast-track innovation into our business.

Ideas go into the WIN funnel, get reviewed, trialed and then implemented if they are successful. It's worked brilliantly for us, generating fresh thinking and new ideas.

It's also brilliant for SMEs and our Alliance supply chain partners - it allows smaller companies to get access to our mindset and our challenges.

Through WIN we've engaged with more than 700 companies in 10 years and vastly expanded our thinking.

A **resilient** and **intelligent** water supply

Exceeding customer **expectations**

A **flourishing** environment

Unlocking efficiency

Tackling climate change

Enabling the **workforce** of the future





Innovate East

Together with our partners at Essex and Suffolk Water and Yorkshire Water, our highly successful franchise Innovate East has helped us address some of our biggest challenges. At its launch in 2019 with a large-scale event in Ipswich, nearly 2,000 people from 400 organisations came together to tackle challenges ranging from leakage to natural capital. Out of that have come innovations such as our water trading platform, Wheatley Water Source, and accelerated progress on digital twinning.

Over the past two years we have transferred Innovate East to a virtual platform focussing on fast-tracking the steps required to achieve our pressing carbon and climate change goals.



Water Resources East

It's important to remember that not all innovations relate to technology. One of the most innovative things we have instigated in recent years is Water Resources East, which was set up within Anglian Water in 2014 to take a holistic approach to water management in our region. It's a multi-sector organisation, now fully independent, that brings together a multitude of stakeholders from public and private sector to break down siloes and develop region-wide water management plans that cater for all needs.

It's an approach that very quickly bore fruit and has been adopted as a national model for water resource management, with parallel organisations in every area of England.



Anglian Centre for Water Studies

The Anglian Centre for Water Studies is an industry-led research centre that brings together leading minds to address the interrelated environmental and social challenges facing our region and, more broadly, the UK.

The Centre's vision is a sustainable water environment created through the implementation of leading environmental and social science research. Its work builds on the research strengths of the University of East Anglia, and involves collaborations with the Universities of Sheffield, Manchester and Cardiff.

It is also building our partnership with businesses and other organisations. As it grows, the Centre will be a leading partnership of diverse experts working from different sectors and disciplines, working together to tackle the water-related challenges we all face.

The national picture

At Anglian Water we believe there are some hugely exciting innovation opportunities being unlocked nationally in collaboration with the rest of the sector.

UK Water Industry Research (UKWIR) is the research platform for water companies in the UK and Ireland, addressing the big questions facing our industry. The collaborative research programme has been running since 1993, focused on the key themes and challenges faced by Anglian Water and other water companies in the UK and Ireland. In that time UKWIR has successfully delivered around 1,500 projects. This work is collated under various research themes, providing quick access to past, present and future projects and their associated outcomes. The research themes are: Water, Wastewater, Sustainability, Regulation, Customers and Asset Management. UKWIR and its members have also developed 12 'Big Questions' to help tackle the key challenges faced by the industry, now and in the future.

Building on the success of our research collaboration with UKWIR, the sector has created a collaborative innovation strategy for the UK water industry. This, coupled with Ofwat's £200 million Innovation Fund, launched to drive transformational innovation in AMP7, and the launch of Spring, offers unprecedented



opportunities for collaboration across the sector and also provides increased visibility and access to innovation activities in the sector. At the time of printing, £38 million has been allocated by the Ofwat Innovation Fund from the first two challenges. So far, we have secured just under a third (£11.5 million) of this funding for transformational innovation projects within Anglian Water.

In the first two challenges 92 projects were proposed by the sector. So far, 20 projects have secured funding: we're leading on three of these, and we're involved in a further four.

The Ofwat Innovation Fund: driving collaborative innovation at pace



Launched in 2020, the Ofwat Innovation Fund is a competition aimed at uncovering new affordable solutions to long-term challenges. Ofwat has made up to £200 million of funding available which will be accessed through a series of annual competitions during 2020-25.



Anglian Water's Head of Innovation Engagement Shauna Berendsen is spearheading the development of nationwide innovation centre, Spring. Spring's role is to attract, connect and support innovators across the industry to accelerate transformation. It's an open platform for all: accessible to water companies, supply chain, academics and regulators, and will provide resources, match needs with solutions and create communities for collaboration. It follows the development of the nationwide Water Innovation Strategy, which Anglian Water's Innovation Engagement Team played a key role in developing. Spring launched in December 2021 and is another step on our journey to help make the UK water sector a global leader in open innovation.

01 Reaching our 2030 carbon goals

We are committed to reaching net zero carbon emissions by 2030, working with our supply chain and the whole water sector to achieve this together.

Our track record

Public and stakeholder awareness of the climate crisis is growing, with COP26 in November 2021 bringing the issue into sharp focus. We know our customers are increasingly concerned about the impacts of climate change, and as one of the largest energy consumers and emitters in the East of England, we have a responsibility to reduce our carbon footprint. That's why we've committed to reaching net zero carbon by 2030, 20 years ahead of the government's 2050 target.

Carbon reductions are not new to us. Although we carried our first climate change risk assessment in 1993, our net zero journey really began in 2010 when we first set ambitious goals to reduce our operational and capital carbon emissions (see page 7 for Our innovation journey). This was a time when measuring and managing capital carbon - the carbon in our assets and what we build - was unheard of. With a committed leadership and a determined

supply chain, by 2021 we'd reduced capital carbon by 61 per cent from our original 2010 baseline, and operational emissions - the carbon produced in running the business day to day - by 35 per cent from a new baseline set in 2014/2015.

Working with government and other leading businesses, we developed the world's first standard for managing carbon in infrastructure (PAS 2080), which is now being used nationally and internationally. Our strong track record of measurement and reporting enabled us to pioneer the use of sustainable financing through Green Bonds, becoming the first utility to launch one with our inaugural £250 million bond in 2017. We've also made huge progress on renewable energy, generating 134.4GWh in 2020/21 - enough to power 40,000 homes.

But we can't rest on our laurels. Cutting carbon to unprecedented levels poses huge challenges to which we don't yet have all the answers. Meeting them will require innovative thinking and new approaches.

The solar array at Grafham Water generates up to 100 per cent of the site's energy needs on a sunny day



How we're innovating

Whole life carbon

We already have a comprehensive approach to measuring and reducing capital carbon, but that isn't the whole picture. Take, for example, an asset such as a pumping station - it needs energy to operate; over its lifetime equipment will wear out and need replacing, and worn-out equipment needs to be disposed of. This is known as whole life carbon. We're leading an innovative Ofwat-funded project, a UK water industry first, which builds on our existing successful approach through the PAS 2080 carbon standard, which we helped develop. It does so by integrating carbon and cost management and creating engaging visualisations of performance to identify carbon hot spots. Our learnings will benefit the whole industry and ultimately ensure our investment solutions are truly sustainable for customers, society and the environment.

Tackling process emissions

Our sector's biggest carbon challenge is process emissions: nitrous oxide and methane released as a by-product of wastewater treatment. Although they're not carbon emissions, these gases contribute to climate change, so we're addressing them as part of our net zero challenge. We're working with other water companies to monitor a number of sites, improving our understanding of the scale and location of process emissions. We're also exploring several new technologies to reduce them (see Triple carbon reduction, page 16). This is a really tricky area which will need many minds applied to it - so we'll share our outputs in the UK and beyond, with the aim of having a full plan in place to manage and reduce emissions by 2030.



Natural capital low carbon solutions

Our pioneering treatment wetland at Ingoldisthorpe uses natural processes to treat wastewater, avoiding the need to build new, carbon-hungry infrastructure and deploy chemical treatments. It's planted with native plants specific to the chalk stream environment, which treat the water by naturally removing phosphates and nitrogen before it is released into the environment. This approach increases the area's biodiversity by introducing new plants and the insects and animals they attract. Importantly, these plants also store carbon in their biomass as they grow, taking carbon out of the atmosphere. This scheme also benefits the local community, as a green space for visitors to enjoy. A footpath around the site allows people to experience the sights and sounds of the wetland. We're hoping to construct more of these treatment wetlands in the next five years.

The future we want to see

- A supportive policy and regulatory framework will accelerate our progress to net zero. In particular, we'd like to see:
 - Support for the Renewable Heat Incentive/Green Gas Levy to promote biomethane to grid
 - As a prosumer, both drawing from and contributing to the grid, we would like to see revised grid connection charges to avoid 'behind the meter' projects becoming unfinanceable
 - Water efficiency included in the successor to the Green Homes Grant for building
 - An end to the planning restrictions on onshore wind projects introduced in 2015 (and extended in 2020)
- It's important that we work with the EA to ensure that biosolids to land continue to be an exemplar of the circular economy through developments to the Biosolids Assurance Scheme which Anglian Water was instrumental in establishing.
- Our net zero 2030 routemap focuses on our own operational emissions, but a lot of energy (and therefore carbon) is also used to heat water in customers' homes and businesses. We'd like to work with energy companies to educate customers about how using less hot water could help reduce their carbon footprint, as well as their energy and water bills.
- We'd like to see heat generated through the water recycling process used more widely as a low carbon heat source, as we've done in two vast greenhouses in Norfolk and Suffolk (see page 17).

Case study

Triple carbon reduction:

Targeting a step change in emissions with a hydrogen breakthrough

Process emissions occur when sewage is treated before returning it to the environment, producing several by-products including the potent greenhouse gas nitrous oxide. The critical need to tackle these process emissions was highlighted as a key priority at COP26. Their reduction and removal remain the toughest challenge for the water industry on the journey to net zero operational carbon. That's why we've partnered with leading innovators to secure £4.2 million of funding from the Ofwat Innovation Fund to develop and demonstrate a novel solution. It targets a step change reduction in the dominant source of these emissions from our operations, together with impressive energy efficiency and renewable energy benefits.

The Triple Carbon Reduction project aims to deliver an integrated solution addressing three potential benefits aligned with the water industry achieving net zero carbon emissions by 2030:

- Developing a viable alternative wastewater treatment process, targeting 90 per cent removal and moving towards elimination of nitrous oxide process emissions from secondary treatment
- Achieving up to an 85 per cent reduction in electricity consumption compared to the conventional treatment process
- Generating an additional source of renewable energy via green hydrogen production through electrolysis, available to be applied in areas that are currently extremely challenging to decarbonise.

Collectively, we describe this as a 'triple carbon' synergy.



Proposed design for the Cambridge waste water treatment plant relocation project.

The project is fully aligned with the Water UK net zero 2030 routemap and the Anglian Water net zero 2030 strategy. By collaborating with academia, businesses and other water companies, it creates an elegant solution to eliminate some of the greenhouse gas emissions associated with water recycling and position the sector within the developing hydrogen landscape, in line with the newly launched UK Government Hydrogen Strategy.

Creating a low carbon water recycling centre for Cambridge

We are planning to build a modern, low carbon waste water treatment plant for Greater Cambridge. The new facility is one of the largest waste water infrastructure projects in a generation and will provide vital services for the community and environment, recycling water and nutrients, producing green energy, helping Greater Cambridge to grow sustainably. Our vision goes beyond just building a new plant - we will build a facility to better serve the community and environment for years to come, one where waste water becomes a valuable resource. The new facility, as well as being operationally net zero carbon, will be energy neutral. It is designed to adapt to changing social and environmental priorities, increasing resilience to storm flows and flooding and provide a long-term solution to how we best treat waste water for a growing Greater Cambridge population.

Case study

Low-carbon sustainable agriculture:

How tomatoes have become a model of the circular economy

This initiative, a collaboration between greenhouse developers Oasthouse Ventures and Anglian Water, is a world first and an exemplar of how innovative thinking can drive the move towards a circular economy.

The project uses warm water (the natural byproduct of the water recycling process), to heat two of the UK's largest greenhouses, capable of producing up to 12 per cent of the UK's tomatoes. A remarkable engineering feat, this project provides a blueprint for sustainable, low carbon food production to meet the challenge of delivering net zero. There are additional environmental benefits, too, since the water that is returned to the chalk stream is cooled, which is better for aquatic organisms and less likely to promote bacterial growth.

This project, which was completed to schedule in October 2020, has delivered two of the UK's largest greenhouses, one outside Fornham, in Suffolk, the other outside Norwich, each covering an area larger than the O2 Arena and some 7m tall.

The provision of heat is one of the biggest factors of greenhouse gas emissions, with natural gas a hugely carbon-intensive resource. The reuse of waste heat from the water recycling process to support sustainable agriculture is an innovative and renewable low carbon alternative to traditional gas-fired boilers, which would be the conventional choice to heat a glasshouse on this scale, and a great example of the circular economy in action.



There is scope to recreate this template anywhere close to a water recycling centre where warm water, as the natural by-product of the water recycling process, is entering a watercourse, and where there is a sufficient area of land available nearby to accommodate a greenhouse. The scheme partners are already exploring a number of further sites.

We are currently exploring the use of similar heating systems powered by waste water in other settings, both domestic and commercial, including new housing developments, community centres and swimming pools.

How does it work?



The greenhouses take advantage of the warm water generated by the water recycling process to provide energy to heat the giant structures, where tomatoes and other produce are grown hydroponically from nutrient-rich water solutions, without the need for soil. Closed-loop heat pumps are used to transfer waste heat from Anglian Water's water recycling centres to the greenhouses to accelerate the growth of the plants. The greenhouses are capable of producing more than 20 tonnes of tomatoes a day. The heat pumps will be powered by a new CHP plant, the carbon emissions of which will be channelled back into the greenhouses to help the plants grow.

02

Delivering healthy rivers

We will bring new ways of thinking to improve the ecological quality of our region’s rivers and streams, prioritising nature-led solutions and collaborative approaches to safeguard and enhance our environment



Our track record

If 2020 was the year of coronavirus, 2021 was the year the world woke up to an issue we’ve long been wrestling with - the quality and overall health of our rivers in the face of more extreme weather, a changing climate and a growing population. The public and government rightly set the bar even higher in terms of the environmental standards expected from the water industry, telling us in no uncertain terms that significant investment and new approaches (including on combined sewer overflows, or CSOs) are needed to improve water quality in our rivers and seas.

And we completely agree. Water companies have a proven track record investing in environmental protection and improvements, and we share the ambitions of our customers that our rivers should be beautiful places, rich in biodiversity. We are wholly committed to preventing environmental harm from CSOs in our region.

In 2017 we set out in our Strategic Direction Statement the ambition to “work with others to achieve significant improvement in ecological quality across our catchments” and we still recognise this as the biggest challenge and opportunity in securing the future health of our rivers.

As part of our 2020-2025 business plan we put forward the biggest Water Industry National Environment Programme (WINEP) of any water company in England and Wales. At £800 million it is more than double the scale of the previous five-year plan. In 2021, £300 million of spending was fast tracked as part of the Government’s Green Recovery Plan, allowing us to begin 200 environmental schemes more than a year early. We’re also committed to taking less water from the environment. Our Water Resources Management Plan for 2020-2025, the sector’s most ambitious, commits us to reducing abstraction by 85 million litres a day, supporting our region’s rare and precious chalk-fed streams and rivers.

How we’re innovating

Setting our business up for success: a dedicated directorate

2022 has seen the formation of our brand new Quality and Environment directorate. The new business unit’s remit is to provide leadership and vision on all aspects of quality and the environment. It will focus on source to sea water quality management, effective delivery of strategy and plans for 2020-2025, and the development of a long-term vision based on the principles of integration, collaboration and innovation.

CSOs: targeted investment for environmental gain

Between now and 2025, we’ll spend more than £200 million on work to reduce storm spills, increase the capacity of our sewer network and tackle surface water flooding. All of our CSOs will have monitors fitted by 2023 so we can track their activity and carry out detailed assessments on any high spillers, meaning future investment is targeted where it will have the most environmental benefit.

Using convening power

Building on the success of initiatives such as Water Resources East (page 12) and Slug it Out (page 21), we’ll continue to take action on river water quality by creating innovative partnerships bringing together key stakeholders. New ways of thinking driven by collaboration play a vital part in our progress.

Cutting carbon while increasing capacity for storm water storage

As part of a £100 million scheme of work, we’ll install additional storm water storage at 110 of our water recycling centres by 2025. Being able to store excess water in this way will help reduce the risk of flooding to homes and businesses and provide additional protection to rivers. Many of the storm storage solutions have been delivered by harnessing gravity to eliminate the need for energy-intensive - pumping, as well as repurposing existing assets to drive savings in both operational and capital carbon.

Letting nature take its course

We are now embarking on 16 unique schemes across the region, all designed to restore unique river habitats, improving ecology and biodiversity. The work will be delivered with a number of environmental bodies, alongside the established Catchment Based

Approach (CaBA) partnerships. The schemes aim to reinstate the natural processes in the rivers that have been lost through historical river management and modification. By changing the river’s shape - narrowing or shallowing some parts - we can increase habitat diversity and allow the river to function more how nature intended it to, and, importantly, without increasing the risk of flooding. We hope to see an improvement in the diversity of invertebrate life in the river, which is an excellent indicator of overall river health, while also increasing the resilience of the river ecosystems to fluctuations in flows throughout the year. In total the work will have a wider ecological benefit across up to 250km of river catchment.

The future we want to see

- We want to see rivers across the region brought back to ‘good ecological health’, or ‘good ecological potential’ where heavily modified. We support Water UK’s ‘21st Century Rivers’ Action Plan’ and the Environmental Audit Committee’s Report into river health, which calls for a new deal for rivers, where everyone from river users, other industries, environmental NGOs and government works together on a new approach to river health.
- We expect to see ambitious targets in the Environment Act to support river health and tackle simultaneous issues such as microplastics and plastic litter, as well as revoking the automatic right to connect new developments to the existing sewer network. We’ve publicly supported Fleur Anderson MP’s call to #BanPlasticInWetWipes and have also fed into the relevant Defra consultation regarding disposable plastics.
- We want chalk streams to continue to be a particular focus within river health going forward, starting with our flagship river restoration project focused on the River Lark in Suffolk, where we have joined forces with local MP, Jo Churchill, and the River Lark Catchment Partnership. Our work with Norfolk Rivers Trust on the River Stiffkey is another key focus area for us.
- To enable the improvement we need on river health, it is essential that water companies have access to the right levels of funding to remove the remaining ‘Reasons for Not Achieving Good’ associated with the water sector by 2030. We’re excited for more projects like the Wendling Beck nature restoration project to spring up across the region, funded by public and private sources.
- We support a future where beavers are reintroduced to upper catchments as part of natural flood risk and integrated water management plans.

Case study

Collaborating to safeguard river water quality

Harnessing citizen science and local data capture

The Catchment Systems Thinking Cooperative (CaSTCo) is a partnership led by United Utilities, between the Rivers Trust, 12 water and sewerage companies (including Anglian Water), academia, and environmental charities. The project was awarded £7.1 million as part of Ofwat's first round of Innovation Funding - the Water Breakthrough Challenge.

CaSTCo aims to revolutionise the way crucial data about the health of England and Wales rivers is gathered and shared. Only 14 per cent of rivers in England are in 'good health' - one of the worst records in Europe. By harnessing the power of citizen science and other monitoring approaches, the project will develop a robust evidence base for tackling environmental challenges through local evidence gathering and community engagement in eight demonstration catchments. It will also provide a national framework of standardised tools and training.



The project is already underway with the development of a national framework of governance and standardisation for catchment data collection, monitoring methods and training. A national governance structure will also be established, with representation from all partners, to manage the programme and shape the framework.

Working with farmers to improve water quality

Operating in an agricultural region, we face a challenge to our raw water quality: the slug pesticide metaldehyde. The regulatory level permitted is equal to one drop in an Olympic swimming pool - a level regularly exceeded in our reservoirs - but removing it at the scale required across our region is not currently possible.

Since 2015, our Catchment Management team has worked with farmers around key reservoirs through our Slug It Out programme. The team use financial incentives to eliminate metaldehyde use, including trial hosting fees, a 'water quality bonus' if targets are achieved, and paying the price difference for farmers to use the alternative ferric phosphate.

Slug It Out has been an unmitigated success: over six years, we have achieved 100 per cent voluntary uptake, and more than 98 per cent reduction in metaldehyde levels. Farmers voluntarily chose not to use metaldehyde on an additional 13,500ha of land outside the scheme's boundaries - a great testament to their confidence in ferric phosphate as an alternative. It also reflects perhaps the scheme's biggest success - strong relationships with our region's agricultural community, built on trust and mutual benefit. This was further demonstrated this winter, the last season before metaldehyde is banned in April 2022, with an amnesty which collected more than 2.6 tonnes of the pesticide.



Case study

Weather forecasting pumping stations:

Keeping a weather eye on water quality

We know our region is particularly vulnerable to extreme weather as the climate continues to change - but the weather doesn't have to be our enemy. Since 2016, our catchment team has been working with agronomy services provider Agrii to install 19 weather stations across our region. These stations monitor weather conditions such as rainfall, wind speed and direction, air temperature, soil temperature and soil moisture. This helps us understand how localised weather affects the catchment.

By monitoring the weather, we're able to forecast which pests and diseases are likely to affect crops in the catchment. This, combined with weather conditions, gives us a good idea of what pesticides will be in use, so we can focus our engagement with farmers about applications of plant protection products and nutrients. This information not only allows us to understand the catchment's response to rainfall, but it also informs abstraction management advice, so the Catchment Team can support risk and supply teams when discussing abstraction management strategies - turning pumps on and off to balance the quantity and quality of our water resources.

We are adding data from another 20 weather stations around the region and upgrading sensors to calculate evapotranspiration (the amount of water lost from surfaces through evaporation and thus the water demand for the crops). Access to the data is also being made easier via a new partnership app 'Rhiza Connect' which allows free and open access to all with an interest in the catchment. It is hoped this local



data will help inform local decision making and water use, while keeping land and water connectivity in the front of land managers' minds.

Working with the weather - rather than against - means we can anticipate the connectivity and potential upstream risks posed by catchment land use and surface drainage. This information helps us focus our engagement to promote local solutions to local challenges in order to protect watercourses and safeguard raw water quality.

Extreme weather and droughts will only become more common as the climate continues to change - especially in our region, which is the driest in the country, but also has lots of land below sea level.

Safeguarding our water resources so we can continue to provide a robust, high-quality supply of drinking water to our customers is key, as is supporting water for food production for our region's many farmers. With these forecasting stations, we can collect and share local weather data with all water users in the catchments, allowing us to make informed decisions about how to love every drop of this most precious resource.

03

Futureproofing our water resources

We will deliver new solutions to rise to the challenge of diminishing water resources in the East of England in the face of climate change, population growth and the needs of the environment.

Our track record

We operate in a region with a rapidly growing population, significantly lower rainfall than the UK average and complex environmental pressures - in particular the need to protect precious and rare chalk streams. In the face of this triple challenge, we've invested and planned over several decades to futureproof our water resources.

We've placed water resilience at the heart of our long-term strategy,

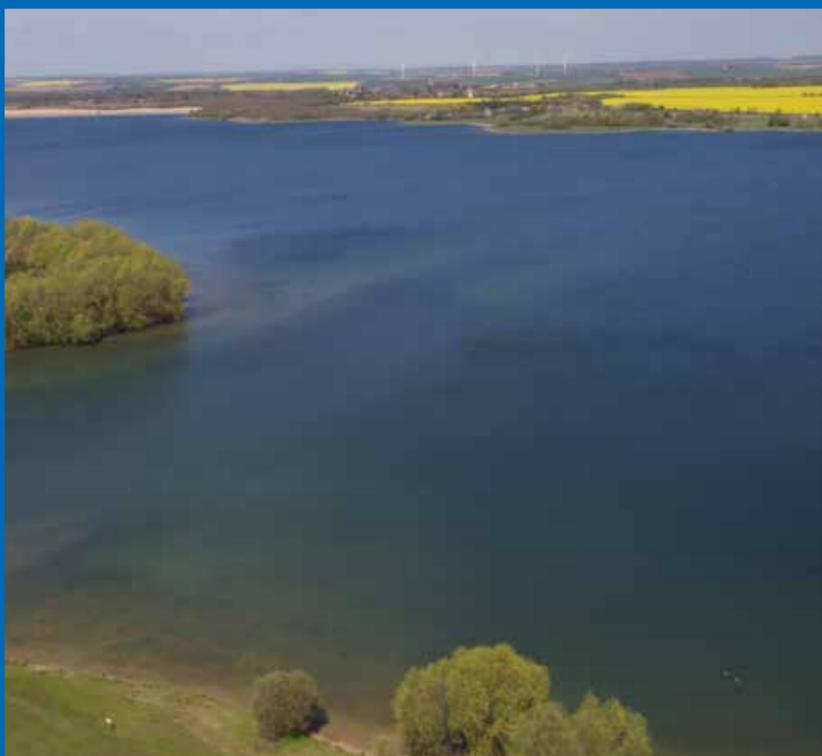
embedding commitments to make the East of England resilient to the risks of drought (and flood) and to enable sustainable economic and housing growth as two of the four 25-year ambitions we set out in 2007 and refreshed in 2017.

Our world-leading performance on leakage reduction, combined with years of investment on supply management, has enabled us to serve 650,000 more people than we did at privatisation in 1989, without

putting any more water into supply. We've reduced leakage by 40 per cent over that time.

We've also been instrumental in designing and delivering entirely new approaches to water resilience, including the development of a much-needed national planning approach. Anglian Water chaired the Water Resources Long-Term Planning Framework in 2016, which paved the way for the development of the Environment Agency's National Framework for Water Resources published in 2020.

One of our most lasting achievements in this area has been the establishment in 2014 of Water Resources East (WRE) (see Our innovation platforms, page 10). Through collaboration and public engagement, WRE brought together stakeholders to safeguard our region's resources for tomorrow, as well as today.



How we're innovating

The Strategic Pipeline Alliance (SPA)

By 2025 we'll deliver a brand new network of hundreds of kilometres of large-scale interconnecting pipelines to move water to drier areas our region, supported by a cutting-edge digital twin which will mirror the physical infrastructure. This will provide us with real-time data, driving insights that will help us optimise the delivery of our service to customers (see case study on page 24).

New multi-sector reservoir systems

Even SPA isn't enough on its own to address our future water needs - so we're developing plans for two new reservoir systems, each on the scale of Grafham Water, to deliver up to 250 million litres of water a day. Crucially, these reservoirs - one in South Lincolnshire and one in the Fens (see Future Fens: Integrated Adaptation on page 32) - are being designed to meet the needs of multiple users, including agriculture and business, as well as helping to manage flood risk. This makes them the most radical of all the strategic resource options which are currently being considered nationally by RAPID (the Regulators' Alliance for Progressing Infrastructure Delivery). If selected in the WRE regional plan and our own Water Resource Management Plan, they are projected to be in operation by the mid-2030s.

Smart meters

We've committed to roll out 1.1 million smart water meters across our region by 2025. With over 260,000 already installed and reporting data, smart meters are playing a vital role in helping reduce demand for water by giving customers access to daily updates on their usage and enabling us to pinpoint and address leaks (see page 25).

Watersource platform

Working with Wheatley Solutions and Northumbrian Water, we've developed an online platform to support future trading of water - an innovation which emerged from Innovate East in 2019. Watersource, an online central 'open' cloud portal, enables users for the first time to spatially identify water resource zones with supply deficits and surpluses. The platform aims to seek new third party water resources options.

Water-smart communities

We're collaborating with partners including the Universities of East Anglia and Manchester, Thames Water, United Utilities, Ove Arup and the Centre for Local Economic Strategies to unlock integrated water management in the UK. Through four development scenarios (private, public, community and water), we'll address how new developments, and the people living in them, can adapt in a sustainable way to three key impacts of climate change - flood risk, water scarcity and water quality. We'll set out new regulatory and policy standards, while improving understanding of cost models and the stewardship of water assets.

Finding new approaches

We're continually exploring new ways to safeguard long-term water resources for our region, including desalination (with the potential to deliver co-benefits through the production of green hydrogen) and aquifer storage, for which we're scoping a trial in Lincolnshire.

The future we want to see

- We want to see much tighter building regulations for water use in new homes and buildings. We support innovation around water-neutral new developments, where water demand is first minimised with efficient devices and water reuse, and then offset through water savings in local existing buildings.
- We want to see a future where there is a strong public awareness of the issue of water scarcity and where customers use water wisely. We will support this through the roll out of smart meters and behavioural change campaigns (see page 25)
- We are committed to offsetting housing growth and the resulting pressures on water demand in our region through programmes to reduce demand, outlined in our Water Resource Management Plan, and our extensive water efficiency programme.
- We see non-household water demand reduction as an opportunity area for innovation and policy development.
- We'd like to see excess winter water stored in reservoirs that will also support wider ambition for economic development, public amenity and biodiversity enhancement.

Case study

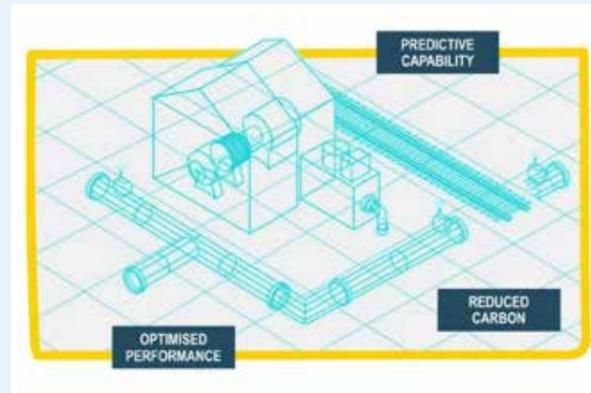
Strategic Pipeline Alliance:

Delivering region-wide resilience

Together with our partners in the Strategic Pipeline Alliance (SPA) – Costain, Farrans, Jacobs and Mott MacDonald Bentley – we're delivering the biggest infrastructure programme in Anglian Water's history. It's a vital pillar of our Water Resources Management Plan (WRMP), which sets out how we will manage the water supplies in our region to meet current and future needs over 25 years.

By 2025 we'll create a new network of hundreds of kilometres of vast interconnecting pipelines, and enhance existing infrastructure, to allow water to be moved from areas in the north of our region, where supplies are more abundant, to areas in the south and east that already face a shortfall. Driven by systems thinking, this new way of approaching our water resource challenge joins up our region's water supplies like never before. The new pipelines will also play a vital role in strengthening resilience by reducing the number of homes and businesses which rely on a single water source.

The SPA is supported by cutting-edge digital infrastructure – a digital twin – which will mirror the physical infrastructure, providing real-time data to drive insight, helping us to monitor and optimise the Anglian Water network. Using artificial intelligence and machine learning, the digital twin will drive improved decision making and help to predict and prevent incidents. Ultimately, the aspiration is for it to form part of the National Digital Twin, a programme led by the Centre for Digital Built Britain, which will see infrastructure owners securely sharing information about their assets to support better outcomes for society and the environment.



Innovating on SPA: low carbon, low impact solutions

We're always looking at better, more efficient ways to deliver this complex programme with the lowest carbon footprint and least possible impact on landowners and communities. We're the first in the UK water industry to use a 'pipe plough', a specialist machine that cuts through the ground and lays pipe at the same time, and which is more typically used to lay gas pipes. Using the pipe plough means we can avoid open excavations during installation, cutting narrower trenches which reduces our impact on the environment, lowers our carbon footprint and creates a safer working area for our people. It's also much quicker and more efficient.

Where we do need to excavate, we're reusing materials wherever possible, lowering our footprint by reducing our reliance on imported bedding material.

Our partners JM Bentley are also trialling the use of HVO fuel on site. Made from waste fats and vegetable oils, this innovative low carbon fuel reduces greenhouse gas emissions by up to 90 per cent.

Case study

Smart metering:

Helping us and our customers manage water use

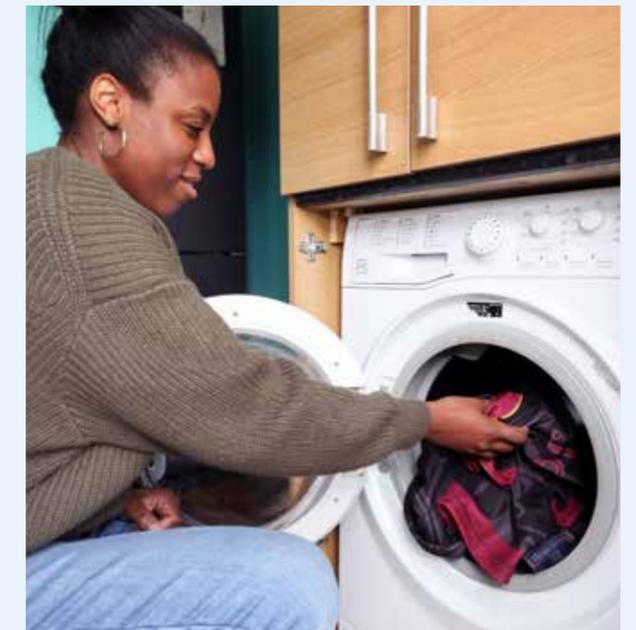
Our ambitious smart metering programme plays a pivotal role in our strategy to safeguard resilient water supplies in the face of climate change, rapid population growth and the need to protect the environment in the East of England.

Smart water meters enable us to develop a near-real time understanding of customers' usage by taking regular remote readings through our Advanced Meter Infrastructure network. This means smart-metered customers can benefit from hourly usage updates through our MyAccount app, supporting them to understand and reduce their usage. The increased insight also helps us to identify leaks in customer properties and on our wider network – for example if we identify that water is running constantly throughout the night, we can investigate and stop leaks in their tracks.

Our programme was created following early trials through the Innovation Shop Window in Newmarket, where we installed 7,000 smart meters in 2017. Through targeted awareness and behavioural change campaigns, combined with insight from the meters, we were able to reduce consumption by an average of 12 per cent per property.

Over the five years to 2025 we'll install 1.1 million smart water meters, covering around 55 per cent of our customer base, making ours the most ambitious smart metering rollout of any water company. The programme is being launched in parts of the region which face a combination of growth, water stress and higher rates of leakage, before being rolled out region-wide.

We anticipate this will translate to significant savings thanks to reduced consumption and reduction of leakage from supply pipes on customers' land.



Taking inspiration from Formula 1

Our IMDS Alliance partners (that's Anglian Water, Kier and Clancy) have come up with an award-winning formula to speed up our smart meter installation programme. By taking inspiration from Formula 1 racing pitstops, they've examined and optimised every element of the installation process, shaving three minutes off the installation time for each meter and £1 million of cost every year. The programme was awarded Supply Chain Initiative of the Year at the 2021 Utility Week Awards.

Changing customer habits

A crucial element of our water resources strategy involves working with customers to help them reduce their water use. Achieving behavioural change is notoriously challenging, but it's central to the delivery of our demand reduction strategy. Through the Anglian Centre for Water Studies we've been collaborating with the University of East Anglia on an ambitious two-year behavioural science project, part-funded by Innovate UK's Knowledge Transfer Partnership. The outcome of the research is a best practice behavioural change toolkit which will be rolled out across the organisation and beyond, in line with our commitment to share our learnings from innovation wherever possible.

04

Innovating on leakage and infrastructure optimisation

We will continue to push frontiers on leakage reduction, creating smart networks and using insight from smart metering to help our networks perform better than ever

Our track record

Our leakage performance stands out as one of our proudest achievements as a business.

We've reduced leakage in the Anglian Water region by 40 per cent since privatisation in 1989, and by 34 per cent since 1997, when specific targets were introduced (versus an industry average of 30 per cent). Our leakage level per kilometre of pipe is the lowest in the industry and we've exceeded our leakage targets for more than 10 years in a row.

We've achieved this reduction in spite of the challenges we face from climate change, a real and present danger. A drier climate puts increased pressure on our systems and increases the risk of physical disruption to our infrastructure through more frequent and extreme changes to ground moisture and temperatures through the seasons.

In February and March 2018 the Beast from the East gripped the nation, leaving hundreds of thousands of customers across the UK without water. Fewer than 0.1 per cent (163) of those customers were in the Anglian Water region. Ofwat commended our performance, stating Anglian Water had "performed well". Less than six months later the East of England faced some of the driest weather in recent memory, with Essex receiving



only 1.4mm of rain. Thanks to record leakage lows and innovative water conservation schemes, we avoided any hosepipe bans and were again commended, this time by the then Secretary of State for Environment, Food and Rural Affairs, Michael Gove, who said: "Here in the Anglian region there are unique pressures that are faced by customers and the water company - this is the driest part of England ... Anglian are the league leaders when it comes to dealing with leaks ... what I've seen here today is a company that's determined to do better, to invest in the environment and to give consumers what they want, which is an end to the leaks which create much frustration and environmental damage."

In 2019 our CEO Peter Simpson joined his peers from Portsmouth Water and Affinity Water as co-sponsors for the Public Interest Commitment for Leakage, committing the industry as a whole to triple the rate of leakage reduction by 2030. Since then the sector has also taken up the National Infrastructure Commission's (NIC) challenge by committing to halving leakage from 2018 levels by 2050.

As a frontier company it is incrementally harder year on year to find new ways to better our leakage performance. However, we are determined to keep pushing boundaries and are investing millions of pounds in advanced technology to help us do so.

How we're innovating

Satellite and drone technology

Using advanced satellite imagery and sub-surface long wave radio waves, we're working with an Israeli company using Japanese satellites to detect underground leaks. The patented analysis algorithms can differentiate ground water from chlorinated drinking water, particularly useful on long pipes that run through rural and agricultural land.

In 2017 we were the first water company to successfully use drones to find underground leaks. Taking a bird's-eye view of the ground surrounding a pipe or an asset, we analyse the live video feed to observe different temperature patterns which can indicate an underground leak.

Using fibre optics to find leaks

Inserted into live water pipes, fibre-optic cables coupled with patented analysis hardware can sense vibrations in the water created by a leak. With the help of an on-board camera, we can survey up to 1km of underground pipe at a time, which not only helps pin-point leakage, but also gives us a comprehensive asset condition survey so we can make informed investment decisions. This technology also provides the opportunity to deliver broadband services to remote locations in our region, supporting the delivery of our purpose to communities.

Network calming

We're investing millions of pounds in pressure management and system optimisation in the period to 2025. The first step to tackling leakage is to prevent it from happening in the first place. Optimisation of our water systems using dynamic control systems developed through our Shop Window (see ANSiG, page 28) ensures that we're operating them in the best possible manner at all times. Going beyond traditional pressure management, we take a true systems-based approach, viewing the system holistically, determining its full potential and then finding the "sweet spot" that keeps it in balance. Working with innovative companies such as Optimatics, we use powerful analytics which run thousands of simulations to determine the best solution.

The world's largest fixed network hydrophone monitoring system

Listening is a tried and tested leak-detection method dating back to the introduction of wooden listening sticks in Victorian times. Today, we're pushing boundaries, leading the development of new advanced leakage sensor technology from concept to design. We now have more than 7,000 advanced leakage sensors permanently installed on 15 per cent of our vast treated water distribution network. This permanent monitoring system enables us to respond quickly to emerging leakage caused by changes in weather and demands on our system. Not content to stop there, we've been working with data science companies to improve the accuracy of the calculated leak locations. By using machine learning we can improve the efficiency of our analysis, and as we build our library we hope to be able to work out the size of a leak from the desktop.

Smart sensors pave way for digital twin

We're aiming to achieve full smart meter coverage of our network by 2030. In addition to customer meters we're also investing in coverage of enhanced pressure monitors, noise loggers and condition monitors for our most critical assets. These will form the backbone of our digital twin, a smart water system, which in turn will enable rapid innovation in processes that can unlock greater and sustained reductions in leakage levels.

The future we want to see

- We'll continue to aim for world-class leakage performance. We want to see well below 10 per cent of treated water lost from our networks and will continue to drive innovation to help us deliver this.
- Following the setting of a new target for water consumption in the Environment Act 2021, we want to see widespread adoption of smart meters. We know from our own smart meter trials that when people are aware of their water usage they're much more likely to try to reduce it. We're aiming to achieve full smart meter coverage by 2030 (where they are practical and possible to install).
- We want to see an end to leaky loos, which typically waste 200-400 litres of water per day. Some 8 per cent of toilets leak - typically dual flush-button types, including those fitted in recent years. This cannot continue, and we're working with national water efficiency groups to put an end to this problem. We expect to see mandatory water efficiency labelling on white goods and fittings introduced and linked to minimum standards for building regulations.

Smart water systems

We see smart water systems as the future of production and distribution to ensure we give the best quality service to our customers. A smart water system is built up of a number of components, some of which are showcased here.

Safe Smart Systems:

Using AI to deliver a joined-up approach to resilience

One of our most exciting current innovation projects, being delivered through the Shop Window, is Safe Smart Systems. This Ofwat-funded initiative seeks to better predict and manage vulnerabilities in the water system, such as leakage, through increased automation.

We see it as the first step to achieving autonomous control of water systems across the UK. Safe Smart Systems will develop a future-oriented, secure and self-regulating artificial intelligence (AI) Decision Engine which will identify and learn the consequences of failure and then trigger proactive interventions to optimise the network.

We're leading the project along with partners Jacobs, Skanska, Imperial College, Airbus Defence and Space, Microsoft and the University of Sheffield, and fellow water companies South West Water, Portsmouth Water and Affinity Water. Together, we've secured funding of £7.5 million in Ofwat's first Water Breakthrough Challenge.

The project brings together globally-recognised leaders in smart technology and systems in a live incubator environment, which is open to the industry. We're rapidly developing a modular prototype solution, and will scale and operationalise it for subsequent nationwide deployment. Through the project we'll standardise data frameworks in the form of a Water Information Management Landscape with the Centre for Digital Built Britain (CDBB) to share with the wider sector.

ANsIG: Digital transformation for the next generation of water supply networks

In 2017, along with Imperial College London, Cla-Val and a group of fellow water companies, we founded the Adaptive Networks Interest Group (ANsIG) to create the next generation of water supply networks, with the ability to dynamically adapt to changing conditions. By taking on complex engineering, mathematical and computing challenges, we've been able to deliver significant improvements in resilience and enhance our ability to manage pressure, reduce leakage, protect water quality and respond to incidents.

Among the innovations achieved to date are an algorithm which automatically finds the optimal placement of new control valves across complex systems, and novel system processes which calibrate and maintain hydraulic models through mathematical optimisation and machine-learning methods, removing the need for human intervention. The learnings we're taking from our dynamically adaptive networks are having a significant impact. Not only are they helping to shape short-term operational decisions relating to interruptions to supply and leakage, they're also informing our long-term investment plans, such as which pipes need to be replaced and rehabilitated.

Our own Shop Window has provided a live physical environment for these new network management methods to be implemented and evaluated.

Electroscan: Finding leaks in live water mains

We are the first UK water company to trial new technology to find and measure leaks in live water mains as part of a new partnership with Electroscan. The ground-breaking technology uses multi-sensor low voltage conductivity and acoustic technology to find leaks from inside the pipe, as well as high resolution real-time video to navigate within the pipe and assess the condition. Uniquely, this work can take place in live water mains, meaning there is no interruption to supply.

The sensors work by measuring the variation of electricity passing through a break or defect in the pipe wall and the volume of water loss in litres per second, enabling the leak to be identified and repaired.



Implementing AI:

Driving cost efficiencies at our water production facilities

We're on a journey to provide the most efficient and resilient service to our customers. The guiding light in achieving that is our smart water strategy - a roadmap for how we transition our ageing infrastructure into the 21st century and deliver a resilient and optimised water supply. One of the key foundations of our smart water strategy is artificial intelligence (AI).

Over the past two years we've brought advanced AI technology to Wing Water Treatment Works, one of the largest water production facilities in the East of England. A first for the business, it was developed to provide real-time operational intelligence for process optimisation for the operational team on-site.

Working in collaboration with Innovyze, we've used their Emagin® platform and machine-learning capability to ingest and analyse millions of rows of historic data. This has built more than 30 models that continue to learn with connected links to 'live' asset data feeds. The platform is able to predict and dynamically respond to system disturbances, changing on-site operations. It enables operational staff to intelligently monitor and adjust setpoints in order to minimise system-wide energy and chemical costs, while ensuring process compliance.

The project has already delivered savings of £150,000 at Wing, money which can be redirected to other customer priorities. Importantly, it's created a platform that has the potential to be rolled out across the rest of our asset base and transform the way we use AI technology in our business.



05

Adapting to climate change and delivering resilience

We are committed to driving resilience to the risks of drought and flooding in our region, with collaboration and systems thinking at the heart of our planning and investment

Our track record

Climate change has been on our agenda for nearly 30 years: we first recognised it as a potential threat in our assessment of water resources in 1993. We set out our first company-wide risk assessment of climate change in 2005, and in 2007 we recognised it as one of our two most fundamental challenges in our first 25-year Strategic Direction Statement. By 2010 we'd set up our Climate Change Steering Group, and the following year we published our first Adaptation Report under the Adaptation Reporting Power of the UK Climate Change Act (2008).

We've continued to build on our plans with a clear focus on understanding the risks we face in our region, and adapting to the changes that we know will come. In 2020 we became the first organisation to publish its Adaptation Report as part of the third five-year reporting cycle. Our report identifies seven key risk areas - water supply, sewer flooding, flooding of our sites, risks to natural capital, transitioning to a low carbon economy, interdependencies, and managing risks to customer service. It sets out both the actions we have taken to date to address them and those we will take in the next five years and beyond.

Climate impacts are inevitable, even if commitments made under the Paris Climate Agreement, which aims to limit the global temperature rise to 1.5° above pre-industrial levels are successful. We're playing our part by committing to reach net zero by 2030 (see page 14). However, if global carbon emissions reductions are not achieved quickly enough, temperature rises, and their impact, could be even higher. We need to adapt our infrastructure and support our communities to be resilient, whatever changes we face.

We know we can't deliver climate resilience alone; collaboration with other organisations is crucial. One such example is our partnership with Water Resources East, the Environment Agency, Cambridge and Peterborough Combined Authority and many regional partners in a taskforce to develop an ambitious plan to manage land and water across the Fens in the face of the warming climate (see Future Fens: Integrated Adaptation, page 32).

We were deeply honoured to be invited to play a part in shaping global solutions to climate change last year when we were invited to act as co-leads of the water theme at the first ever COP Resilience Hub at COP26 in Glasgow. Being at COP also brought the opportunity to share our learnings from Future Fens: Integrated Adaptation and forge new international collaboration, in particular with the Living Deltas Hub, with whom the taskforce is applying to join the UN Race to Resilience.



How we're innovating

Partnering on the Climate Resilience Demonstrator (CReDO)

We're currently participating on a ground-breaking project which explores the interdependencies between different infrastructure assets in the event of severe climate-change-related weather events. The Climate Resilience Demonstrator (CReDo) brings together Anglian Water, UK Power Networks and BT in a project led by the National Digital Twin programme to create a digital twin of interconnected infrastructure assets. This important initiative will help us collectively adapt our assets and approaches to resilience in a changing climate. See page 33 for more details.

Planning for pipe bursts in hot weather

Pipe bursts caused by frozen pipes thawing have posed a challenge for the water sector for many years and require substantial maintenance investment. As winter temperatures warm over the coming years due to our changing climate, the frequency of freeze/thaw-related bursts will likely decrease. However, as summer temperatures rise and the frequency of drought increases, soils will shrink and move, leading to an increase in summer bursts. Pipe bursts will therefore move from primarily winter occurrences to primarily summer occurrences. We've undertaken pioneering research to better understand this issue, including variables around geology and pipe materials, so that we can plan our investment to meet this new challenge.

Flood and Coastal Resilience Projects

In 2021 we were part of seven successful applications to Defra's Flood and Coastal Resilience Innovation Programme. This £150 million programme is funding 25 areas across England to improve resilience to flooding and coastal change.

Around £45 million will come to our region to help communities we serve to adapt to a changing climate. The projects we're involved in will demonstrate how practical, innovative actions can work to improve resilience to flooding and coastal erosion, and include the management of surface water, groundwater and coastal erosion risks, alongside catchment-scale interventions.

Baking in the variables

The cost of delivering resilience in a changing climate is difficult to quantify, since the degree of warming is still unclear. So we're shaping our investment plans by using a 'low' climate change scenario (based on a 1.5° temperature rise) and a 'high' scenario (a 4° rise) to understand comparative adaptation costs. We'll develop our plans to deliver the most cost-effective programme of investment to ensure resilience in water and water recycling assets, and will build on learning gleaned from the Defra Innovation Programme.



The future we want to see

- We'd like to see greater collaboration between organisations, and more use of systems thinking. Climate change is complex and fast changing. It poses a significant challenge and no organisation acting alone can solve the issues. We're already working in collaboration on a host of projects, but would like to see all sectors of society taking resilience seriously, with strategic place-based approaches to climate adaptation brought to the fore.
- We want to see ambition and delivery on adaptation raised up the agenda at COP27 in Egypt, putting it on a level with mitigation in international and national policy, and local delivery.
- We want a future where water use is much reduced, and people use water wisely to reduce their carbon and water footprints while also starting to adapt to a drier future.
- We want to work with others to develop more certainty and clarity around terms such as 'resilience', so that everyone understands what it is and how it can be measured. We'd like to see targets explained fully and clearly so that everyone can galvanise behind a shared goal.

Case study

Future Fens: Integrated Adaptation Taskforce

One of the areas of the UK most exposed to climate change impacts, the Fens are on the frontline of rising sea levels, at growing risk of severe tidal flooding. Yet this region, spanning three counties in the East of England, is also the driest part of the country, with water shortages a real and increasing risk, particularly during the summer months. This landscape is a microcosm of the vast challenges the world faces from climate change.

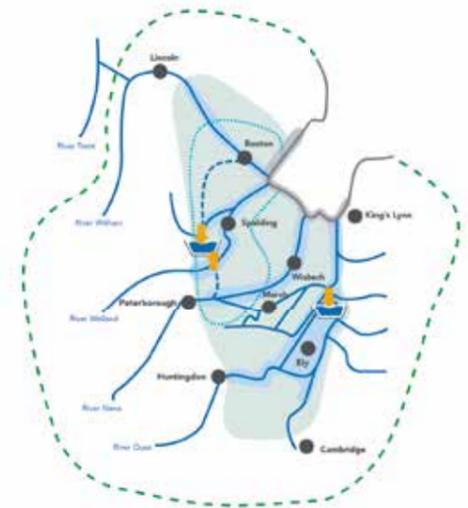
In response to this, we've convened the Future Fens: Integrated Adaptation taskforce. It's a collaboration led by sponsor bodies Anglian Water, Water Resources East, the Environment Agency and the Cambridgeshire and Peterborough Combined Authority, along with more than 40 regional partners.

The initiative deploys holistic systems thinking to manage water resources in a better and more joined-up way. It aims to ensure the Fens can adapt successfully to the consequences of climate change and unlock a wealth of new opportunities for the area, while supporting the Government's net zero carbon goals.

It combines flood risk management, including upgraded coastal defences, barriers and barrages, with new open water transfers and reservoirs serving multiple sectors. Together, these investments will unlock economic growth, new housing developments and improved transport links, as well as benefiting nature and tourism. Two new, multi-sector reservoirs (see page 23) will provide additional water supply resilience for public water supplies, farmers and the food industry, and improve the water environment.

Downstream flood barriers or barrages will protect growth areas in the Fens, enabling key local infrastructure projects such as a rail connection from Wisbech to Cambridge and the dualling of the A47 to move forward. Using open channels, rather than pipes, to move water would benefit nature, tourism and navigation, as well as providing further water storage and flood risk management benefits.

For more information, please visit:
https://wre.org.uk/wp-content/uploads/2021/11/Future-Fens-Integrated-Adaptation-manifesto_November-2021.pdf



- New reservoir intake
- New flood risk management strategy
- Adaptive plan for The Wash
- Landscape boundary within which water strategy will be aligned with land use management (i.e. National Flood Risk Management and Environmental Land Management Strategy)
- New open water transfers
- New reservoir (indicative location)
- Boston to Peterborough wetland corridor

Leading the way

In November 2021 Anglian Water was invited to co-lead the water theme at the first ever UN Resilience Hub at COP26, where we showcased the Future Fens: Integrated Adaptation initiative and taskforce as an exemplar of best practice on adaptation and resilience.

At the COP26 event, the taskforce unveiled a joint vision for future environmental and social prosperity for the Fens with the release of a ground-breaking shared manifesto, which sets out the risks, opportunities and shared commitments of the partners.

The taskforce also announced a commitment to join the UN Race to Resilience in partnership with the Living Deltas Hub, its partner at the event, in order to share knowledge and best practice on adaptation and resilience with other low-lying coastal deltas around the globe which are dealing with the effects of climate change.

Case study

CReDo - joining forces to deliver resilient infrastructure

Changing weather as a consequence of climate change will impact all types of infrastructure, from water to power supplies and telecommunications. These assets are connected in a host of ways, including energy networks, IT networks and roads. A failure in any one of these can have cascade effects which lead to failures elsewhere - an issue which has become all the more acute in the face of ever more frequent extreme weather events.

We've been partnering with BT and UK Power Networks on a first-of-its-kind project with the National Digital Twin programme (NDTp) run by the Centre for Digital Built Britain. The Climate Resilience Demonstrator (CReDo) is an exciting collaboration between owners of infrastructure assets, researchers and innovators. It applies the UK's state-of-the-art capabilities in systems engineering, digital asset management and modelling of the climate crisis to plan a more resilient built environment, keeping us all safer in the face of flooding and extreme weather.

The CReDo project looks specifically at the impact of flooding caused by climate change on energy, water and telecoms networks. It demonstrates how those who own and operate them can use secure information sharing, across sector boundaries,

to plan for, and mitigate the effect of flooding on network performance and ensure reliable service delivery to customers.

Delivered through the NDTp, CReDo is developing the UK's first digital twin to combine energy, water and telecoms networks, to provide a practical example of how connected data can improve climate adaptation and resilience. The project is funded by UK Research and Innovation (UKRI), the University of Cambridge and the Connected Places Catapult.

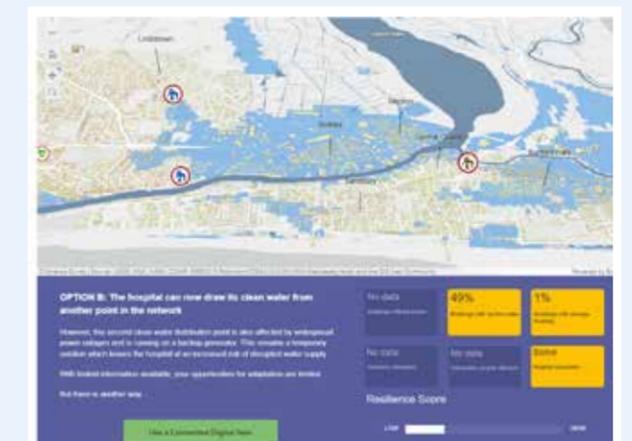
CReDo was previewed at COP26 in November 2021 with an interactive simulator app, using fictionalised data from an imaginary city, Sunford City, and a fictional series of storms to show how the technical demonstrator could help asset owners in their decision-making processes. The simulator was accompanied by a powerful film, Tomorrow Today, telling the story of a vulnerable elderly man who finds himself stranded in his rapidly flooding home without access to his telephone line in the midst of a storm.

The demonstrator itself is nearing completion and we hope to continue our collaboration to maximise our shared learnings from the project.



Visit digitaltwinhub.co.uk

Resources related to the demonstrator will be available on the Digital Twin Hub so those developing similar digital twin projects will be able to benefit from recommendations, lessons learned and other resources developed during the project.



NATIONAL DIGITAL TWIN PROGRAMME | CReDo Climate Resilience Demonstrator

love
every
drop.



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