Evidence against quality tests

Long-term delivery strategy

Bristol Water

Bournemouth Water

South West Water

Contents

This document, our Long-Term Delivery Strategy (LTDS), describes how, with our partners and collaborators, we will deliver the long-term ambition we share with customers and communities for high quality water and a thriving environment in our regions.

As we look to the next five years and beyond, we face several challenges and areas of uncertainty. We need to respond to changing weather patterns associated with climate change, the impact of over half a million more people living in our region by 2050, and rising expectations on the role that we play in the environment. At the same time we need to meet long-term targets and objectives for the sector set by government, including the Environment Act.

Our Strategic Direction, driven by our purpose, *to support the lives of people and the places they love for generations to come*, sets our ambitions and goals to 2050. Here, in our Long-Term Delivery Strategy (LTDS), we describe how we will meet these goals and how our plans will adapt in the face of change.

Achieving ambitious improvement at pace means continued meaningful engagement, effective collaboration, and the quick uptake of innovation. It will also require increased investment in key areas. In preparing our long-term strategy we have thought carefully about when is the right time to invest, balancing the need to improve with the impact on customers' bills. Our strategy is based on our customers' priorities in what needs to be done and when as well as choices in fairness on who pays for improvements between customers of now and those of the future.

For most customers, bills have fallen over the last 10 years, in real terms, and we are committed to keep delivering the best value and affordable services in the long run. We will continue to support those in need and, over the journey to 2050, we will continue to engage and consult to adapt our plans rapidly to the changes that may arise and affect our local communities and the environment.

The last few years have seen us make solid improvements, having delivered overall 70-80% of our Outcome Delivery Incentives, however like all companies in the sector there is more to do to meet the stretching targets set to 2025. By 2025 we will have delivered our best environmental performance ever and built a good foundation for our future plans. Our strategy builds on this foundation and aims to deliver much more.

Our plan for 2025 to 2030 (the AMP8 plan) is the first step in delivering our strategy to reach our 2050 targets and the AMP8 enhancement schemes are an integral part of our long-term investment plan.

To achieve our ambition, we are targeting real improvements and this document shows the benefits that will materialise along the way to 2050. In line with priorities and obligations we will tackle first, improvements where change is needed most and where wider benefits will be realised. These improvement programmes include continuing the acceleration of reduction of sewer overflows and pollution, and the reduction of leakage in our water distribution network. We are also planning to do more in restoring nature and contributing to achieve carbon emissions reductions.

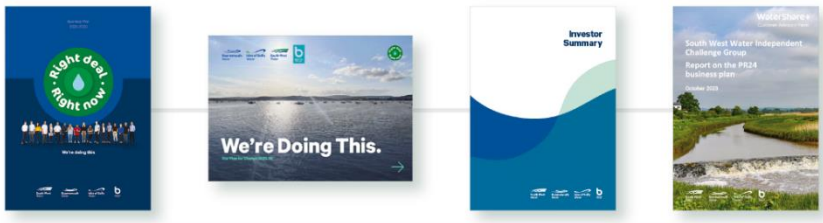
Our LTDS document follows Ofwat's recommended document structure of **strategy, rationale foundation** and **Board assurance**.

We built this strategy so that customers, partners, and regulators can count on us to deliver and so that generations of the future can rely on us for a high quality and resilient service.

Document map

The primary documents within the business plan submission are illustrated below. Other supplementary information, reports and documents are also referenced within these documents and can be accesses using a link in the document, where appropriate.

Level 1 • **Main documents**



Level 2 • **Our strategic priorities**

Water quality and resilience | **Storm overflows and pollutions** | **Net zero and environmental gains** | **Addressing affordability and delivering for customers** | **Action plans to 2025**

Level 3 • **Evidence against quality tests**

Risk and return | **Outcomes** | **Long-term delivery strategy** | **Data, information and assurance** | **Costs and efficiency** | **Engagement and affordability** | **Track record of delivery**

Level 4 • **Supporting documents and data table commentaries**

Deliverability and supply chain | **Markets and competition** | **Enhancement business cases** | **What we have heard from customers and communities** | **Data table commentaries**

Strategic plans to 2050

Our Strategic Direction to 2050 | **South West Water Water Resources Management Plan** | **Bristol Water Water Resources Management Plan** | **South West Water Drainage and Wastewater Management Plan** | **Long-term Drinking Water Quality**

Executive summary

Our purpose is 'Bringing Water to Life, supporting the lives of the people and places they love for generations to come'.

We are a business which needs to focus on the long term, with an enduring presence in our communities to provide an essential service. Our assets serve multiple generations and major new schemes can require decades of planning and delivery. Three and a half million people rely on us every day to provide resilient and affordable services and yet the foundation on which our services are built – the natural environment – is vulnerable to change, whether this be the climate, land-use, abstraction levels or the climate.

The past few years have also shown that we need to be resilient and adaptive to extreme conditions such as the dry weather of 2022, which was amongst the driest weather in our region in the past 200 years, combined with the ongoing impacts of the pandemic which saw significantly more demand on our services as people flocked to the South West for holidays and remote working.

We have identified challenges which could impact on our future operations, including climate change, population growth and changes to expectations of our services. Combined these create a range of alternative possible futures for us.

Our long-term delivery strategy (LTDS) identifies the investment required to manage long term resilient services in the face of this range of alternative futures. It also identifies the circumstances under which we would need to adapt our plans and what actions we would need to take to remain on course and meet our long-term ambitions.

Our AMP8 plan has been developed alongside and as part of our LTDS, to ensure that our AMP8 plans form the first step of our delivery strategy and that the pace and scale of investment is informed by profiling over the longer term to balance legal requirements, customer expectations and affordability.

Our future ambition

Our starting point is our Strategic Direction to 2050 – our guiding star for the future. This sets out our ambitions, the leadership and action we will take, the action needed from others, and the opportunities we must collectively grasp if we are to ensure high-quality, reliable, and resilient water and wastewater services for future generations.

Our overall goal is to protect and enhance the environment at every stage of our operations and provide a resilient service in the future. Achieving this will require us to continue to change the ways that we, our customers, and stakeholders all use and interact with our services and the aquatic environment. Our five ambitions to 2050 are:

- Resilient water resources through healthy catchments – by re-balancing the amount of water we use with the amount we take from the environment
- Top quality drinking water – an enduring primary priority through innovating in treatment and distribution of water
- Controlled and managed wastewater flows – through reducing our reliance on storm overflows, upgrading treatment capability, and creating smart sewer networks which help prevent sewer flooding and pollution incidents
- Environmental gains and net zero – by using catchment based, joined up, natural capital solutions which deliver against all our ambitions
- Being trusted by customers stakeholders and communities – by delivering against our promises, providing exceptional levels of service and fair and affordable bill.

We tested draft ambitions with customers and stakeholders and acted on feedback received. In this document we set out the targets which form part of these ambitions. These have been developed based on legal and regulatory requirements, existing commitments, and areas where customers expect improvements.

We describe how we propose to meet these ambitions, what steps we will take to reach our long-term targets, aiming for a balanced approach.

Our approach

Our Board has overseen and challenged the development of our LTDS, ensuring that it reflects our purpose and strategic direction. It has also considered how the LTDS shapes and aligns to our AMP8 plan.

We have followed Ofwat's guidance for developing our long-term delivery strategy and acted on feedback received from Ofwat, stakeholders, customers and our WaterShare+ independent challenge panel.

Independent experts supported the development, challenge, and assurance of our strategy.

Developing a long-term strategy is not new to us, we have developed long-term plans in water resources for a long time, and more recently for the drainage and management of wastewater flows. Working with our drinking water regulator we regularly review and update our well-established strategy for water quality.

The approach taken for the LTDS has allowed us, for the first time, to integrate all our long-term plans into one core 'pathway' that is more explicit in describing the trade-offs to make and the milestones to reach along the journey to 2050.

We have taken a robust, bottom-up approach to developing our delivery strategies and, in developing the wide range of options available to meet our 2050 targets, we have considered the impact of scenarios of change including Ofwat's prescribed scenarios and our own company-specific scenario, reflecting that local expectations on year-round access to a healthy environment and smarter healthier homes will change.

Customers will expect increased resilience against drought, optimised and circular use of water and protection against flooding as the impacts of climate change become felt. Similarly, increased recreational use of watercourses and coastal waters may expand our catchments requirements for designated waters. This is particularly relevant for our region where we have bathing water designations that are driven by the public or stakeholders groups which in-turn influence our investment plans.

Our strategy

We have developed a long-term delivery strategy in consultation with our customers that meet their priorities and that is adaptive to plausible futures. More than ever our strategy and its pace are determined by customers' priorities and by the environmental ambition we share as a sector.

The building blocks of our strategy are:

- to deliver our strategic plans to increase resilience in water resources, deliver environmental improvements and stop overflows as early as we possibly can deliver
- to maintain our focus on supplying high quality drinking water, improving appearance and moving towards a lead-free network by 2050
- to fund net zero plans from our base plans with no impact on customers' bills and maximise the benefit of our maintenance programmes to achieve long-term improvement in interruptions to supply and improvement in the number of total pollution incidents
- to embed policies such as our Green First policy in all planning and delivery activities for the early uptake of green and low carbon solutions
- to deploy smart technologies in particular in our networks to create more intelligence and better information for our decision-making
- to continue challenging ourselves through ambitious enhancement capex and opex efficiency targets of c. 15% and 17% respectively
- to monitor change in key external factors such as climate change and adopt a more climate resilient pathway as early as 2030 if a climate adverse future is triggered
- to hold ourselves to account by reporting annually and transparently on our progress on the journey to 2050.
- We understand the impact of benign and adverse scenarios and our plan includes the actions we need to take now to remain open to external changes as defined in the common reference scenarios.

Long term investment plans

A sustained transformational programme of investment is required to deliver legal requirements and respond to future challenges.

We forecast that meeting our 2050 targets will require sustained enhancement investment in the order of £10bn between 2025 and 2030. This starts with a step change of £1.8bn for enhancement during 2025 to 2030.

The profile of the investment plan responds to the priority to address environmental performance and our commitment to deliver early improvements in the level of storm overflow spills.

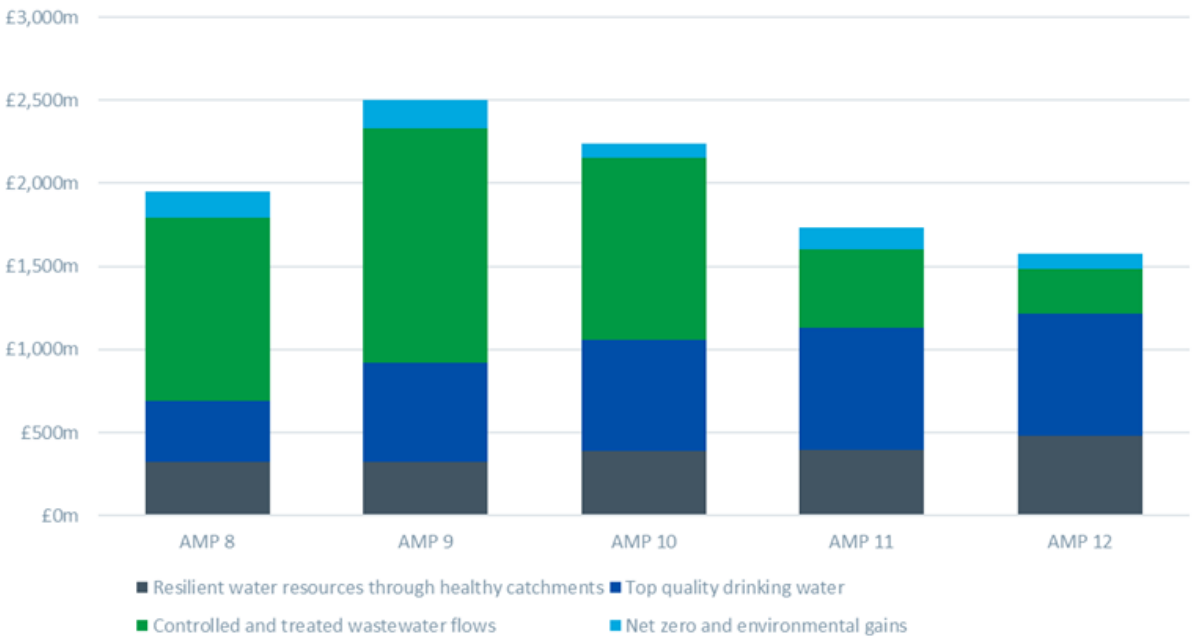


Figure 1. Long term investment by ambition

Key investment drivers are maintaining water supplies and addressing storm overflows, which together equate to around 45% of future investment needs. This is consistent with customer expectations around the priority of those investment areas within the long-term plan.

Whilst there is much focus on environmental performance, our plan maintains an equal balance between water and wastewater over the long term as high quality drinking water remains a top priority for our customers.

In discussion with our delivery partners we have carefully assessed the opportunities and constraints attached to the delivery of such an ambitious plan. We have taken care to phase activities and allow for the development of capacity and the learning from innovation.

Our Board has reviewed and challenged information on the pace and sequencing of information within our LTDS and the balance between expenditure now and in the future. This has included challenging run rates and pace of investment - water resources, lead, and storm overflows.

Our adaptive plan

The implementation of our strategy is based on an adaptive plan that is built following Ofwat's guidance, making sure we deliver against all policy and regulatory targets and milestones along the way.

With increasing levels of uncertainty our plans need to be adaptable to different futures. We have considered possible scenarios of change and defined four plausible futures that we may face between now and 2050.

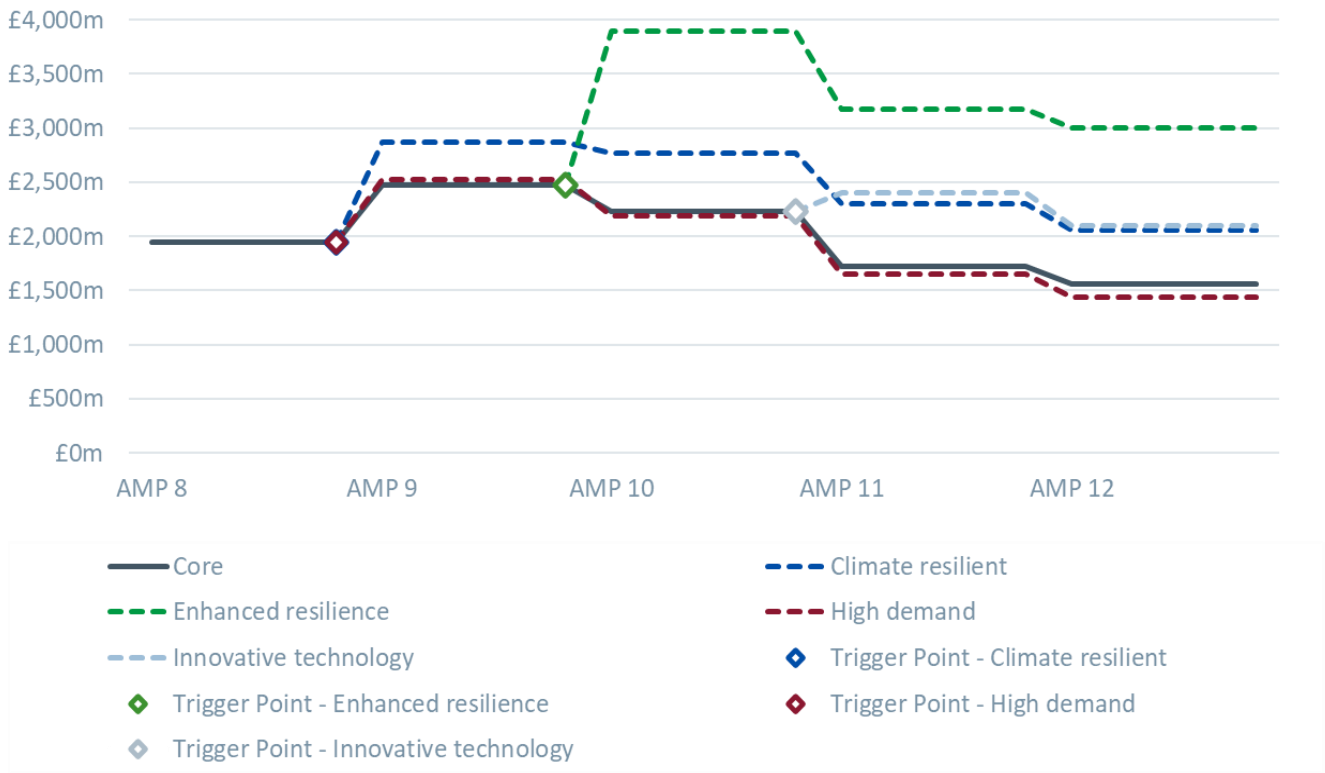


Figure 2. LTDS adaptive plan

The core pathway is based on a 'most likely future' in which trends observed today continue out into the future, and it includes the investments most adaptable to plausible future states of the world (low/least regrets).

Our core pathway profile reflects our ambition to tackle storm overflows as early as possible whilst leaving choices open for further improvements when the benefits of this programme have been realised from 2035 onwards.

Sensitivity tests carried out on our core plan show that it is more sensitive to adverse than benign conditions of change and that the largest impact on our plan would come from adverse climate change scenarios and highest expectations from customers.

The first adaptive pathway may be triggered as early as 2030 to respond to a future where climate change conditions have worsened from today and there is no acceleration of technology development.

Changing course to this adaptive pathway may drive additional total investment circa £2bn between 2030 and 2050 and we have estimated the likelihood of this pathway as 20%.

Long term strategy by ambition

Resilient water resources

Whilst our Bristol Water resource zone has a healthy balance of supply and demand in the short to medium term, our South West Water and Bournemouth Water regions require investment to meet the environmental requirements set for the region, and to provide sufficient headroom to respond to even a benign climate change future.

With investment in desalination for the Isles in Scilly by 2025, no further investment in resources is anticipated here. Investment is however required in all mainland zones to meet Environment Act targets to reduce demand and to meet 2050 targets for leakage and per capita consumption (PCC).

The total enhancement investment for our core pathway is c. £2.03bn over the 25-year planning period.

Alternative futures give a range of c.£40m to £80m, of additional investment over the 25-year period, with the strategy being most sensitive to changes in the 'demand' scenario' – with higher demand requiring additional investment in new resources to retain a supply demand balance. This demonstrates the importance of a successful smart metering strategy to avoid the need for additional expenditure.

Top quality drinking water

Our strategy includes a significant programme of investment in 2025-2030 across all mainland zones to mitigate emerging risks to initiate our long-term programmes of cast iron mains replacement and lead pipe replacement.

Whilst our investment profile to address water quality risks is broadly flat across the 25 years, we ramp up our programmes of lead pipe and cast iron mains replacement, investment which is back end loaded as we balance investment needs with those required to meet legal requirements in the short to medium term.

The total enhancement investment for our core pathway is c. £2.9bn over the 25-year planning period.

Under alternative futures we forecast a range of c.-£335m to +£740m of additional investment over the 25-year period, with the strategy being most sensitive to 'local expectations' on the acceptability of large water usage for flushing purposes.

Controlled and managed wastewater flows

The total enhancement investment for our core pathway is c. £4.46bn over the 25-year planning period. This integrates our DWMP and is aligned with the efficiency levels that we seek to achieve.

The predominant investment driver is storm overflows, with 836 sites to address by 2050 to meet legal requirements. In response to customer and stakeholder feedback, our core pathway contains investment to accelerate and meet our target by 2040, ten years ahead of requirements.

Alternative futures give a range of c.£1.1bn to £3.5bn of additional investment over the 25-year period, with the strategy being most sensitive to different futures for 'local expectations' and climate change – as increased rainfall frequency and intensity raise the levels of flood risk.

In this ambition we plan investment to meet river water quality tightened standards in compliance with environmental obligations. This large programme is weighted towards 2030-2035, with a compliance target in 2038 and investment deferred from 2025-2030 to 2030-2035 in discussion with regulators to manage affordability.

Environmental gains and net zero

Our strategy for nature recovery includes investment in management of our land, management of invasive non-native species and interventions to support fish and eels. We intend to embed a nature-positive culture as we continue to deliver measurable biodiversity enhancement through across our operations and through our ambitious nature recovery programme on our own land and beyond.

The total enhancement investment for our core pathway is c. £550m over the 25-year planning period. For net zero, our investment is assigned to base expenditure. We also plan to embed a Net Zero culture as we continue to decarbonise our operations by reducing our emissions of nitrous oxide and methane and support our supply chain to adopt low carbon materials and processes.

This ambition includes investment to remain compliant with sludge recycling requirements. Two new major processing plants included in AMP8 will deliver a better quality product and produce biomethane, supporting our net zero target.

Alternative futures give a range of c.£50m to £290m of additional investment over the 25-year period, with the strategy being most sensitive to different futures for 'local expectations' and climate change

What we will deliver and how much it will cost

Below we set out a schematic summary of what our strategy will deliver by 2050.

2030			2050
All water quality samples meeting all stringent tests **Customers enjoy the way water looks and tastes**	• Zero supply interruptions longer than 12 hours	• All treatment works upgraded and able to address impacts of climate change in source waters	• Remove and replace all lead pipes
Resource availability increased **Leakage 9% on our network, 4% on customer pipes**	• New strategic reservoir at Cheddar in operation • 100% properties smart metered	• 2039 Risk of severe restrictions in a drought reduced to 1 in 500 year risk • New strategic resources – Mendip quarry and Poole Harbour	• 50% leakage reduction and 25% water consumption reduction
Storm overflows at beaches addressed	• Zero ecological harm from overflow discharges	• 2040 Programme of tackling all storm overflows complete – decade ahead of target	• Sustainable drainage in all new properties and retrofitting existing homes underway • Screens fitted on all overflows
125,000 hectares of habitat created or restored **Net zero target for our operational carbon emissions**	• Reduced nutrients in wastewater discharges by 80% • Convert all wastewater emissions to biogas • Renewable energy • 1,000 smart ponds to attenuate flood	• 2045 Race to Zero commitment to reduce greenhouse gas emissions (GHG) across our entire value chain	• 375,000 hectares of habitat created or restored • Seagrass restoration along our 860 miles of coastline
Zero water poverty **Sector leading customer service** **100% customer issues solved first time**	• Seamless, connected experiences • Across all channels • AI and machine learning to tailor customer services		• Maintain zero customers in water poverty • 100% customer and community satisfaction with our services

Meeting our long-term ambitions means a step up in bills in AMP8 (returning to 2020 levels in real terms) and further bill increases in future years. Our long term bill projections show that bills continue to rise in the long term, but flatten for South West Water customers from 2040. Alternative pathways contribute to higher bills as we address the need for additional resilience to extreme change.

We have thought carefully about ***when*** is the right time to deliver enhancement investment, balancing the need to improve with the impact that this has on customers' bills and the deliverability of our programme. To mitigate the impact and acutely aware of affordability we will continue to maximise the benefits of our base plan and we have included tough efficiency targets of c.15% on all enhancement expenditure from now to 2050.

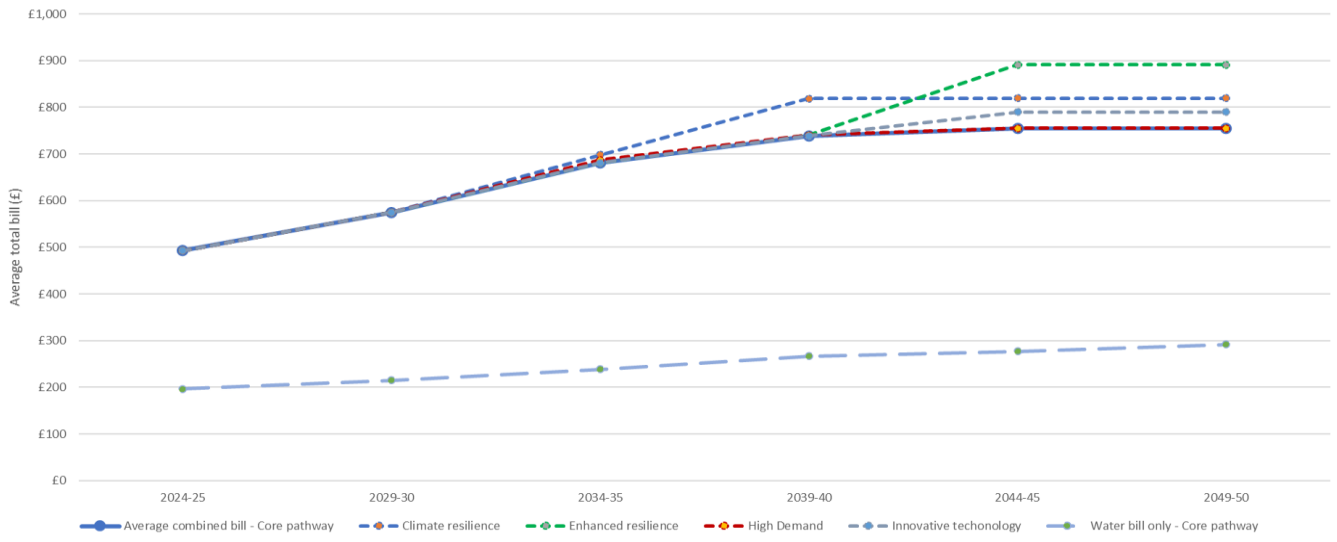


Figure 3. SWB bill impacts from long-term enhancements

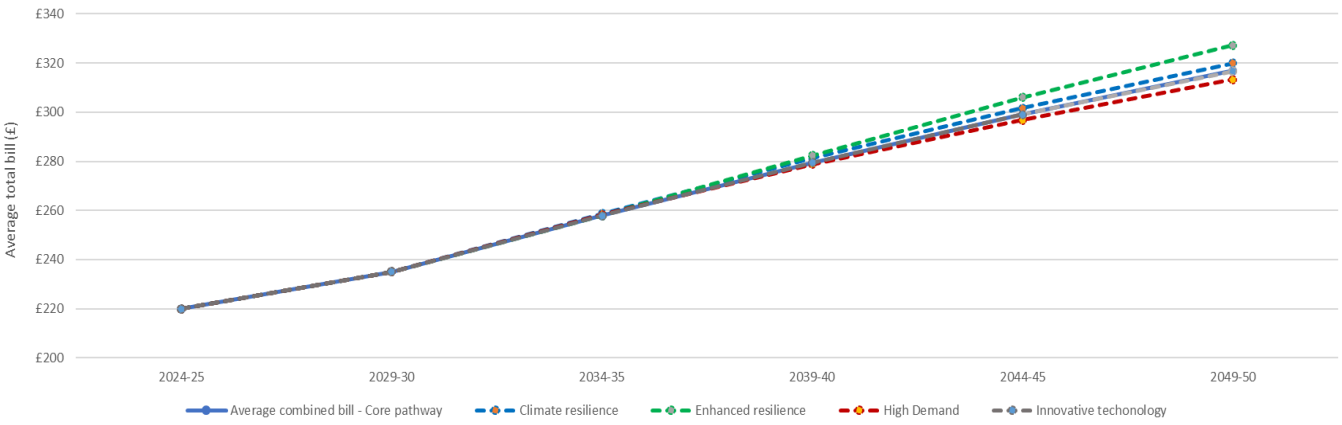


Figure 4. BRL water bill impact from long-term enhancements

Ambition and 2050 targets - our vision statement

Each and every day we operate a water recycling system for the region. We take in rainfall that falls from the skies, store it, treat it and provide it to homes and businesses as safe clean drinking water. When used we collect it, with wastewater draining from homes and businesses, and make it safe for all, and release it back into the environment, where it travels to the sea and then the cycle starts all over again.

We have set out our strategic direction to 2050, driven by our purpose, to support the lives of people and the places they love for generations to come. And stewards of this system, as water makes its way through the landscape, our networks, and rivers we work hard to ensure that water continues to provide healthy habitats for wildlife and recreational spaces.

Over the last thirty years we have invested, innovating to deliver world-class drinking water, cleaner, safer bathing beaches and more reliable services. We have also supported nature to thrive and pioneered ways to give our customers a say in our business and a share in our success – all for a little over £1 a day.

Our purpose provides our overarching reason for existing: Bringing Water to Life – protecting the people and the places we love for generations to come.

Over recent months and years we have engaged widely and heard clear messages from our customers, stakeholders, regulators and investors on what they expect from us in the immediate future and in the longer term.

Significant challenges lie ahead and some are very real today and we have set ourselves five ambitions to act as our guiding vision to 2050.

- Resilient water resources through healthy catchments – by re-balancing the amount of water we use with the amount we take from the environment
- Top quality drinking water – an enduring primary priority through innovating in treatment and distribution of water
- Controlled and managed wastewater flows – through reducing our reliance on storm overflows, upgrading treatment capability and creating smart sewer networks which help prevent sewer flooding and pollution incidents
- Environmental gains and net zero – by using catchment based, joined up, natural capital solutions which deliver against all our ambitions
- Being trusted by customers stakeholders and communities – by delivering against our promises, providing exceptional levels of service and fair and affordable bill.

Shaping our 2050 ambitions with customers

Our ambitions have been determined through engagement with our customers and stakeholders, our strategic planning frameworks (WRMP, DWMP, DWI, WINEP) and informed by legal requirements.

Here, we summarise what customers have said, their priorities shown in the figure below, and how they have shaped our ambitions.

Figure 5. Customers priorities

We have engaged c. 30,000 customers and 1,100 stakeholders for PR24 over the last 18 months directly through surveys, focus groups, workshops and our customer forum. We have also held consultations on our long-term Water Resource Management Plan (WRMP) and Drainage and Wastewater Management Plan (DWMP) and we have been listening to customers through our day-to-day channels.

Since 2020, we have been building a deeper relationship with customers through our pioneering WaterShare+ scheme, giving customers both a stake and a say in the business. This has been a very important and unique step in advancing a new type of social contract between us and our customers, and one we are very proud of.

To develop our plans we asked c. 30,000 customers through a combination of qualitative and quantitative research, overseen by our independent WaterShare+ challenge panel. We spoke to customers about what they expect or us now and in the future - we listened and reflected their views in the ambitions we have developed.

We played back these ambitions through a series of focus groups and different pieces of research and engagement. They are supported by most of our customers and stakeholders. We also explored the pace and scale of investment alongside understanding if a combined bill impact changed their preferences.

Unsurprisingly, customers' highest priorities are unchanged from five years ago: drinking water quality, preventing pollution and flooding, and protecting beaches are just as important today as ever. However, other environmental priorities have risen up the list, with storm overflows in particular not being a priority for customers five years ago. This shows the need to be adaptive to changes in priorities over time.

Customers' number one priority remains for us to ensure the basic requirement of a clean, safe drinkable water supply is protected and maintained. Today's customers want to pass on a healthy asset base to future customers and do not find it acceptable to allow assets to deteriorate, even if service was maintained, as they feel this will impact on service in the longer term. They expect us to invest enough to maintain and protect top quality drinking water which is the element of service that is most important to them.

The environment is increasingly important for our customers, who are now much more aware of pollution incidents and storm overflow spills. Our customers and stakeholders expect us to demonstrate environmental leadership and want us to prioritise activities where we have a direct impact on the environment, such as rivers and coastal waters. Customers consistently selected **controlled and managed wastewater** flows in their top three of our ambitions for speed of improvement, however they are mindful of the costs of this and prefer a gradual approach.

Further information on our customer research is provided in the following documents:

Resilient water resources through healthy catchments

What have we heard?

Customers want to us to ensure we have a plentiful water supply while protecting the rivers and oceans.

- Resilient water supplies are a high priority for our customers and stakeholders
- They recognise the pressures on water resources from climate change, changing weather patterns and population growth and want us to protect services and the environment for future generations
- While they are pragmatic about the costs there is a general view across customers and stakeholders that more environmentally friendly water supply resilience could be accelerated.

Customers want to see a balanced portfolio of options and do not want us to reply on any single approach or solution. Customers and stakeholders would like us to explore more innovative and collaborative solutions, such as using existing water bodies for storage, as well as using more tried and tested approaches.

- In principle, customers prefer water efficiency to new resources, but are sceptical that everyone can make the behaviour changes required and view supply options as more reliable.

What is our ambition?

We meet future demand and boost resilience through connected water resources, whilst balancing the needs of customers and communities with those of the environment through careful management of our catchments.

- We aim to balance the water needs of people and the needs of the natural environment. Our journey to delivering world class water starts with protecting rivers that are important sources of drinking water
- We are looking forward and acting now to manage the potentially serious consequences of the onset of climate change and the increasing volumes of new housing and tourists in the region could have serious consequence for water availability
- Last year's drought shows what could be commonplace in the future - as the likelihood of hotter, drier summers, and more heatwaves increases. As our region is still officially in drought, we are already developing and delivering substantial investment in water resilience measures now so will deliver a fundamentally different supply position by 2025. This includes investment in new sources and desalination, alongside a step change in investment to tackle leakage and support to help customers to use less water
- Our revised, more ambitious plan from 2025, is to build on this and ensure we fully break the drought cycle. We will work with our partners in harmony with nature to protect rivers and in doing so protect drinking water sources.

Top quality drinking water

What have we heard?

- Our customers want us to ensure that they always receive clean, safe water
- Customers are satisfied with the current performance which is viewed as good
- They want us to invest enough to maintain and protect top quality drinking water which is the element of service that is most important to them
- They do not generally consider there to be an urgent need to make significant improvements in the cleanliness of their drinking water – but expect that localised issues are addressed
- Most customers consider that lead improvements to customer supply pipes should be covered by all customers – irrespective of who has lead pipes.

What is our ambition?

Innovative low-carbon treatment processes provide high quality water which is delivered to homes and businesses through resilient networks that continuously monitor water quality and minimise supply interruptions.

- Our ambition is to protect and enhance the environment at every stage of our operations. We will deliver reliable, high-quality water through investing in smart resilient networks and careful management catchments, cutting leakage and water wastage by harnessing artificial intelligence (AI), data analytics and smart meters
- We have developed an ambitious long-term approach to delivering high quality and resilient drinking water supplies for our customers through on-going water quality investment and maintenance programmes
- In order to ensure that our customers always receive a clean, safe water supply we have considered the future water quality risk across all aspects of our water supply. This includes tackling raw water deterioration, understanding how our treatment processes and networks need to be enhanced to mitigate population growth and changing nature of water supplies in our region, securing greater asset resilience to extreme events and being forward looking in our approach to understanding the risks of 'forever chemicals' and emerging contaminants.

Controlled and managed wastewater flows

What have we heard?

- The environment is increasingly important for our customers who are much more aware of pollution incidents and storm overflow spills following recent media coverage
- Our customers and stakeholders want us to be a good neighbour; they want us to demonstrate environmental leadership by controlling and treating wastewater flows to protect the environment. They recognize how the environment underpins our way of life in the South West as well as the tourism economy and they want us to reduce pollution incidents and storm overflow spills. They want us to maintain our high-quality bathing waters and they do not want to see homes and businesses flooded
- Our customers and stakeholders expect us to control and treat wastewater flows through a healthy, resilient sewerage system. Customers want us to pass on a healthy asset base to future customers and don't find it acceptable to allow assets to deteriorate. They want us to do more to invest in the region's sewerage infrastructure to reduce its current impacts on the environment
- Customers value the environment in the South West highly, particularly the water environment. Most of our customers actively experience the rivers and beaches in the region, with nearly two thirds visiting beaches regularly.

What is our ambition?

Resilient natural and built wastewater infrastructure that protects communities and the environment.

We need to do things differently. The current system relies too much on storm overflows and this is no longer acceptable.

So, we have been working with our customers and stakeholders to develop our plans for the wastewater system and storm overflows, as we ensure we continue to evolve and enhance our wastewater recycling processes and protect the environment.

We aim to evolve the water recycling system into one that future generations can be proud of and will:

- Protect people, homes and businesses from flooding
- Support tourism and the long-term economic health of the region
- Increase the use of nature-based solutions, innovating to protect our unique environment and reducing our carbon footprint
- Eradicate pollutions and the damage caused by plastics, fats and wet wipes for the long-term benefit of all
- As we look to reduce the reliance on storm overflows, we face extreme pressures from climate change, growth and plastic pollution. Our plans aim to deliver at pace and deliver our storm overflow programme by 2040.

Environmental gains and net zero

What have we heard?

- Our customers and stakeholders expect us to demonstrate environmental leadership. They want us to play our part innovatively to be a good neighbour to support the local environment, with both tourism and our local way of life in the region depending on the environment
- Our customers strongly agree that all environmental issues are high priority (including deforestation, ocean pollution, single-use plastics, air pollution, river pollution, climate change, waste disposal, the impact of chemicals and loss of biodiversity)
- Our customers list climate change as one of their key concerns. They recognise changes in the weather. They acknowledge the stress that climate change can have on water company infrastructure in the future and recognise the importance of protecting works as the effects of climate change may worsen over time. However, whilst customers support our plans overall, a significant minority are less comfortable seeing bills rise to pay for investment to deliver net zero – seeing this as something the company should 'just do'
- Our customers want us to work with others, to minimise our impact on the environment and to go beyond this to demonstrate stretching performance to boost the environment and to effectively communicate our activities to demonstrate leadership. They want us to explore new approaches to delivering our vital services in harmony with nature and tell us they think it is more efficient to prevent problems before they arise rather than remedy them
- Biodiversity and catchment management plans, alongside waste management and chemicals, are high priority environmental issues for customers, who welcome any positive change we can achieve.

What is our ambition?

Protected and enhanced natural resources and the wider value of water and wastewater to environment, society and the economy is realised.

- We see the water catchment as a whole system. The environment is the cornerstone of public health and our way of life is under threat from both climate change and species decline. Our journey to delivering world class water services starts with protecting rivers that are important sources of drinking water
- Our reservoirs have a dual purpose. They provide storage for water supplies and also allow us to protect water supplies for aquatic habitats and wildlife in times of hot and dry weather. This is why over the last 16 years we have increased the number of reservoirs in our region from 24 to 27
- Sustainable catchment solutions prevent run off from roads, fields and farmland getting into natural water courses and reservoirs which can reduce water quality and be harmful to nature. For over 15 years we have delivered award winning best-practice agricultural land, forestry and peatland management and restoration investments. Focusing on the natural environment means we can reduce expensive upgrades to water treatments works and processes – as well as protecting the natural environment, this keeps bills more affordable

- We will go beyond minimum compliance requirements to demonstrate environmental leadership by delivering measurable biodiversity enhancement across our region. We will explore new approaches to delivering our vital services in harmony with natural processes and work through initiatives such as our Upstream Thinking catchment management programme to prevent problems before they arise rather than remedy them
- We will play our part innovatively to be a good neighbour to support nature, with both tourism and our local way of life in the region depending on the environment, looking for opportunities for nature recovery at a landscape scale with our neighbours.

Being trusted by customers stakeholders and communities

What have we heard?

- Research shows customers want to be treated as individuals and want their water company to manage their expectations better, provide clearer communication, and show trust and empathy
- Our customers consider fair and affordable bills to be essential and think it is unfair that 3% of the population pays for 36% of the designated beaches in England and the up to 10 million visitors to the region each year
- Most of our customers have consistently stated, since 2020, that they are happy with the level of service they receive. The relative priority to customers to improve services across 17 of our investment areas indicates that customers rank 'outstanding customer service' as a lower priority for investment across our regions, believing it is good enough.

What is our ambition?

We work together with customers and stakeholders to create thriving, low-carbon communities and an ecologically rich local environment. We create excellent customer and community experiences through every interaction with us.

- Day to day, we will ensure that customers get the best possible experience every time they need us, improving our customer experience and ensuring we deliver outstanding performance against both the utility sector and other sectors
- We are already committed to zero water poverty in our region – we are leaders in developing support for customers and we are committed to promoting progressive charging so that every customer has a fair and affordable water bill
- We will boost active participation of customers and communities in the sector and make it easy for customers to reduce their water consumption and manage their water bills.

Our LTDS covers the first four ambitions. The fifth ambition (being trusted by stakeholders and communities) is an overarching ambition which does not have any material enhancement expenditure associated with it and is not therefore included separately in this LTDS.

Obligations and regulatory targets

Alongside customers' and stakeholders' priorities we have taken into account our legislative and regulatory policies and targets to ensure we meet all our obligations.

Resilient water resources through healthy catchments

Legal targets

- Environment Act 2021: 37% reduction from 2017/18 by 2038 and 50% reduction from 2050
- Environment Act 2021: PCC: 110 l/p/d by 2050 - 20% reduction in the use of the public water supply per head of population by 2037/38 (based on 2019-20 levels)
- Environment Act 2021: Business Demand: 9% reduction by 2037/38 (from 2019-20 levels); 15% reduction by 2050.

Our ambitions

- Create greater capacity through a diverse portfolio of water sources, strategic regional resources and inter-connectors
- Protect and boost river flows
- Reduce leakage in the network and at customers' homes.

Table 1. Resilient water resources through healthy catchments, long term targets

Measures	Mandatory or discretionary	Units	2024/25 SWW	2050 SWW	2024/25 BRL	2050 BRL
Leakage (annual)	Mandatory	Megalitres per day (Ml/d)	99	64	32	22
Per Capita Consumption (annual)	Mandatory	Litres/ person/ day (l/p/d)	146	110	153	110
Business demand (annual)	Mandatory	Megalitres per day (Ml/d)	162	137	59	41
SDBI (EPA sub-measure)	Mandatory	%		100%		100%
Smart metering coverage	Discretionary	%		100%		100%

Top quality drinking water

- Ensure world class drinking water that meets stringent water quality standards
- Progressively address emerging risks
- Create resilient, smart networks with real-time tracking and management of water pressure, flow and quality.

Table 2. Top quality drinking water, long term targets

Measures	Mandatory or discretionary	Units	2024/25 SWW	2050 SWW	2024/25 BRL	2050 BRL
Compliance Risk Index	Mandatory	Numerical CRI score	2.0	0	4.7	0
Customer contacts about water quality	Discretionary	Number of contacts per 1,000 population	1.3	0.5	0.8	0.5
Lead	Discretionary	No. lead pipes	C. 220,000 properties in all regions	Lead free network	C. 220,000 properties in all regions	Lead free network
Supply interruptions	Discretionary	Hours:minutes:seconds (HH:MM:SS) per property per year	00:05:00	00:03:00	00:05:00	00:03:00
Mains repairs	Discretionary	No. per 1,000km of mains	132	125	131	125

Controlled and managed wastewater flows

- WISER: Pollutions: Trend to minimise all pollution incidents should continue and at least a 30% reduction of all pollution incidents (category 1 to 3) by 2030 on current 2025 targets. However, there are potential changes to the definition of pollution that would impact on this target
- Storm Overflows Discharge Reduction Plan – Sep 2023:
    - Headline target: Water companies will only be permitted to discharge from a storm overflow where they can demonstrate that there is no local adverse ecological impact

    - By 2035: all storm overflows discharging near designated bathing waters, and 75% of storm overflows discharging into or near 'high priority sites'
    - By 2045: all remaining storm overflows discharging into or near 'high priority sites' (e.g. SSSIs, shellfish protected waters, Marine Conservation Zones)
    - By 2050: all remaining storm overflows. This is the legal requirement for the sector, and our DWMP issued in June 2023 set out how we would achieve this 10 years ahead of this mandated target
- Create resilient smart wastewater networks with real-time tacking and management of capacity
- Increase our wastewater storage and sewer capacity. We plan to significantly reduce sewer spills to rivers and seas by increasing the capacity of our sewers and by increasing surface water storage
- Return treated water safely back to the environment. We will protect rivers and seas from pathogens and nutrients
- Enhance sustainable drainage to reduce the risk of flooding and pollution. We plan to prioritise natural infrastructure solutions to reduce the risk of flooding and pollution, working with housebuilders and community stakeholders to integrate sustainable and green solutions
- Evolve our water recycling and sewerage system to meet the needs of our communities and the environment
- Enhance sustainable drainage to reduce risk of flooding and pollution.

Table 3. Controlled and managed wastewater flows, long term targets

Measures	Mandatory or discretionary	Units	2024/25 SWW	2050 SWW	2024/25 BRL	2050 BRL
Total pollutions	Discretionary by 2050	No. pollution incidents per 10,000km of the wastewater network	25.8	19.5	NA	NA
Serious pollutions	Mandatory	Number	2	0	0	0
Internal sewer flooding	Discretionary	No. incidents per 10,000 sewer connections	0.80	0.46	NA	NA
External sewer flooding	Discretionary	No. incidents per 10,000 sewer connections	14.1	8.9	NA	NA
Bathing water quality	Discretionary	%	94%	95%	NA	NA
Storm overflow spills	Mandatory (no harm)	Average number of spills per overflow	20.0	5.1	NA	NA
Sewer collapses	Discretionary	No. collapses per 1,000km of sewer network	10.5	8.3	NA	NA

Environmental gains and net zero

- Environment Act 2021: River Water Quality: contribute to the national target to reduce phosphorus loadings from treated wastewater by 80% by 2038 (based on 2020 levels)
- UK government Commitment: Net Zero Strategy interim target of 63-76% by 2035 and Net Zero operational emissions by 2050
    - 100% of South West Water's energy comes from renewable sources and by early 2024 our Bristol Water region will also be using 100% renewable energy
    - We can use our land and resources to increase renewable energy generation. We are part of a larger group of companies that is championing renewables on our estate and across the group. We are investing in renewables as we look to build a portfolio of renewable schemes that increase our energy security and resilience. We have already invested in £160 million in renewable energy generation, at no extra cost to our customers
- Increase biodiversity, boost nature through habitat creation – We have legal duties given the land that we own to conserve and enhance biodiversity. This means that we must:
    - Consider what we can do to conserve and enhance biodiversity
    - Agree policies and specific objectives based on our consideration
    - Act to deliver our policies and achieve our objectives.

Table 4. Environmental gains and net zero, long term targets

Measures	Mandatory or discretionary	Units	2024/25 SWW	2050 SWW	2024/25 BRL	2050 BRL
Operational GHG (waste)	Mandatory	Tonnes CO2e	83,752	15,688	NA	NA
Operational GHG (water)	Mandatory	Tonnes CO2e	67,329	16,001	30,651	6,042
Embodied GHG Emissions	Discretionary	Tonnes CO2e per £1m	385	0	NA	NA

Measures	Mandatory or discretionary	Units	2024/25 SWW	2050 SWW	2024/25 BRL	2050 BRL
Catchment management	Discretionary	Hectares of 'Upstream Thinking' project interventions	134,000	196,500	NA	NA
Biodiversity	Discretionary	Biodiversity units per 100km2 of land in the company's area	0	8	0	2
Discharge permit compliance	Mandatory	%	99%	100%	100%	100%
River water quality	Mandatory	Kg of phosphorus	52,621	516,801	NA	NA

Residual GHG emissions in our operations in 2050 will be more than offset by our renewables and peatland restoration and tree planting activities that we do to protect drinking water supplies, prevent flooding and store carbon.

Contribution of base to long term performance

In setting our 2050 forecast outcomes we have carefully considered how we can maximise the value of base investment. We have used historical trends to forecast performance improvement.

We know that continuous improvement delivered from base activities will become more difficult to achieve as service levels improve and marginal gains reduce. However, we want to maximise the benefits we get from all our activities and take all the opportunities that innovation and system-based approaches will offer in reducing investment needs or in maximising multi benefits across our regions.

In the table below we present the results of our analyses of how much base activities contributes to improving performance. The results are presented by performance commitment, and they are based on historical data as well as trend analyses.

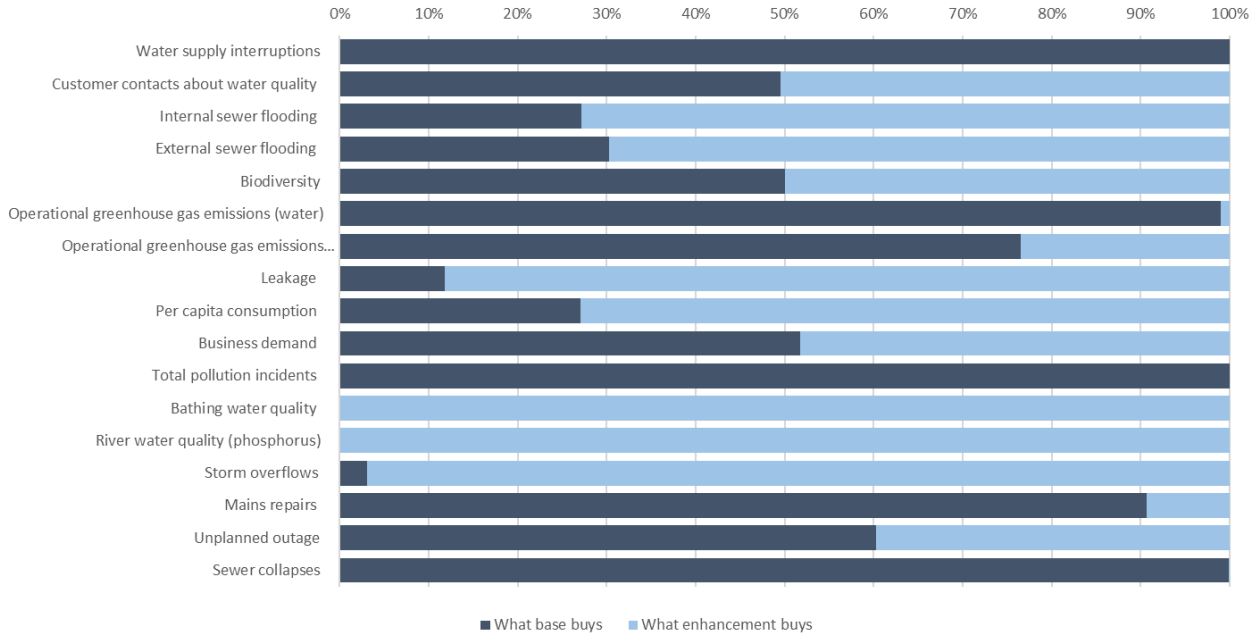


Figure 66. Contribution of base investment to performance by PC

This analysis has informed the development of stretched targets where we believe we can achieve improvements from current levels of base activities. These concern performance areas such as interruptions to supply (100%), total pollution (100%) and maintaining the health of our asset base (100% for network and 605 for unplanned outage following the change of method).

Conversely, we understand the areas of performance where improvements will be achieved through investment of additional enhancement expenditure. Those correspond to areas of where new standards come into force and require an extension of the asset base or the start of new activities.

Finally, this analysis has helped inform the synergies and co-benefits we can gain from the contribution of base to meeting improved levels of performance for areas such as water quality appearance, leakage, PCC and flooding.

Pace of delivery of long term targets

The investment needs that are necessary to meet our 2050 ambitions in the face of adverse change are significant and there is a complex landscape of interim legal and regulatory targets to hit along the way.

We have paced the journey by balancing the need for investment with the impact on the bill of our customers and, when optimising the long-term profile of investment, we have considered: how we meet our **obligations**, deliver on customers **priorities** and **stretch ourselves** to achieve more from base maintenance – all whilst **balancing fairness** across all generations. These four principles have been used to guide the development of our LTDS as follows:

- For compliance metrics (CRI, discharge compliance and serious pollution incidents), the profile of investment is designed to deliver full compliance across the planning period
- For asset health metrics (mains repairs, sewer collapses, unplanned metrics), our aim is to deliver at least stable asset health through a smooth base investment programme, which spreads the costs evenly and does not store up problems for future generations
- For remaining metrics, the pace of investment is determined by legal and regulatory requirements and customer priorities.

Our strategy

We have followed Ofwat guidance and acted on the feedback that we received for the development of the core and adaptive pathways of our strategy. In accordance with Ofwat's guidance on long-term delivery strategies, we have had regard to the regulator's final public value principles, published in March 2022. Our adaptive plan is designed to meet our strategic ambitions, building on, and integrating the key components of our WRMP, DWMP, WINEP, DWI long term strategy and our resilience plans.

Government policies and obligations set key targets and milestones of the earlier years of our adaptive plan. AMP8 enhancements will be key enablers to meeting long term targets and they are required to set us on the right track and right pace.

Our core pathway includes our WRMPs and DWMP and the least regrets interventions that we have identified during optioneering under the scenarios prescribed by Ofwat, and a company-specific scenario that reflects local expectations.

Our sensitivity analysis has shown that our plan is more sensitive to adverse than benign conditions. The impact assessment shows that largest impacts are from adverse conditions in climate change (£1.68bn) and the highest likely increase in local expectations (£2.22bn). At an aggregate level the main adaptive pathways of our plan may be triggered as early as 2030 by the need for more resilience to changes in climate and to changes in local expectations from our customers and stakeholders. More detailed pathways are provided in the detailed strategies.

Context

Challenges and trends

As a water company we face the impact of global challenges on our operations and the marked trends that we observe in the economy, and in our region more widely, present several risks for the future as well as opportunities for how we can best deliver and improve on our services. Our LTDS prepares the way to address them successfully to protect our customers and the environment.

1. Reducing the levels of raw water against increasing demands	2. The need to adapt our infrastructure to be resilient to the impacts of climate change	3. The need to decarbonise and increase carbon sequestration
In the face of rising temperatures and growing populations, the delivery of resilient service in the future requires that we all adapt to how we use, and interact with our services and the aquatic environment	Overall, the risk of storms in our region is set to double, with impacts on our sewers and treatment works resulting in higher risk of sewer flooding and increased dependence on storm overflows.	We will need to meet the government's Net Zero target by 2050 by reducing our greenhouse gas emissions across our operations.
4. Affordability challenges from sale of future investment	**5. The need to adapt our workforce**	**6. The need to protect the environment, so that it continues to be at the heart of resilient services**
We need to balance the need for, and increased pace of, future investment while ensuring that bills are affordable for all, especially in the context of the current cost of living crisis	We need to respond effectively to a changing workforce by making the most of the skills and talent in our region, and ensuring that we are able to hire and provide continued support for our employees in 'future-proofing' the skills they need as our operations evolve.	We depend on the environment for high-quality wate resources. Our operations need to be in tune with the natural water cycle, taking only what e need from rivers and returning wastewater treated to a high standard so that the cycle can continue.

The South West is particularly vulnerable to climate change, given its 860 miles of coastline, with the western approaches of the Atlantic Ocean exposing the area to impacts from rising sea levels and storm intensity. We are already starting to observe the impacts of drought, rising temperatures, flooding, rising sea levels and storm surges, and coastal erosion on our operations.

Growing population and changing demographics – As the population and demographic of the world change – so too do they in the South West. Official forecasts suggest an additional 530,000 extra people will be living and working in the region by 2050, adding to the 3.5 million who currently live in the regions we serve. As a popular coastal region, our resident population swells during the year to up to 10 million as visitors come to enjoy the environment in the South West. During parts of the pandemic, due to the increase in home working and 'staycations', we had half of the anticipated 2050 growth in population due across the region, concentrated in the tourism areas of Devon and Cornwall.

Our approach

For the development of the LTDS we have followed a robust asset management approach and complied with Ofwat's final guidance for adaptive planning. We have acted on the feedback, both sector wide and company specific, that Ofwat provided following our liaison meeting.

In developing the wide range of options available to meet our 2050 targets we have considered the impact of scenarios of change including Ofwat's prescribed scenarios and our own company-specific scenario called 'local expectations' (see Rationale section).

Our company specific scenario reflects that local expectations on year-round access to a healthy environment and smarter healthier homes will change. Customers will expect increased resilience against drought, optimised and circular use of water and protection against flooding as the impacts of climate change become felt. Similarly, increased recreational use of watercourses and coastal waters may expand our catchments requirements for designated waters. This is particularly relevant for our region where we have bathing water designations that are driven by the public or stakeholders groups which in-turn influence our investment plans. Similarly, we anticipate changes to customers desire for further flood risk protection.

In response we have determined a company scenario that captures specific changes in our local environment including changes in expectations of our customers on flooding, drought, lead, access to bathing waters and sludge disposal options. From the optioneering carried out, using the common reference and the company specific scenarios, we have elicited the least regrets interventions. They are included in our core pathway.

We have used these scenarios during our optioneering process to assess their impact and identify the least regret interventions to include in our plans so that they remain open to changes over time. Our optioneering process involves assessing the costs and incremental benefits of a long list investment options, derived from feasibility studies, scoping and costing of solutions. We also draw on our stakeholders and partners to help us identify and co-deliver solutions where feasible. This step was informed by the key sources of evidence from our strategic plans, WRMP, DWMP, WINEP, bioresources and our DWQ long-term strategy.

We have determined a company scenario that captures specific changes in our local environment including changes in expectations of our customers on flooding, drought, water quality appearance, access to bathing waters and sludge disposal options. From the optioneering carried out, using the common reference and the company specific scenarios, we have identified the least regrets interventions. They are included in our core pathway.

An overview of our process is provided below.

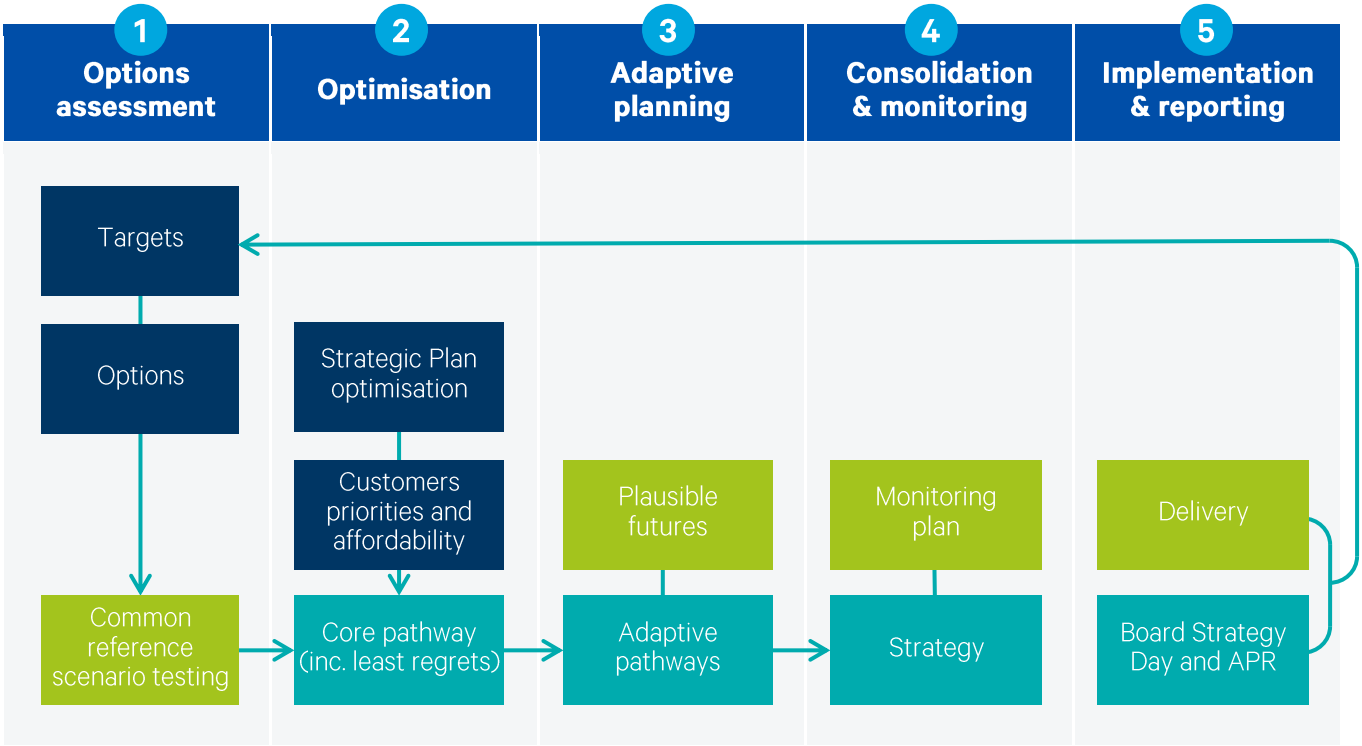


Figure 77. Adaptive planning method

We have carried out sensitivity analyses and quantified the impact of the scenarios on our plan. The results of the impact assessment are presented, here, aggregated and separately for each of our ambitions in the individual strategy sections of this document.

In addition, as per our framework for assessing long term delivery strategies shown in the figure above, we have defined four additional plausible futures, which could materially affect how we deliver our ambitions in the long-term. In line with Ofwat guidance, our plausible futures shown in the table below, are informed by plausible combinations of adverse and benign scenarios for climate change, demand, environmental destination and technological innovation – but not all at once.

We consider a future plausible if it is at least as likely as any single common reference scenario dimension's 'plausible extreme' materialising in isolation (holding all other dimensions constant). We describe the methodology and matrix of relationships used to identify the combinations of scenario outcomes which are both compatible and plausible in the Rationale section of this document.

- **Most likely** – the most likely future is based on our current expectation of future trends given what we observe today and what we know about the future. In this future, (i) we experience continuation of climate trends towards RCP 6.0, (ii) demand reduces gradually as government policy drives PCC to 110 l/p/d, (iii) there is emergence and adoption of new innovative technology (iv) our current abstraction licences are reduced in line with regulatory frameworks and (v) local expectations over the outcomes we deliver are in line with current trends
- **Climate Resilient** – an adverse climate scenario leads to low PCC through government policy and behavioural changes, whilst environmental destination and local expectations remain constant
- **Enhanced Resilience** – tested as a sensitivity to Climate Resilient, a prevailing climate adversity also promotes customer and local stakeholders to raise the level of expectations they have for the sustainability and outcomes delivered by water companies alongside a tightening of abstraction restrictions to mitigate ecological damage

- High Demand – a medium stabilisation climate pathway does not promote a strong adaptive response from Government or customers, and market-led water efficiencies are offset by a moderate increase in hotter and drier conditions, resulting in no change to per capita consumption. Abstraction restrictions do not materially change as climate-driven ecological harm is limited. With limited change to behavioural and environmental outcomes, local expectations for company performance remains stable over time
- Innovative Technology – An accelerated availability of innovative technology enables us to identify opportunities to improve beyond current performance outcomes (or deliver current outcomes at lower cost) which, in turn, sets higher customer and local stakeholder expectations. Technological developments in demand management mitigates the need for further abstraction restrictions.

Table 5. Our approach, plausible futures - combination of scenarios

Plausible futures	Climate	Demand	Env Destination	Technology	Local expectations
Climate resilient	+ 4.3°C by 2081	110 l/p/d	Current legal requirements with enhanced outcomes to 2050	Low	Current
Enhance resilience	+ 4.3°C by 2081	110 l/p/d	Enhanced legal requirements to 2050	Average	Highest
High demand	+ 2.8°C by 2081	140 l/p/d	Current legal requirements with enhanced outcomes to 2050	Average	Current
Innovative technology	+ 2.8°C by 2081	110 l/p/d	Current legal requirements with enhanced outcomes to 2050	High	Highest

Our adaptive plan to 2050

Our adaptive plan looks out to 2050 with the objective of meeting the ambitions and targets we have established in consultation with our customers – and making sure we deliver against all policy and regulatory targets and milestones along the way. We have carried out 'bottom up' analyses of the core and adaptive pathways for each of our ambitions. In this section we present the aggregated and summarised view of the adaptive plan of our LTDS. The detailed adaptive plans of each of our ambitions are presented in individual sections in this document.

The core and adaptive pathways of our adaptive plan are shown in the figure below. The core pathways of our WRMPs (in compliance with guidelines) and DWMP have been integrated into our overall core pathway.

The core pathway

The core pathway is based on a 'most likely future' in which trends observed today continue out into the future, and it includes the investments that are most adaptable to plausible future states of the world (low/least regrets).

The core pathway shows the direction in the level of enhancements that will be required.

We forecast our core pathway to drive levels of enhancement investments in the region of £2.0bn as an average per AMP, for the next fifteen years.

This is reflected in the step-up in enhancement investment in 2025-2030 and which we forecast to continue over the long term to 2050. The earlier years of the long-term plan, up to 2040, are framed by the ambitions and obligations of government policies and of regulations. The latter years of the long-term plan, post 2040, offer scope for choice to be driven by future environmental plans from Government and by changes in customers preferences.

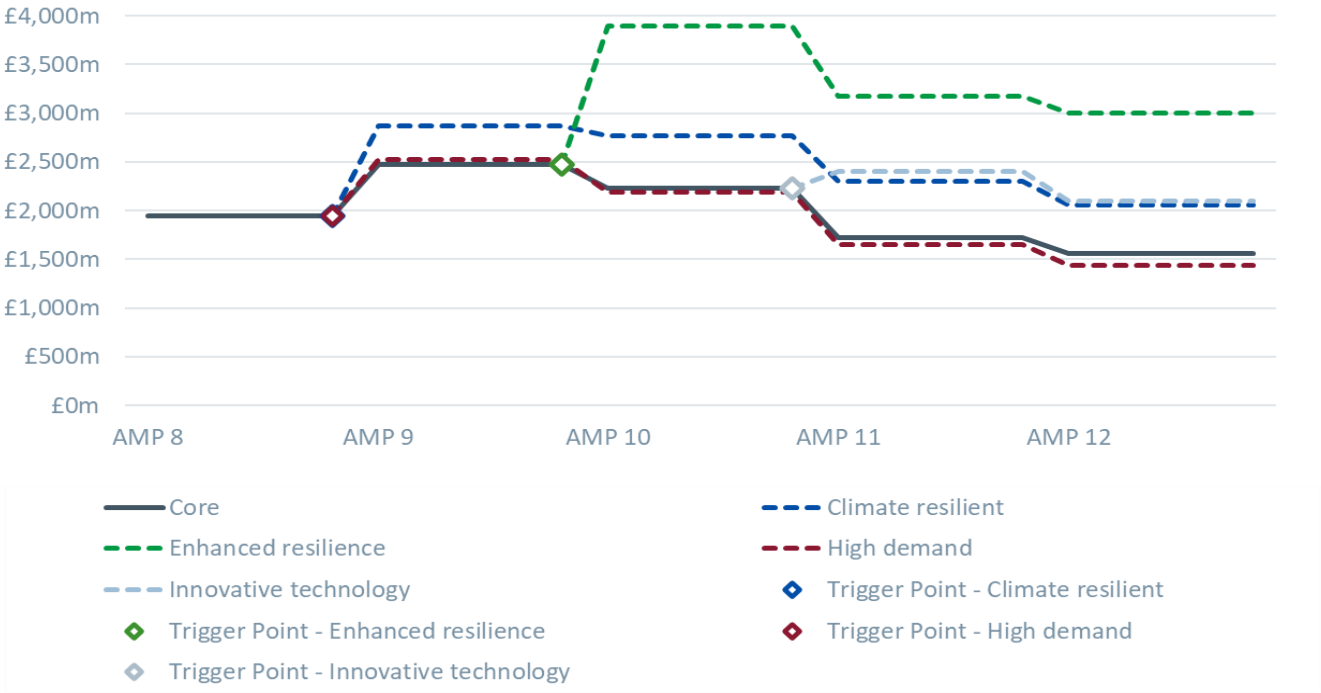


Figure 88. 2050 adaptive plan – core and adaptive pathways to plausible futures

Core pathway of Resilient water resources through healthy catchments - average over 2025-2050: £405m per AMP

Our long-term supply and demand forecasts show that, if we do not take action now, there is a significant risk that we will not be able to meet our customers' demand for water. If we do nothing, there will be a gap of nearly 200 million litres per day by 2050 and, whilst reducing demand is our primary course of action, this does not completely close the gap across all our supply zones. Our core pathway builds on the experience and learnings we have taken from the current period and builds on the investment we have made in creating additional water supplies in the current period, particularly in Cornwall and Devon.

Our core pathway drives focus on (i) water efficiency, both with respect to household and business demand for water, on (ii) reducing wastage of water particularly through leakage control, on (iii) enhancing our natural environment through studies in the early years to determine the sustainable levels of abstractions from our rivers and before implementing solutions to achieve reduced abstractions and hence improvement to our natural environment and on (iv)increasing resilience to supply through more connectivity of our network.

Core pathway to Top quality drinking water – average over 2025-2050: £579m per AMP

For water quality, the core pathway aims to improve drinking water quality and customer confidence by reducing water quality risks from source to tap, using innovative low carbon treatment processes to provide high quality water which is delivered to homes and businesses through resilient networks.

Excellent drinking water quality starts with the quality of the water in the rivers, and the core pathway continues our award-winning programme of agricultural, peatland and forestry land management and restoration investments. These sustainable catchment solutions prevent run off from roads, fields and farmland which can harm rivers and reservoirs with nutrients and contaminants. Focusing on the natural environment also means we can minimise or delay expensive upgrades to water treatments works and processes, phasing investment programmes to deliver best value.

We remain in continuity with our existing drinking water strategy, which has led to major upgrades to two of our largest water treatment works, Alderney and Knapp Mill, in the Bournemouth area this AMP. They will utilise the state-of-the-art technology first used in our new Mayflower Treatment Works in Plymouth, and as such they will significantly reduce water quality risks for future years.

The impact of climate change on river and reservoir levels is affecting the quality and quantity of our source waters and requires that we look beyond the sources we have historically been able to rely on. Treatment processes and networks need to continue being upgraded to mitigate population growth and changing nature of the water sources in our regions. The presence of legacy lead pipes in domestic properties and the impact of emerging contaminants in the water sources are key focus areas to ensure a safe and sustainable supply for generations to come.

In our core pathway we continue our programme of lead pipe replacement as part of our network improvement programmes and we mitigate risks of adapting to a Climate Change Adverse by initiating enabling works enabling the rapid deployment of mobile Powdered Activated Carbon (PAC) treatment as a temporary shorter-term measure to mitigate the risk posed by algae blooms. This will allow us to phase the delivery of permanent Granular Activated Carbon (GAC) treatment at these sites as we build our understanding and prioritisation of risk to changing raw water conditions. Applying this adaptive planning approach in this way is allowing us to phase more than £100m of investment in water treatment works upgrades to deal with these risks.

Core pathway to Controlled and managed wastewater flows – average over 2025-2050: £893m per AMP

To protect bathing waters and rivers we have long term objectives to evolve our water recycling and sewerage system to meet the needs of our communities and the environment, to enhance sustainable drainage to reduce risk of flooding and pollution and to create resilient smart wastewater networks with real-time tracking and management capacity. The core pathway is designed to deliver a step up in reductions of storm overflow spills as well as manage sewer flooding, and to mitigate uncertainty by investing earlier in nature-based and sustainable drainage solutions that take time to provide benefits but accommodate the future pressures from climate change and growth. With uncertainty in these solutions over the long term we have included programmes to monitor the effectiveness of our nature-based enhancement interventions on flooding outcomes in our least regrets options. Our core pathway also includes starting to tackle improvements at inland bathing waters (with an adaptive pathway to do more if local expectations support an increase in pace).

Our core pathway to **Controlled and managed wastewater flows** includes our storm overflow programme, developed in collaboration with the Environment Agency, and based on a range of options delivering improvements at 283 locations and completing our investment at all beach and coastal locations by 2030, which is strongly supported by our customers who consider this to be a key priority for our investment. This is the largest investment building block of the core pathway and is profiled to deliver environmental improvements as early as we can. More information is provided in our document Protecting Bathing Waters and Rivers, our storm overflow enhancement business case. The LTDS integrates our DWMP with enhancement investment allocated to this ambition (flooding, storm overflows, pollution and WINEP plans) and to our Net zero and environmental gains ambition for bioresources.

Core pathway to Net zero and environmental gains – average over 2025-2050: £109m per AMP

Our ambition is to deliver environmental gains and net zero as part of building a better future and our core pathway focuses on the delivery of our Biodiversity Strategy, Bioresources Strategy whilst recognising the benefits to our customers of the wider group's Net Zero Plan. Our Biodiversity Strategy aims to support the Government target to reverse the decline of species and habitats in the South West of England, both on and beyond our landholdings in collaboration with others, which is our duty in supporting the delivery of new Local Nature Recovery Strategies and commitments under the Environment Act (2021). We will also continue to reduce the amount of nutrients, namely Phosphorous, contained in treated wastewater returned to the environment, in order to improve river health under the Environment Act 2021.

Our Bioresources Strategy aims to provide a safe and resilient outlet for the by-products of wastewater treatment and generate added value through enhanced bioproduct for renewable energy generation. In our core pathway we recognise that we need to plan for the end of disposal to land and invest in alternative technologies such as small scale advanced thermal conversion facilities. The actions we have proposed in our AMP8 plan will act as pilot programmes to investigate potential benefits of scaling up in future AMPs. We will also invest in a strategic reserve storage site which as a means of mitigating risk of sudden reduction in landbank availability in the near to medium term.

We will continue to test and trial new technologies and innovations to extract energy from bioresources, sensitive to the presence of micro-plastics and forever chemicals, and we will explore with our partners novel and safe uses and markets for the resulting by-product.

Our Net Zero Plan set out ambitious plans to reduce operational carbon emissions and hit our Net Zero target by 2030, with a further commitment to reduce greenhouse gas emissions (GHG) across our entire value chain by 2045. We will continue to focus on reducing our omissions of Nitrous Oxide and the repurposing of Methane as a source of fuel for our own use. We will also continue to actively support our supply chain to decarbonise and reach net zero targets, as well as seeking opportunities to collaborate with strategic low carbon infrastructure initiatives. In AMP8 and AMP9 we plan to continue delivering improvements through our base activities. We will also continue to work with others to investigate and trial fugitive emissions reduction. Our long-term delivery strategy anticipates that acceleration towards net zero goals will require additional enhancement expenditure post 2030. At present solutions and costs are too uncertain and we have not included those in our strategy. Progress In preferences and technologies will be reassessed as we monitor and review the implementation of our strategy.

Sensitivity analyses and impact assessment of scenarios

When developing our plan, we have tested the impact of the common reference scenarios and of our company specific scenario 'Local expectations'. This scenario reflects that local expectations on year-round access to a healthy environment and smarter healthier homes may vary significantly over time. Customers will have different expectations in increased resilience against drought, optimised and circular use of water and protection against flooding as the impacts of climate change become felt. Similarly, increased recreational use of watercourses and coastal waters may expand our catchments requirements for designated waters (we provide In the Rationale section more information on how we arrived at the company specific scenario).

The sensitivity analyses and impact assessment of the different scenarios show that, overall, our long-term plan is more sensitive to adverse conditions than benign conditions. This is consistent with the planning assumptions of our strategic plans which have been based on current climate change conditions (close to RCP2.6) and which include the earliest possible uptake of innovation. With these planning assumptions already built in our core plans, it is natural to observe little impact of Ofwat's benign scenarios.

In the diagram below we provide the summarised quantified impact assessment of the scenarios (both common reference scenarios and company-specific). The impact is shown as an additional investment (blue) or reduction in investment (green) resulting from using each scenario dimension (adverse or benign) as a planning assumption.

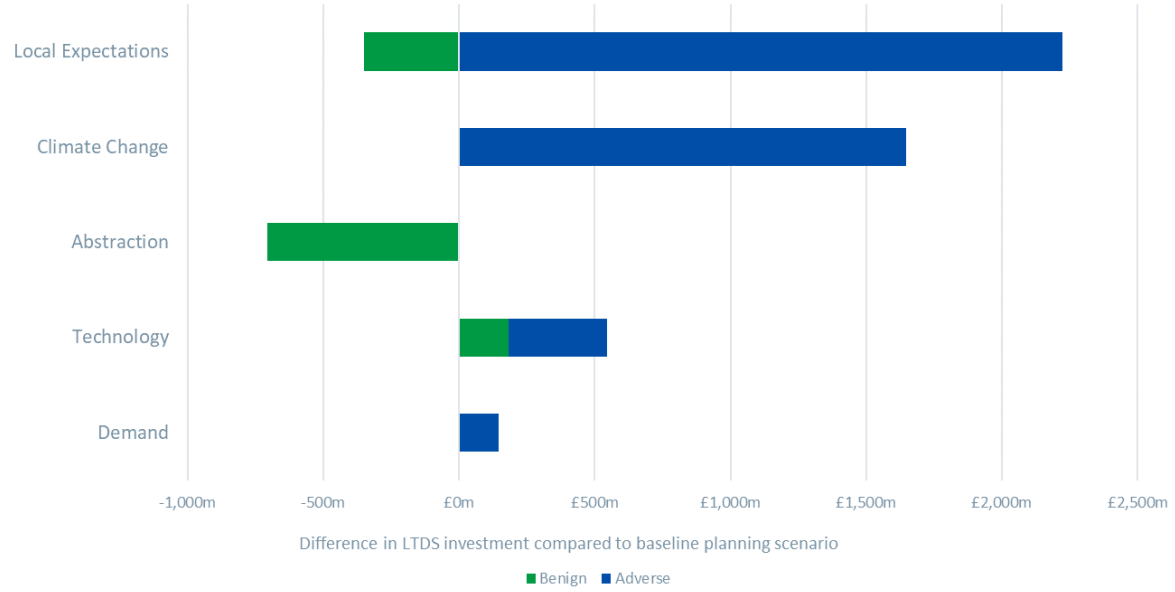


Figure 99. Impact of benign and adverse scenarios on the core pathway

The quantification of the impact assessment also shows that the largest impacts on plans come from adverse scenarios in climate change (+£1.68bn) and to increased levels in local expectations (+£2.22bn) (see graph below).

The weather of the last three years shows just how challenging trends in climate change can be on all aspects of our operations – and it is no surprise that our analyses show that if climate change is more severe or earlier than expected, we will need to deliver increased resilience. This could add up to 20% to our investment plans in the future. Prioritising low regrets investment early, building resilience early and working in partnership will be essential to keeping these costs down as well as minimising the impact of climate change on the services to customers and communities.

Similarly, whilst we deliver high performance in flooding, changes in expectations on flood risk protection from our customers in the South West region, may drive an additional programme of interventions, representing a sizeable impact on our plans.

The climate change adverse scenario assumes that, whilst tighter chemical restrictions are likely in the future, it will take longer for technologically feasible solutions to be developed for the treatment and removal of those chemicals. As such, tighter permit limits would not take place until later in the period. Conversely, with tighter permits (or new permits on additional substances) being likely in the future, a slow/benign technology scenario attracts more investment to meet compliance. This explains why the 'green' section of the technology benign scenario drives additional investment rather than reduces investment.

Our core pathway planning assumption for resilient water resources adopts an enhanced environmental destination and abstraction. This planning assumption is required to meet the Environmental Agency (EA) policies in abstraction licence capping and planning guidance as determined by our national and local regulator. For this reason, we do not observe an impact to core pathway investment from the common reference scenario of 'abstraction adverse'. On the other hand, we find that under an abstraction benign scenario we expect to deliver the required water available for use headroom using only our core pathway demand management options and therefore may defer investment in additional supply options. This results in a reduction in investment of £706m between 2030 and 2050 compared to the core pathway.

The technology scenario cuts both ways. For our water investment plan, technology acts as an efficiency and reduces our overall investment need. More details are provided in the individual section of this document for each ambition and in our strategic plans WRMPs and DWMP.

Table 6 Sensitivity analyses and impact assessment of scenarios, sensitivity of ambitions to scenarios (common reference and company specific)

Ambition	Scenario	High sensitivity areas
Resilient water resources through healthy catchments		Our plan is most impacted by the Demand Adverse scenario, driven by persistently high demand placing pressure on the existing capacity of water treatment works affecting ultimately impacting on the resilience of supply to customers. The core pathway drives accelerated interventions to improve demand management such as metering and the extension of our 'upstream thinking' programme that improves catchment management. Our core plan is based on the core WRMP which complies with the Environmental destination set by the Environment Agency and our local EA regulator. This aligns with Ofwat's adverse scenario and therefore there is no impact on the core pathway. We have assessed the impact of benign abstraction scenario and this shows a reduction of investment which corresponds to no investment in supply sources for our region. Our core WRMP is compliant with the water resources planning guidelines.
Top quality drinking water		Our plan is most impacted by the expectations of customers in appearance, taste and odour of their water and by the impact of adverse scenarios of climate change. Changes may be driven by the impacts of higher intensity of rainfall increasing dissolved iron and manganese abstracted into our treatment processes and ultimately into our distribution network, and increased propensity for algal blooms, leading to likelihood of extreme levels of taste and odour causing compounds such as geosmin and methyl-isoborneol, as well as an increased potential for algal toxins
Controlled and managed wastewater flows		Our plan is most impacted by Climate Change and Local Expectations, driven predominately by impacts to the risk of sewer flooding in a 1-in-50 year storm from the increased intensity of rainfall. These scenarios affect how much surface water we will need to manage over short periods of time.
Net zero and environmental gains		Our plan is most impacted by Climate Change and Local Expectations as, all our biodiversity workstreams delivered in the natural environment, are highly sensitive to climate change impacts, in particular temperature rise and more erratic, extreme rainfall and drought events.[1] (with most vulnerable being INNS management and fish/eel interventions). Our bioresources strategy, on the other hand, is most vulnerable to changing local expectations over treatment and recycling of sludge as we face uncertainty on disposal routes.

[1] We also find that reductions in permitted levels of water abstraction may also affect our biodiversity ambitions insofar as these restrictions are responding to, and therefore correlated with, concurrently deteriorating flow of water in our rivers. However, given that the ultimate driver of low river flows are driven by an adverse climate change scenario, we do not consider adverse water abstraction scenario to be associated with incremental impacts to our ambition.

Least regret options in our core pathway

The least regrets interventions were identified during optioneering under the different scenarios below and have been included in the core pathway of our strategy.

Table 7. Least regret option in our core pathway

Ambition	Least regret activity	Why this in the core pathway
Resilient water resources and supply through healthy catchments	Accelerate our Advanced Metering Infrastructure (AMI) in AMP8, installing meters on a compulsory basis in our Bournemouth zone and investing in driving water efficiency down	To inform the targeting of capital investment in pipeline replacement using information from smart meters to target leakage and PCC reduction
	Expansion of the Restormel water treatment works and development of Littlehempston and Whitecross distribution schemes	To increase water availability for use needed in the majority of futures
	Environmental and engineering studies to assess the best ways to deliver supply resilience	To identify new adaptive approaches should adverse futures emerge
Top quality drinking water	Strategic interconnector schemes to build resilience in supply and to reduce the risk to interruptions	To sustain uninterrupted supply in the majority of futures and support environmental destination by allowing for the optimum movement of water.
	Research, investigations and enhanced analytical capability for emerging contaminants and future potential chemical and biological risks to drinking water quality, such as PFAs ('forever chemicals'), endocrine disruptors, personal care products, disinfection by-products and microbiological pathogens	Pre-emptive work to keep future options open should more adverse futures emerge
Controlled and managed wastewater flows	Early investment and benefits monitoring of nature-based surface water separation and removal	To meet our storm overflow reduction plans goals in the majority of futures
	Monitor the effectiveness of our nature-based enhancement interventions on flooding outcomes	To identify new adaptive approaches should adverse futures emerge
Delivering Net zero and environmental gains	Restore peatland to build a landscape that is more resilience to drier climate	To deliver target outcomes in the majority of futures
	Upfront land purchases and partnership working to unlock matched funding opportunities that can bring forwards significant tree planting activity should more adverse futures emerge	To build-in resilience to a potential adverse climate scenario whilst delivering co-benefits to raw water treatment
	Pro-active audits of current species, pre-emptive biosecurity installations and ambitions public awareness campaigns and engagement about Invasive Non-Native Species (INNS)	To deliver target outcomes in the majority of futures
	Funding research projects and pilots for innovative INNS management, carbon sequestration (marine seagrass and saltmarsh), nature-based solutions, and fisheries improvements	To identify new adaptive approaches should adverse futures emerge
	Investment in pilot scheme to explore new and innovative bioresource recycling and disposal routes	To identify new adaptive approaches should adverse futures emerge

Adaptive pathways

Whilst the core pathway is based on a 'most likely future', t**he adaptive pathways are alternative pathways we may take to deliver our ambitions if one or more of the plausible futures as defined above are realised.**

When testing our plans against the different futures we have modelled the changes required to adapt as a set of additional or different totex interventions that will be required to meet our 2050 ambitions. We have carried out a 'bottom-up' modelling, by ambition, building on the work of the WRMPs and DWMP.

For each individual ambition, we describe the adaptive plans and pathways in detail in the following sections of this document. Here we present an aggregate view of the adaptive pathways showing the pathways that our strategy will follow to adapt to different futures. Decisions on the need to adapt to plausible futures will be guided by our monitoring plan and a risk-benefit assessment involving stakeholder engagement and modular solutions. The governance of the LTDS has been integrated into our business-as-usual process with clear accountability on monitoring and reporting.

For each pathway we have defined trigger points set to enable delivery of benefits in time to meet all of our 2050 and intermediate regulatory targets and to meet any constraint attached to delivering investment on the ground. The monitoring metrics supporting our decision-making are described in Rationale section and listed in the appendix 2 of this document.

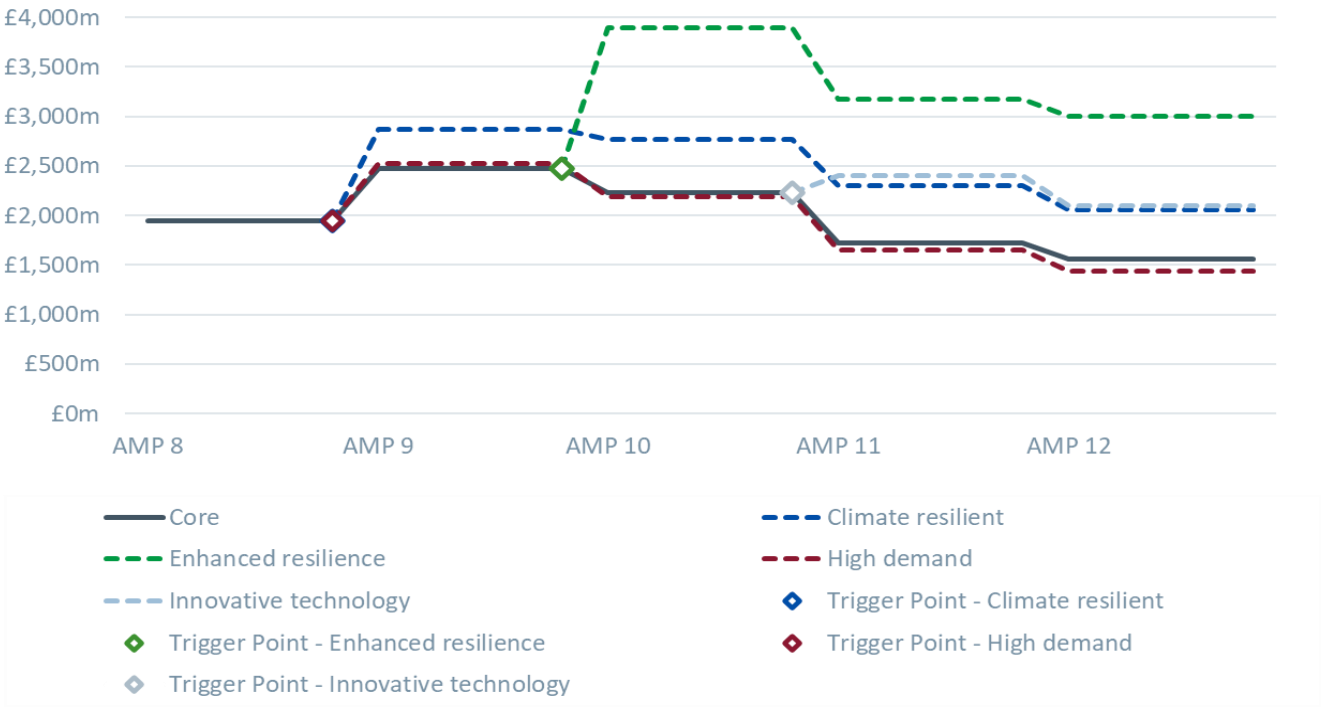


Figure 1010. 2050 adaptive plan

How we will adapt to meet our ambitions

Here we describe for each pathway the actions we will take to adapt and how we set the trigger points that we will monitor.

Climate resilient adaptive pathway – trigger 2030 – likelihood 20%

Whilst our core pathway accelerates actions to reduce demand, adverse climate conditions will drive the need for increased resilience to drought and to interruptions of supply through investment from 2030 to 2050 at Sidford borehole, Allers Springs, Couchil Springs and in the interconnector Roadford to Colliford.

Our drinking water quality investments are adaptive in nature. However, our modelling shows that climate change adverse conditions will increase the risks to CRI and the number of Water Quality contacts as we need to tackle increased levels of iron and manganese resulting from higher intensity rainfalls and extreme levels of taste and odour resulting from increased algal blooms. We are preparing to mitigate the risks of raw water deterioration by upgrading seven water treatment works (WTW) to allow for the rapid mobilisation and deployment of mobile treatment technologies so that our water treatment works remain in service during adverse raw water conditions. These mobile treatment options allow us to delay the delivery of more permanent GAC solutions, at cost of more than £100m, which gives us more time to prioritise and plan these investments as well as timing them to coincide with future maintenance schemes for efficiency. In addition, our core plan assumes an initial benefit from smart networks in AMP9, with increasing benefits from AMP10 onwards that allow us to reduce our consumer contacts with lower cost options.

Increased frequency and intensity of rainfall will increase the levels of flood risks and drive large programmes of capital investment when the pathway is triggered, driving additional enhancement expenditure up to £300m per AMP from 2030 to 2050. More frequent occurrence of low flows, flooding and rising temperatures are expected in the future which may create increased risks to biodiversity targets as new INNS become able to establish, breed and spread more rapidly whilst stressed habitats become more susceptible to invasion. Mitigation will require front-loading of additional capital investment in 2030 to safeguard against risks developing. Moreover, increased summer temperatures in exposed upstream tributaries due to lack of riparian shading and increased average winter water temperatures threaten high priority fish species (e.g., salmonid egg survival) and reduce the geographical range of suitable freshwater conditions for native species. Beyond INNS control, an increased risk of drought will mean that water attenuation in the landscape will become a core business activity - resulting in a need to expand our Upstream Thinking (UST) programme from 2030 onwards.

Our modelling shows that the first adaptive pathway may be triggered as early as 2030. This is to respond to a future where climate change conditions have worsened from today and there is no acceleration of technology development. Changing course to this adaptive pathway may drive additional investment circa £2bn totex between 2030 and 2050.

High demand adaptive pathway – triggered 2030 – 5% likelihood

Our ambitions for resilient water resources and top quality drinking water are most sensitive to the High Demand future. Our adaptive pathway future is designed to mitigate the pressure of persistently high demand from consumption and growth, which risks exceeding the current capacity of our water treatment works. In this plausible future, we explore the lack of behavioural response from customers to environmental and sustainability signals (as evidenced by high per capita usage of water) lowers the expectation of water companies to improve sustainability of their operations.

In the context of our water quality contacts outcomes, this means that mains replacement programmes can be delayed and substituted for intensive use of flushing and other operational measures, despite the impact on water usage.

We have placed a decision point in 2028 to re-evaluate the expected impact of government sustainability policies, such as mandatory water labelling, on household consumption. If, by 2028, it does not appear that behavioural changes will have a material impact on overall demand then we will need to deliver front-loading of additional capital expenditure through 2030 to 2040 to increase treatment capacity at Littlehempston, Northcombe and Dotton WTW with additional operating expenditure from 2035 onwards associated with these treatment works.

Enhanced resilience adaptive pathway – triggered 2035 – 15% likelihood

In this plausible future, we assume that customers respond to water labelling and sustainability policies to reduce their usage of water. In-turn, customers expect water companies to respond which may mean that the level of flushing adopted under the core pathway are no longer deemed acceptable by stakeholders and customers. This would put additional pressure on mains replacement to tackle the root causes of water quality contacts.

Our adaptive pathway for enhanced resilience requires a significant step up in our flooding programme to combat increased climate pressures whilst also halving the overall level of flood risk during a 1-in-50 year storm. To prepare for this plausible future, we will monitor the effectiveness of our nature-based enhancement interventions so that, if we need to adapt to a lower level of flood risk in the future, we can do so through more sustainable solutions and create greater value for customers and our communities in the longer term. Overall, moving from a 10% to 5% flood risk would drive the largest increase in enhancement investment needed to achieve target levels for sewer flooding in a 1-in-50 year storm. This accounts for two thirds of the expenditure for the Enhanced resilience adaptive pathway (compared to our most likely plausible future). Aside from reducing flood risk, this future is associated with an increased designation of bathing waters across our catchment which will require investment of an additional c.£10m every five years.

In this future we will also be able to measure smaller traces of nutrients from our discharges. We anticipate that this future will tighten the compliance thresholds for nitrogen removal which will increase our overall investment in biological treatment and that it will bring forwards chemical treatment of discharges.

Lastly, an enhanced resilience future will require us to adapt our bioresources strategy as our long-term targets for bioresources are most at risk to changes in use of landbank for sludge. Whilst there is significant uncertainty over the future of the sustainability of recycling treated bioresources to agriculture we have estimated a trigger point in 2035 for an adaptive pathway in which we may need to expand treatment beyond incineration and that would need to be enabled through legislation and in consultation.

We have placed a trigger point for this pathway in 2035, with investment phased over this period to realise a halving in the sewer flood risk in a 1-in-50 storm before 2040.

Innovative technology adaptive pathway – triggered 2035 – 30% likelihood

Our adaptive pathway for innovative technology reflects the need to address increased flood risk levels, a similar scenario as enhanced resilience without the added pressures on flooding from an adverse climate change scenario. Instead, this plausible future assumes that climate change follows a stable pathway at RCP6.0 but that increased availability of innovative technologies mean that our stakeholders and customers expect us to perform better on flooding outcomes.

Aside from enhanced expectations, availability of new innovative technologies may materially affect our core pathway for bioresources. Although currently pyrolysis is an unproven thermal destruction option, it compares favourably to incineration in terms of energy recovery and carbon emissions. We have therefore estimated a trigger point in 2035 to include building pyrolysis technology as final treatment stage of sludge.

We have placed a decision point for this future ahead of 2035, as a more favourable case for uptake of innovation than the benign scenario of climate change in the common reference scenario.

When are the triggers and decision points set

In the table below we summarise the trigger and decision points of our adaptive plan are summarised below. The rationale behind the timing of the trigger and decision points is provided in the description of each pathway.

Table 8. Date of triggers and decision points of our adaptive plan

Future	What ambition is impacted	Likelihood	Date of decision	Date of trigger
Climate resilience	Resilient water resources and supply through healthy catchments Top quality drinking water **Controlled and managed wastewater** flows Net zero and environmental gains	20%	2028	2030
Enhanced resilience	Top quality drinking water **Controlled and managed wastewater** flows Net zero and environmental gains	15%	2033	2035
High Demand	Resilient water resources and supply through healthy catchments Top quality drinking water	5%	2028 (SWW) 2033 (BRL)	2030 (SWW) 2035 (BRL)
Innovative Technology	**Controlled and managed wastewater** flows Net zero and environmental gains	30%	2038	2040

SEMD and cyber attack – a special consideration

Our adaptive plan takes account of long-term needs to meet security obligations and provide resilience to cyber attacks. Our core pathway includes enhancement to deliver increased emergency capability across our company, and in direct response to emerging long term risks such as Drought and Power Outages. Our pathway is targeted to these risks and includes the least regrets SEMD interventions, where enhanced capability of equipment and personnel ensures quicker reaction and more effective response to risks out of our control. The Security and Emergency adaptive pathways ensure that we can cope with changes in plausible futures, such as 'Climate Resilient', and that we have plans for long term threats, culminating in customer impact and supply resilience during incidence of drought, hotter drier summers, and more severe storms. Considering event frequency of climate change and impacts arising both directly (power outages and more frequent incidents) and indirectly (higher customer demand and expectation), we must be able to respond to the future of 'High Demand'. If our customer demand changes, our emergency response and alternative water arrangements must change with it. Whilst our core pathway is linear, we must be adaptive and flexible to changes in customer requirements and plausible impacts, therefore we will continually monitor national risks through SEMD Policy and industry initiatives.

As we expand our use of smart technologies, data and digital solutions to deliver operational excellence, we will also continue to assess and mitigate the risk presented by global cyber security threats. The use of AI and automation will continue to increase as will our information technology (IT) and operational technology (OT) asset base. We will continue to invest in both corporate IT and OT to ensure that we are able to keep pace with emerging threats to protect customer data and maintain a stable services. As described in the Enhanced Business Case for Cyber Resilience, cyber threats will continue to rise and will increase in complexity.

In the future we expect the NIS Regulation to include wastewater assets into its scope and the regulation of AI can also be expected. We have included enhancement investment to comply with future regulations in our long-term plan (and therefore not in AMP8).

We have determined two adaptive pathways. The first is an increase in investment under the climate resilient future to respond to an increase in replacement rate of assets and to the impact of rising temperature on the data centres. The second is reduced investment as technology provides the opportunity to be smarter and faster. This is however counter-balanced by investment required to protect assets and data resulting in additional cyber security investment needs.

Bill impacts from long-term enhancements and investment profile

Driven by customers' priorities we have thought carefully about ***when*** is the right time to deliver enhancement investment, balancing the need to improve with the impact that this has on customers' bills and the deliverability of our programme.

Government policies and obligations set key targets and milestones for the earlier years of our long-term plan which we must meet. Overall, the key investment drivers of our investment plan are maintaining resilient water resources and addressing storm overflows, which together equate to around 45% of future investment needs. We know this will increase bills, so we have been particularly challenging on ourselves so that our customers do not shoulder more than their fair share.

For example, we do not believe our customers should pay for Net Zero, so we have not included this in our investment plans. Equally, we have applied a stretching efficiency challenge on ourselves in the short term and we have assumed this level of efficiency will continue. In the graph below we show the forecast enhancement investment required to meet our ambitions in the most likely future.

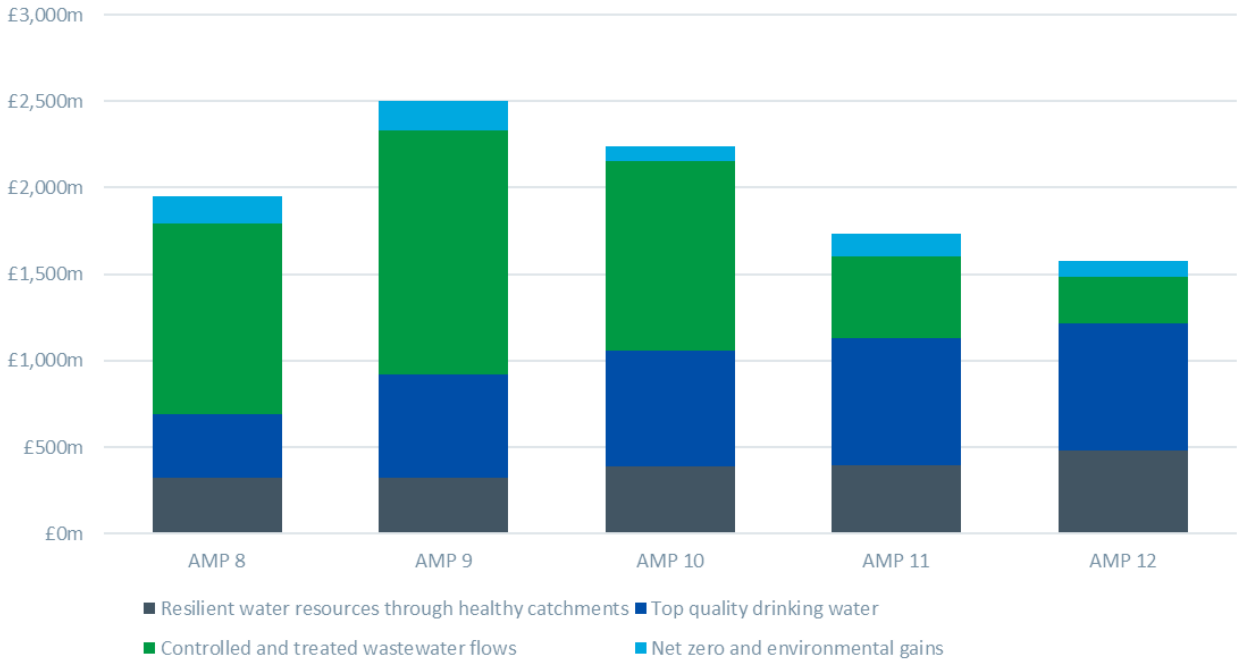


Figure 1011. Long-term investment by performance commitment

We have developed a long-term investment plan for each of our ambitions and this bottom-up approach has allowed us to create a more detailed and more granular view of investment needs, enabling us to reflect more closely the views of our customers and stakeholders in each area of performance.

To best optimise our plan we use our asset management planning approach to select the programmes of interventions delivering most value where, for example, wider benefits to society and the environment will be realised. We have extended the range of quantified benefits to a broader set of metrics, assessing for example environmental, biodiversity and natural capital impacts and benefits, greenhouse gas emissions, availability of water, engineering scope, and whole life-cycle costs where applicable as well as the Environmental Outcome metrics using the EA guidance for our WINEP. Where available we use the value our customers place on them and we monetise benefits to inform the prioritisation of our investment plans. With the results of our optimisation runs we have phased the investment plans to achieve the best balance in the long term of performance and costs and the tables below summarise the key decisions supporting our plan profile.

Table 9. Bill impacts from long term enhancements and investment profile

• Resilient water resources through healthy catchments	
Accelerating	• Promoting demand side reductions through leakage and water efficiency - particularly in our South West Water region • Using metering and water efficiency - bringing forward a roll-out of smart metering, enabling additional demand reductions and more progressive charging regimes that will improve the affordability of future investment programmes • Supply schemes and SROs e.g., treatment capacity increases and new sources (Cheddar 2 reservoir)
Phasing	• Leakage expenditure is delivered on a linear profile in the Bristol Water region – noting that less and less leakage reductions are delivered given the rising nature of leakage reduction costs

Top quality drinking water	
Accelerating	• water treatment works upgrades to reduce CRI risk and maintain compliance • Research into emerging contaminants, e.g., PFAS • Increased flushing and calm network operation to improve discolouration
Phasing	• Cast iron mains replacement to reduce discolouration risk – following our strategy of addressing risks at source first, i.e., upgrading water treatment works • Getting an early start on our lead pipe replacement programme so we can provide a lead free network by 2050 • Improve the inter-connectivity of our regions before making future decisions around more expensive new water sources

Controlled & treated wastewater flows	
Accelerating	• Storm overflows at bathing beaches and delivering one third of storm overflow investment by 2030 • Nutrient reductions to achieve the 2038 target
Phasing	• The profile meets the 2035 targets for storm overflows discharges as set out in the Environment Act 2021. Moving the installations of overflow screens until after 2040 means that we can achieve the spill reduction by 2040 in line with customer views but phase costs whilst meeting screening 2050 targets – noting that it may in the future be found to be unreasonable to screen overflows that rarely spill, if at all • We have profiled parts of the nutrient programme within the WINEP into AMP9. We have also reprofiled AMP9 into AMP10 – whilst still meeting 2038 targets for 80% Phosphorous removal as set out in the Environment Act 2021 • Note: in line with recent changes to guidance, river monitors are reduced in scope, and are set at 25% in AMP8, 75% in AMP9

Environmental gains and net zero	
Accelerating	• Bioresources investment in AAD – to reflect investment required to maintain compliance with environmental standards and to ensure that sludge can be safely disposed of
Phasing	• Continued biodiversity improvements through expansions of our Upstream Thinking programme.

Despite efforts to smooth our investment profile and reduce our costs where possible – it is largely our statutory obligations and key targets that are driving the early bill increases between 2025 and 2035 before levelling off.

In the graphs below we show the bill impacts of our long term plans, under different future, for our customers in the South West region and for our customers in the Bristol region.

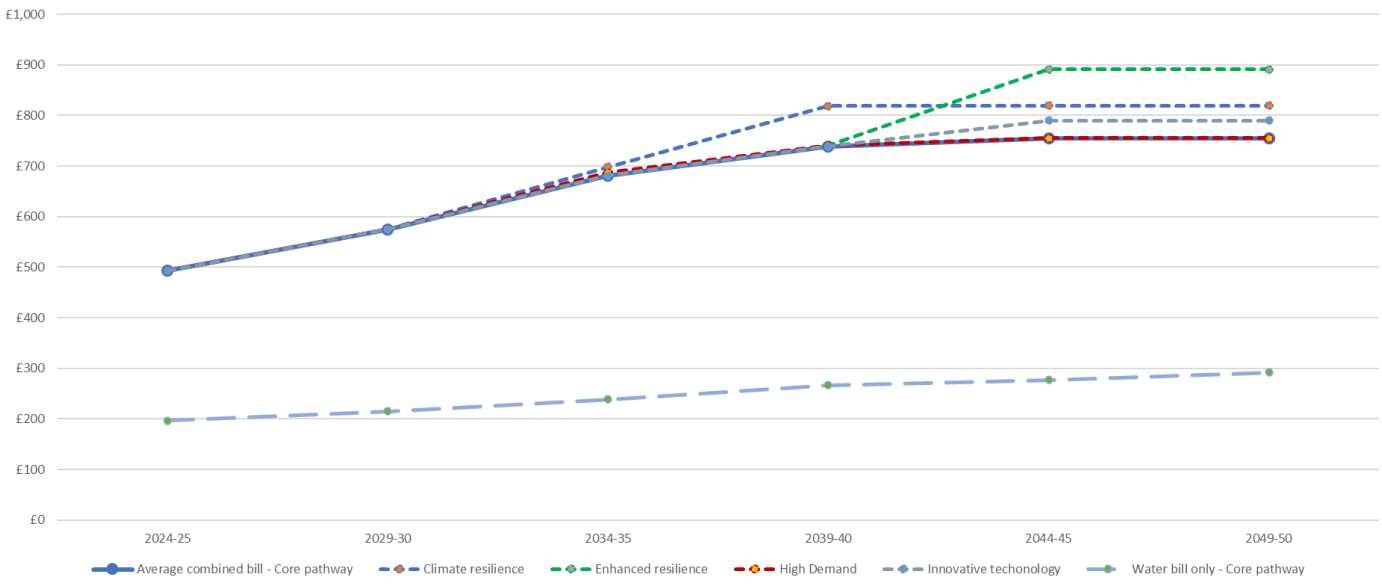


Figure 1112. South West Water bill impacts from long-term enhancements

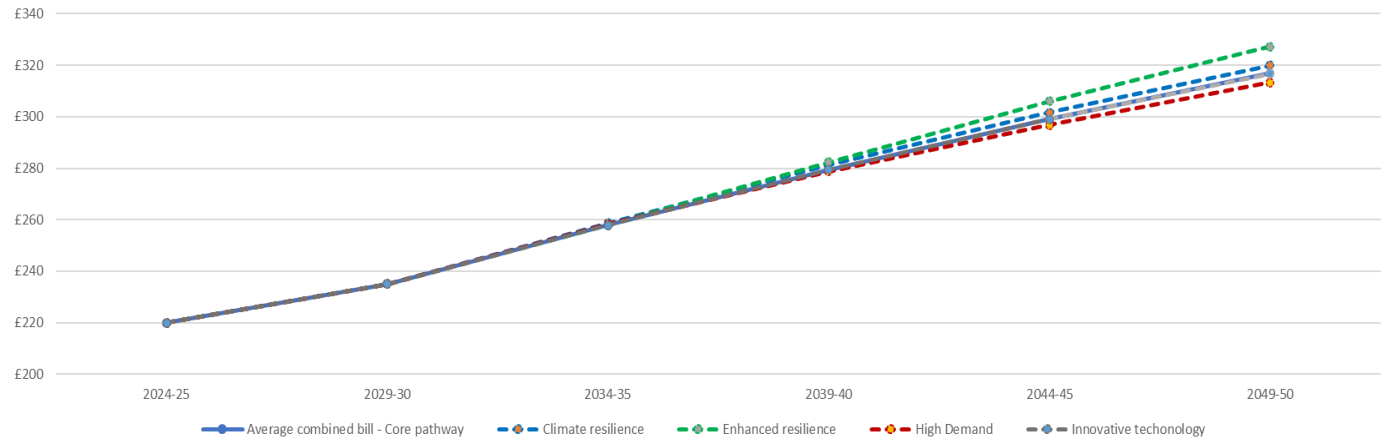


Figure 1213. Bristol Water bill impact from long-term enhancements

Resilient water resources through healthy catchments

Ambition

Our ambition is to meet future demand and boost resilience through connected water resources, whilst balancing the needs of customers, communities with those of the environment through careful management of our catchments.

What our customers and stakeholders say

We have consulted our customers through the research carried out in the development of our plan and specifically during the consultation process supporting the development of our WRMP24.

Customers and stakeholders have told us that:

- Resilient water supplies are a high priority for our customers and stakeholders, and they recognise the pressures on water resources from climate change, changing weather patterns and population growth
- They see the need for an increased priority on the environment in general and strongly support environmental improvements in the context of water resources. While they are pragmatic about the costs there is a general view across customers and stakeholders that our rivers should be protected, and that more environmentally friendly water supply resilience could be accelerated
- They strongly support increasing the speed of investment to reduce leaks to meet supply and demand deficits. Customers prefer water efficiency to new resources but are sceptical that everyone can make the behaviour changes required and they view supply options as more reliable so expect continued investment in these over the medium and long-term. They increasingly support smart metering; and stakeholders want to ensure that problems with smart metering in energy are avoided
- They see us as custodians of our region's biodiverse water environment, including our rivers, reservoirs bathing waters and coastlines. Our Environmental Research report (September 2022) identified that 83% of customers across Devon and Cornwall wanted us to increase investment in environmental priorities – with ocean pollution, single use plastics, climate change and deforestation being the issues of greatest concern.

Our objectives

- **Create greater capacity** through a diverse portfolio of water sources, strategic regional resources and interconnectors. To do this, we will consider the long-term needs of all users of water across water company boundaries, develop and deliver supply schemes to increase sustainable water supply, and increase interconnection to help us move water around the region in response to changing weather patterns.
- **Protect and boost river flows** – we will reduce water abstraction at sensitive locations and optimise releases of water from our reservoirs to manage river flows throughout the year. We will complement this programme with rainwater harvesting and nature-based storage solutions to reduce reliance on river abstraction and improve water efficiency. We will also carry out river restoration schemes across our catchments, boosting habitats and restoring natural flows
- **Reduce leakage** in the network and at customers' homes – this will be delivered by targeted mains replacement, enhanced active leakage management and increased pressure management. Smart metering will reduce leaks on customers' supply pipes. We will create smarter water networks which, combined with smart metering at customers' properties, to help identify leaks and prevent issues from escalating.

Our adaptive plan

Our adaptive plan for delivering resilient water resources through healthy catchments consists of a core pathway and two potential adaptive pathways.

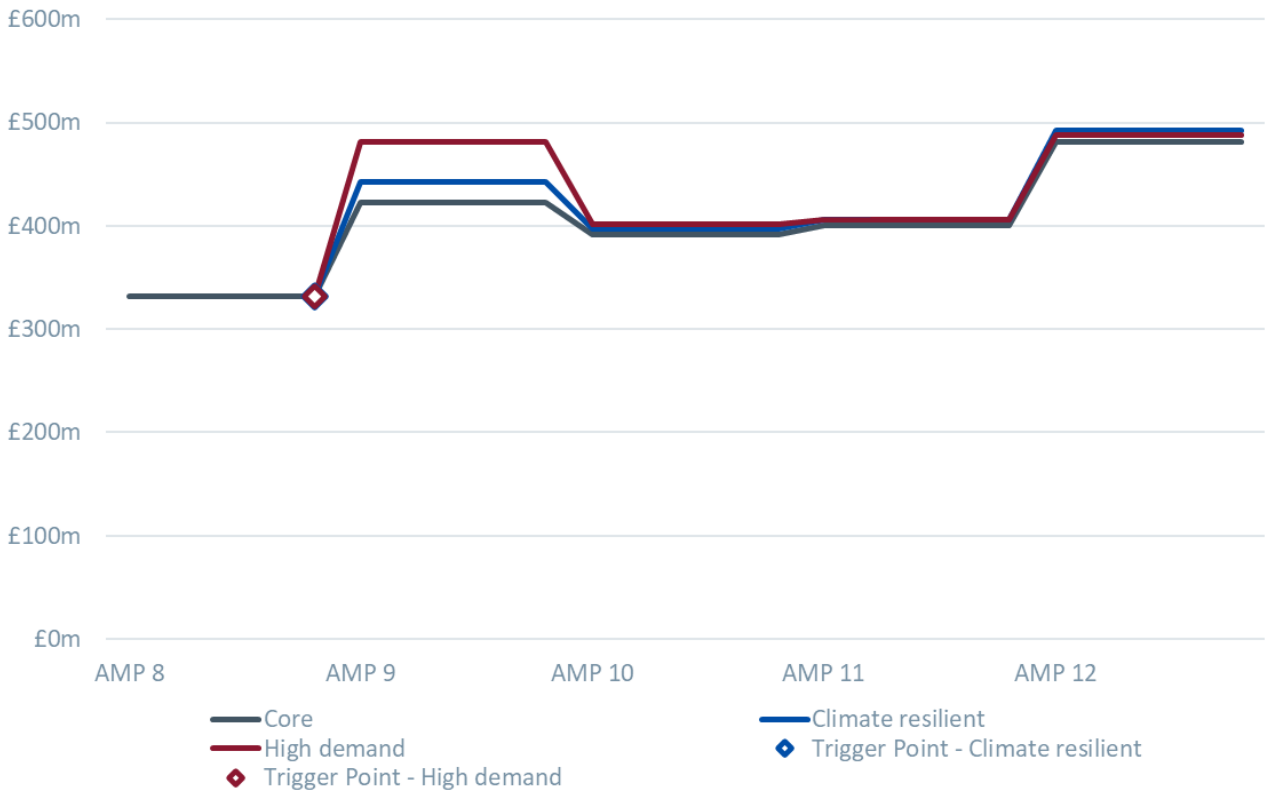


Figure 1114. 2050 adaptive plan – resilient water resources through healthy catchments

Our core pathway plan seeks to maximise demand side interventions early and ahead of supply options, reducing the need to rely on capital and carbon intensive solutions in the short-term. This also enables us to adapt better to different futures as we will manage demand effectively and so be able to construct new supply options in the areas of most need and at the correct time.

In 2028, ahead of a 2030 trigger point, we will decide whether we need to adapt to a **climate resilient** future of RCP 8.5 in which a higher prevalence of drought conditions will put pressure on our ability to deliver our supply-demand balance requiring investment in new water sources.

In 2028, ahead of 2030 trigger point, we will also decide whether we need to adapt to a **high demand** future in which the pressures on our supply-demand balance will require a significant expansion in water treatment works capacity.

Our adaptive pathways for these plausible futures will be guided by our monitoring plan and a risk-benefit assessment involving stakeholder engagement and modular solutions. This forms part of our overall WRMP and Upstream Thinking Programme. We will work with delivery partners and academic bodies to ensure our interventions are delivering the outcomes needed for our ambitions.

Our core pathway

To deliver our core pathway we will accelerate our Advanced Metering Infrastructure (AMI) in AMP8, installing meters on a compulsory basis in our Bournemouth zone and spending £10m on driving water efficiency. In addition, to set our course to halve leakage by 2045, we will increase leakage investment in acoustic loggers and narrowing the granularity of our existing monitoring approaches, alongside our targeted asset renewal programme and installing pressure-management schemes across our network.

Whilst we prioritise demand management and leakage reduction as far as possible, meeting our near-term resilience objectives will require significant increase in investment in new water resources across our South West and Bournemouth regions.

Demand management will still continue to be a priority in our core pathway beyond AMP8 in order to meet our ambitious DI reduction per head of population, PCC and leakage targets. However, beyond AMP8, in order to meet our ambitions across the majority of future scenarios, we will need to take forwards two significant new water resources: Cheddar 2 Strategic Resource Option and Mendip Quarries Strategic Resource options. Alongside this, our analysis for the Wimbleball Water Resource Zone (WRZ) has found the following 'least regrets' investments in new water sources such as the Brampford Speke and Stoke Cannon boreholes.

Our 'least regrets' core pathway investments

Aside from options needed in most of the future scenarios, we have identified investments we could make beyond 2030 to allow us to adapt to more intense drought conditions should they emerge. We have set aside £3m in AMP8 for environmental and engineering studies to assess the best ways to deliver supply resilience from 2030 and beyond, including how to meet more adverse pressures should they emerge.

Our AMP8 plan will involve ongoing monitoring of the Wimbleball WRZ to decide on the need for additional supply options in 2030, as well as clear decision points to consider strategic resource options in specific WRZs. This programme of AMP8 investment include a focus on environmental studies, adaptive planning, and engagement with stakeholders to determine necessary balance between investment, environmental considerations, and customer impact.

In the context of our Upstream Thinking programme, we will also realise a net gain of c.450 biodiversity units (BNG) by 2030 and c.810 by 2050 across seven new river catchment projects. This is in addition to continued growth in our partnership working across the remaining thirteen river catchments that we currently already have projects in.

How we have arrived at our core pathway

Our core pathway has been developed with consideration of a wide range of solutions from demand management to optimising the use of our current water resources and investing in potential new source. It has been tested/developed under the conditions of the common reference scenarios, as defined by Ofwat, and includes least regrets activities. Finally, it has been optimised to provide the best value to our customers.

Our first step leads us to an 'unconstrained' long list of options which we then apply a multi-criteria optioneering assessment. Our optioneering process involves feasibility investigations[2], stakeholder acceptability assessments[3], strategic environmental assessments (SEA)[4], and the net benefit contribution towards the supply-demand balance of the applicable Water Resource Zone (WRZ)[5].

We regard river catchment management delivered through partnership working as a key function of our role as a water company which presents a raft of ideal opportunities for the company to conserve and enhance biodiversity beyond our landholdings. These activities are grouped within our Upstream Thinking programme, where we work with farmers and landholders to installing interventions that realise habitat improvements as well as support the region's water source resilience. We discuss this in more detail in our 'Environmental gains' and net zero' and ambition.

[2] This involves assessing environmental, biodiversity and natural capital impacts and benefits, greenhouse gas emissions, availability of water, engineering scope, and whole life-cycle costs.

[3] This involves Internal and external stakeholder input, including potential strong objections from landowners and partner agencies.

[4] This considers natural capital, and biodiversity net gain, alongside other considerations such as carbon emissions and Minimal Liquid Discharge (MLD).

[5] This includes understanding the average incremental costs (AIC) per unit of benefit, such as m^3 of additional water availability or Ml/d of water transfer capacity, to allow for comparability across projects of different types.

Sensitivity testing our core pathway

Our modelling shows that our core pathway is most affected by demand adverse and climate change adverse.

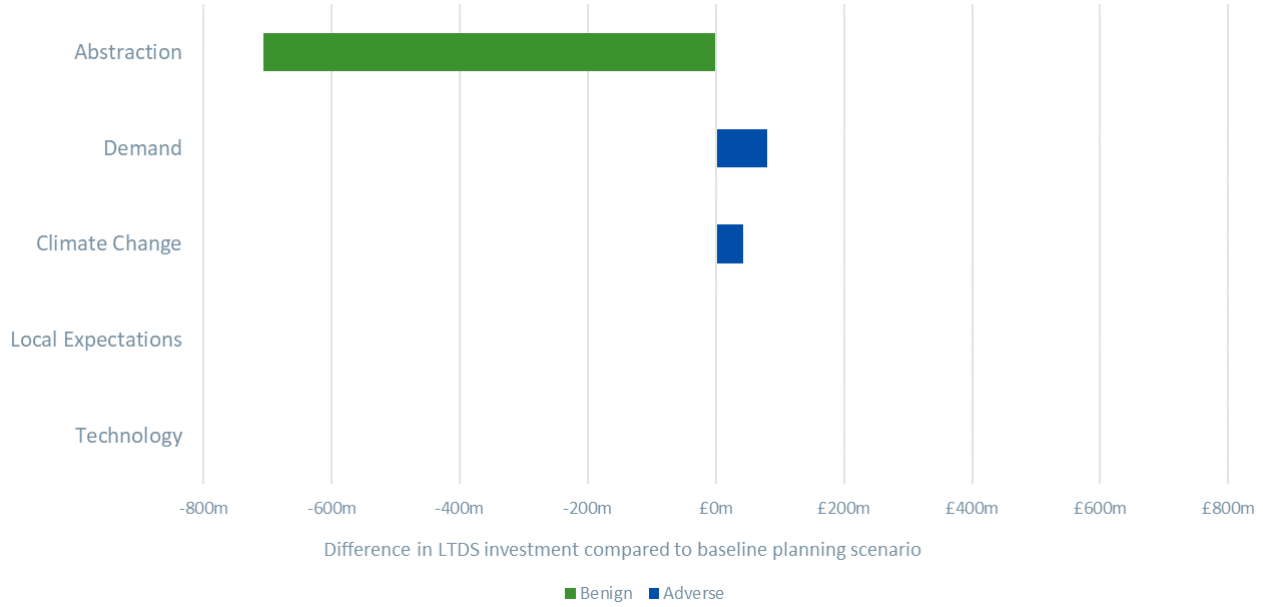


Figure 1215. Impact of benign and adverse scenarios on the core pathway

Our core pathway planning assumption for resilient water resources adopts an enhanced environmental destination and abstraction. This planning assumption is required to meet the EA policies in abstraction licence capping and planning guidance as determined by our national and local regulator. As we have a high share of sensitive rivers in the South West and Bournemouth regions categorised within the highest protection bands our medium ED assumption is the same as the "Enhanced" scenario for South West Water, although supposed to align with the National Framework's "Business as Usual Plus (BAU+)" scenario. For this reason, we do not observe an impact to core pathway investment from the common reference scenario of 'abstraction adverse'.

On the other hand, we find that under an abstraction benign scenario (absent an enhanced environmental destination with abstraction licence capping) we expect to deliver the required water available for use (WAFU) headroom using only our core pathway demand management options and therefore may defer investment in additional supply options. This results in a reduction in investment of £706m between AMP9 and AMP12 compared to the core pathway.

This testing also identified that persistently high demand throughout the next 25 years would place significant strain on the capacity of our water treatment works. The increase in investment is driven by the requirement for greater raw water treatment capacity to maintain balance in this scenario. On the other hand, given that our core pathway is based on PCC underlying the demand benign scenario, we do not measure an impact from the benign scenario.

We further found that climate change will reduce rainfall in summer and intensify in winter. So, in addition to reducing abstraction from rivers in summer, we must also capture more rainfall during winter. This means there is a greater likelihood of extreme weather which affects how much water is available at any given time, and some years cause more stress on our systems than others. An increase in investment is driven by new water sources and interconnection capacity to maintain the supply-demand balance.

Our adaptive pathway for Climate Resilient

Our adaptive pathway for a climate resilient future is designed to mitigate the impacts of an adverse climate change outcome (RCP 8.5), in particular the effect of decreased rainfall during summer months and increased propensity for drought conditions.

We have placed a trigger in 2030, by which time we will have a further 5 years of data on the emerging RCP and its regional impact on our operations. To prepare for this, we will take a decision no later than 2028 on whether trigger point conditions will be met during AMP9. If, by 2028 this outcome appears likely, then we will begin preparatory work to land purchases for new sources (i.e., 'Sidford borehole', 'Allers Springs', 'Couchil Springs') to deliver sufficient supply capacity until our core pathway Strategic Resource Options (SROs) are operational in 2035/36. Alongside new supply options, we will also expand our interconnection capacity between Roadford and Colliford to make better use of the sources already available in our catchment.

Our adaptive pathway for High Demand

Our adaptive pathway for a high demand future is designed to mitigate the pressure of persistently high per capita consumption which risks exceeding the current capacity of our water treatment works.

We have placed a trigger in 2028 in order to re-evaluate the expected impact of government sustainability policies, such as mandatory water labelling, on household consumption. If, by 2028 it does not appear that behavioural changes will have a material impact on overall demand, then we will need to deliver front-loading of additional capital expenditure in AMP9 and AMP 10 to increase treatment capacity at Littlehempston, Northcombe and Dotton WTW with additional operating expenditure from AMP11 onwards associated with these water treatment works.

Our investment plan

Our core pathway enhancement investment plan is categorised according to the performance outcomes they will support, in particular: drought resilience (i.e., percentage of the customer population at risk of experiencing severe restrictions in a 1-in-200 year drought), per capita consumption (i.e., the average use of water per person per day), leakage, (i.e., reduction in distribution system leakage in mega-litres per day) and biodiversity (i.e., a measurement of an area's value to wildlife based on the size and quality of habitats).

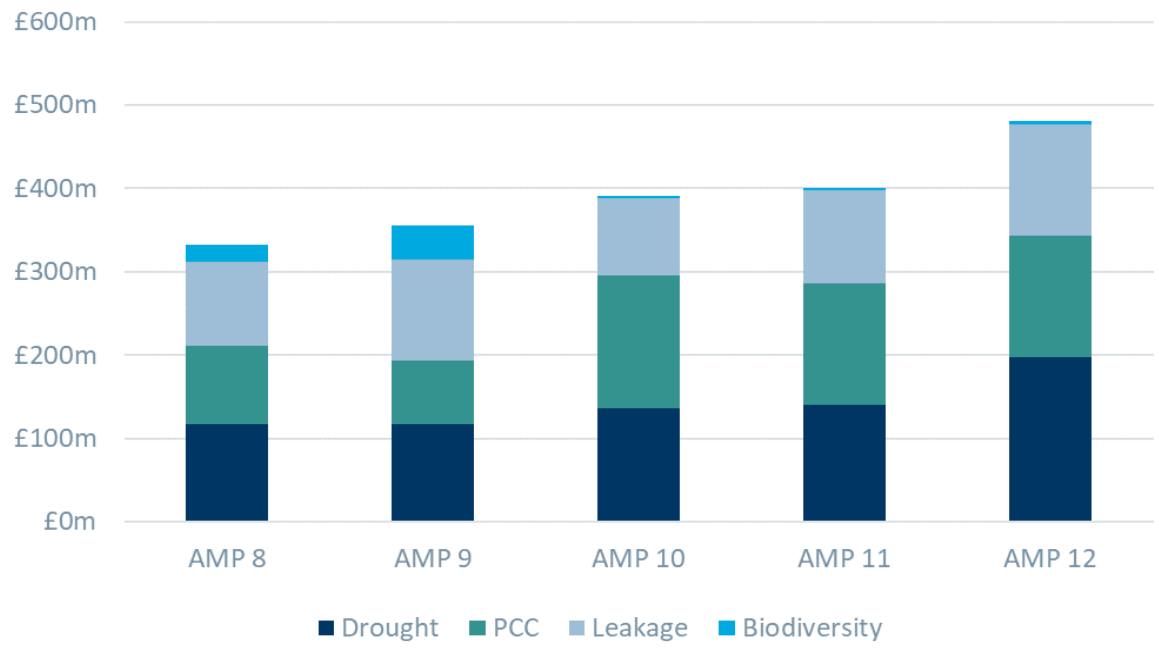


Figure 1316. Long term investment by performance commitment

To make sure we are delivering our core pathway of investments at the right pace over time we have developed a 'Best Value Index' (BVI) which scores different implementation plans according to their impact on the environment, society and resilience – leading to a total of 16 metrics where have been weighted and combined into a single score for each iteration of core pathway implementation. This process has allowed us to prioritise delivery of options which give the best long-term outcomes for customers and our communities.

For example, our best value planning approach has identified that front-loading leakage investment may create cost and disruption to customers due to high levels of asset renewal over a short period of time. However, back-loading leakage interventions may lead to unfair allocation of costs on future generations with similar levels of disruption. Instead, we have adopted an 'intelligent pathway' of steady progress on leakage to smooth out this impact.

We will deliver against our long-term objectives through our core pathway delivery mechanisms described below.

How we will deliver greater capacity through diverse water sources

We will increase the capacity of drinking water through strategic regional resources with collaborative regional planning that considers the long term needs of all users of water across company boundaries."

Table 10. Our investment plan to deliver capacity through diver water resources

Delivery mechanism	Activity
Build new sources	Build the 'Cheddar 2' strategic reservoir
	Development of Strategic Resource Options (SROs), including Mendip Quarries
Increase water treatment capacity	Expansion of Northcombe WTW
	Increase Pynes to licence limit
	Lay new raw and treated water main between Prewley and Northcome water treatment works
Develop new groundwater sources	Enable permanent use of the Brampford Speke borehole
	Enable permanent use of the existing Stoke Canon borehole
	Build new intake pumping station on River Tamer to Roadford Reservoir
Optimise licence use	Develop a new groundwater source at Lymington
	Wimborne transfer to Longham licence change
	Accelerate new licence for abstraction of River Lyd between November and March
Expand water reuse schemes	Mendip Quarries raw water transfer to River Stour
	South Dorset Aquifer Recovery Scheme
	Christchurch Wastewater treatment works IPR 2 transfer to Longham Lakes
	Develop a strategic scheme abstract treated effluent discharged from Poole Wastewater Treatment Works as a source of water for supply further downstream
Catchment Management	Improve resilience of the environment to drought and enhance biodiversity through innovative collaborative land management delivery models, delivered under Upstream Thinking scheme and wider natural resources and water resources resilience programmes (e.g., peatland restoration, freshwater fish conservation and nature recovery).

How we will deliver protect and boost water flows

We will achieve sustainable levels of water abstraction to protect river flows and wildlife in rivers and reservoirs and optimise released of water from our reservoirs to manage river flows throughout the year.

Table 11. Our investment plan to deliver, protect, and boost water flows

Delivery mechanism	Activity
Reduce per capita demand	Offer 'Watersmart' initiatives to smart meter customers to provide personalised bills and water use behavioural nudges
	Offer home efficiency visits (HEV) to customers and schools directly through partnerships with local authorities or as part of usual flow regulatory installation visits
	Engagement with household customers through apps and other social media, with targeted mass media awareness, behaviour change campaigns and the installation of flow regulators
	Engage non-household customers in their water use, supporting these customers through site audits, targeted support on rainwater harvesting and water efficient options such as waterless urinals.
Reduce abstraction at sensitive locations	Investigate levels of sustainable abstraction for environmental protection across 17 locations
Implement rainwater harvesting programmes	Include rainwater harvesting in all new developments to provide non-potable supply for toilets and washing machines
	Launch the 'Rainshare initiative' for communities to direct harvested rainwater into a centralised shared resource
	Work with the local councils to identify suitable locations for community-based rainwater harvesting twinning schemes. This initiative will install rainwater harvesting systems in buildings that have low demand but can generate high rainfall yields.

How we will reduce leakage on the network, in the network, and at customers' homes

Table 12. Our investment plan to reduce leakage on the network, in the network, and at customers' homes

Delivery mechanism	Activity
Asset maintenance	Use targeted asset renewals and mains replacements to fix leaks and prevent future leaks
	Support to customers to repair supply pipes and programmes of customer supply pipe renewal
Operational measures	Pressure management schemes, including specialised pressure reducing valve installations across our water distribution network
Improved diagnostics	Drive improvements in pinpointing leakage, including sub-dividing district metered areas and introducing new technology such as acoustic logging
	Develop data analytics to improve our understanding of customer side leakage rates, dovetailed with targeted repair programmes
Smart networks	Expand our successful smart network trials, building on learnings and working with innovators to utilise emerging technologies to improve process automation, real-time remote control and event forecasting
Smart metering	Smart metering upgrades and basic meters replaced by smart meters for household customers
	A targeted smart metering installation programme for non-household customers

The benefits that our plan will deliver

Our plans show that, if we do nothing, there will be a gap of nearly 200 million litres per day by 2050. Whilst reducing demand is our primary course of action, this does not completely close the gap across all our supply zones. We must work in harmony with our catchments to secure resilient supplies into the future and to protect our lifestyles and the places that we love. By 2050, our strategy should deliver the following benefits to our customers and communities:

Boosted capture and storage of rainfall responding to seasonal changes, with increases in reservoirs for people and for protecting the environment

Our catchment will benefit from a climate-resilient portfolio of water resources, ensuring environmental protection and meeting the water needs of homes and businesses in the face of climate change and population growth. This includes diversifying our raw water resources and exploring various climate independent sources and water reuse schemes. This will include more non-river sources – such as desalination and re-use; and rainwater harvesting in new builds by default.

Our Upstream Thinking programme will increase the flow of cleaner raw water with reduced pollutants (e.g., faecal coliforms, sediment, dissolved organic carbon, manganese, geosmin), address emerging threats (e.g. veterinary medicines and antibiotics), ensure reliable clean drinking water, richer biodiversity and support to farmers to improve sustainable practices.

Help people to use less and to waste less ourselves

We will roll out a comprehensive smart metering program to help customers manage their water usage efficiently and detect leaks promptly, promoting fair water billing.

Potable water is not the default choice where local recycling is better

Most of the water needs of the home are met through rainwater harvesting and water re-use. Localised storage and treatment are standard for new homes and housing estates. Dual plumbing within homes allows for different sources of water to be used for different purposes. Treated effluent is re-used for industry and agriculture.

Top quality drinking water

Ambition

Our ambition is to provide high quality drinking water to homes and businesses through resilient networks which proactively identify and fix leaks, continuously monitor water quality and minimise supply interruptions.

Delivering clean safe drinking water that our consumers can trust is at the heart of our business and our customers consistently rate drinking water quality as a top priority in our customer engagement. By continuing to put quality first we will ensure our customers and visitors to our regions can enjoy our drinking water now and in the future. Our strategy to 2050 is to improve drinking water quality and customer confidence by reducing water quality risks from source to tap. We will have a continued focus on addressing issues in source waters and therefore allow us to promote the most sustainable level of treatment in the future. This will reduce our Compliance Risk Index (CRI) and Consumer Contacts performance commitments to reach our targets and reduce the risk of water quality events under a changing climate.

What our customers and stakeholders say

We have consulted our customers through the research carried out in the development of our plan and specifically during the consultation process supporting the development of our Drinking Water long-term strategy. We have engaged with the Drinking Water Inspectorate (DWI) and based our plans on the medium-term programmes of improvement that we had defined together at PR19. DWI have supported all of our proposed water quality schemes and have provided formal letters of support.

Customers and stakeholders have told us that:

- Customers are generally satisfied with the current performance in this area which is viewed as good. Given the high importance placed on health and safety, customers are often surprised to learn that lead pipes are still used to supply some homes and they therefore support their replacement, prioritising faster progress on this over improvements to the taste, smell and appearance of water
- Our customers want us to invest enough to maintain and protect top quality drinking water which is the element of service that is most important to them
- Our customers and stakeholders have told us they want us to identify and tackle discolouration and taste and odour risks direct from source and recognise it is more efficient to focus activity on prevention of problems before they arise where possible rather than remedy them later. This has been an inherent part of our strategy so far
- Customers also care about interruptions to their water supplies and want their supplies returned quickly, although they view this as a lower priority compared to other service areas for improvements
- DWI have also indicated continued expectations to drive down consumer contacts and CRI scores in our liaison meetings, the annual Chief Inspectors Reports and the DWI Guidance on Long Term Planning.

Our objectives

Our ambition is built upon three objectives:

- Ensure world class drinking water that meets stringent water quality standards. We plan to continue to innovate in our water treatment processes to provide the best possible performance through low carbon approaches. We also plan to continue our programme of tackling lead pipes on our network in and customers' homes and workplaces to reduce the small associated risk to public health
- Progressively address emerging risks. We plan to drive improvements in pinpointing leakage and use targeted asset renewals and mains replacement to fix leaks and prevent future leaks
- Create resilient, smart networks with real-time tracking and management of water pressure, flow and quality. We plan to adopt smart water networks which can remotely and continuously monitor water flows and quality and diagnose emerging problems. Combined with smart metering at customers' properties this will help to identify leaks and water quality issues quickly and prevent small issues from escalating into problems which impact on our customers.

Our adaptive plan

Our adaptive plan for top quality drinking water consists of a core pathway and three adaptive pathways.

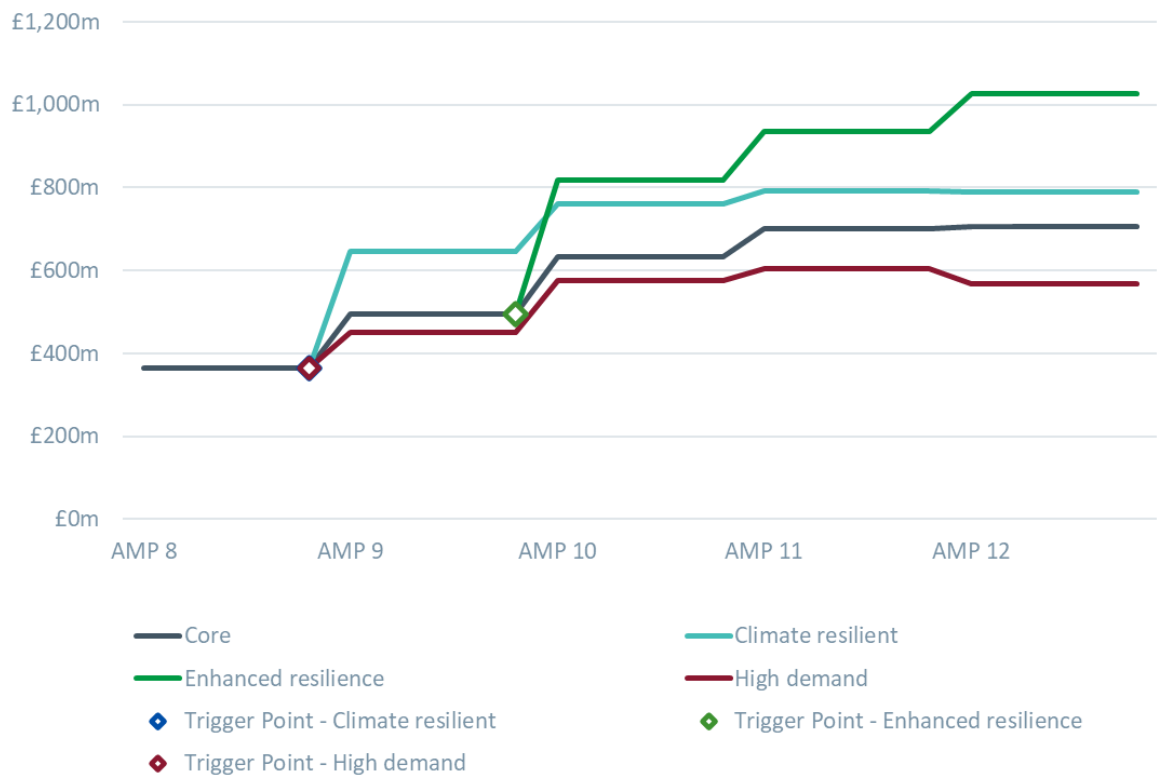


Figure 1417. 2050 adaptive plan – top quality drinking water

Our core pathway enhancement investment plan will reduce the risk arising from treated water through a combination of upstream interventions at our water sources whilst upgrading our treatment facilities and increasing our ability to transfer raw or treated water between sources to mitigate risks as well as manage lead levels. This will be complemented by an ambitious lead-pipe replacement programme starting in AMP8.

In 2028, ahead of an AMP9 trigger point, we will decide whether we need to adapt to a **climate resilient** future of RCP 8.5 in which increased rainfall intensity will lead to greater surface water run-off whilst warmer conditions are expected to increase propensity for algal bloom in our water sources. This will require a step up in enhancement investment to deliver our target water quality contacts under our core plan. Under this scenario, we may also need to adapt to changing raw water quality as aquifers and farming habits change under more extreme environmental conditions, which could impact nitrate concentrations and other chemical and microbiological parameters at our ground water sites.

In 2028, ahead of an AMP9 trigger point, we will decide whether we need to adapt to a **high demand** future in which customers do not change their water use behaviour and therefore do not expect their water companies to step up on outcomes. This means that we will be able to reduce our mains replacement programme (compared to core) and continue using flushing as a means of maintaining water quality, in addition to smart water networks to manage transient water quality issues more effectively before they impact consumers.

In 2033, ahead of an AMP10 trigger point, we will decide whether to adapt to an **enhanced resilience** future in which customers are less accepting of flushing as a means of managing water quality due to its environmental impact (particularly during drought periods). This will require an increase in investment in water mains replacement.

In 2038, ahead of an AMP11 trigger point, we will decide whether to adapt to an **innovative technology** future in which our investment in reducing water quality contacts will benefit from efficiencies driven by Smart Water networks.

We discuss each pathway in more detail in the following sections.

Our core pathway

We continually review water quality risk (i.e., CRI) and raw water deterioration across water sources and treatment facilities on a site-by-site basis. Mitigations targeted at the source, before they are abstracted into our treatment processes, offer the best value for customers and the environment. We achieve this through our Upstream Thinking catchment management programme, details of which are included in our Biodiversity Strategy.

To determine longer term investment priorities for CRI, we need to evaluate the residual risk associated with abstracted water. This risk is set to increase in the medium term. In particular, we have observed an increased incidence of algal blooms caused by recent extreme weather events across several of our reservoirs. We have also identified three sites in need of enhanced treatment as part of our DWI Hazard Review Notice and have reported an overall increase in CRI in the Bristol Water region due to compliance failures at some of our largest works in 2023.

To ensure that we mitigate these risks and maintain the highest quality water supplies in the near-term, whilst also enabling us to meet more challenging climate pressures should they arise, we plan to significantly increase investment in treatment upgrades in AMP8. We will either rebuild water treatment facilities, install new water treatment works where it is more economic, or install new treatment processes at 17 sites across our operational area: three in Bristol and 14 in our South West region. Specifically, our AMP8 programme will deliver:

- Rebuild Bratton Fleming (SWB), Stowey and Littleton WTW (BRL)
- Substantial treatment upgrades at four water treatment works (Greatwell, Dotton, Woodgreen and Cheddar) to mitigate the risk of raw water deterioration and improve consumer acceptability
- Low cost, low regrets solutions at seven sites to mitigate the risk of deteriorating raw water quality impacting our ability to treat and supply water at Delank, St Cleer, Bastreet, Dousland, Prewley, Avon and Venford WTWs
- Two cost effective chemical dosing upgrades to improve water appearance and reduce customer contacts at Allers and Pynes WTWs
- One scheme to install additional booster chlorination in our BRL network with additional measure to control the network chlorine concentrations more effectively.

In the longer-term (2030 onwards), our core pathway investments in water treatment works process upgrades are to:

- Invest in GAC treatment (or other innovative trace organics removal processes if viable) by 2050 to mitigate the growing risks from algal blooms and emerging contaminants
- Ensure all of our treatment works deliver water with an average manganese concentration of <1µg/L by 2050, to prevent the root cause of consumer appearance contacts and contribute to our 2050 consumer contacts target. This may be achieved through a range of solutions, including catchment management, low-cost chemical dosing upgrades, conventional manganese filters or innovative manganese removal processes
- Invest in asset health of our water treatment works to minimise our CRI score and spend enhancement investment synergistically with capital maintenance to get best value for customers
- Provide for additional treatment that minimises taste and odour and disinfection by-products, which may include additional UV treatment, disinfection upgrades and improved management of the distribution network
- Research and improving analytical capabilities for emerging contaminants of concern, such as forever chemicals, to inform our strategy and any innovative treatment options that may be required.

With regards to Water Quality contacts, historic improvements have been largely driven by first-time flushing programmes, optimised through our dedicated DOMS flushing model. This has delivered significant benefits to customers at low cost. However, under more adverse climate pressures with increased length and frequency of dry weather patterns, our ability to clean our network through flushing will be reduced. Moreover, flushing alone is expected to lead to a plateau in performance improvements until we deal with the root causes through targeted replacement of cast iron mains, as well as removal of manganese from our source water as mentioned above. Delaying this investment risks potentially burdening future generations with a disproportionate cost.

For this reason, we have capped the maximum amount of flushing when developing our LTDS. This has helped us determine the long-term mains renewal rates that are needed from AMP8 onwards to set us on the right glide path to our long-term target by 2050. Our AMP8 investment in asset renewal is £58m, with £42m in SWB and 12m in BRL.

Our lead pipe replacement programme in AMP8 focuses on the immediate actions that we need to take to begin a glidepath towards a lead-free supply system by 2050, whilst identifying what we can be doing in AMP8 so that we learn and evolve our approach to the removal of lead pipes in the future. As a first step on our journey to a lead-free water supply by 2050, our AMP8 lead pipe replacement programme will reach almost 20,000 customers across our operating area, with 14,440 in SWB and 4,500 in BRL.

Our 'least regrets' investments

Our strategic interconnectors not only provide a means of managing lead levels, but also to build in resilience by allowing us to make the most of our available water resources to mitigate risk of waterbody deterioration. Water quality risk is expected to mount at our Colliford, Roadford and Wimbleball WRZs, driven by changing rainfall patterns, drier winters and longer, hotter summers. Our AMP8 interconnector investment programme will enable quicker recovery from disruptions whilst maintain supplies to our customers despite the increasing effects of climate change. The options for AMP8 were selected out of a total of 44 possible interconnector schemes as the least regrets schemes that will provide benefits under all future scenarios.

Aside from our strategic interconnectors programmes, our AMP8 investment also includes research, investigations and enhanced analytical capability for emerging contaminants and future potential chemical and biological risks to drinking water quality, such as PFAs ('forever chemicals'), endocrine disruptors, personal care products, disinfection by-products and microbiological pathogens. This pre-emptive least regrets investment will allow us to inform our strategy and keep future options open should more adverse futures emerge.

We will also adopt an 'opportunistic' approach to lead pipe replacement as part of our business as usual network improvement plans throughout AMP8 to realise joint benefits where this is possible.

Finally, we will provision low-cost enabling works that support the rapid deployment of mobile PAC treatment as a shorter term measure to allow additional PAC dosing that reduces the risk posed by algae blooms. This will allow us to phase the delivery of permanent GAC treatment at these sites as we build our understanding and prioritisation of risk to changing raw water conditions.

How we have arrived at our core pathway

We have developed our overall core pathway for this ambition using an optioneering approach that relies on a stochastic simulation model developed by external consultants Arcadis. The options used to populate this model were developed in partnership with external technical experts to ensure we considered a wide range of options to meet the investment need and to ensure that our scopes are accurate and effective at meeting the need. An independent consultancy was also used to challenge and verify the options considered. Against these scopes of work, our costing models were applied to produce the scheme cost estimate.

Consistent with our overall LTDS methodology, the stochastic simulation model tests this long-list of options to generate hundreds of iterations of the net-benefits data for each option. This allows us to assign a probability distribution to the expected net benefit of each of our options, with upper and lower bounds reflecting the most benign (i.e., upside risk) and adverse (i.e., downside risk) incremental net benefit.

From here, we are able to apply relevant priorities and dependencies that represent the set of rules (or 'constraints') that the optimisation must follow when selecting combinations of options to achieve the optimisation's objectives. These selection rules include (i) mandating that outcomes are achieved where they relate to a statutory obligation, (ii) requirements to realise outcomes by prescribed points in time, (iii) any inter-dependencies between options such as those that must be delivered exclusively, concurrently or sequentially of one another (iv), any upper or lower thresholds on the total cost or total performance outcomes.

Finally, we set the overall goal of the optimisation (so-called 'optimisation objectives'), once all options have been selected and combined into a single pathway subject to meeting the constraints. These optimisation objectives may be either (i) to minimise certain types of cost, (ii) to maximise particular performance outcomes, or (iii) to select options which minimise overall uncertainty (or some combination of these three objectives).

Sensitivity testing our core pathway

Our modelling shows that our core pathway is most affected by local expectations and climate change.

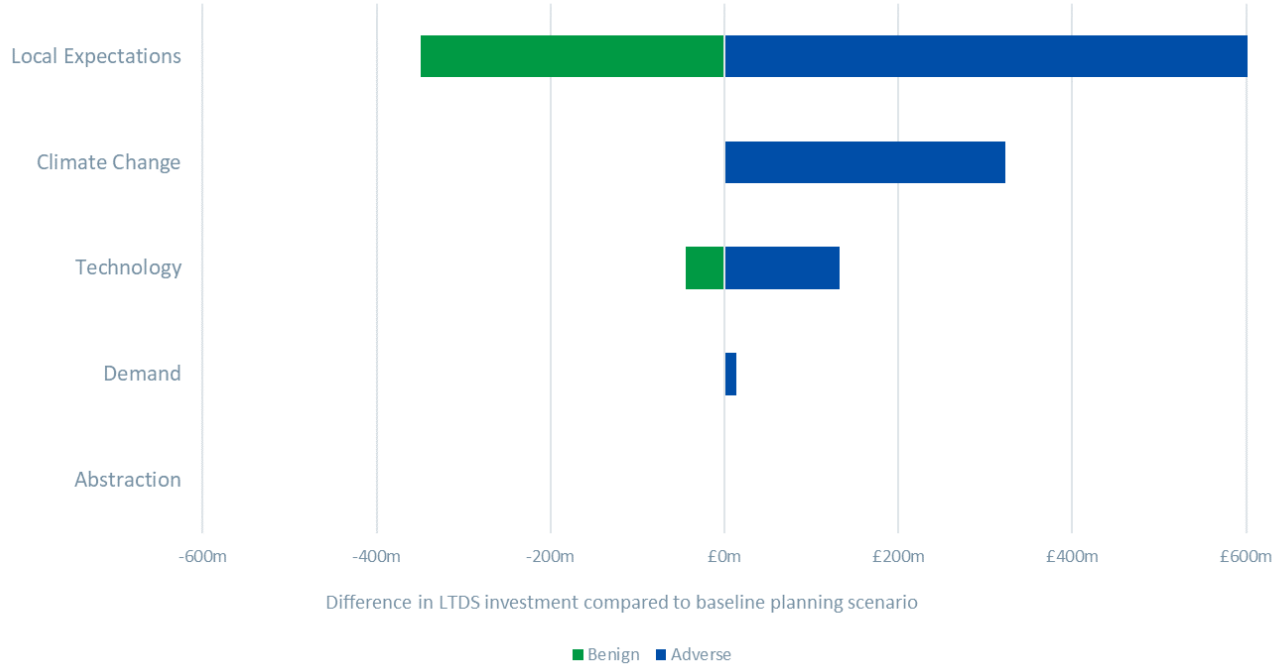


Figure 1518. Impact of benign and adverse scenarios on the core pathway

Our sensitivity testing shows that the local expectations adverse scenario has the greatest impact on core pathway investment due to pressure from customers and stakeholders to increase our rate of mains replacement as a means of improving discolouration, smell and taste of water as opposed to flushing. Local expectations benign, on the other hand, affects core pathway investment in the opposite direction – reducing mains replacement investment requirement. Cast iron mains replacement is potentially our single most expensive intervention that may be required to 2050 to reduce consumer contacts.

Climate change adverse leads to an increased overall cost associated with delivering CRI and WQ contacts due to higher intensity of rainfall increasing dissolved iron and manganese abstracted into our treatment processes and ultimately into our distribution network through an increased surface run-off. Moreover, as demonstrated by extreme weather in recent years, an adverse climate scenario also increases the propensity for algal blooms, which increases the likelihood of extreme levels of taste and odour causing compounds such as geosmin and methyl-isoborneol, as well as an increased potential for algal toxins. These impacts will increase costs associated with delivering CRI and water quality contacts performance outcomes. There may also be impacts to groundwater aquifers of climate change that require additional treatment at many of our simpler sites.

Technology adverse leads to an increase in costs due to requirement to install more legacy monitors that are more expensive and less reliable than the next generation of innovative solutions. Technology benign, on the other hand, has the opposite effect by enabling earlier adoption of next generation monitoring equipment. The overall impact of technology on our core pathway is relatively low.

We do not find a material impact of demand adverse nor from abstraction scenarios.

Our adaptive pathway for Climate Resilient

To mitigate the increased pressures on CRI and WQ contacts from increased dissolved nutrients and surface run-off we will need to bring forward GAC, ozone and manganese investment at Avon and Bastreet water treatment facilities from AMP10 and AMP11 into AMP9 and AMP10.

We have also identified that we will require additional treatment investments and upgrades across nine water treatment works (Allers, Pyness, DeLank, Dousland, Venford, Wendron, Littlehempston, Burrows, Stanbridge) as well as ozone retrofits at existing GAC sites. We will also need to increase investment in removal of nitrates due to increased use of fertiliser deployed in agricultural lands near to our water sources.

Our adaptive pathway for High Demand

Whilst there is a negligible direct impact of water demand on our ability to deliver water quality outcomes, there is a more material indirect impact in the form of local expectations. In particular, in this plausible future we assume that the lack of behavioural response from customers to environmental and sustainability signals (as evidenced by high per capita usage of water) also lowers the expectation of water companies to improve sustainability of their operations.

In the context of our water quality contacts outcomes, this means that water companies do not face incentives to adopt more costly mains replacement programmes instead of (lower cost) flushing and other operational measures. Therefore, in a high demand future we will face relatively lower costs associated with delivering our target outcomes.

Our adaptive pathway for Enhanced Resilience

In this plausible future, we assume that customers respond to water labelling and sustainability policies to reduce their per capita usage of water and therefore expect water companies to respond in kind. In practice, this means that the levels of flushing adopted under the core pathway are no longer deemed acceptable by stakeholders and customers and we will need to target root causes of water quality contacts by increasing our programme of mains replacement for water quality purposes.

Our investment plan

Our core pathway for investment is categorised according to the performance outcomes it will deliver, in particular: CRI, WQ contacts, lead and resilience (increasing our ability to transfer of raw or treated water from areas of surplus to areas of deficit when resources are short or when there are imbalances in supply-demand across our networks).

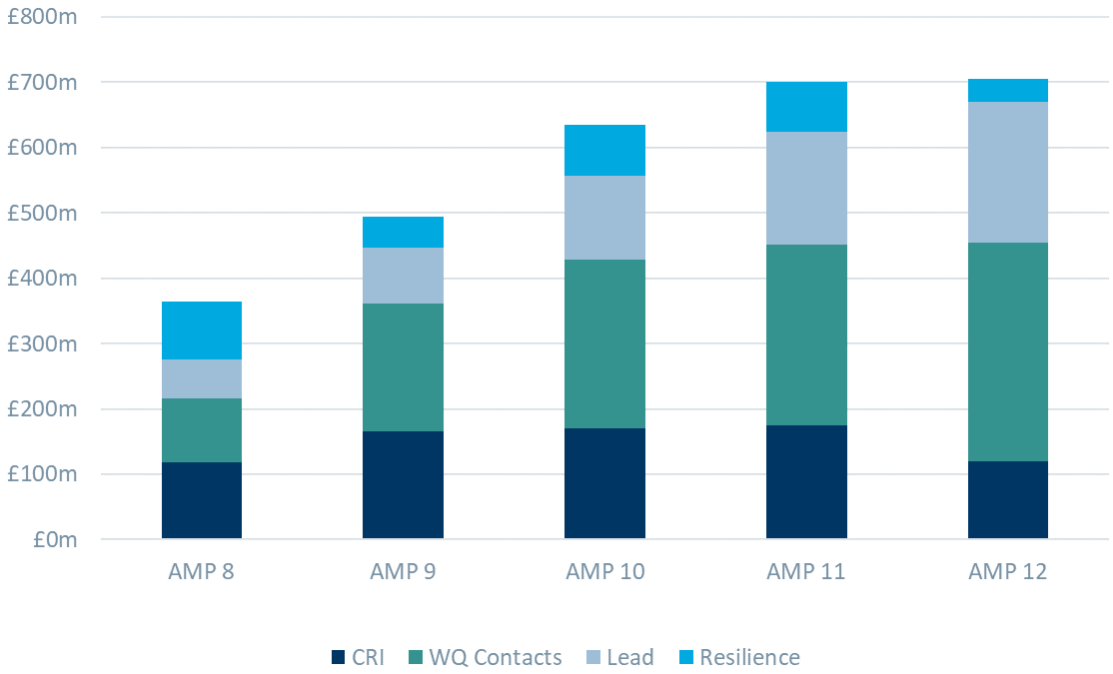


Figure 1619. Long term investment by performance commitment

Our proposed timetable of delivery over AMP8 has taken account of the WQ risk and deliverability. Whilst customers want us to invest in maintaining top quality water supplies, we know that they want bill increases to be smooth and protections to be in place for those in vulnerable circumstances. We have phased our programme to smooth out our enhancement investment for water treatment works upgrades along with enhancements for new water treatment works over the course of 2025 to 2030. Our approach ensures that we are focussing on public health risks first, with a particular focus on microbiological risks at Dotton, Woodgreen and Greatwell. We have phased our programme up to 2050, in order that the plan should be affordable, deliverable and fair for future generations.

We will deliver against our long-term objectives through our core pathway delivery mechanisms described below.

How we will ensure world class drinking water that meets stringent water quality standards

To deliver this, we will make significant upgrades across multiple water treatment works to ensure water quality and safety. This includes dedicated manganese filters, upgraded processes, new GAC treatment, membrane improvements, and UV mitigations.

Table 13. Our investment plan to ensure our drinking water meets stringent water quality standards

Delivery Mechanism	Activity
Investments in water treatment works	Dedicated manganese filters and de-chlorination (Dotton WTW)
	Site rebuild with upgraded processes (Bratton Fleming WTW)
	New GAC process (Lowermoor WTW)
	Upgraded membrane treatment and secondary manganese filters (Woodgreen WTW)
	pH correction, UV and further evaluation of effectiveness of covering of slow sand filters (Cheddar WTW)
	Substantive rebuild with ceramic membranes and GAC post slow sand filters (Stowey and Littleton WTW)
	New Low pressure UV system (Cheddar WTW)
	Additional contact tank (Greatwell WTW)
	Long-term risk review across WTW's in the Bristol Water area (Surface water works and downstream distribution systems) and installation of booster chlorination
	Enabling works to accommodate mobile activated carbon dosing (Venford, Avon, Dousland, Bastreet, St Cleer, De lank and Prewley WTW's)
	Chemical dosing upgrades (Allers & Pynes WTW)

How we will progressively address emerging risks

To deliver this long-term objective we will invest strategically to reduce risks from contaminants like manganese, geosmin, dissolved and total organic carbon in various catchment areas. We focus on maintaining water quality, reducing treatment needs, and safeguarding the environment for a resilient water supply.

We will also invest across our network and at customer taps to improve customer experience. We will prioritise engineering works to prevent contamination, replace cast iron mains for improved water appearance, and employ advanced monitoring for better research and planning.

Lastly, we will invest in reducing lead exposure through proactive lead pipe replacement programmes and innovative dosing trials.

Table 14. Our investment plan to address emerging risks

Delivery Mechanism	Activity
Investments in our sources – catchment management	Mitigate risk from Manganese and Geosmin (Fowey Catchment)
	Mitigate risk from Geosmin and MIB (Avon Catchment)
	Mitigate risk from Dissolved and Total organic Carbon (DOC, TOC), Manganese (Meldon Catchment)

Delivery Mechanism	Activity
	Mitigate risk from Geosmin (Upper Camel Catchment)
	Mitigate risk from Colour and Turbidity (Stour, Avon Catchment)
	Mitigate risk from DOC and Geosmin (Withy brook / Lynher, Venford, Tavy Catchment)
	Mitigate risk from Multiple Catchment derived risks (ongoing non WINEP scheme) including pesticides, DOC, nutrients, etc. (Otter, Tamar, Yeo, Dart, Wistlandpound, Argal and College, Drift, Stithians, Cober, Exe and Fernworthy)
Investment across our networks and at customer tap	Engineering works to allow bypass for cleaning and inspection to reduce risk of microbiological contamination (Service reservoirs and treated water tanks) – delivered from base expenditure
	Lead strategy / enhanced trials to reduce consumer exposure to lead and avoid reliance on chemical dosing long term (Regional Lead Strategy)
	Cast iron mains replacement to reduce customer contacts relating to water appearance and improve consumer confidence (Discolouration strategy)
	Advanced monitoring, and new laboratory equipment to facilitate further R&D to improved knowledge and understanding to support effective planning (contaminants of emerging concern, e.g., PFAS)
	Targeted mains renewal of between 50 and 200km per AMP to mitigate high discolouration risk
	Extend conditioning levels of large diameter trunk mains which carry water from water treatment works to centres of population to mitigate need to renew or rehabilitate
Investment to reduce lead exposure	Innovative dosing trials pilot dosing rigs at the University of Bath and our Barrow water treatment works to evidence optimum dose to control plumbosolvency for different waters and at different times of the year.
	Proactively replace lead pipes for customers on a support tariff
	Remove remaining lead pipe in our distribution system
	Opportunistically replacing lead pipes where we are replacing distribution mains
	Trialling wider proactive lead replacement programmes and approaches to inform our future plans

How we will create resilient, smart networks with real time tracking and management of water pressure, flow and quality

To deliver this long-term objective we will continue to invest in innovation and in the adoption of new and emerging technologies. Investments in network improvements and smart meter installations will enhance resilience and water consumption monitoring for our customers. We are expanding our water quality monitoring system and collaborating with the CREWW research centre at the University of Exeter. Our smart network trials will leverage emerging technologies for improved automation and forecasting.

Table 15. Our investment plan to create resilient, smart networks with real time tracking and management of water pressure, flow and quality

Delivery Mechanism	Activity
	Adopt 'quality first smart network' by expanding the capability of our water quality monitoring system
	A new transdisciplinary research centre with laboratory facilities opening in 2023 on the University of Exeter's campus. (The Centre for Resilience in Environment, Water and Waste (CREWW))
	Expand our successful smart network trials, building on learnings and working with innovators to utilise emerging technologies to improve process automation, real-time remote control and event forecasting.
	Invest in network improvements and connectivity to increase resilience to extreme weather events and sustained power outages
	Install smart meters to improve our understanding of water consumption trends, help customers to monitor usage and identify leaks

The benefits that our plan will deliver:

Our long-term delivery strategy will ensure that the future of water services prioritises customer satisfaction and environmental stewardship. By ensuring a safe, reliable, and technologically advanced water supply, we are committed to meeting the needs of our customers while safeguarding the environment for future generations.

A safe, high quality supply of drinking water:

Our customers can trust in a consistently safe water supply that not only looks and tastes great but also meets the highest quality standards. Reversing ecological decline and restoring the environment has resulted in improved water quality whilst reducing the need for extensive treatments.

A seamless customer experience:

It is rare for customers to experience an issue, but if they do, we have already let them know when it will be resolved. Quality issues are identified quickly preventing them from escalating into problems which impact on our customers.

Emerging issues are quickly identified and addressed:

We are well-prepared to handle emerging issues such as microcontaminants. With advanced monitoring and detection systems, we can quickly identify and address these challenges. Our proactive approach ensures that our water supply remains resilient and continues to meet the highest safety standards, providing peace of mind to our customers. Smart technology across our water network assets provides self-monitoring capabilities. This proactive approach allows us to detect potential issues before they impact our customers' experience.

Controlled and managed wastewater flows

Ambition

We will evolve our water recycling and sewerage system to meet the needs of our customers, communities and the environment through resilient natural and built infrastructure using sustainable drainage approaches and safe return of treated water to the environment.

What our customers and stakeholders say

These targets have been informed by our regulatory and statutory obligations to customers and the environment, as well as by what our customers have told us is important to them over the longer-term. In particular:[6]

- Protecting the local environment and healthy, resilient infrastructure are ranked as the two highest priorities for investment and improvement by our customers. They therefore support investment to reduce pollution incidents (serious incidents in particular) and to deliver wider environmental improvements in bathing water quality and storm overflows, as well as steady improvements to maintain and improve asset health over time.
- Reducing the use of storm overflows is of increasing importance to our customers, with their frequent use seen as unacceptable. They are highly supportive of mandated investment in this area, and that we go beyond our minimum legal targets.

Our objectives

Our ambition is built upon three long-term objectives:

1. Evolving our water recycling and sewerage system to meet the needs of our communities and the environment. We will increase our sewerage and treatment capacity and storage to cope with larger flows and map hazards to allow for targeted maintenance to prevent and control potential pollution incidents.
2. Enhancing sustainable drainage to reduce the risk of flooding and pollution. We will separate surface water from our network where we can and add storage to slow the flow of water through our network and reduce storm discharges. We are putting nature first, using nature-based solutions to help us reduce the volume of surface water entering our sewers and helping us to hold back the peaks of flow.
3. Creating resilient smart wastewater networks with real-time tacking and management of capability. We will work with our innovation partners to develop and implement technology that improves visibility and remote control of our network.

These ambitions reflect the needs and expectations of our customers and stakeholders. Through extensive research carried out as part of our DWMP consultation process, PR24 business planning and wider, ongoing engagement initiatives, our customers have told us that:

- Our customers and stakeholders want us to demonstrate environmental leadership by controlling and treating wastewater flows to protect the environment. They recognize how the environment underpins our way of life in the South West as well as the tourism economy and customers' valuations for related outcomes (e.g., bathing water quality) are notably higher than in other parts of the country.
- Our environmental stakeholders view overflows of untreated sewerage into rivers caused by heavy rain or blockages of sewers as the biggest problem for water quality in their local areas and want us to significantly decrease sewage outflows to improve our environmental performance.
- Of the legally required improvements, sewage spills are the biggest single priority for customers and they value tackling storm overflow spills that impact on public health most highly. Reducing storm overflow spills and maintaining water quality at bathing beaches are both a higher priority for customers than reducing pollution incidents, but all are important to them.

[6] Further details of our engagement with customers can be found in our DWMP, p.47-53

Our adaptive plan

Our adaptive plan for **controlled and managed wastewater** flows consists of a core pathway and three potential adaptive pathways: climate resilient, enhanced resilience and innovative technology.

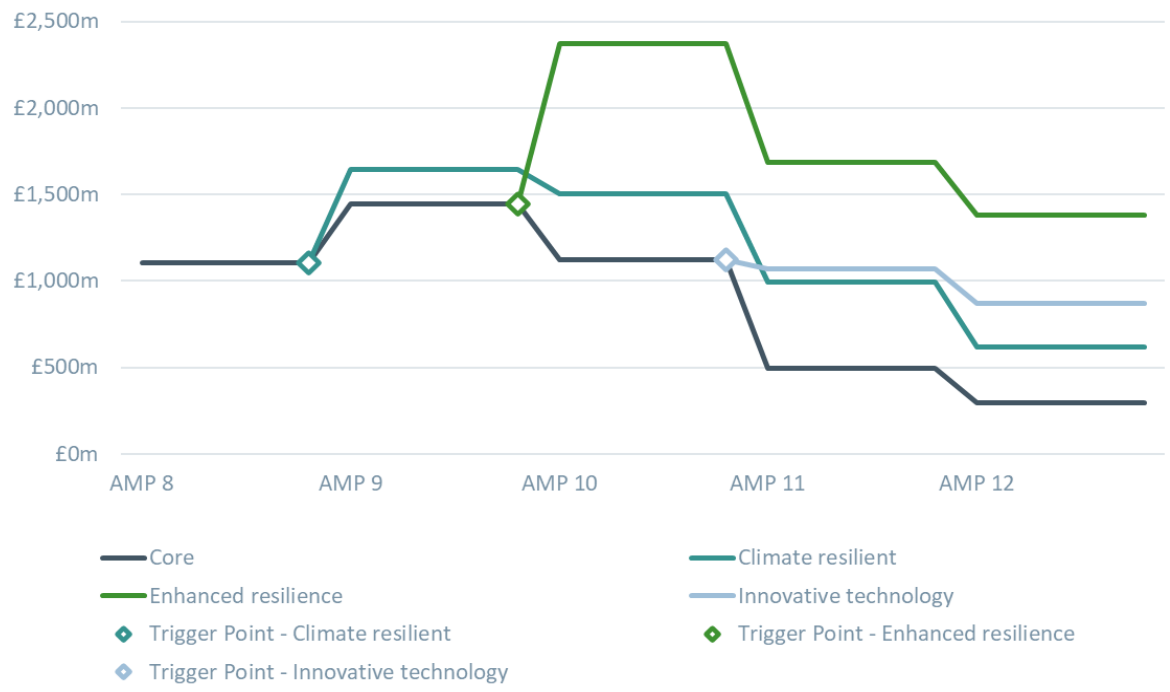


Figure 1720. 2050 adaptive plan – controlled and managed wastewater flows

Our **core pathway** represents an enhancement investment programme to meet a marked reduction in the frequency of storm overflow use as well as manage sewer flooding in the face of rising pressures of climate change.

In 2028, ahead of a 2030 trigger point, we will decide whether we need to adapt to a **climate resilient** future of RCP 8.5 in which increased frequency and intensity of rainfall will *increase* the risk of flood during a 1-in-50 year storm and require us to increase level of investment in our flooding programme to maintain performance.

In 2033, ahead of a 2035 trigger point, we will decide whether to adapt to an **enhanced resilience** future in which our customers and stakeholders expect us to halve the level of flood risk during a 1-in-50 year storm in the face of rising climate pressures (RCP 8.5).

In 2038, ahead of a 2040 trigger point, we will decide whether to adapt to an **innovative technology** future in which efficiency benefits are delivered through new innovative technologies and, as a consequence, our stakeholders and customers expect us to reduce the level of flood risk during a 1-in-50 year storm given we remain on a stable climate pathway (RCP 6.0).

We discuss each pathway in more detail in the following sections.

Our core pathway

Through our DWMP and WINEP24, we have identified which types of activities will best deliver against our long-term targets for controlling and treating wastewater flows. Our core pathway enhancement investment for controlling flows include a mixture of flow removal and capacity expansion as well as identifying ways to reduce surface water flows and groundwater infiltration into the wastewater network. In terms of treatment, we will deliver a range of different solutions including nature-based reedbeds, re-direction of flows, and biological and chemical treatment.

Our Storm Overflows (SO) investment includes improvements to our sewerage network to reduce the volume and speed of water moving through the network, increasing our monitoring of water quality in rivers, investigating performance to build our future plans and screening our storm overflows to further reduce the impact on the environment if they spill. By 2040, our investment will have delivered the requirements of the Storm Overflow Discharge Reduction Plan (SODRP) ten years ahead of the required date.

We are putting nature first, using nature-based solutions to help us reduce the volume of surface water entering our sewers and helping us to hold back the peaks of flow. As the effectiveness and deliverability of nature-based solutions are better understood, we expect to see the use of these solutions rise and the proportion of traditional, more carbon intensive schemes will decline over time in our long-term plan to 2050. We plan to spend 50% of our SO investment over the next 25 years on blue-green projects that combine nature-based solutions and traditional engineered solutions to remove surface water from our existing sewer network. By 2050 we aim to deliver 20% of our SO solutions through solely-nature-based approaches.

Our discharge compliance and river water quality investment plan includes a first tranche of improvement schemes which will contribute to the national requirement to remove 80% of the nutrient (phosphorus) loading to freshwater systems by 2038 (against a 2020 baseline). We are targeting those waterbodies where improvements are the most urgent or they will deliver the most significant improvements to the environment.

Our 'least regrets' core pathway investments

In choosing the options to meet our long-term targets we have considered which are most flexible to changes in the pressures we may face. Climate change will affect our ability to deliver compliant outcomes across our wastewater treatment works as well as achieve our sewer flooding targets.

To this end, we have prioritised early investment in nature-based surface water separation and removal interventions in 2025-2030 and 2030-2035, complemented by traditional storage-based solutions. In practice, our core plan will separate approximately 1,400 hectares of surface water through nature-based solutions alongside expansion of rainwater storage by 550,000m. This mix of 'green' versus 'grey' solutions will enable us to deliver near-term targets whilst also better preparing us should an adverse climate change scenario emerge in the longer-term.

In light of the impact of these plausible futures, we have brought together a set of 'least regrets' enhancement activities into our core pathway, resulting in £715m in 2025-2030 to meet our commitments to address at least 38% of high-priority sites storm overflows by 2030 (as per SODRP).

How we have arrived at our core pathway

Our core pathway has been arrived at through a robust analytical framework, developed for the industry and regulators. Strategic objectives are selected (including no overflow spilling more than 10 times a year by 2050), and each catchment is put through a risk-based catchment screening, baseline risk and vulnerability assessment and problem characterisation against these objectives. Where intervention was needed to meet the objectives, catchments went on to options development and assessment, with the final plan undergoing programme appraisal.

Options are considered through the following stages:

4. First, needs and requirements are identified by collaboratively identifying risks and issues with the Environmental Agency, other water companies and partners. From here we propose actions, developed in partnership, to address risks. This leads to a set of (unconstrained) options.
5. Next, options are taken through a multi-criteria analysis screening, and scored according to how well they meet the obligations, contribute to wider WINEP outcomes and impacts to natural assets, technical feasibility and deliverability. Scores are weighted based on the Environmental Agency guidance, and options are screened out of selection if they fall below certain thresholds.
6. The resulting 'constrained' set of options then proceed to a more detailed assessment of whole life cost, natural capital benefits and carbon assessment to identify 'preferred' options. Preferred potions are then assessed against least cost, best value and alternative options for regulatory appraisal.

Sensitivity testing our core pathway

We have tested our core pathway against the common reference scenarios, as illustrated in the chart below.

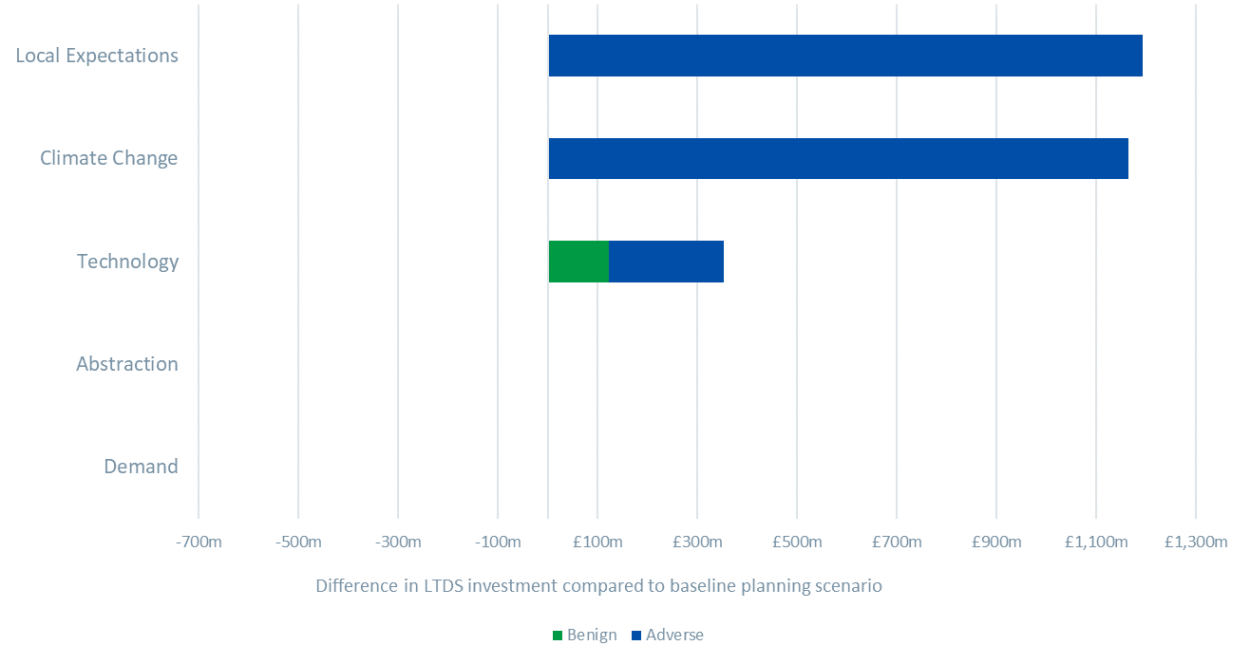


Figure 1821. Impact of benign and adverse scenarios on the core pathway

This testing identifies that customers' willingness to accept (or pay for) different levels of flood risk in a 1-in-50 year storm will most materially affect our core pathway investment (local expectations adverse). We will need to step up investment in order to reduce the risk of sewer flooding from our 2025 target level of 10% of properties to 5% level of risk. Since our core pathway is predicated on local expectations benign (today's expectation of future expectations) there is no impact of this scenario on core pathway expenditure.

An adverse climate change scenario delivers a similar effect, but with increases our flooding programme needed to maintain existing flood risk levels of 10%. This is because a climate change adverse scenario of RCP 8.5 (50th percentile) will increase rainfall intensity by c.13%, causing greater volumes of surface water which must be managed in shorter periods of time. Our hydraulic simulation models predict that, based on current levels of wastewater network capacity, this rainfall intensity will increase the likelihood of overloading our sewers and pumping stations as well as raising the risk of failing environmental permits at our wastewater treatment works.

On the other hand, our testing finds that climate change has minimal impact on storm overflow spill frequency and therefore, core pathway costs attributed to storm overflows will be sufficient to address the improvement required under all scenarios. Instead, scenario testing identified that the driver of intervention for storm overflow reduction is the environmental imperative and regulatory requirements to reduce storm spills to improve the water environment, with no material driver from climate change.

With regards to climate change benign (RCP 2.6), our assessment of IPCC analysis finds that RCP 2.6 does not have a material impact on atmospheric warming pre-2050 compared to our core pathway assumption of RCP6.0. We have therefore not included this scenario in our sensitivity testing results.

Both an adverse and benign technology scenario have positive impacts on core pathway totex. Under an adverse technology scenario, where adoption of innovative technology is slow, we will face an increase in delivering SO spills in AMP10 and AMP11 due to need for additional traditional monitoring technology. On the other hand, a benign technology scenario is expected to tighten the nutrient removal requirements on our wastewater discharges as technology enables us to better identify and remove smaller trace amounts.

Whilst the scenario testing for LTDS focuses on the interaction of uncertainty with enhancement investment, we also find that an adverse demand scenario of 130 l/p/d would also increase levels of base (but not enhancement) expenditure for compliance of our wastewater treatment works from 2030 onwards. We do not find an impact from abstraction on either base or enhancement expenditure needed to deliver our **controlled and managed wastewater** flows ambition.

Our adaptive pathway for Climate Resilient

Our adaptive pathway for climate resilient is designed to mitigate the impacts of an adverse climate change outcome (RCP 8.5), in particular the effect of increased rainfall intensity on wastewater treatment works compliance and sewer flooding targets.

We have placed the trigger point for this pathway in 2030, by which time we will have a further 5 years of data on the emerging RCP and its regional impact on our operations. To prepare for this, we will take a decision no later than 2028 on whether trigger point conditions will be met during 2030 -2035. A step-up in our flooding programme over the course of 20 years to 2050 will focus on surface water separation interventions.

Aside from our flooding programme, we will also need to install more river monitors upstream and downstream of each of our storm overflow sites as the risk of overflow spills increases with more unpredictable and intense rainfall.

Our adaptive pathway for Enhanced Resilience

Our adaptive pathway for enhanced resilience will require a significant step up in our flooding programme to both combat increased climate pressures whilst also halving the overall level of flood risk during a 1-in-50 year storm. We have tentatively placed a trigger point for this pathway at the beginning AMP10, with investment phased over this period to realise a halving in the sewer flood risk in a 1-in-50 storm before AMP11.

To prepare for this plausible future, we will monitor the effectiveness of our nature-based enhancement interventions so that, if we need to adapt to a lower level of flood risk in the future, we can do so through more sustainable solutions that can create greater value for customers and our communities in the longer term. Overall, moving from a 10% to 5% flood risk would increase the enhancement investment needed to achieve target levels for sewer flooding in a 1-in-50 year storm by £40m per year (compared to our most likely plausible future).

Aside from reducing flood risk, this future is associated with an increased designation of bathing waters across our catchment. To deliver this, we will need to invest an additional c.£10m per AMP in order to address additional storm overflow sites located near bathing waters.

In this future we will also be able to measure, and therefore required to remove through our wastewater treatment facilities, smaller traces of nutrients from our discharges. In particular, we anticipate that this pathway will tighten the compliance thresholds for nitrogen removal which will increase our overall investment in biological treatment from AMP9. Moreover, we will also bring forwards chemical treatment of discharges forward by one AMP, so that this programme runs from AMP9 through to AMP12.

Our adaptive pathway for Innovative Technology

Our adaptive pathway for innovative technology reflects the cost associated with halving the level of flood risk in a 1-in-50 year storm (as with 'enhanced resillience') but without the added pressures on flooding from an adverse climate change scenario. Instead, this plausible future assumes that climate change follows a stable pathway at RCP6.0 but that increased availability of innovative technologies mean that our stakeholders and customers expect us to perform better on flooding outcomes. We have placed a decision point for this future ahead of AMP11.

Our investment plan

Our core pathway enhancement investment plan is categorised according to the performance outcomes they will support. This includes: storm overflow spills (i.e., the average number of spills per storm overflow site), wastewater treatment works discharge permit compliance (i.e., performance of wastewater treatment works in line with their numeric discharge permit conditions), river water quality (i.e., percentage reduction in phosphorus emissions to river catchments), sewer flooding (i.e., flooding due to overloaded sewers such as during extreme weather events) and operational resilience.

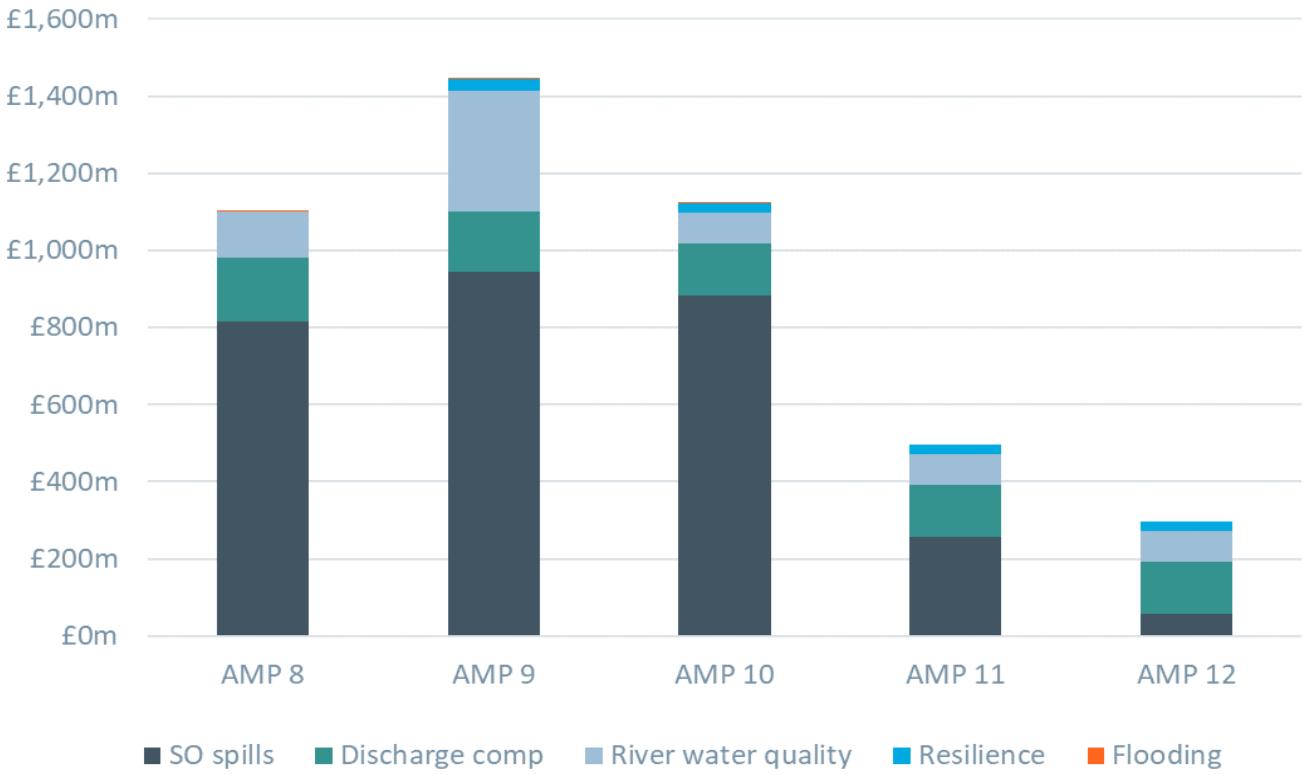


Figure 1922. Investment plan – controlled and managed wastewater flows

Beyond compliance date targets, we have responded to customer expectations by committing to deliver our environmental improvements early, prioritising schemes that will reduce ecological harm and protect shellfish waters.

Our adaptive planning has identified that future impacts can vary significantly, with costs up to 65% higher when tackling flooding. This means that we need to be ambitious and work at pace to ensure that we do not put excessive cost burdens on future generations. We have considered this as we have looked to profile our investment across AMP periods. Due to the significance of the coastal nature of our region, we are also prioritising all bathing waters in AMP8. Furthermore, we will deliver spill reductions at all overflows to meet.

Because of the weight of expectation of the delivery of a sufficiently urgent SO programme, balance has been made across our whole investment portfolio to ensure that this can be achieved. Less urgent nutrients schemes (for example), which have a more relaxed delivery schedule, have been phased for investment in AMP9. We maintain the commitment to deliver these investments, but have chosen to phase the delivery of these improvements.

How we will evolve our water recycling and sewerage system to meet the needs of our communities and the environment

We will increase our treatment capacity to cope with larger flows and map hazards to allow for targeted maintenance to prevent and control potential pollution incidents.

Our storm overflows programme will increase peak volume of rainwater that our network is able to safely manage and return to the natural environment, through a combination of storage, greater sewer capacity and better management of storm overflow sites. We have selected a mix of storage and surface water separation as SWW consider this mix delivers best value with 10-20% of surface water being removed from the network and the remaining solution being targeted towards storage.

We will also respond to growth by increasing treatment at works that are predicted to meet population thresholds and reduce the impact of chemicals and nutrients from our wastewater treatment works on the environment. To deliver this, we will upgrade our wastewater treatment works, utilising both green and grey solutions, and redirect flows from smaller works. The full set of activities we plan to deliver under our core pathway are described below.

Table 16. Our investment plan to evolve our water recycling and sewerage system to meet the needs of our communities and the environment

Delivery Mechanism	Activity
Surface water storage and separation	Add 153,773 m^3 of storage to capture rainfall and reduce overflows by 2030, with 550,889 m3 of rainwater storage capacity added to the network by 2040
	Rehabilitate 214km of sewers in AMP8, reducing the levels of surface water that infiltrate into them
Network resilience	Upgrading 123 of our 655 wastewater treatment works so that they can accommodate higher dry weather flows as well as uprating 100 of our wastewater treatment works and sewer pumping stations (SPS) so they process more flows
	Surveying 2,785 km of our sewer network (c.12%) for upgrades or replacement
Targeting overflow sites	Installation of MCERTS meters[7] to provide real-time flow monitoring at emergency overflow sites by 2035
	Invest in improvements in 740 overflow sites by 2040
	Upgrade wastewater treatment works for increases in pass forward flow (PFF)
	Fit all storm overflow sites with 6mm screens to reduce aesthetic litter during discharges by 2045
Investigations	Investigations into nutrients loading, chemical impacts of wastewater and microplastics
Wastewater Treatment Works upgrades	Upgrade to reduce nutrient (phosphorus) loading to freshwater systems through enhancements to River Axe SAC in Devon and the River Camel SAC in Cornwall
	Upgrade up to 230 wastewater treatment works for nutrients and chemicals by 2037
	Upgrades to remove non-nutrient chemicals such as emerging containments, microplastics, organic pollutants, anti-microbial resistance etc.
	Address septic tank discharges to surface waters
	improvements to reduce phosphorus levels in effluents
Watercourse interventions	Install 245 river monitors in AMP8, with an additional 733 by AMP9
	Enhance treatment of wastewater across 13,000km of waterbodies

How we will enhance sustainable drainage to reduce risk of flooding and pollution

Our long-term targets for this outcome focus on delivering natural flood management techniques across our catchments and supporting our customers to increase their adoption of sustainable drainage solutions.

We will separate surface water from our network where we can and add storage to slow the flow of water through our network and reduce storm discharges. We are putting nature first, using nature-based solutions to help us reduce the volume of surface water entering our sewers and helping us to hold back the peaks of flow. This will include scoping and trialling more nature-based solutions and SUDs schemes so that over time, as the effectiveness and deliverability of these schemes are better understood, they will rise and the proportion of traditional, more carbon intensive schemes will decline.

Table 17. Our investment plan to enhance drainage to reduce risk of flooding and pollution

Delivery Mechanism	Activity
Local delivery partners	Work with stakeholders to integrate green spaces, trees and natural drainage in urban areas

[7] MCERTS is the Environment Agency's Monitoring Certification Scheme of equipment that monitors pollution.

Delivery Mechanism	Activity
	Work with housebuilders to build private drainage, such as water-butts, permeable paving, rainwater harvesting systems and green or blue roofs, providing drainage and an important supply of water to use in the home and garden
	Exploring co-funding opportunities for sustainable drainage with Plymouth City Council and other partners
Nature-based solutions	Construction of detention basins, swales, soakaways, ponds and wetlands
	Surface water separation from sewage network and create of Sustainable Drainage solutions (SUDs)

How we will create resilient smart wastewater networks with real-time tracking and management of capability

We will work with our innovation partners to develop and implement technology that improves visibility and remote control of our network. We have already begun this journey by installing 100% monitoring across our storm overflow sites which gives us visibility when they operate. We'll widen the visibility we have of what's happening across our network, meaning we'll be able to predict when events may occur and where we can, take preventative action to stop this. The data we'll gather will also help us have a better understanding of how our sewerage network operates each day, meaning we can make more efficient choices about how to operate, maintain and invest in the future.

Table 18. Our investment plan to create resilient smart wastewater networks with real-time tracking and management of capability

Delivery Mechanism	Activity
Monitoring of SO	Deploy monitors to continuously monitor river quality and the potential impact that storm overflow discharges
	Estuarial investigations to identify suitable locations for monitor locations in estuaries in future
	Investigations to better understand risks at storm overflows discharging into or within 50m of a designated protected area, a chalk stream or a eutrophic special area, or have the potential to have an adverse local ecological impact
	Monitoring of spills to storm tanks, upgraded from Event Duration Monitors to MCERTs flow monitors
Monitoring of bathing waters	Enhancing our sampling and monitoring programme and sharing this information in near real time, allowing us to all understand the quality of bathing water quality throughout the year
Monitoring of wastewater assets	Installing sewer-level monitors and pressure and flow meters on our rising mains to provide early warning and visibility of potential pollution incidents
	Measurement and monitoring of emergency overflows and of SO at wastewater treatment works and sewage pumping stations
	Monitors being installed with opportunity to utilise AI to predict where spills may occur and help us to respond before a pollution incident occurs
	Measurement of Flow to Treatment at wastewater treatment works to ensure that this is achieved before any flows are diverted to storm tanks
	Monitoring of emergency overflows (EO's) at network pumping stations

The benefits that our plan will deliver

Our controlled and managed wastewater flows ambition will evolve our water recycling system into one that future generations can be proud. As stewards of the water cycle in our catchment, we will deliver safe, empowering outcomes for our communities and the environment.

By 2050, our strategy should deliver the following benefits to our customers and communities:

Greater access to and enjoyment of our waterways

The significant reduction of storm overflows and pollution incidents, combined with increased water quality monitoring, will reduce the risk to public health or ecological harm to rivers and seas. This in turn will enable our communities to make the most of accessible bathing waters across our watercourses and coastline throughout the year as we rebuild trust in the quality of our waters.

A sustainable local tourism economy

Through responsible stewardship of wastewater flows, we will help our catchment to realise its potential as the premier destination for nautical tourism in England – supporting long-term economic health of the region.

A healthy local environment

As we increase our use of nature-based solutions to reduce the flows entering our sewer network we'll see additional benefits as biodiversity around these sites increases, carbon is stored, and the amenity value of areas improves.

Reduced risk of flooding and pollution events

Our programmes to work with communities to adopt sustainable drainage solutions and divert flows away from sewers will ensure that the risk of flooding to homes and businesses is kept at low levels even with the increased water into the system from increased rainfall and population growth. In doing so, we will eradicate damage caused by plastics, fats and wet wipes for the long-term benefit of all – providing peace of mind to our communities.

Net zero and environmental gains

Ambition

Our ambition is to deliver environmental gains as part of building a better future, through our Pennon Group Biodiversity Strategy, SWW Bioresources Strategy and Pennon Net Zero Plan.

- Our Biodiversity Strategy aims to halt the decline of species and habitats in the South West, both on and beyond our landholdings, which is our role in supporting the delivery of new Local Nature Recovery Strategies and commitments under the Environment Act (2021).
- Our Bioresources Strategy aims to provide a safe and resilient outlet for the by-products of wastewater treatment and generate added value through enhanced treatment for renewable energy generation.
- Our Net Zero Plan sets our ambitious plans to reduce our operational carbon emissions and hit our Net Zero target by 2030 with a further commitment to reduce greenhouse gas emissions (GHG) across our entire value chain by 2045.

What our customers and stakeholders say

In forming the objectives that underpin our ambition, we have engaged extensively with our customers and stakeholders carried out as part of our PR24 business planning and wider, ongoing engagement initiatives. Our customers and stakeholders have told us that:

- We need to demonstrate environmental leadership. They want us to play our part innovatively to be a good neighbour to support the local environment, with both tourism and our local way of life in the region depending on the environment. There is a consensus that we are not currently doing enough.
- We should prioritise activities where we have a direct impact on the environment, such as rivers and coastal waters. Most actively experience rivers and beaches in our region with almost two-thirds reporting activities that were in contact with water and they want rivers to be clear, healthy-looking, free of chemicals and sewage.
- Achieving a zero-carbon footprint is seen as important but ranked as a lower overall priority compared to our other objectives within this ambition. Whilst customers show support for our plans overall, a significant minority is less comfortable seeing bills rise to pay for investment to deliver net zero.
- Initiatives to improve the environment (including biodiversity) should be prioritised. Biodiversity is ranked 5th – this was not even a top 10 priority in PR19 showing how much priorities can change and how important the environment is becoming. Customers are particularly supportive of measurable commitments related to 'creating and restoring habitats'. Biodiversity and catchment management plans, alongside waste management and chemicals, are high priority environmental issues for customers, who welcome any positive change we can achieve. INNS are recognised as one of the top drivers of biodiversity loss world-wide and we have a pioneering approach to work with stakeholders to reduce their impact.
- Customers and stakeholders typically have limited awareness of resource recovery from wastewater management and perceive treatment largely as disposal. Historically, this has attracted stigma due to concerns about perceived negative impacts of disposal on public health and the environment. For these reasons, we do not engage directly on the technologies, processes and outcomes associated with bioresource recovery. However, our customers have expressed support for having the environmentally responsible cultures in place (e.g., minimising waste, maximising recycling and minimising our carbon footprint). Our bioresource strategy is therefore built upon these core principles.

Our objectives

We will deliver against this ambition through the following long-term objectives:

Increase biodiversity through further habitat creation and improvement via:

- Management of our land. We will maintain all protected and ecologically designated sites in favourable condition and continue our programme of biodiversity enhancement and management on other sites in Company ownership, including through peatland and other habitat restoration and tree planting.
- Partnership working. We will deliver biodiversity and nature recovery in partnership with others in the catchments in which we operate in beyond our land holdings. Our Upstream Thinking catchment management programme for clean water supply and water resource outcomes will continue as the key delivery route, but we will expand these principles of working with NBS to all deliver outcomes for both clean and wastewater assets, across all catchments.

- Managing the increasing risks of INNS. We will continue to implement a range of biosecurity measures and trial new approaches to seek to prevent the introduction of new INNS to our assets; or the spread of existing INNS from our sites. We will be working with water sports, angling and other stakeholders to prevent the spread of INNS, both within the region and on regional biosecurity measures.
- Fish and eels. We will continue to work to install fish and eel passage interventions including the removal of in river barriers to enhance river habitat for fish and eels, contributing to population resilience towards local climate changes impacts on river flows and water temperatures. Aside from this, we will continue to deliver an improved screening infrastructure for the protection of fish and eels at drinking water intakes.

Use our land and resources to generate renewable energy. To do this we will implement a transformational strategy to recover value and energy from 100% of our sewage sludge as part of our SWW Bioresources Strategy. We will deliver this using Advanced Anaerobic Digestion (ADD) treatment processes to generate biomethane, which then can be used to produce electricity through Combined Heat and Power (CHP) generators or used as biomethane (an alternative to natural gas).

Reduce our operational carbon emissions and hit our Net Zero target through:

- Sustainable living. We will improve the ways our assets operate, increasing the energy efficiency of water and wastewater processes such as investing in our pumping stations and reducing leakage, and tackling process and fugitive emissions.
- Championing renewables. We will deliver 50% energy use from our own renewable sources by 2030, including energy recovery from sewerage sludge, with remainder of our grid electricity purchased from renewable energy contracts.
- Reversing emissions. We will deliver carbon storage in the landscape through habitat improvement and other catchment management investments both on our own land and through increased partnership working, for example our Peatlands Partnerships scheme. This includes peatland and woodland carbon storage as well as improved soil management. Not only will these schemes deliver benefits for net zero, but they will also deliver improvements in water quality, increasing the value to customers of the schemes.

Long-term goals

We will measure our journey across each of our long-term goals through a suite, both output and outcome-based, and a new biodiversity common performance commitment (Biodiversity Net Gain, BNG). We have made forecasts for the delivery of verified BNG units across the Pennon Group area from AMP8 onwards, with 1,600 Units to be realised in AMP 8 and 9 and a total 9,165 by 2050.[8]

Our long-term goals are summarised in the table below beneath each of our objectives:

Table 19. Long-term goals to increase biodiversity

Increase biodiversity through further habitat creation		2025	2050
Biodiversity units	per 100km2	2.39	7.27
INNS biosecurity measures	no. additional installations	60	120

[8] Whilst this is the principal measure of success, which is available for our biodiversity programme, it is not a suitable measure for all aspects of this programme (e.g., fish, eels, catchment management or INNS outcomes). To assure delivery in these areas, we will also set performance output targets in these other areas.

INNS events	no. events held	125	175
INNS engagement	no. organisations reached	150	170
INNS participants	no. event attendees	5,000	6,000
Catchment management	% of drinking water catchments with schemes	80%	100%
Peatland restored	km^2 additions	2,000	8,000
New catchment management	hectares additions	60,000	240,000
Trees planted	no. additions	250,000	100,000

Table 20. Long-term goals to generate renewable energy

Use our land and resources to generate renewable energy		2025	2050
Satisfactory sewage sludge disposal	proportion of bioresource product	100%	100%
Recovery of energy from bioresources	proportion of bioresource product	25%	100%
Reduction in treated bioresources transported to agriculture	proportion of bioresource product	0%	50%
Sludge meeting enhanced product status	proportion of bioresource product	80%	100%

Table 21. Long-term goals to decarbonize and net zero emissions

Decarbonise our operations and Net Zero emissions		2025	2050
Operational carbon emissions	reduction in net generation	0%	100%

Our adaptive plan

Our adaptive plan for Net Zero and environmental gains consists of a core pathway and three adaptive pathways.

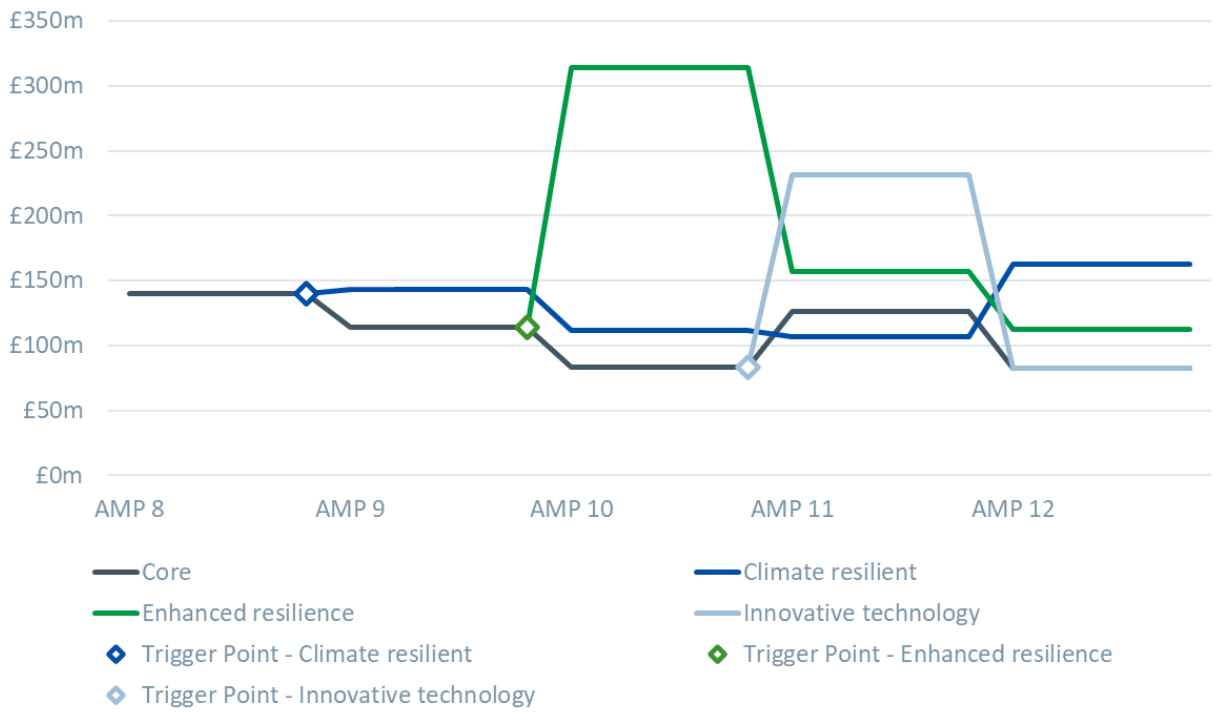


Figure 2023. 2050 adaptive plan – net zero and environmental gains

Our core pathway for this ambition has been built by bringing together the activities and investments of The Pennon Group Biodiversity Strategy and SWW Bioresources Strategy. Whilst our Biodiversity and Bioresources strategies have interdependencies and share some joint objectives, they relate to different enhancement schemes which are affected by different exogenous drivers (e.g., common reference scenarios). For this reason, whilst we combine these activities together into a single LTDS strategy for this ambition, we discuss each of the core pathway activities for Biodiversity and Bioresources separately below.

Our Net Zero strategy, on the other hand, is primarily driven by our base expenditure. However, in this section we do not include this investment within the core pathway nor define adaptive enhancement investment pathways for the Net Zero objective. Instead, we describe activities within our fugitive emission reduction plan separately whilst highlighting the contributions to our Net Zero objective from enhancement investment in Biodiversity and Bioresources.[9]

In 2028, ahead of an AMP9 trigger point, we will decide whether we need to adapt our biodiversity activities to a **climate resilient** future of RCP 8.5 in which more frequent occurrence of low flows, flooding rising temperatures are expected to increase threats to natural habitats and native species and impact water attenuation in landscapes. This will require us to bring forward biodiversity investment and ramp up existing long-standing partnerships with delivery partners across our regions in response to this future.

In 2033, ahead of an AMP10 trigger point, we will decide whether our bioresources activities will need to adapt to an **enhanced resilience** future in which we face a reduction in the availability of agricultural landbank for disposal of sludge due to a shift in local and/or farmer acceptability. This will require us to invest in alternative disposal facilities from AMP9 onwards.

[9] As discussed, we have not included our fugitive emissions reduction plan as part of this core pathway but describe the outputs and expected outcomes from this investment plan as part of the 'Net Zero' sub-heading of this chapter.

In 2038, ahead of an AMP11 trigger point, we will decide whether our bioresource activities will need to adapt to an innovative technology future in which new 'advanced thermal conversion' (ATC) technologies such as pyrolysis and gasification become commercially viable. This will require us to invest in alternative disposal facilities from AMP11 onwards.

Our core pathway

Our biodiversity core pathway includes enhancement investment that will deliver against our four LTDS biodiversity objectives (Management of our land, Partnership catchment working, Managing INNS, Fish and Eels), enabling us to go beyond regulatory and statutory duties so that not only are risks mitigated but multiple benefits realised, extending beyond biodiversity to include water quality improvements. This investment will extend the catchment management and nature-based solutions work to cover all catchments where there are issues with too much run-off or poor water quality. This will include working with farmers to stop rural catchment derived flows getting into wastewater networks and causing flooding or storm discharge issues. it could also include working in catchments to increase overall water quality at bathing waters alongside asset investments.

Our bioresources core pathway includes enhancement investments include Advanced Anaerobic Digestion (AAD) facilities to generating renewable energy from bioresources as well as ensuring compliant recycling to agriculture. Due to the potential risk of future loss of agricultural recycling as an outlet for treated bioresources, we are also investing in small scale ATC to assess the potential technologies that may be required in future AMP periods.

Our 'least regrets' investments

Our biodiversity core pathway of investments focuses on the mitigation of the risks presented by climate change, as well as (to a lesser extent) population growth and abstraction reform in both benign and adverse future scenarios. In particular, given the Southerly and Westerly position of our region in the UK, we consider ourselves to be 'on the front line' of national climate change impacts. For example, low flows from drier weather threaten protected species and landscapes, dried up soils more easily erode during flash rainfall events, warmer rivers threaten ecosystem health whilst new INNS may spread faster and wider than before with climate change. In this context, we have adopted mitigation of climate change related risks as the priority for our LTDS core pathway from AMP8 onwards.

Investments needed in AMP8 to meet our biodiversity objectives in the majority of common reference scenarios include £2m to restore peatland to build landscape resilience to drier climate. We will plant 300,000 trees, not only help meet our biodiversity targets, but to also deliver water quality benefits. We have brought forwards significant tree planting activity into our AMP8 biodiversity core pathway to maximise the return period of these investments, bringing forward associated reductions in water treatment costs and building-in resilience to a potential adverse climate scenario now. We will also work with landowners, co-investing £9.5m to reduce nutrient pollutant run-off and restore soil quality across our catchments. Across our rivers, we will invest in £12.1m to install 9 screens and 11 pass for the benefit of fish and eels.

Investments needed in AMP8 to keep biodiversity options open for the future include pre-emptive work to enable further tree planting through a combination of upfront land purchases and partnership working to unlock matched funding opportunities.[10] To make sure we can adapt to proliferating INNS in a future adverse climate scenario (should it emerge), our core pathway includes pro-active audits of current species, pre-emptive biosecurity installations and ambitions public awareness campaigns and engagement. The INNS program of investment in AMP8 is £15.7m (TOTEX). We are also scaling up our digital habitat mapping platform and biodiversity data management system ('AI-Dash') with smart monitoring metrics to better enable us to monitor and respond to adverse future scenarios. Finally, we are funding 38 research projects (AMP8 investment is £3.8m for pilots for innovative INNS management, carbon sequestration (marine seagrass and saltmarsh), nature-based solutions, and fisheries improvements should they be required in adverse future scenarios.[11]

[10] This will allow future planting to most appropriately planned, resourced, and monitored for sustainable longevity while avoiding the costs of rising land price.

[11] Where there are opportunities for new innovative solutions we are continuing to identify and initiate partnership working to enable new novel approaches and trials – including through our Upstream Thinking (UST) and Catchment Based Approach (CaBA) programmes which deliver benefits across water quality improvements, nature recovery and societal cohesion in the socio-political landscape.

To deliver our biodiversity core pathway investment programme it is essential we secure skills and mobilise resources both within Pennon and across our supply chain. Timely investment in specialist staff during AMP7 has grown resources into a small team in anticipation for the scale of work to be done in AMP8 and beyond. We will continue to invest in ensuring we have the skills we need by pursuing Biodiversity Net Gain metric training for partner ecologists and staff to ensure that we have a consistent approach to improve our natural environment.

Our bioresources core pathway will meet our AMP8 performance targets by investing in Advanced Anaerobic Digestion (AAD) facilities to generating renewable energy from bioresources as well as ensuring compliant recycling to agriculture. We will increase our bioresources treatment capacity in line with projected increases in sludge yields which is monitored and reported annually as part of the APR process.

We do not consider it proportionate to anticipate capital investment to mitigate growth-driven treatment capacity pressures beyond AMP8. This is because sludge yield growth is inherently stable and historic forecasts perform well against actual measurement. The AMP8 investment plan will deliver the first stage of AAD capacity required for the 2030 sludge yields, with the future increased capacity required for 2050 planned in future investment periods.

However, currently a large share of our treated product is recycled via agriculture landbank and therefore our strategy will be affected by future changes in physical availability or social acceptability of this recycling option.

Changes to legislation, stakeholder sentiment or farmer acceptability for recycling treated product for fertilisation will require us to expand our capacity of thermal destruction of post AAD product. To mitigate this, as part of our core pathway, we plan to invest in small scale advanced thermal conversion facilities. These facilities will act as pilot or trial programmes to investigate potential benefits of scaling up in future AMPs. We will also invest in a strategic reserve storage site, as a means of mitigating the risk of a sudden reduction in landbank availability in the near to medium term.

Aside from our investment, we will continue to evaluate the risk of potential loss of landbank capacity on a periodic basis by tracking media and agricultural sector sentiment. We will also assess constraints that may prevent us from expanding our future incineration capacity (e.g., land availability, transport capacity, planning restrictions, technology and skills).

Beyond AMP8, we will monitor the development of innovative technologies such as pyrolysis (i.e., for energy recovery) as potential alternatives to thermal destruction.

How we have arrived at our core pathway

Our biodiversity core pathway optioneering approach prioritises meeting regulatory requirements whilst following our principles of "Protect the best" of our most valuable natural assets[12], "Restore and enhance the rest" through by increasing biodiversity across our sites, and working in partnerships "beyond our landholdings" to contribute to wider landscape recovery through our Upstream Thinking programme.

Following these principles, we developed our biodiversity core pathway in three steps:

- First, we select options required to deliver our legislative duties and broader ambitions both in the short term (AMP8) and the long term (AMP9 to AMP12). This long term view included consideration of investments that could be required today in order to maintain flexibility for the future, particularly in the event of more adverse scenarios climate change scenarios should they come to pass.
- Secondly, we optimise across these outcomes so that the mix of investments delivers our long term objectives in the most effective way, balancing trade-off and interactions between options. In particular, we prioritise options that would deliver the most co-benefits (i.e., benefits across multiple objectives) to water quality in the natural environment and reduction in treatment inputs of raw water intake in the longer-term.[13] Options are then rated based on deliverability (e.g., availability of resources, expertise, availability of partnerships) and budget availability (i.e., both internal funding versus government grant funding). Finally, we apply expert judgement to consider the trade-offs and interactions between different interventions. A final audit process is then conducted to ensure that the optimisation decision-making process has been robust.

[12] Including Sites of Special Scientific Interest (SSSI), County Wildlife Sites (CWS) and sites with other statutory designations of both international and national strategic significance.

[13] This approach is aligned to Pennon's 'Green First' approach to our other strategic long term plans (DWMP and WRMP) which intends to scale up and normalise the use of NBS in business-as-usual planning and operators and shift emphasis away from low-cost 'grey' (i.e., traditional capital investment) optioneering as a default.

- Lastly, the optimised set of core pathway investments is profiled to achieve the optimum balance of benefits and affordability in the longer term, considering feedback from our customers and other stakeholders on their priorities. For example, tackling risk from Invasive non-native species early and preventing spread into new areas. This means that we are investing at the right time to deliver best value for our customers and the environment both in the short and long term, whilst pre-empting future risks where it is most efficient to do so today rather than wait.

Our bioresources core pathway optioneering focuses on treatment and energy recovery solutions via a resilient and cost-effective infrastructure for managing expected sludge yields out to 2050. We have used our 'Decisio' modelling tool to comparing different solutions against a range of criteria, including: operating measures versus capital interventions, solutions with different carbon impacts, energy recovery yields and transportation costs.

Sensitivity testing our core pathway

We have reviewed our biodiversity and bioresources core pathway against the common reference scenarios to understand situations that would necessitate the need for a different set of solutions to meet our ambitions. Our core pathway is must sensitive to local expectations adverse and climate change adverse.

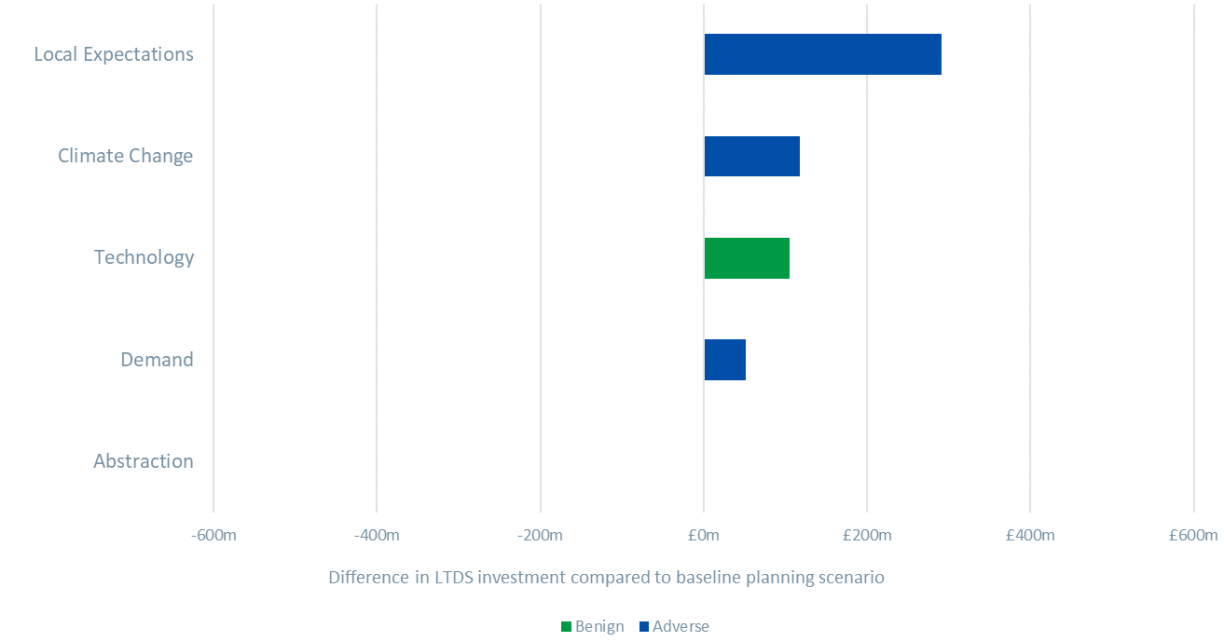


Figure 2124. Impact of benign and adverse scenarios on the core pathway

In particular, under local expectations adverse, a loss of availability of agricultural landbank for bioresources product would require significant capital investment in alternative disposal facilities such as incineration. On the other hand, local expectations benign is in line with our existing core pathway planning assumption and therefore no impact is measured for this benign scenario.

Sensitivity testing shows that all our biodiversity workstreams delivered in the natural environment are highly sensitive to climate change impacts, in particular temperature rise and more erratic, extreme rainfall and drought events.[14]

With regards to an adverse climate change scenario, the biodiversity core pathway activities most vulnerable are INNS management and fish/eel interventions. In particular, with more frequent occurrence of low flows, flooding and rising temperatures expected in the future, new INNS will be able to establish, breed and spread more rapidly. Stressed habitats will become more susceptible to invasion. Moreover, increased summer temperatures in exposed upstream tributaries due to lack of riparian shading and increased average winter water temperatures threaten high priority fish species (e.g., salmonid egg survival) and reduce the geographical range of suitable freshwater conditions for native species. Beyond INNS control, an increased risk of drought will mean that water attenuation in the landscape will become a core business activity. On the other hand, we do not find an impact of climate change benign compared to our core pathway planning assumption.

Innovative technology benign will affect the technologies that are commercially viable for sludge recycling which will increase our overall capital expenditure programme whilst boosting the energy we can recover from our bioresources product. On the other hand, we do not find an impact of innovative technology adverse compared to our core pathway planning assumption.

Demand adverse has a relatively low impact on our bioresources activity driven by gradual increase in sludge processing requirements.

Finally, reductions in permitted levels of water abstraction may also affect our biodiversity ambitions insofar as these restrictions are responding to, and therefore correlated with, concurrently deteriorating flow of water in our rivers. However, given that the ultimate driver of low river flows are driven by an adverse climate change scenario, we do not identify direct impacts of water abstraction scenarios on our biodiversity ambition.

Our adaptive pathway for Climate Resilient

This plausible future will require us to increase biodiversity investments to deal with threats from increasing concentrations of blue-green algae and dissolved organic carbon (DOC) from increased rainfall events.

Under this adaptive pathway, there will be a significant increase in the pace and scale of delivery of our existing biodiversity core pathway activities whilst strengthening our focus on NBS and carbon management initiatives. We will be leveraging on our existing examples of successful partnership working as well as accelerating our initiatives on our own land.

Under this pathway we would also accelerate wetlands creation, firstly under WINEP drivers in AMP9 (which has not been the case in AMP8), and secondly through alternative partnership funding streams (for example; the Water Net Gain project awarded through the Ofwat Innovation Fund in 2023). This ring-fenced innovation funding is a key enabler for adaptive activity which will generate the evidence base for costs and benefits of wetlands alongside an increasing number of wetland projects already contributing to the development of best practice across the water industry.

We also expect that under this adaptive pathway for biodiversity, the increased risk of drought will mean that water attenuation in the landscape will become a core business activity. We would seek to deliver this at scale and pace via expanding our existing successful mechanisms such as our catchment management partnership and peatland restoration schemes.

We will therefore bring forward investment and ramp up existing long-standing partnerships with delivery partners across our regions in response to this future. Our Upstream Thinking programme has estimated up to c.£5m additional investment for new emerging threats in an adaptive pathway for biodiversity.

Our key adaptive biodiversity investment activities under this plausible future are:

- Increasing investment into INNS management and eels/fish programme. This will involve investing in proactive INNS measures including biosecurity and installation of infrastructure before INNS arrive to reduce the risk of long-term costly containment and management under a more adverse future.
- Accelerating wetlands creation programmes. Preparatory work in AMP8 for this adaptive activity will involve building the evidence base for costs and benefits of wetlands for the future and contribute to a growing body of evidence on best practice for wetlands creation across the industry.
- Expanding water attenuation in the landscape schemes via Upstream Thinking and Peatland Partnership. Restoration of damaged peatlands protects them against the risks of climate change to keep them actively storing water and carbon in the landscape. In the farmed landscape Upstream Thinking delivers more storage in soils and vegetation cover as well as ponds and wetlands.
- Accelerating our tree planting programme. Preparatory work for this adaptive activity will involve upfront land purchases and tree planting via partnerships to unlock match funding opportunities while these are still available.

As part of our LTDS monitoring strategy we will regularly evaluate whether we expect conditions for this pathway to materialise in the near future. A summary of the metrics and trends that we will monitor are provided in the table below:

Table 22. Our adaptive pathway for Climate Resilient, summary of metrics and trends to be monitored

Trigger points	Description
Establishment of new INNS or spread of existing priority INNS or new pathogen or disease outbreak (e.g. trees)	An enhanced and intensive response programme of targeted INNS management activities specific to the species introduced or spreading due to climate change or new pathways, including more strategically placed washdown facilities and better resourced survey and monitoring, education & engagement programmes Management strategies to reduce and contain new tree diseases
High priority species extinction	Increased scale and pace of habitat restoration targeted to support the South West region's most at-risk high priority species remaining. This would increase resourcing of SWB and BRL biodiversity enhancement programmes to investment in hiring more expertise and training alongside dedicating more time and resource to collaborative partnership projects through UST
Av. river temperature exceeds summer and winter thresholds for ecosystem balance	More legal specialist advise will be required to meet legislative duties under the fish/eels regulations and more external ecological consultancy will be needed (or in-house capacity further resourced) Reaching this trigger point in an adverse abstraction future scenario compounds the negative impacts expected, further resourcing to manage collaborative working with regulators and aquatic ecology specialists will be required (across business functions with Water Resources colleagues) Decreased oxygenation levels in rivers and reservoirs, increased algal blooms and biosecurity risks such as disease would also require increased investment to resource risk management
Drought restrictions Level 3 Or a prolonged period of drought exceeding 2 years of Level 2 restrictions	The impacts of a Level 3 non-essential use ban on agriculture, tourism, industry would be profound, leading to a reduced level of service where processes are particularly reliant on water supply. Habitats, species, soils, groundwater and freshwater supply, ecosystem services and any human activity that depends on the natural environment would take several years to recover from the absence of water in the landscape. Should two or more prolonged low-rainfall periods follow one another in close succession this can prevent recovery for a longer amount of time Environment Agency abstraction permits stipulate that SWW will need to be taking 209 ML a day less from existing river sources by 2050 (1) In this context, water attenuation in the landscape through the delivery of nature-based solutions – such as ponds, small farm reservoirs, wetland creation, saltmarsh restoration, peatland restoration, habitat improvements and regenerative land management practices – all become crucial to a resilient water resources management plan. Innovation for better water attenuation in the landscape will be required (e.g., smart ponds) Research, development, reviews, trials and investigations into novel methods of nature-based solutions applications will be required at scale and pace as a cross-industry growth area of high priority INNS can take advantage of drought conditions or flooding events to spread; stressed habitats are more susceptible to invasion
Acidification of the ocean beyond local ecosystem bandwidths of resilience	This trigger point would also result in species decline and possible extinction alongside loss of habitats and the ecosystem services provided by local ocean environments. Our adaptive actions would require investment into investigations, pilots, research and development of NBS in the marine environment These activities include research into restoration of seagrass meadows, estuarine saltmarshes and wetlands. As well as innovative policy interventions such as establishment of conservation areas in collaboration with local authorities and emerging statutory nature recovery partnerships Marine INNS are also increasing. We are the first to conduct marine surveys, investigations and to pilot control measures for invasive seaweed. Further research is needed to understand the impact on marine INNS Innovative adaptive actions relating to marine ecosystem health are emerging rapidly, particularly novel carbon sequestration methods. SWW hold a unique space in the water industry with responsibility for approximately 1/3 of England's coastline and the South West hosts hubs of expertise in marine research. Therefore, we have prime potential networks and partnerships to demonstrate proactive leadership in this space

Our adaptive pathway for Enhanced Resilience

This plausible future will require us to adapt our bioresources strategy. Our long-term targets for bioresources are most at risk to a future in which local expectations change overuse of landbank for treated product.

Whilst there is significant uncertainty over the future of the sustainability of recycling treated bioresources to agriculture (a practice that is universally applied across the UK), we have estimated a trigger point in AMP10 for an adaptive pathway in which we may need to expand incineration technology to destroy the post AAD product.

We have chosen a trigger point in 2035 for this adaptive pathway due to the universal impact this change would have to the entire UK wastewater sector, with enabling legislation requiring undergoing consultation and the scope and scale of industry adaptation also requiring a significant lead-time.

Our adaptive pathway for Innovative Technology

Aside from enhanced expectations, availability of new innovative technologies may materially affect our core pathway bioresources strategy. Whilst currently pyrolysis is an unproven Advanced thermal conversion option, it compares favourably to incineration in terms of energy recovery and carbon emissions. We have therefore estimated a trigger point in AMP11 to include the costs of building pyrolysis technology to destroy the post AAD bioresources.

Our investment plan

Our core pathway enhancement investment plan is categorised according to the performance outcomes they will support, in particular: biodiversity and sludge disposal.

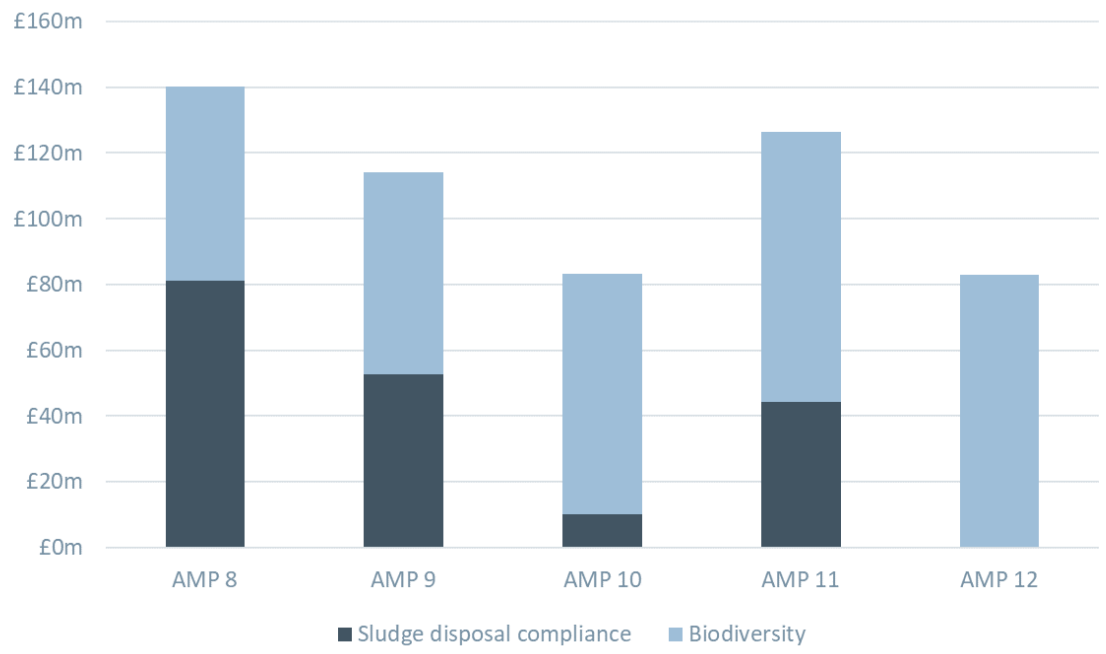


Figure 2225. Investment plan by sludge disposal and biodiversity

To halt the decline of species and habitats in the face of increasing climate change impacts and compounding pressures on water resource catchments, a significant increase of investment into natural resource management will be required over time.

The key to unlocking multiple benefits for the natural environment, whilst ensuring we mitigate and adapt most efficiently to heightened risks, is to focus future investment in partnership delivery mechanisms and continue to grow the effectiveness of our Catchment Management approach. Alongside this it is crucial to maintain a steady level of investment into INNS control, fish and eel conservation and biodiversity net gain. Not only to meet new and evolving legislative requirements but to go beyond and 'do the right thing' in trailing novel approaches and developing best-practice in nature-based solutions to both protect *and* restore local fauna and flora up to 2050 and beyond.

In responding to customer and stakeholder feedback, we have brought forwards several biodiversity schemes to deliver benefits ahead of statutory duties. For example, compliance on fish and eel regulations by 2030 represents a minimum requirement as our responsibilities as a landowner. However, we know we need to go further and do the right thing for the natural environment in our region, there should be no delay to the fish and eel installations planned for AMP8.

To ensure balance of cost across the programme, we have also identified options for phasing biodiversity works into AMP9. Moreover, in some cases our schemes rely on enabling changes elsewhere. For example, our De Lank and Camelford Weir projects should be phased into AMP9 as delivery is determined by the major external factor of abstraction reform, which needs to be resolved first in collaboration with our stakeholders and regulators.

The core pathway investment profile for bioresources assumes the current predicted increases in sludge yield beyond 2030 will not be met in AMP8 therefore the future core pathway investment is centred around providing additional capacity in the AMP immediately prior to a deficit occurring in the capacity of the AAD assets. The profile assumes that the outlet of recycling treated bioresources to land is maintained during the LTDS time period.

A summary of the delivery mechanisms and activities to deliver increased biodiversity through further habitat creation are provided in the table below.

How we will deliver increased biodiversity through further habitat creation

Table 23. Our investment plan to deliver increased biodiversity

Delivery mechanism	Activity
Improving eel/fish passage and screens	Improving eel passage to reach habitats upstream of our abstraction points. Phased AMP 9 investment of £12.1m (CAPEX) across 20 schemes for SSSI, NERC and EEL driver schemes that were S+ and will be delivered by 2035
	Weir removals and fish pass installations, for example at Loxhore Pond in North Devon on the River Yeo (Barnstaple) and at Bolham Weir on the River Exe
	Protect all migratory fish species close to Gunnislake (River Tamar) and Restormel (River Fowey) through the installation of Eel Regulations compliant intake screens
Managing INNS	INNS audits, surveys and investigations including reservoirs, canals and marine sites
	Monitoring and surveillance for priority INNS or sites
	Improvement and no deterioration on priority sites with INNS population management including invasive crayfish, fish and plants and trialling novel control methods e.g. Zebra mussels and invasive red algae seaweed. Seek to eradicate INNS where feasible or contain them
	Wide range of no deterioration work including implementing a range of exemplar biosecurity measures such as installing wash down facilities, promoting biosecurity plan, rapid response plan and two pathway action plans for angling and watercraft and supporting the SW Regional Invasive Management Plan. Working with vast range of stakeholders, particularly site users such as anglers and sailors, to raise awareness of INNS and how to carry out effective biosecurity measures to prevent their spread
Habitat and species improvement	Biodiversity net gain delivered on our landholdings through partnership projects beyond our landholdings
	Planting 300,000 trees across the region by 2030
	Dual chemical dosing at 7 sites in the Rivers Axe and Camel, including NBS to reduce dosing requirements
	23 schemes by 3035 to reduce the number of Reasons for Not Achieving Good Status (RNAGS)
	Chemical dosing and innovative treatment technologies at 29 sites
	Reduce the phosphorus discharged from Plymtree STW down to 1 mg/L
	Storage and catchment solutions in 13 bathing water areas

How we will use our land and resources to generate renewable energy

Table 24. Our investment plan to generate renewable energy

Delivery mechanism	Activity
Reducing product yield and improving quality	We will invest in new AAD treatment capacity, reducing the volume of product that is required to be recycled and improving its quality
Renewable energy generation through Advanced Anaerobic Digestion (ADD)	We will generate and capture biomethane to generate renewable energy, reducing our carbon footprint in the management of wastewater assets as well as to be transported as a source of renewable energy in our region. To do this, in AMP8 we will build new treatment sites in Devon and Cornwall

How we will reduce our operational carbon emissions and hit our Net Zero target

Climate change is undeniable, and we're taking bold steps in the Greater South West to respond to the changes we are all experiencing. By 2030, we're committed to achieving Net Zero, proving our dedication to minimising our impact on the planet.

Our fugitive emissions reduction plan will provide a reduction in emissions of up to 3,975 tCO2e in 2029/30. This investment includes a mix of monitoring, measuring and process optimisation on potentially all SWW's 71 ASP sites. Beyond AMP8, we expect to continue and expand this programme by monitoring, measuring and process optimisation across more wastewater treatment works and into wastewater networks.

Aside from this, we will also ensure activities across all other parts of our operations are low carbon. This includes investing in climate-independent water sources, water reuse, and enhanced transfer networks. We will repurpose brown field sites, restore peatlands and invest in energy recovery from our bioresources product.

Table 25. Our investment plan to reduce carbon emissions and hit Net Zero

Delivery mechanism	Activity
Carbon sequestration through Natural Resources	Woodland carbon storage, restoring ecosystem services that lock carbon, nitrogen and methane back into the soil and vegetation
	Peatland restoration (c. 2,000ha per AMP) and improved soil management through partnership working under our catchment management projects
	Planting 250,000 trees across the region by 2030
Eliminating carbon emissions from our operations	Expanding our renewable generation capacity with on-site solar, hydro-electric and wind
	Purchasing grid electricity from contracts with renewable energy generators
	Investment across monitoring, measuring and process optimisation to reduce fugitive emissions
Generating renewable energy	Use AAD to recover energy from our bioresources product in the form of biogas

The benefits that our plan will deliver

Over the next 25 years our ambition will deliver the following benefits for stakeholders in our local communities:

Increase biodiversity through further habitat creation

Our biodiversity will deliver the 18,000 Biodiversity net gain units from habitat restoration and management and control of INNS using catchment management approaches across all our abstraction catchments. We will have installed fish and eels screens on all our intakes, whilst removing all barriers that are not required to protect SWB and BRL's operational activities and free passage over all remaining weirs

Use our land and resources to generate renewable energy

Our bioresources strategy will treat 100% of all bioresources through an AAD process to recover energy and help reduce the carbon emissions of the SWB operation. We will create a valuable bioresources product that is compliantly and beneficially recycled to agriculture for as long as legislation and stakeholder sentiment allow whilst ensuring a resilient, sustainable and efficient outlet for all SWB bioresources, that enables the continued environmental and circular economy benefits of the wastewater treatment processes for the environment and agriculture.

Decarbonise our operations and net zero emissions

By 2030 we will be carbon neutral, with 100% renewable sources of energy and will improve energy efficiency of our water and wastewater pumping stations. Beyond our operational carbon emission, we will also produce biogas as a waste product from our sludge processes and restore our peatlands to capture atmospheric carbon. We will plant 1.5 million trees and restore 10,000 hectares of peatland to secure our landscape against climate change and ensure our they continue to store increasing volumes of carbon to mitigate increasing atmospheric concentrations.

Rationale

Our LTDS reflects the best way of meeting our short-term and long-term objectives in a way that balances risk and affordability for our customers.

This section sets out the decision-making framework we have developed to arrive at our LTDS, including the uncertainties we have tested against across all our activities, and how we plan to respond to them. Beyond this, we also provide a line-of-sight between our LTDS and our other long-term strategies and present the findings of our affordability analysis.

Methodology

While our ambitions are clear, the investment activities required from us to deliver against these ambitions (and the associated costs) over the long term are dependent on parameters relating to a wide set of possible future states, including climate change, customer behaviour, technological advancement and regulatory or legislative changes. To account for this, we define a set of plausible future scenarios to help us assess how our core investment programme may need to adapt to deliver on our outcomes and targets.

An overview of our LTDS adaptive planning framework is set out below.

We apply Steps 1 to 3 to each of our individual ambition areas, before consolidating across ambitions into our single overall LTDS strategy as part of Step 4.

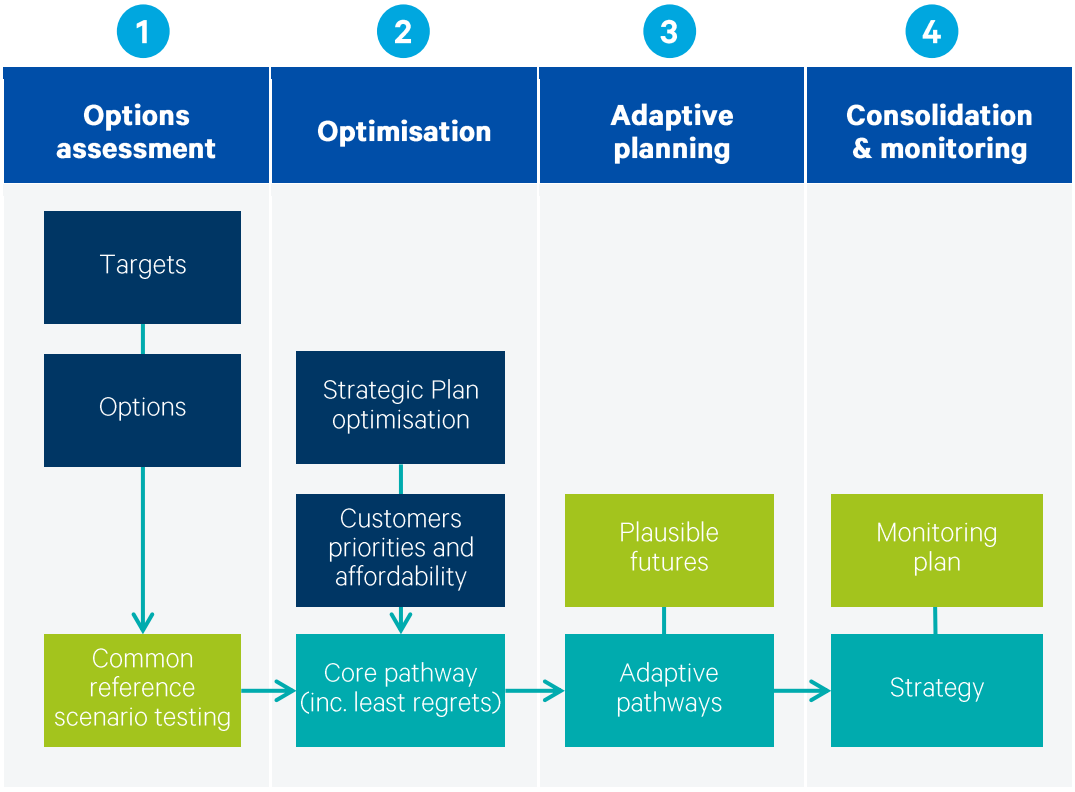


Figure 2326. Our LTDS adaptive planning approach

Step 1: Options assessment

For each ambition area, we have defined the long-term **targets**, and outcome performance measure (OPM) targets informed by our customers' preferences and priorities.

In building our strategic plans and the LTDS we use our business-as-usual optioneering process (as described in our AMMA document). With more data and information available on costs and benefits we have expanded the type and range of options considered at this stage to include regional and system solutions, 'green' and 'blue' options, new technology and partnership programmes. We have reviewed our policies and developed a Green First policy which has been implemented throughout optioneering.

The values for each of these characteristics are in part driven by underlying structural factors, including the prevailing outcomes of the common reference scenarios (climate change, demand). These interactions will allow us to assign a '**least regrets'** score (either quantitatively or qualitatively, discussed below) to each option during optimisation (step 2). From the outset (step 1), we ensure we have included options which can be phased proportionately over time in response to changing external circumstances as well as those which deliver co-benefits across different objectives.

We use **common reference scenario testing** to evaluate the impact of future uncertainty on the incremental benefits, costs and timings of our options. **Scenarios** are defined by a set of external factors (or 'parameters') which: (i) affect the net benefit of our options, and (ii) may take different values in the future compared to today. Some of these parameters are more uncertain and/or more impactful on our options than others. The most uncertain and impactful parameters affecting our options are defined below.

Table 26. Step 1: Options assessment, areas of material uncertainty reflected in our scenario testing of options

Uncertainty	Description	Impact
Climate Change	Climate projections show an increased chance of warmer, wetter winters and hotter, drier summers. Extreme weather events will also become more frequent and sea levels will continue to rise	Our sewers, wastewater treatment works and storm overflow sites will be affected by increasing levels of rainfall which affect outcomes such as storm overflows and sewer flooding in a 1-in-50 year storm. Our water resources will also need to become more resilient to increased likelihood of drought conditions affecting our supply-demand balance. Making this more challenge is that many of our assets are situated in coastal locations, meaning that increasingly sea level rise and coastal erosion increase risk of asset flooding
Demand	Per capita use of water depends on customer behaviour trends which are partly driven by government policy and changing societal norms	Our demand management outcomes will be affected by implementation of Government-led water labelling policies and low-water product requirements, sustainable building regulations, customer adoption of rainwater harvesting for non-potable water use and increased innovation in supply chains to improve water reuse
Technology	The pace, scope and cost-effectiveness of technological developments impact both the delivery costs and impacts of various enhancement activities	Our demand management outcomes will be affected by the emergence of smart water networks and full smart meter penetration. Our wastewater compliance activities will also be affected by advances in monitoring and removal of nutrients, whilst sewer flooding outcomes will be affected by real-time monitoring technologies
Environmental Destination	The level and phasing of environmental destination abstraction licence reductions depends on Environmental Agency's assessment of ecological outcomes	Our enhancement investment in new water resources and supply resilience will be affected by how we are able to use existing abstraction sites to maintain our supply-demand balance
Local expectations	Our customers' attitudes and priorities affect whether a particular outcome is valued and considered affordable. Our ambitions reflect our current understanding of customers' views and what these are likely to be in the future, but we need to anticipate how these could evolve over the next 25 years.	Wastewater treatment and storm overflow enhancement schemes will need to be extended to deliver additional designated bathing waters expected by our customers, as well as any extension to the time periods during which existing bathing waters will be designated. Our sewer flooding investments will need to increase to deliver the level of flood risk for a 1-in-50 year storm that customers and stakeholders expect

We have adopted the dimensions of Ofwat's common reference scenario (Climate Change, Demand, Technology and Abstraction) as well as one additional company-specific scenario named Local Expectation). We arrived at our company-specific dimension through a series of deliberative workshops over the course of the 2022/23, including a challenge and review undertaken by experts at the University of Exeter, as described below.

Strategy and planning workshops were held during the development of our LTDS. One objective was to develop a shortlist company specific factors that may materially influence future enhancement outcomes. Our overall approach to developing company-specific scenario is as follows:

Arriving at our company-specific scenario of 'local expectations'

Based on this assessment process, 11 potential company-specific factors were identified for consideration as scenarios in step 4. We applied the following assessment criteria to this long-list: (i) what are benefits of building an adaptive pathway around this uncertainty (ii) what is the degree of uncertainty around this factor (i.e., within a 'plausible extreme'), (iii) what is the materiality of impact on strategic choices or enhancement expenditure. The outcome of this assessment arrived at the following factors:

- Change to flood risk targets – Based on our dDWMP, this considers whether further improvements to the protection of customers will be required in the future to reduce the number of catchments that would be at risk of a 1 in 50-year (severe) storm.
- Changes to bathing water and inland bathing water designation – If more applications are approved in the region for bathing water designation this may increase the environmental requirements and need for enhanced treatment processes.
- Change to land bank available for sewerage sludge – If agricultural acceptability for biosolids changes due to shifts in retail market attitudes or government policy this will affect the options for of bioresource reuse / disposal and require the company to invest in alternative downstream solutions (e.g., incineration).

From this shortlist, we considered interactions and commonalities that would help us to combine and rationalise these impacts into a common set of drivers. We identified that these factors are driven by customer's and stakeholders' expectations for particular outcomes of relevance to

our catchment. Whilst these factors affect different ambitions, they share a common driver and therefore we have grouped them together in a single company-specific scenario: changing local expectations.

For each

scenario, we first define a 'most likely' scenario outcome based on our best view of each parameters' future state (summarised below) and then define a set of 'plausible extreme' scenario outcomes which adopt an 'adverse' or 'benign' change to a single parameter value compared this 'most likely' scenario.[15]

Table 27. Step 1: Options assessment, our baseline (most likely) planning scenario

Parameter	Baseline value	Description
Climate Change	6.0 RCP	'Medium' stabilisation pathway reflecting a 2.0°C to 3.7°C temperature increase by 2081
Demand	110 l/p/d	'Low' demand profile

[15] In the current context, 'benign' is defined as a future state which allows us to deliver better outcomes with the same level of investment whilst 'adverse' is defined as the opposite.

Parameter	Baseline value	Description
Technology	Slow emergence profile	2040 emergence of smart networks and cost efficiency in wastewater network management 2045 for full penetration of smart metering
Abstraction	203 Ml/d peak reduction	'BAU+' abstraction reduction, WRMP only
Local expectations	Customers and local stakeholders current long-term expectations	Existing bathing water designation levels, attitudes to water main flushing, current risk of sewer flooding in a 1-in-50 year storm (i.e., 10%) and landbank availability for bioresources

In line with Ofwat guidance, we have adopted common reference scenario parameter values for climate change, demand, abstraction and technology. In addition, we also model further company-specific scenarios with respect to local expectations. Our LTDS 'plausible extreme' scenarios are summarised below.

Table 28. Step 1: Options assessment, our LTDS plausible benign and adverse scenarios

	Scenario	Parameter change	Description
1	Climate Change: Benign	RCP 2.6	This represents a 0.9°C to 2.3°C temperature increase by 2081
2	Climate Change: Adverse	RCP 8.5	This represents a 3.2°C to 5.4% increase by 2081
3	Demand: Benign	110 l/p/d	This represents the government 2050 target levels for per capita consumption
4	Demand: Adverse	140 l/p/d	This represents a 18% increase in average usage compared to the government 2050 target
5	Abstraction: Benign	Legal requirements	Existing abstraction licence terms do not change from today's levels nor do we reduce our abstraction beyond legal requirements based on customer or environmental objectives
6	Abstraction: Adverse	Enhanced requirements	New environmental requirements across push all mainland WRZs into deficit (if no action taken)
7	Technology: Benign	Accelerated emergence	Full smart metering penetration emerges with smart networks including leakage and innovation occurs. Wastewater cost efficiency in network management is realised Technology permits the industry to achieve a lower limit for Nitrogen reduction from 2040 onwards which drives additional WINEP investment needs
8	Technology: Adverse	Low emergence	Full smart metering penetration is delayed until 2045, with smart networks including leakage and innovation occurring in 2040. Wastewater cost efficiency in network management is realised in 2045 and that technology does not advance sufficiently quickly enough to impose tighter treatment requirements before 2050
9	Local expectations: Benign	Current levels	Existing bathing water designation levels, attitudes to water main flushing, current risk of sewer flooding in a 1-in-50 year storm (i.e., 10%) and landbank availability for bioresources
10	Local expectations: Adverse	Enhanced levels	Increased bathing water designation levels, lower acceptability of water main flushing, reduced risk of sewer flooding in a 1-in-50 year storm (i.e., 5%) and reduction in landbank availability for bioresources

Using these benign and adverse scenarios defined above, we have developed a qualitative framework to explore impacts on our networks, water resources, bioresources, treatment facilities and operational facilities.[16] From here, we quantitatively test each scenario using our modelling tools for different ambition areas.[17] We discuss the individual approaches adopted for all ambitions in Step 2 (Error! Reference source not found.).

[16] For example, we identified a range of impacts to our water network under a climate change adverse scenario, such as increased supply interruptions, mains repairs and leakage driven by bursts related to increasing freeze / thaw events on pipelines and values.

[17] For example, our Drinking Water Quality approach uses a stratified Monte Carlo sampling technique which generates 100 iterations of the NPV with each taking a different combination of common reference scenario outcome. This allows us to assign a probability distribution to the NPV of each of our options, with upper and lower bounds reflecting the most benign (i.e., upside risk) and adverse (i.e., downside risk) incremental net benefit.

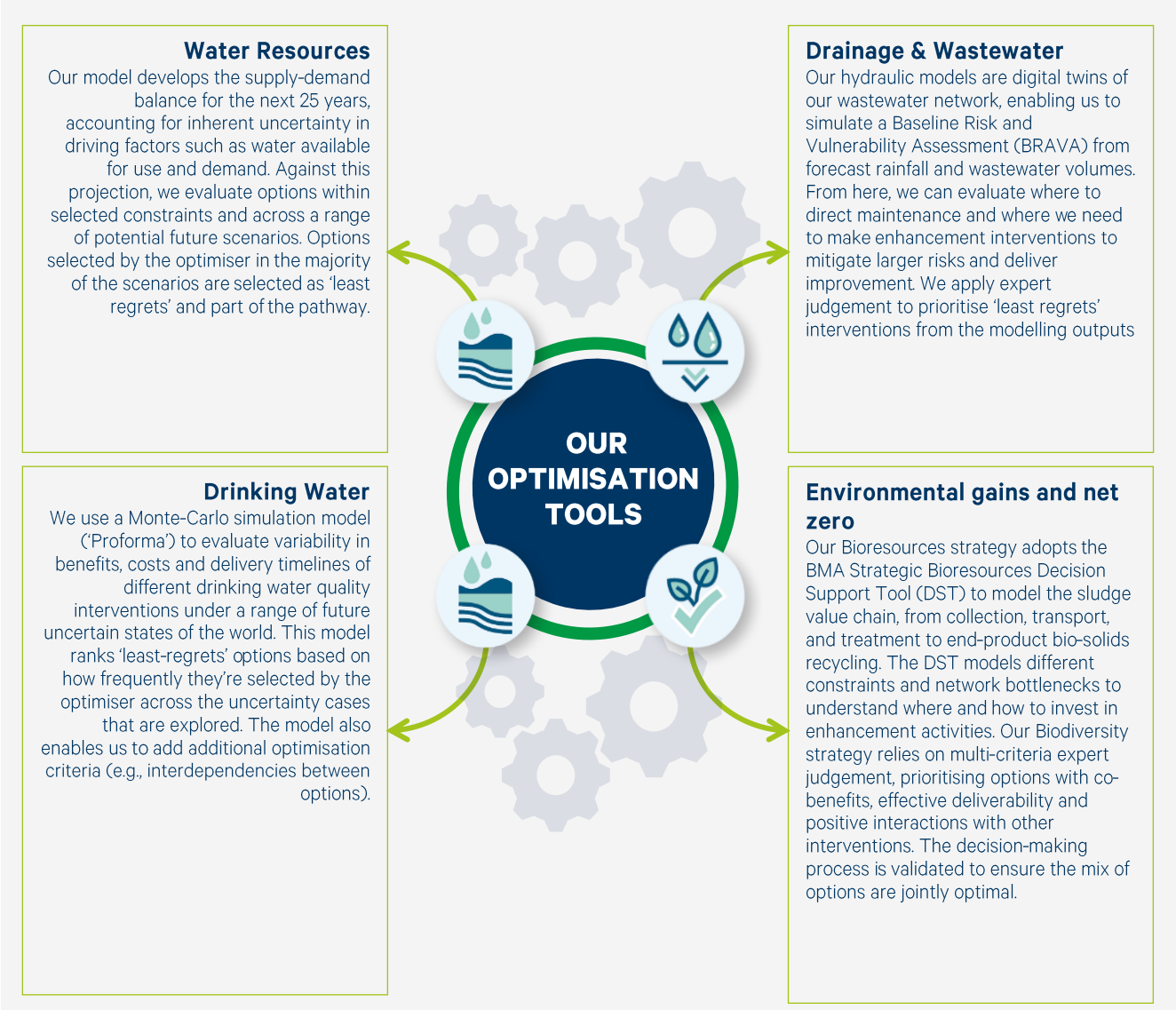
The result of our scenario testing provides a holistic assessment of the impact of uncertainty on the costs and benefits of individual options, enabling us to later select combinations of options which minimise downside risk.[18] These are known as the 'least regrets' options. We later also evaluate common reference scenarios at the *ambition*-level, which is discussed in the next section of this chapter.

In addition to the parameters reflected in our scenarios, we define assumptions for less material uncertainties which we hold constant across scenarios. These assumptions and supporting evidence are documented in the Foundation section of this document and include factors such as our regulatory framework and government policy agenda.[19]

Step 2: Optimisation

From the long-list of feasible options, we undertake an investment optimisation at the **ambition-level** to determine the optimum combinations of options, including scale and sequencing, to meet the long-term targets within that ambition.

The activities and outputs we deliver across our business require the use of different modelling and optimisation tools and techniques. A summary of the suite of optimisation tools deployed within each of our LTDS ambitions is in summarised in the**Error! Reference source not found.** below.



[18] As an example, where two options are expected to deliver a comparable expected net present benefit towards a particular long-term target, we can select the more agile intervention which can be delivered in a phased or modular profile over the medium term to anticipate and adapt to changing requirements.

[19] A discussion of our assumptions is provided in the 'Foundations' section

Figure 2427. Our suite of optimisation models and approaches

Using these tools and approaches, we develop a core pathway for each of our individual ambitions including the selection of the combinations of 'least regrets' options that:

1. Meet our PR24 performance commitments targets, in both benign and adverse scenarios
2. Meet our LTDS ambitions in the majority of plausible futures, and / or:
3. Are a preparatory step in 2025-2030 to mitigate pathway lock-in and keep future options open.

Least-regrets criteria 1. and 2. (above) are applied quantitatively by our Water Resources and Drinking Water optimisation models, based on the frequency with which options are selected under different scenarios over time. For the Drainage and Wastewater and Environmental gains optimisation approaches we apply these steps qualitatively through expert judgement. Across all ambitions, we validate all optimisation outputs and to assess options under criterion 3.

Having developed a preliminary core pathway for each ambition we profile each pathway to first meet our statutory obligations and then to deliver best value to our customers and stakeholders based on their relative priorities. This set of four core pathways (one for each ambition) are brought together into our overall LTDS core pathway to balance bill impact and benefits assessment and achieve fairness and affordability over time.

Step 3: Adaptive planning

Our core pathway is, by definition, designed to reflect the set of investments that are most adaptable to future states of the world and we must define how this core pathway may need to adapt under a small number of **plausible futures**.

In line with Ofwat guidance, our plausible futures are informed by adverse, benign and likely scenarios for climate change, demand, environmental destination and technological innovation – but not all at once.

	Benign	Likely	Adverse
CLIMATE	RCP2.6	RCP6.0	RCP8.5
	Climate projections show an increased chance of warmer, wetter winters and hotter, drier summers. Extreme weather events will also become more frequent and sea levels will continue to rise. Our sewers, wastewater treatment works and storm overflow sites will be affected by increasing levels of rainfall which affect outcomes such as storm overflows and sewer flooding in a 1-in-50 year storm. Our water resources will also need to become more resilient to increased likelihood of drought conditions affecting our supply-demand balance. Aside from this, many of our assets are situated in coastal locations, where increasing sea level rise and coastal erosion increase risk of asset flooding.		
TECHNOLOGY	Faster	Average	Slower
	Faster technology brings online the benefits from a more technologically advanced water and wastewater systems (including cyber security) which reduces investment needs. The exception is where we believe technology advances will lead to increased investment, i.e., we are able to reduce lower technically achievable limits for Phosphorus removal, which would drive investment up. Technology also benefits from lower carbon materials and fleet emissions. Typically, these advances occur five years ahead of the slower technology scenario.		
DEMAND	Low growth and low demand	Current growth and managed demand	High growth and high demand
	We use ONS data to predict total growth across our region. This regional forecast is then proportioned across our region using local plans. There is little variance in the two forecasts so we test high and low demand by varying customer consumption levels – testing 140l/p/d under a high demand and 110l/p/d under low demand by 2050.		
ABSTRACTIONS	Current requirements	Current requirements with enhanced outcomes	Enhanced requirements
	The level and phasing of environmental destination abstraction licence reductions depends on Environmental Agency's assessment of ecological outcomes. Our enhancement investment in new water resources and supply resilience will be affected by how we are able to use existing abstraction sites to maintain our supply-demand balance.		
LOCAL EXPECTATIONS	Current levels of expectations	Increased expectations	Highest expectations
	Local customers' expectations on year-round access to and health of their environment, and on smarter healthier homes will change. Customers will expect increased resilience against drought, optimised and circular use of water by companies (e.g. reduction in the use of water for flushing) and protection against flooding as the impacts of climate change are felt. Increased recreational use of watercourses and coastal waters may expand our catchments requirements for designated bathing waters.		

In arriving at our set of plausible futures, we define a conceptual framework to assess the likelihood of different scenario outcomes materialising in combination with one another (i.e., futures).

We first evaluate positive or inverse relationships between different scenario outcomes (adverse, likely, benign) and the underlying relationship mechanisms, before identifying combinations of different scenario outcomes which are both internally compatible and plausible.

We consider a future to be plausible if it is within "outer limits of plausibility" implied by Ofwat's set of common reference scenarios.[20]

[20] Ofwat's common reference scenarios are, themselves, futures which deviate from companies' "most likely" future by layering on a single adverse or benign change to a scenario parameter (i.e., climate, demand, environmental destination, abstraction). In this way, Ofwat's "outer limits of plausibility" is defined by the adverse or benign common reference scenario that is least likely to materialise alongside the other scenarios' 'most likely' outcome.

Our framework for identifying plausible futures is illustrated below, visualised as a matrix of trade-offs between adverse scenarios including the direction of influence. Climate change sits at the centre of this framework as the only "exogenous" adversity which affects all other scenarios (partially driven by factors contained within the system). We have identified 8 mechanisms (labelled below) which transmit either a positive or negative influence from one scenario to another.

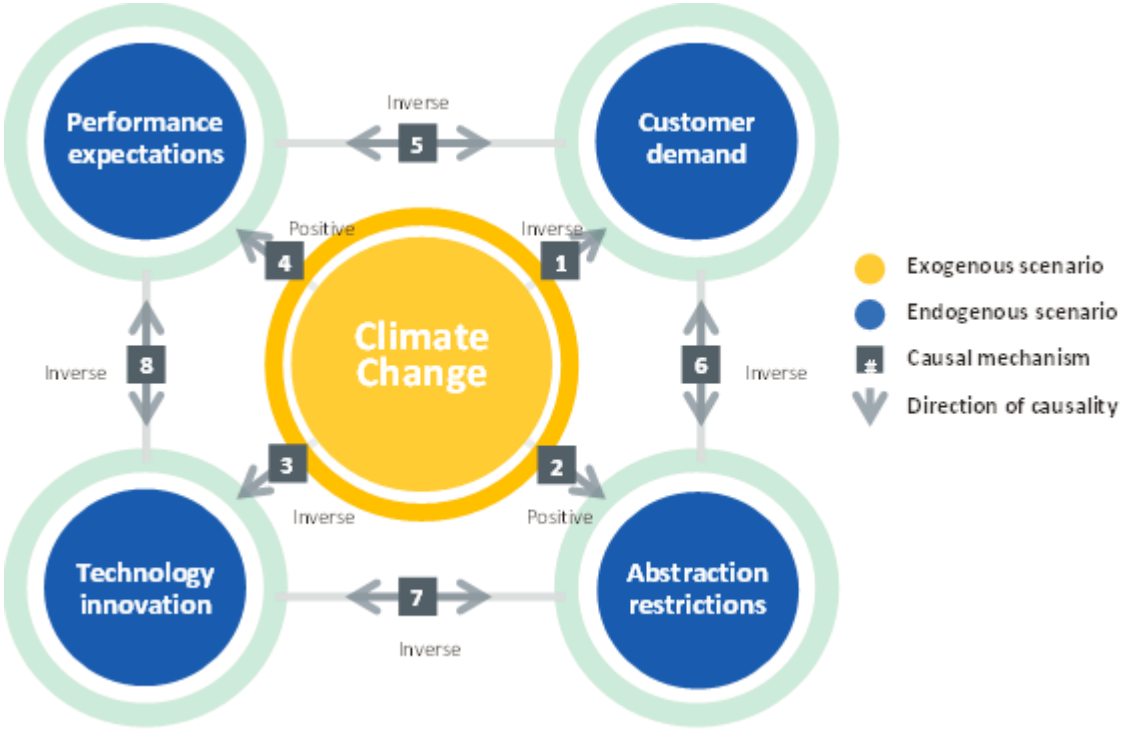


Figure 2528. Plausible futures framework

For example, we consider an **adverse climate change** scenario to be incompatible with an **adverse customer demand scenario** in which PCC remains at today's levels – instead, we consider that these adversities are inversely correlated. This is because adverse climate pressure is expected to deliver a stronger government policy response (e.g. enhanced water labelling policies, low-water product requirements and of sustainable building regulations) and behavioural change (e.g. increased rate of adoption of rainwater harvesting for non-potable water use) that will drive down PCC compared to today's levels.

Having evaluated the expected direction of influence between different scenarios, we have arrived at a set of futures characterised by correlations that are compatible and plausible.

These futures are summarised in below.

Table 29. Step 3: Adaptive planning, LTDS Plausible Futures

Plausible Future	Climate	Technology	Demand	Env Destination	Expectations
Climate Resilient	+ 4.3°C by 2081	Low	110l/p/d	Current legal requirements with enhanced outcomes	Current
Enhanced Resilience	+ 4.3°C by 2081	Average	110l/p/d	Enhanced legal requirements	Highest
High Demand	+ 2.8°C by 2081	Average	140l/p/d	Current legal requirements with enhanced outcomes	Current
Innovative Technology	+ 2.8°C by 2081	High	110l/p/d	Current legal requirements with enhanced outcomes	Highest

- Climate Resilient – an adverse climate scenario leads to low PCC through government policy and behavioural changes, whilst environmental destination and local expectations remain constant.
- Enhanced Resilience – tested as a sensitivity to Climate Resilient, a prevailing climate adversity also promotes customer and local stakeholders to raise the level of expectations they have for the sustainability and outcomes delivered by water companies alongside a tightening of abstraction restrictions to mitigate ecological damage.
- High Demand – a medium stabilisation climate pathway does not promote a strong adaptive response from Government or customers, and market-led water efficiencies are offset by a moderate increase in hotter and drier conditions, resulting in no change to PCC. Abstraction restrictions do not materially change as climate-driven ecological harm is limited. With limited change to behavioural and environmental outcomes, local expectations for company performance remains stable over time.
- Innovative Technology – An accelerated availability of innovative technology enables us to identify opportunities to improve beyond current performance outcomes (or deliver current outcomes at lower cost) which, in turn, sets higher customer and local stakeholder expectations. Technological developments in demand management mitigates the need for further abstraction restrictions.

Step 4: Consolidation and monitoring

We do not expect that any given single plausible future will prevail consistently over the 25-year period. Instead, we expect to transition across plausible futures over the course of the next 25 years as new evidence emerges about the prevailing state of the world. This means that our actual cumulative investment for each ambition, as measured at any given point in time, may be some combination of discrete (non-overlapping) annual total costs over more than one scenario.

To understand how our cumulative investment profile for each ambition may take shape over time, we adopt an adaptive planning approach which complements our core pathway with a set of adaptive investment pathways for each plausible future. This enables us to articulate a single long-term strategy that allows for the possibility of transitioning between plausible futures at defined points in time.

How we define trigger and decision points

We first identify a set of common trigger points defined by the set of circumstances that characterise the emergence of a new plausible future that requires an adaptive investment pathway. There is high level uncertainty as to if and when futures might be realised. Therefore, our approach to setting trigger points for the next 25-year period is based on monitoring continuously a set of observable metrics over time.

This will allow us to update information as to when a trigger point is likely to be reached (as certainty increases) and creates a forward-looking monitoring framework allowing to work backwards from trigger points to decision points. At decision point, we review and carry out preparatory work to change course and follow the relevant adaptive pathway. The principles of the approach are provided in the figure below.

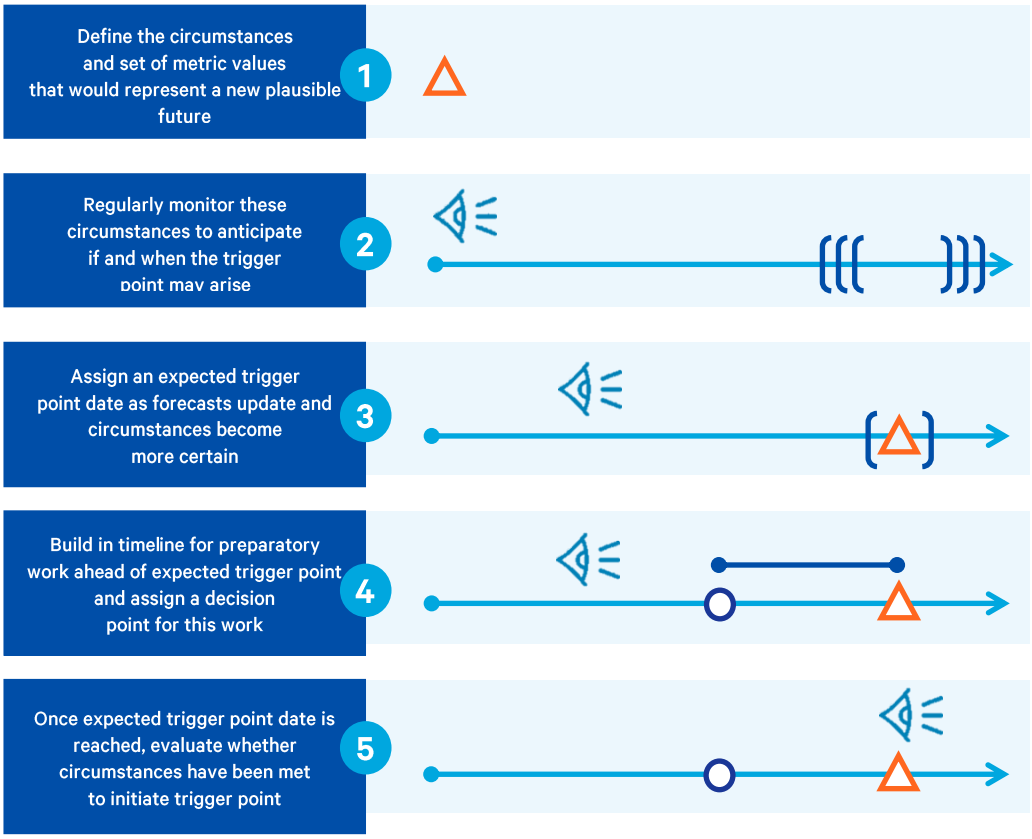


Figure 2629. Our approach to defining decision and trigger points

Our trigger point monitoring plan represents a flexible and practical approach to managing uncertainty. It allows us to set out a baseline of the current view on when trigger points might be expected to materialise, so that we can plan for any actions around the associated decision points needed in advance.

It also allows us to re-evaluate and update these trigger point and decision point timings as and when new information becomes available to us.

Applying this approach, we:

- ensure that we have clearly defined how such trigger points are expected to move us into different plausible futures; and
- have a clearly defined set of metrics in place, against which we can evaluate whether we have reached, or are expected to reach, a trigger point and therefore when decisions need to be made ahead of any trigger points.

How we assess changes in futures - decision-making process

The plausible futures that we have defined above cumulative by layer adverse or benign common reference scenarios on top of our 'baseline' future. In identifying the key trigger points and when these might be expected to occur, we therefore need to regularly evaluate whether:

- the conditions under each of the common reference scenarios have already breached their trigger point metrics based on the latest available monitoring metrics and data or
- the conditions are expected to be breached in the upcoming period based on trend analysis or updated external forecasts.

We evaluate this by asking the cumulative sequence of questions outlined in the decision tree summarised below.

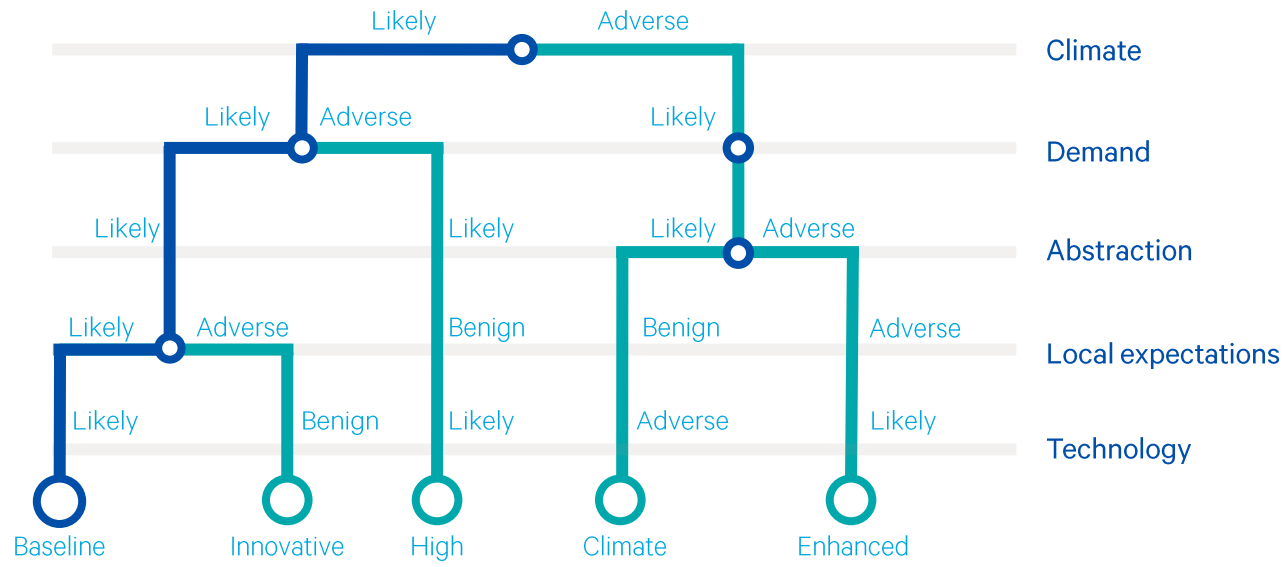


Figure 2730. Moving onto different plausible futures

For example, in each monitoring period we ask: have we already breached, or expect to breach in the upcoming period, the trigger point metrics for: climate change (adverse), demand (adverse), abstraction (adverse), local expectations (benign or adverse) and / or technology (benign or adverse).[21]

If the answer is 'no' throughout this sequence of questions we remain on our most likely Future. If we find that certain questions result in 'yes', depending on the combination of trigger points met, this may lead us to an alternative Plausible Future. This means that, whilst each monitoring metric is defined at the common reference scenario level, taken together it amounts to a Plausible Futures monitoring framework.

As part of our trigger point monitoring plan, we have defined the key metrics that we will regularly review to answer the sequence of trigger point assessments. We take a holistic, RAG-based approach to defining and monitoring the trigger point metrics which allows us to:

- account for a range of relevant contextual factors that may not be easily defined by metrics. While quantitative metrics can be more easily observed, some judgement will be required in weighing up the impact of other qualitative factors on each scenario
- bring together our assessment of each individual metric into a single view for each common reference scenario as to whether a trigger point is more likely to materialise.

Trigger points have been set taking account of customers preferences which impact the pace at which we deliver, obligations which set milestone targets on the way to 2050 and deliverability of the programmes of interventions needed to reach our 2050 goals. Once a trigger point has been identified as likely, we then revisit the investment profiling of the relevant adaptive pathway to ensure that interventions are deliverable in time to deliver our long-term objectives.[22]

This approach consists of three key steps:

[21] The sequence of these questions is based upon the cumulative structure of our plausible futures rather than the chronology with which we expect any given adversity to materialise over time.

[22] For example, based on today's best view of future, we have generated a set of trigger points and adaptive pathways beginning at specific points in time between now and 2050. These trigger points may occur earlier or later than we have currently anticipated. So, whilst our the adaptive pathways presented in this document have been are optimised to deliver our objectives with respect to the anticipated trigger point dates, we will need to reoptimise these investment profiles if trigger points happen earlier or later than anticipated.

First, we define a set of metrics against each of the common reference scenarios, based on a combination of national/regional statistics and sector/company measures where relevant (as set out in appendix A1). This includes identifying a regular period over which each individual metric will be reviewed and updated, which could be tied to when data becomes available (e.g. annually), or on a more ongoing basis.

Second, from this list of metrics, we classify the **lead metrics** for each of the common reference scenarios. In each case, these represent metrics that are both observable and quantifiable to allow for regular measurement and monitoring. For each of these lead metrics, we then identify a current set of 'baseline' values representing the measurement taken at the beginning of the LTDS from which we will measure the *change* in each metric over time.

We have developed a decision tree to inform how we will operationalise this monitoring framework and take action when required. This enables us to test whether a metric has changed materially since our last measurement and, if so, how persistent this change has been. Based on this, we derive a RAG status for each individual lead metric:

- if green: the measurement is either unchanged, or the change is limited, such that no immediate action is required. We will therefore continue to assess this lead metric as per the monitoring plan
- if amber: the measurement has changed materially, but this change has only been observed over a short time period. We will therefore flag for further monitoring and updates to assess whether this change does become more persistent
- if red: the measurement has changed materially and persistently over a sufficiently long time period. We will therefore take this forward to determine whether further action in moving towards and decision point and trigger point is needed.

Third, while these lead metrics provide an important view on whether a trigger point might materialise, further qualitative metrics also need to be considered in arriving at a robust and holistic view as to whether this is the case.

We bring our assessment of the lead metrics together with wider judgements on whether a trigger point is more likely to materialise by asking whether any further information has arisen regarding changes to our trigger point assessment. For example, this could include media coverage of certain issues and/or challenges facing the sector, or changes in government policy or legislation.

In bringing these qualitative judgements together, we will be able to take a more robust and transparent view in developing an overall RAG status for each common reference scenario and therefore whether we need to move to a decision point in anticipation of a trigger point materialising. An overview of our decision-making process is illustrated below.

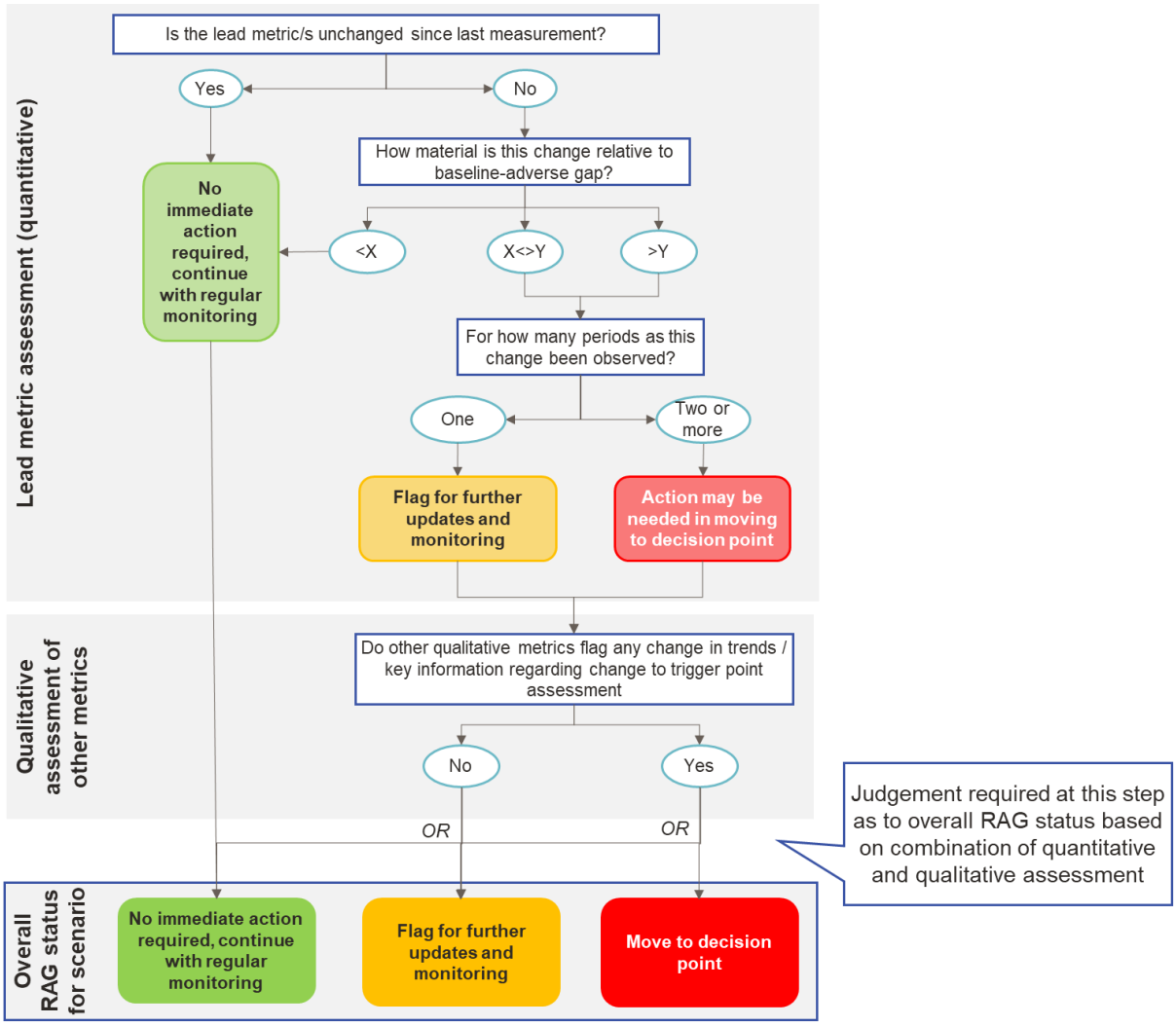


Figure 2831. Decision making processes for operationalising our LTDS monitoring plan

This approach will provide us with sufficient information at regular points in time to make informed decisions by ensuring that we continue to update and assess the relevant metrics at a granular level to flag any significant changes, while taking a streamlined and pragmatic approach as to when and how these feeds into any changes to our long-term strategy.

Common reference scenario testing

We have tested each ambition of our LTDS against Ofwat's common reference scenarios as well as against a bespoke scenario for Local Expectations. The detailed results from this testing approach are reported within each ambition section. The table below provides a heat-map showing where our plan is most sensitive to future uncertainty.

Table 30. Common reference scenario testing, Scenario testing of ambitions

Ambition	Climate	Demand	Technology	Abstraction	Expectations
Resilient water resources through healthy catchments	Medium	High	Low	High	Low
Controlled and managed wastewater flows	High	Low	Medium	Low	High
Maintaining top quality drinking water	Medium	Low	Medium	Low	High
Environmental gains and net zero	Medium	Low	Medium	Low	High

Key: Low or no impact; Medium impact; High impact

Results of scenario testing

Resilience water resources through healthy catchments is most sensitive to 'Abstraction Benign' and 'Demand Adverse' scenarios. With regards to abstraction, our sensitivity testing shows that, absent the enhanced environmental destination with abstraction licence capping assumed under our core pathway, we expect to deliver the required WAFU headroom using only our core pathway demand management options and therefore defer all investment in additional supply options. With regards to 'Demand Adverse' we find that persistently high demand places pressure on our existing capacity of water treatment works affecting our ability to provide resilient water services to customers.

The core pathway for this ambition will mitigate the risks of adapting to a Demand Adverse scenario by prioritising demand management and leakage reduction and we have included an adaptive pathway for a high demand future which includes expanding treatment capacity across our Littlehempston, Northcombe and Dotton water treatment works.

Top quality drinking water is most sensitive to 'Local Expectations Adverse' driven by pressure from local stakeholders and customers to reduce reliance on network flushing for managing discolouration, taste and smell of water thereby affecting our water quality contacts targets. We also find that 'Climate Change Adverse' has a material impact due to increased propensity for algal blooms and surface run-off.

The core pathway for this ambition takes steps to mitigate risk of adapting to Local Expectations Adverse by adopting an 'opportunistic' approach to lead pipe replacement as part of our business-as-usual network improvement plans throughout AMP8 to realise joint benefits where this is possible. Our core pathway will mitigate risks of adapting to a Climate Change Adverse by initiating low-cost enabling works that support the rapid deployment of mobile PAC treatment as a temporary shorter-term measure to mitigate the risk posed by algae blooms. This will allow us to phase the delivery of permanent GAC treatment at these sites as we build our understanding and prioritisation of risk to changing raw water conditions.

Controlled and managed wastewater flows is most sensitive to 'Local Expectations Adverse' and 'Climate Change Adverse', driven predominately by impacts to the risk of sewer flooding in a 1-in-50 year storm. These scenarios affect how much surface water we will need to manage over short periods of time.

The core pathway for this ambition is designed to mitigate this uncertainty by investing earlier in nature-based and sustainable drainage solutions whilst allowing for the pressures such as climate change to be accommodated when needed. Ultimately this means the bills that customers pay are greater in later years, especially if more severe future scenarios turn out to be true. Based on customer feedback, our core pathway investment also accelerates the delivery of SODRP targets which will strengthen our resilience to emerging adverse scenarios.

Environmental gains and net zero is most sensitive to 'Local Expectations Adverse', driven by a loss of availability of agricultural landbank for bioresources product that would require significant capital investment in alternative disposal facilities such as incineration.

The core pathway for this ambition is designed to mitigate this. We plan to invest in small scale advanced thermal conversion facilities. These facilities will act as pilot programmes to investigate potential benefits of scaling up in future AMPs. We will also invest in a strategic reserve storage site which as a means of mitigating risk of sudden reduction in landbank availability in the near to medium term.

Fairness and affordability of our LTDS

We have set out stretching and ambitious plans to further enhance affordability for all, whether currently at risk of struggling to pay, whether current or future customers. As part of our PR24 Affordability and Acceptability research, our customers have told us that our plan focuses on the right things and is good for future generations.

Our research shows customers are supportive of investment areas they believe are in need of improvement such as the use of storm overflows and ensuring supply resilience, even though they have the greatest impacts on customer bills. Our proposed plan is seen as better value for money than the 'must do' plan, as the investments improve service and help lower bills in the longer-term.

Customers were generally highly supportive of the need for investment, with those accepting the plan citing that it was a good plan for future generations and focuses on the right things. 78% of households feeling able to answer the question prefer an increase in bills to start sooner, spreading increases across different generations of bill-payers, and only 22% prefer an increase in bills to start later, putting more of the increases onto younger and future bill-payers. This support is clear across all regions and segments, with even support from those struggling to pay at 68%.

Those rejecting the plan felt that water companies should pay for more from their profits, or that profits are too high. We recognise the need to communicate more with customers about these elements of our organisation, and our unique WaterShare+ model will allow for increasing transparency and challenge around issues such as executive pay and dividends, to ensure we rebuild trust with our customers and communities.

Foundation

Our foundations represent the evidence and assumptions that input into our decision-making processes and underpin our LTDS. Where there is future uncertainty over our evidence we adopt assumptions, based on a framework that provides a clear line-of-sight between an evidence-based observation, such as a trend or activity that could change in the future, and a most-likely future state of the world. Our evidence and assumptions are summarised below.

Figure 2932. Assumptions and evidence for our foundation

Evidence

Our LTDS is built on a robust evidence base that informs what we need to deliver, what we need to do to deliver and what this means for customers. This comes from:

- understanding our obligations and effectively engaging with communities and customers
- identifying the contribution of base expenditure to our goals and deploying analytic and decision-making tools to evaluate optimal enhancement solutions and
- understanding how this will impact customer bills.

In this section we step through the key building blocks of evidence that have fed into our LTDS and how we have assured that it is robust.

Obligations

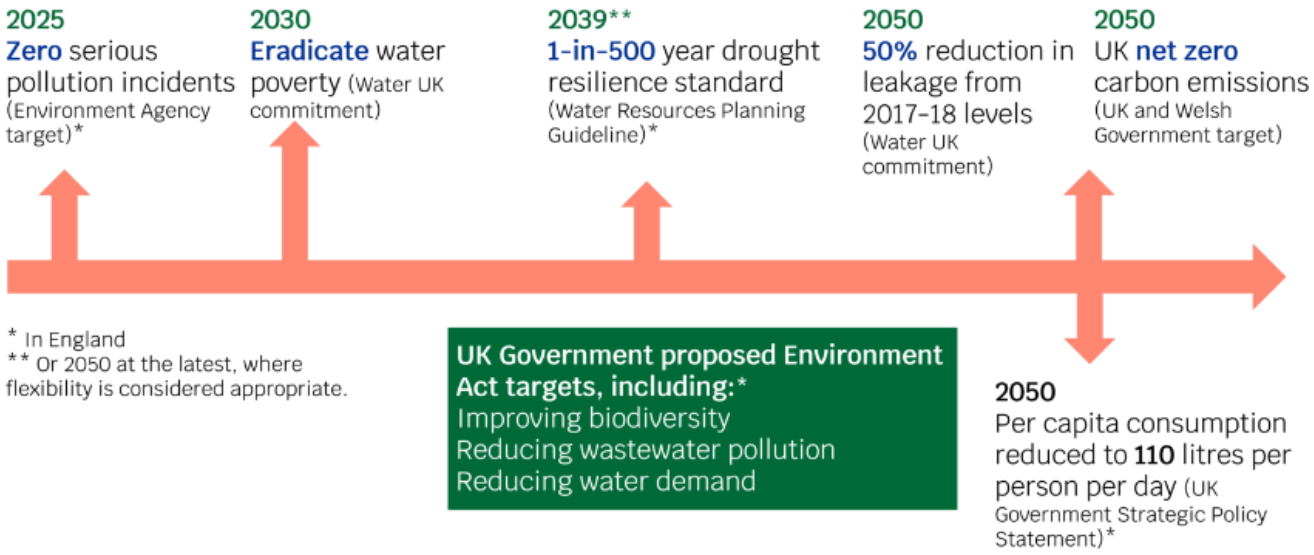


Figure 3033. Building blocks of evidence for LTDS

Research and consultation

Our LTDS is based on the priorities of customers and stakeholders in our region and how they want us to invest for our local needs. Our Strategic Direction Statement and PR24 business planning process has involved them directly engaging through surveys, workshops, focus groups and interviews to build up our insights for our LTDS.

We have conducted research over four phases. This has allowed us to provide structure to the research and ensure inputs to the business planning process are carried out at the right time.

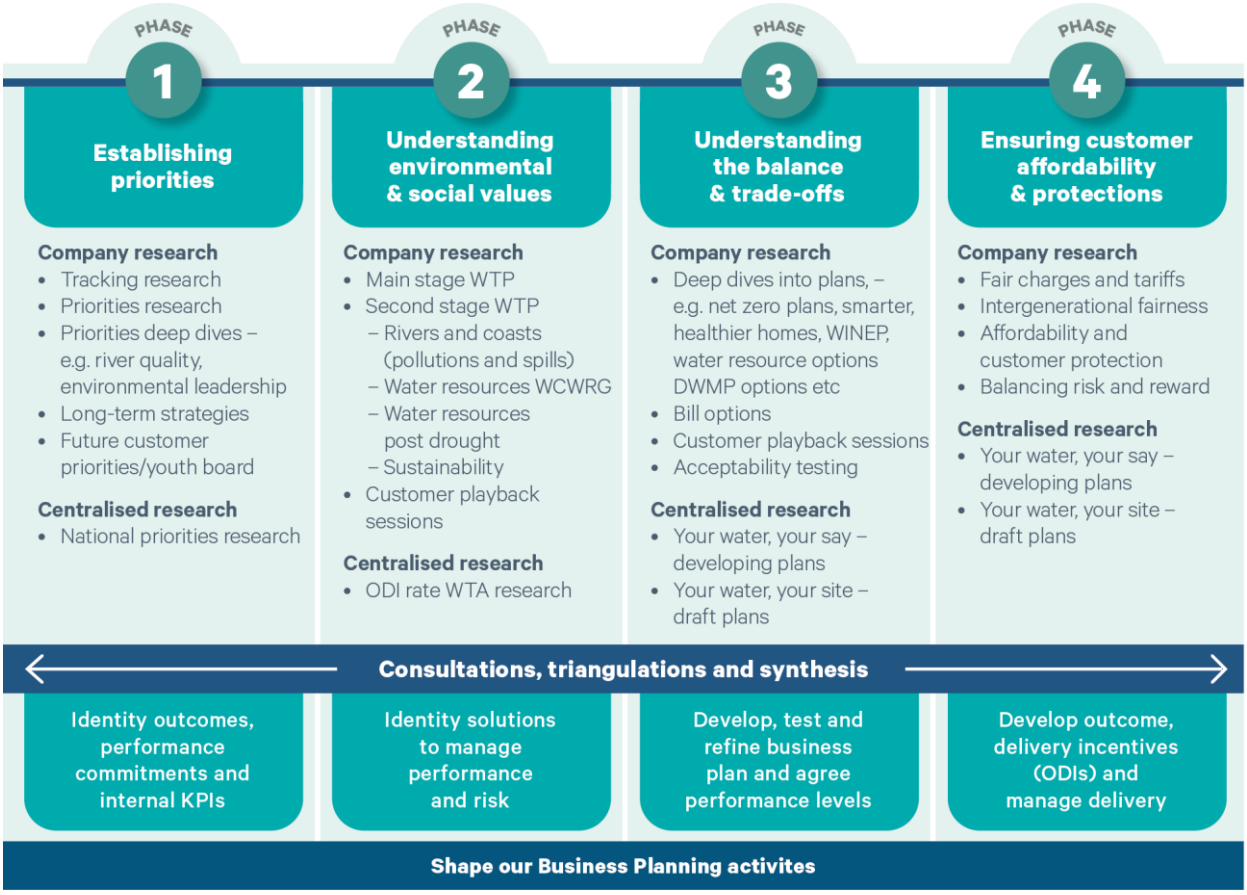


Figure 3134. Our approach to customer research and consultation

Through an updated sampling strategy and segmentation analysis, we have ensured that the research we have carried out has a wide reach and is representative of the customers we serve, including harder to reach customers:

- future and younger members of the communities
- vulnerable customers are heard to understand their specific needs
- customers in all regions – Isles of Scilly, Bristol and Bournemouth are included in the research
- Non households and retailers
- Stakeholders (through an aligned but separate workstream).

We achieve this through a range of forums and research methods, including focus groups, workshops, surveys and one-to-one interviews. The design of the research aims to be interactive and engaging. Our engagement is run by experts in water regulation and engagement so that the 'conversations' with customers on specific topics are understandable and ensure that the insights gathered are robust.

Preferences and priorities

Aside from our statutory and non-statutory obligations, our investment decisions are steered by the service and performance outcomes that our customers and stakeholders most value. To understand where investment delivers the greatest marginal benefit, we undertake regular 'Willingness to Pay' research to that uncovers information on how much customers are prepared to pay (through their water bills) to achieve improved outcomes.

In updating our core Willingness to Pay programme, we draw on a wider set of data including Ofwat's own research, to provide 'triangulated' values for use in best value planning and incentive setting. We have used independent feedback from Frontier Economics and other peer reviews, including academic experts in willingness to pay. The WaterShare+ Panel provides oversight and input, providing a link between engagement and decisions in the plans.

Performance from base expenditure

Base expenditure is the maintenance cost required to keep delivering the current levels of service across all of our core business activities. In assessing our base maintenance needs, we use a suite of investment and risk optimisation models to understand the underlying risks to performance and service as a result of asset aging and condition deterioration.

However, we also continually look for opportunities to deliver improvements to our current performance level from base expenditure where this is achievable. These performance improvements from base expenditure set the 'baseline' on top of which our enhancement investment programmes can deliver a step-change in performance for customers and stakeholders. It is therefore important that the targets we set in our LTDS consider this expected baseline level of ongoing improvement, to ensure our enhancement schemes are stretching and delivering value for money for customers.

We have forecast the Performance Commitment Levels (PCLs) expected to be delivered through base expenditure alone (referred to by Ofwat as 'what base buys') before setting the 'stretch' that will be delivered through enhancement schemes.

These forecasts have been derived through a separate 'bottom-up' (econometric) and 'top-down' (trend) analysis of historic data, conducted by external economic consultants, before being assessed by asset management and operational experts to triangulate the analyses and arrive at an agreed forecast position for 'what base buys'. These analyses use historical data on base expenditure, our own PCLs, adjustment factors to account for the impact of historical enhancement investment on PCLs and changes to the definitions of PCs over time.

The results of this analysis are reported in our LTDS data tables, with a snapshot summary provided in the chart below, showing the share of performance improvements we expect to deliver through our base expenditure versus the share delivered from enhancement investment.

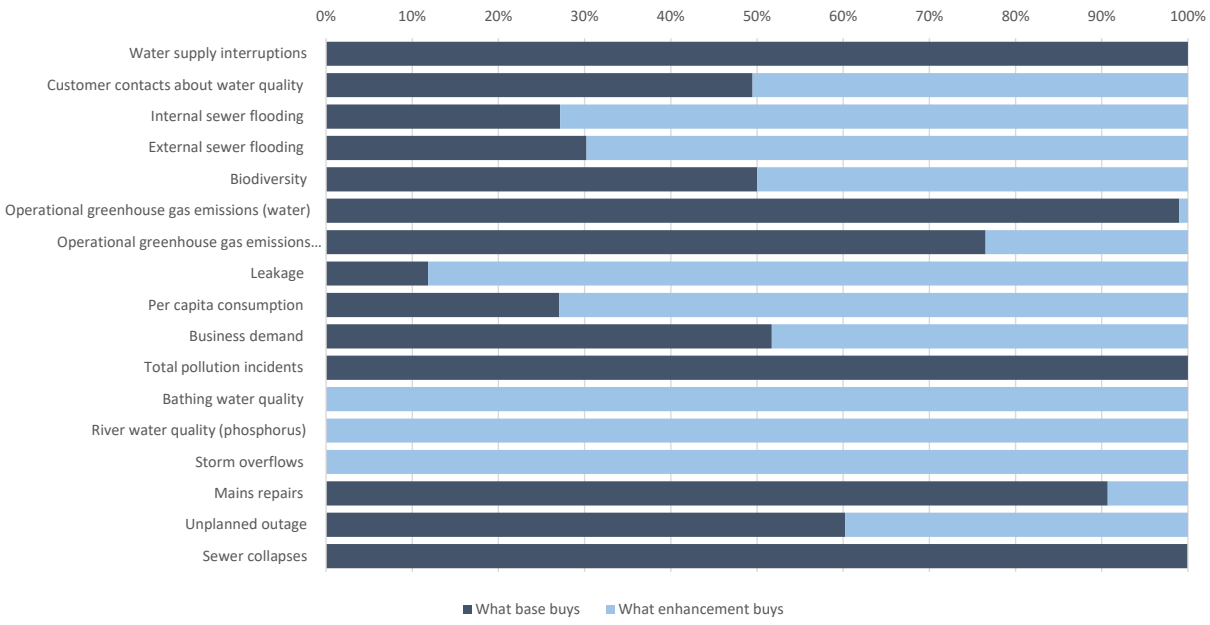


Figure 3235. Contribution of base expenditure to performance

Data and analysis

Our decision-making tools are only as effective as the data which they rely on, in particular the costs and benefits of different investment options and how these are influenced by changes to structural conditions (common reference scenarios). For this reason, we undertook an extensive asset condition survey programme ahead of PR24 planning in addition to our normal programme of inspections during routine maintenance activities. Our survey programme included inspection of approximately 9,500 key Civils and MEICA assets at 21 water treatment works, 37 wastewater treatment works, 9 water pumping stations and 10 sewerage pumping stations. Pumping stations have been selected that are representative of our asset base. These surveys covered approximately 5,000 individual assets.

Incremental capital and operating costs are estimated through a rigorous cost benchmarking assessment which uses historic data where available, performing a set of adjustments to arrive at a generalised unit cost estimate that can be appropriately applied in different contexts.

The marginal benefits of our options are based on the impact that they have on our service or performance outcome measures. To quantify and compare this impact across different outcomes we apply a valuation methodology rooted in customer and societal willingness to pay research – as previously described.

Assumptions

Our LTDS sets out the areas of greatest uncertainty affecting the delivery of our ambitions over the next 25 years and how these have been accounted for. The most material areas of uncertainty affecting long-term enhancement investment decisions are built into our adaptive planning approach as individual scenarios (as described in Section 3). Beyond these scenarios, there are a broader set of uncertainties for which a reasonable most-likely central assumption can be drawn from available evidence.

To achieve this, we have developed a framework that provides a clear line-of-sight between an evidence-based observation, such as a trend or activity that could change in the future, and a most-likely future state of the world. From here, we articulate the impact mechanism through which this future state may affect the delivery of the LTDS. Lastly, we outline how we will continue to evidence this assumption across the next 25 years. This framework is summarised below.

Assumption	The most-likely future state of the observation over the course of the next 25 years, including how this is expected to evolve over time.
Observation	An external trend or stakeholder activity which may change in the future with the potential to affect how we will deliver our long-term ambitions, but which we cannot accurately model.
Impact	How the observation impacts the delivery of our long-term ambitions and the consequences that this has for the development of our LTDS.
Evidence	The underlying sources of evidence on which our assumption has been based, and the frequency with which this evidence will be revisited over the course of the next 25 years.

Figure 3336. Our LTDS assumption framework

The assumptions underpinning our Foundation fall into six key themes:

Government policy, legislation and regulation (Themes 1 to 3) inform both our statutory commitments and also the frameworks within which our company operates. Factors within this theme include changes to infrastructure policy, environmental legislation and the regulatory regime which govern our strategic planning frameworks. Overall, we have assumed a stable trajectory in line with existing objectives and commitments which will provide our investors with reasonable certainty over the future direction of the sector.

Society and customer attitudes and behaviours (Theme 4) affect our ability to deliver our strategy. Patterns of urban creep and transitory migration are expected to follow the existing available forecasts. We do not otherwise assume any further systemic changes to customer behaviour beyond those driven by government policy (e.g., via water labelling policies).

Wider economic conditions and climate pathway (Theme 5) affect the business environment that we operate in and the cost and availability of the inputs we need to deliver our long-term ambitions, across both upstream labour and capital markets. Overall, we have assumed economic conditions will be stable and will provide us with access to markets and resources needed to deliver our ambitions, whilst climate pressures will not exceed those reflected in our common reference scenarios.

Asset performance and technology (Theme 6) of our physical network affects how much base expenditure is required to maintain current service levels and, therefore, our ability to fund additional enhancement activities. Our LTDS assumes that we will be able to fund our base maintenance requirements going forwards given the projected rates of asset deterioration, with access to new technologies emerging no sooner than reflected in the common reference scenarios.

In the remainder of this section we set out each of our individual assumptions according the LTDS assumption framework.

Theme 1: Government policy, legislation and regulation

With regards to government policy, we expect a stable trajectory in line with existing objectives and commitments which will provide our investors with reasonable certainty over the future direction of the sector. We expect that the governments 'Net Zero' commitments will remain a priority and, in line with this, that there will be local government support for increasing sustainable urban development.

Table 31. Assumptions, Government policy, legislation and regulation

Assumption	Observation	Impact	Monitoring
Changes to the political landscape will not materially impact the structure of investment in the industry	Whilst there have been numerous changes in government administrations and a number of significant political events (e.g., Brexit) in recent years, there has been no material impact on the cost of capital or appetite for investment in the water industry	There will be no significant change in the drivers of our business operations	We will continue to monitor stakeholder and customer insights related to political events
Our Net Zero commitments will retain their current level of prioritisation	Our ongoing engagement with stakeholders indicates a continued emphasis on climate-related objectives and the government continues to position Net Zero as a legally binding priority out to 2050	We will echo the priorities of society and the government in holding our own Net Zero strategy at the heart of our long-term ambition	We will continue to test our stakeholder's priorities and government agendas
Reduction in PCC to 110 l/p/d is contingent on Government and Local Authorities implementing sustainable housing policies	Trends in social values and government policy agenda are driving more sustainable consumption behaviours, which has manifested in increased number of sustainable housing schemes across our catchment. This is having the effect of driving down water consumption through increased uptake of eco-friendly technology	Reduction in PCC will moderate the overall increase in demand driven by population growth, alleviating pressure on the supply-demand balance of our WRMPs	We will continue to engage with Local Authorities on sustainable housing development policies and trends
All new local development schemes will include sustainable drainage systems	A review by the Department for Environment, Food and Rural Affairs (Defra) has approved mandatory inclusion of sustainable drainage systems from 2024	Whilst urban creep will continue to increase the overall cost of managing surface water runoff, the relationship between new developments and surface water runoff will reduce	We will continue to engage with Local Authorities on sustainable housing development policies and trends

Theme 2: Regulatory regime

We expect that broader regulatory and licencing framework with remain stable out to 2050, with the five-year price control period remaining the key mechanism through which successive business plans will be agreed and funded. In particular, where existing planning frameworks already adopt long-term horizons, we expect that these will remain unchanged.

Table 32. Assumptions, regulatory regime

Assumption	Evidence	Mechanism	Monitoring
The current regulatory regime for the water and wastewater industry will remain unchanged	Changes in the regulatory regime to date have been based on incremental evolution done in close consultation with the sector and customers. There is no current or expected consultation on fundamental changes to the way Ofwat regulates our activities	We will continue to operate under five-year price control reviews, with statutory planning and water industry ownership structures remaining unchanged	We will continue to engage closely with Ofwat, both formally and through working-groups, on proposed changes to the regulatory regime
Pennon will submit high quality PR24 business plans with minimal differences between original submissions and final decisions	The PR14 and PR19 price review processes did not materially change enhancement funded outcomes and changes to overall allowed costs did not lead to underperformance	There will be no material changes to the outcomes planned in the PR24 business plans linked to enhancement funding	We will continue to engage with Ofwat across future price control consultations
Company and regional WRMP frameworks will remain unchanged	Regional plans have been developed with a long-term planning horizon and we continue to see these as effective and understand their permanence	Our current and future plans will be based on the current planning guidelines	We will continue to engage with customers and Ofwat on the effectiveness of the existing planning guidance and any proposed changes

Theme 3: Health and environmental legislation

Our long-term ambitions cover a period of 25 years and are based on statutory obligations that we can reasonably observe or anticipate today. However, it is likely that the definitions and thresholds associated with existing obligations may change, priorities may move, or that entirely new policies or outcomes may emerge. Whilst we recognise this uncertainty today, our LTDS must begin by being rooted in our current understanding of future policies and legal and regulatory requirements.

Based on the evidence available at the outset of the LTDS, we do not assume material changes to legal standards. However, we do find evidence to inform an assumed decrease in the legal standards for lead traces in drinking water in the long-term as detection rate of technology improves.

Table 33. Assumptions, health and environmental legislation

Assumption	Evidence	Mechanism	Monitoring
Lead standards will remain at 10µg/l until at least 2035, with reduction to 5µg/l by 2040 and no detectable lead by 2055	DWI research advocates for the ability for water companies to manage the removal of lead from drinking water by 2055	The pace of lead standard reductions will act as a backstop to our planned profile pipe replacement over the next 25 years	We will monitor guidance from DWI
There will be no legal requirement for water companies to introduce fluoridisation to water supplies in the UK or for removal of Microplastics and per-and-polyfluoroalkyl (PFAS)	DWI long-term planning guidance does not indicate toward a need for widespread fluoridation	We have not included the provision of fluoridation, or any associated activities, in our long-term water quality plan	We will continue to monitor guidance from DWI to ensure we can respond in a timely manner
Supply-pipe ownership remains with the property owner and there is no expectation for Pennon to adopt private supplies at their expense	We have not observed any indication that the responsibilities for supply pipes will differ from the way in which they are shared now	The size of our network will not increase materially due to the inclusion of supply-pipes	We will continue to engage with customers and Ofwat over the boundaries of responsibility for supply pipes

Assumption	Evidence	Mechanism	Monitoring
There will be no material changes to the environmental destination beyond that outlined in the common reference scenarios	The 25 Year Environment Plan sets out an ambitious agenda for the next 25 years, aiming to improve the environment for the next generation with specific targets for sustainable abstraction	There will be future obligations on water companies through WINEP though those exact obligations may not be fully known right now	We will continue to engage with our community and the Environmental Association
Abstraction reduction limits will not be more stringent than outlined in the common reference scenario		We will not test for higher abstraction reduction scenarios than the common reference scenarios	

Theme 4: Stakeholders

Beyond the formal frameworks within which we operate, our LTDS is shaped by the communities we serve and the pressures this may place on our asset base. Pressures are expected to increase with population growth and continued urban creep across our catchments. We also do not find it plausible that PCC will reduce materially beyond average target levels of 110 l/p/d.

Table 34. Assumptions, stakeholders

Assumption	Evidence	Mechanism	Monitoring
Resident population growth will equal ONS forecast	Population projections have historically fallen within the forecasted range from the ONS	We will not test demand scenarios beyond the thresholds specified by the Ofwat common reference scenario specifications	We will continue to monitor outturn in forecast and actual population growth forecasts from ONS and Local Authority projections
The rate of urban creep will be between 0.4 and 1.1 m2/house/year	Impact of Urban Creep on Sewerage Systems, UK Water Industry Research (UKWIR)	We will increase our drainage water volumes in line with the UKWIR urban creep assumptions	We will monitor local urban creep statistics from UKWIR outputs
Absent policy intervention, there will be no material changes to customer behaviour in the short-term beyond those reflected in our PCC projections	Whilst we have been successfully undertaking focused activity on reducing PCC, we have not seen a significant shift in customer consumption rates over this period	Customer demand for water will not exceed 110 l/p/d by 2050 as per our WRMP projections	Monitoring metrics developed under the WRMP will be used to evaluate this assumption going forwards
There will be no significant increase in tourism or transient population growth, with PCC for these customers equal to residential customers on average	Apart from the 2020-21 Covid-19 period, we have not observed marked year on year increase in tourism or transient population growth	Fluctuation in seasonal demand will remain within current levels, without increasing pressure on our systems beyond what we observe today	We will review ONS population statistics and Local Authority information regarding seasonal and transient population flows into our catchment
Beyond the parameters considered in the SWW company-specific scenario, customer and stakeholder expectations for the outcomes that Pennon will deliver will remain unchanged up to 2050	The outcomes that Pennon will deliver will remain unchanged up to 2050 (Assumption). Our customer research and engagement programmes undertaken over the last two price control reviews has indicated marginal, but not material, shifts to expectations of the Pennon business.	The outcomes our customers and stakeholders expect of us will not change out LTDS ambitions or the level of outcomes underpinning them	We will continue to engage with customers and monitor political and media sentiment around our long-term ambitions

Theme 5: Wider economic conditions and climate pathway

The assumptions regarding the wider set of economic conditions include factors which less directly affect activities in water sector. Whilst long-term macroeconomic predictions are often set within broad confidence intervals, their impact on the activities in the LTDS are not expected to be as material as legal standards and regulatory policy which directly apply to our business.

The key interaction between economic conditions and our LTDS is in the cost of the inputs we will need to deliver our outcomes, from capital to labour. However, we do not find evidence to suggest that there will be material change to current levels.

The prevailing climate change projection, on the other hand, will have a much more material impact across a wide range of the outcomes in our LTDS.

Table 35. Assumptions, wider economic conditions and climate pathway

Assumption	Evidence	Mechanism	Monitoring
There will be economic stability in the UK out to 2050	Although there have been periods of 'short term' economic instability, CPI/CPIH have remained at relatively stable levels over the past 50 years. Wider measures of economic stability such as unemployment also support this	Whole life cost options appraisal to use future costs that are not materially different from those seen today	We will review Government CPI/CPIH historic and forecast trends as part of our business planning process going forwards
The UK will have the appropriate skills bank to deliver upon the plans we have made	Historically we have always had the support of the local economy and supply chain sufficient to deliver our plans and we have invested in our local economy to support this	The plans that we have described will be delivered by the workforce available. We will not have to invest more per person in our workforce than we already do today.	We will continue to work closely with local partners, including our Upstream Thinking Partners, universities and colleges to develop the supply chain necessary to respond to these programmes
There will be no material change in employment levels seen in our region	Although employment rates have historically varied, we have seen them stabilise over the last 5-10 years with economic prosperity in Pennon catchment populations	Affordability will not be materially different to what we experience today	We will monitor ONS regional labour market statistics
Energy prices will remain largely stable	Whilst geopolitical events have caused short term increases in energy prices, these have largely stabilised and market pressures are expected to ease in the medium to long term	Future whole-life cost options appraisals will not use materially different energy costs than those used today	We will continue to monitor Department for Energy Security and Net Zero (DESNZ) energy price forecasts
Climate change will not exceed the RCP 8.5 projection	Whilst we have seen changes in climate in our region, we have no reason to expect the range of climate change to exceed Ofwat's common reference scenarios	No modelling to be undertaken beyond RCP8.5	We will monitor regional climate trends through our trigger point monitoring framework for common reference scenario.

Theme 6: Asset performance and technology

Our assumptions regarding asset performance and technology are key to all base and enhancement activities which are delivered through our physical infrastructure. In particular, the rate of asset deterioration and base funding requirements will affect our ability to deliver enhancement activities.

Based on the available evidence, we assume that we will continue to be able to maintain our existing levels of service through sufficient base funding.

Table 36. Assumptions, asset performance and technology

Assumption	Evidence	Mechanism	Monitoring
Our base investment requirement for maintaining asset health will equal allowances	Our underlying asset failure rates and asset condition has not materially changed	We assume incremental improvement through base allowances and our schemes are designed with correctly forecast asset lives and future maintenance needs	We will revisit base maintenance requirements through price control reviews
Deterioration modelling based on past experience is a fair representation of the future asset performance	We have used deterioration modelling successfully over the past 20 years to inform our investment needs	We will continue to use deterioration modelling as an input into our strategy decisions	We will continue to draw inferences from our asset deterioration modelling as new data becomes available

Assumption	Evidence	Mechanism	Monitoring
Technology will not become available faster than the projections made in the common reference scenario	Historic efficiency improvements from technology have been incremental rather than step-change and current horizon scanning does not revise this expectation going forwards	We will remain on current trend efficiency path until at least 2035	We will monitor technology trends through our trigger point monitoring framework for the technology common reference scenarios

Accounting for wider uncertainty

Our LTDS adopts a robust and proportionate approach to mitigating risk from future uncertainty, focusing our adaptive planning efforts in the areas where expected impacts are most material, future states most uncertain and pre-emptive planning most suitable. Error! Reference source not found. sets out our overall approach to uncertainty which categorises and accounts for risk according to a decision-tree based on the principles of proportionality and the effectiveness of mitigation activities.

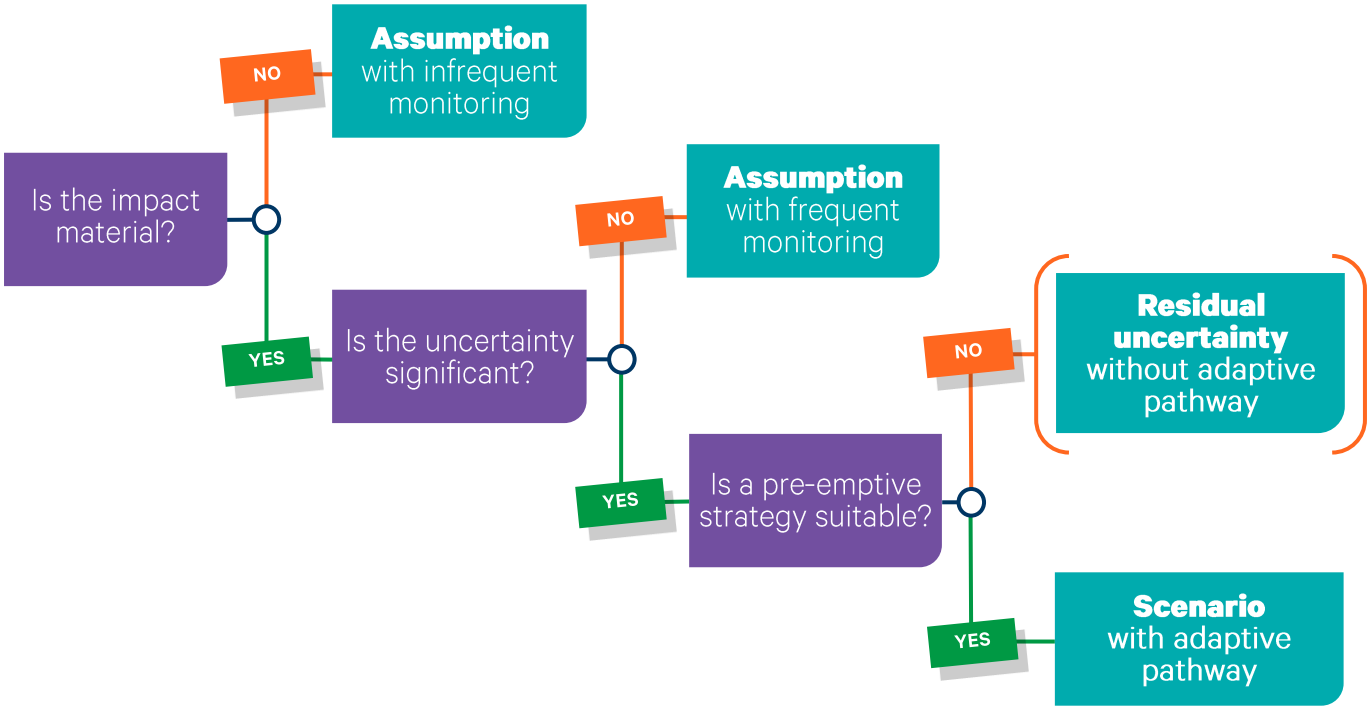


Figure 3437. Our approach to mitigating risk from future uncertainty

In the above diagram we show how we use assumptions, scenarios and residual risks, to manage future uncertainty in our LTDS. They are explained below:

- **Assumptions** are adopted for areas of uncertainty with low materiality or expected future variability.[23] The frequency with which assumptions need revisiting will depend on the degree of uncertainty around the assumption[24]

[24] For example, the evolution of the regulatory regime is relatively stable over time compared to market trends (e.g., customer behaviour). We therefore propose to focus relatively more effort in monitoring and anticipating the latter compared to the former as part of our assumption monitoring framework.

- Scenarios are adopted for material areas of uncertainty where pre-emptive adaptive planning is proportionate and effective at mitigating the risk before it materialises. This includes areas of uncertainty which require reallocating significant resources in order to mitigate impacts, and where a trigger point monitoring framework enables decision-makers sufficient foresight to do so in a reasonable time frame[25]
- **Residual uncertainty** captures possible future states which have a material and uncertain investment impact but which have limited value as a company-specific scenario for the purposes of adaptive pathway planning. This is either because there is limited scope for pre-emptive action or else it would not be proportionate or effective to do so.

This final category includes impacts which cannot be reasonably pre-empted or mitigated ahead of time such as the Covid-19 pandemic. Whilst it is not proportionate to reflect all areas of uncertainty within adaptive planning or monitoring framework we must ensure that we are able to respond effectively to mitigate potential adversities or benefit from unforeseen opportunities.

Board assurance

We have followed a board assured process to develop and challenge the development of our long-term strategies. The Board has been involved and focused in the following areas:

- Each year in September there is an annual board strategy day focused on the longer-term direction of the company. This was the start of the PR24 process in the main in September 2021
- Review of dedicated customer engagement to inform strategic direction and our strategic framework plans
- Review and challenge of the evolution of strategic plans and board assurance over submissions (DWMP, WRMP, Drinking water submissions to the DWI)
- Development of Strategic Direction to 2050 – including individual 1-2-1 engagement with Board members on key features of our future strategy
- Updates on the development of long-term plans and LTDS at PR24 Board Committee meetings
- Direct feedback from the WaterShare+ Panel following review of our strategic plans and emerging LTDS, through regular attendance of Panel Chairs at Board meetings, and Board Committee chair attendance at WaterShare+ meetings
- Review of third party assurance on our LTDS, including strategic and technical assurance.

Table 37. Board assurance

Statement	Board review
The Board has challenged and satisfied itself that the LTDS reflects a long-term vision and ambition that is shared by the board and company management	Board sets the long-term strategy and vision for the business. As part of a listed group, this is published each year in the Annual Report. The Annual Report 2023 sets out long term challenges and targets we face, how we are responding and our ambitions and strategy to 2050 – for all stakeholders Board and Board Committee meetings are used to discuss and challenge future direction given regulatory requirements, actual and potential future legal duties, customer needs and research outcomes Board has shaped and challenged our business plan and long-term direction. Through Board Committee and 1-2-1 meetings, our Strategic Direction to 2050 is based on Board direction, setting out the key trends we observe, the challenges we face, and ambitions and strategies that we have. This was summarised in the 2023 Annual Report
The Board has challenged and satisfied itself that the LTDS is high quality, and represents the best possible strategy to efficiently deliver its stated long-term objectives, given future uncertainties	At each stage of the PR24 process the Board has reviewed strategic documents and submissions and technical assurance documents Board has reviewed the development of our overall plan and LTDS, including feedback from discussions with regulators, customers and stakeholders, allowing them to challenge assumptions and objectives Board has reviewed plans and reflected challenges back into our plans. For example, through challenges to the run rates of investment we have revised our plans (e.g. lead, storm overflows)

[25] In practice, our scenarios are defined as 'plausible futures' which bring together probable combinations of Ofwat's common reference scenarios and Pennon's company-specific scenario.

Statement	Board review
The Board has challenged and satisfied itself that the LTDS will enable the company to meet its statutory and licence obligations, now and in the future	Board has overseen, challenged and the building blocks of the LTDS, including DWMP, WRMP and long-term water quality strategy have followed a Board Assured process Board has received technical assurance on each of these components and the overall LTDS – including confirmation that plans meet legal duties and evidence and third-party validation of our capability to deliver
The Board has challenged and satisfied itself that the LTDS is based on adaptive planning principles	Board has received technical assurance which confirmed that our LTDS is based on adaptive planning principles
The Board has challenged and satisfied itself that the LTDS has been informed by customer engagement	We have taken the WaterShare+ through all of our long-term plans – WRMP, DWMP, DWI. Our regulators attend and participate in WaterShare+ meeting, and many of our meetings are held in public Board has received regular updates on how customer engagement has shaped our plans. It has also heard directly from our WaterShare+ customer challenge panel. Technical assurance has confirmed the line of sight between customer engagement and our plans
The Board has challenged and satisfied itself that the LTDS has taken steps to secure long-term affordability and fairness between current and future customers	Board has reviewed and challenged information on the pace and sequencing of information within our LTDS and the balance between expenditure now and in the future. This has included challenging run rates and pace of investment - water resources, lead, and storm overflows. Board is championing progressive charging research and proposals reflected achieving fairness between current and future customers Board has regular updates and review of our affordability and fair charging strategies.
The Board has challenged and satisfied itself that the 2025-30 business plan implements the first five years of the long-term delivery strategy	Our AMP8 plan has been developed in tandem with our LTDS. Board has received external assurance to confirm the alignment between short- and longer-term strategies
The Board has provided evidence of where it has challenged company management and an explanation of the process it has used to arrive at the view that its strategy is the best it can be	The Board drives the future ambition and strategy of the business. As part of a listed group, our ambition and strategy are published each year in the Annual Report. The Annual Report 2023 sets out long term challenges and targets we face, how we are responding and our ambitions and strategy to 2050 – for all stakeholders Annual Board Strategy Days test and challenge the direction and future strategy of SWW and the group overall, including strategies that are embedded into our plans and tested with customers

Holding ourselves to account

The LTDS will be fully integrated into our existing governance framework.

Trigger point metrics which have been identified within our monitoring framework will be reported quarterly via the Investment Planning Committee; a body which exists to oversee in-AMP capital investment programme, and to ensure that all decisions are aligned to the Final Determination, regulatory commitments and overall company strategy. Monitoring of these metrics will be the responsibility of the asset management function, and the Investment Planning Committee will receive a report each quarter on the status of trigger point metrics, noting the direction of travel and any risks.

Annually, at the Board's Strategy Day, the Board will be presented with an update on the LTDS and any risks which may necessitate moving to an alternative pathway. These annual reports will support the business planning process for PR29 and beyond.

Finally, as part of our Annual Performance Reporting we will publish an update on our LTDS including an assessment of the trigger points. In doing so, our process and reporting will be transparent and available to our customers, regulators and stakeholders.

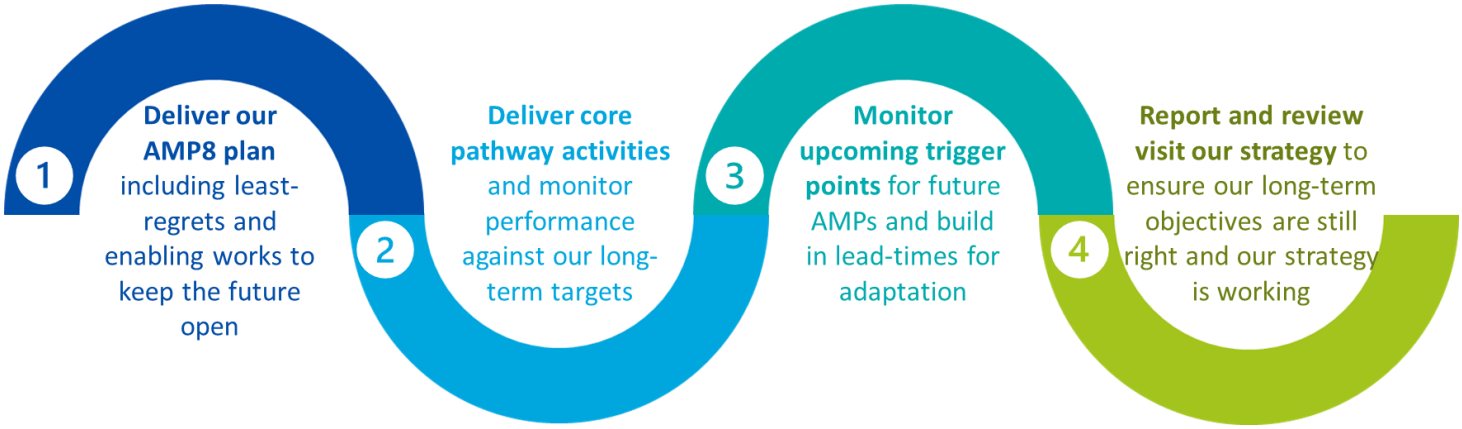


Figure 3538. Implementing our LTDS

As a provider of essential services we are used to planning for the long-term and dealing with uncertainty. The LTDS framework has provided an additional tool to ensure that we are planning holistically and adaptively across our business. It has already delivered additional benefits in terms of its transparency for our stakeholders and our readiness to adapt quickly to new circumstances.

WaterShare+ Customer Advisory Panel

The WaterShare+ Customer Advisory Panel is an independent group of customer, business and social representatives.

In response to customer feedback we launched our WaterShare+ initiative in 2020. For our New Deal Business Plan for 2020-25, we promised lower bills, improved service, better environmental protection, a stake and greater say in what we do, and a commitment to share successes if we beat our targets. In the space of three years, we have achieved something never seen before. 90,000 customers, four times the number of institutional shareholders, now have a direct say in how South West Water is run. This is the equivalent of 1 in 14 households in the South West.

As customers help shape and deliver our plans, it is only right that they are offered a real stake in the business and a greater say in what we do and how we do it. So, in 2020 we launched a first-of-its-kind shareholder scheme for customers – giving them the opportunity to get involved, hold us to account and share in successes.

Alongside, an independent WaterShare+ Customer Advisory Panel was established to protect the interests of our customers – it provides an independent review of our commitments and delivery of our promises as the voice of the customer. Customers from all regions have the opportunity to join the regular public meetings held by the Panel, to find out how we are delivering our business plan for the benefit of customers, communities and the environment.

Since 2020, the WaterShare+ Panel has operated and provided independent challenge on our actions and performance. This is a role that will continue until 2025 and beyond.

The Panel is an independent group of customer, business and social representatives. It is regarded by Ofwat as the Independent Challenge Group (ICG) for South West Water and Bristol Water. The Panel members have extensive experience in customer behaviour and engagement, customer representation, customer vulnerability and social welfare, business planning, both within the water industry and elsewhere, and water industry engineering and operations. Most of the members have been through several water industry price reviews.

The Panel is chaired by Lord Matthew Taylor, with Peaches Golding OBE (Chair of the BWCP) as Deputy Chair. The membership of the Panel is strengthened with attendance by expert advisors from the Consumer Council for Water (CCW), EA and Natural England (NE).

The Panel's primary objectives are to:

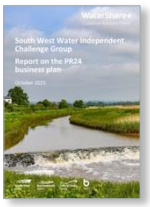
- Contribute to the development of the PR24 Business Plan by challenging the company's proposals, particularly through the review and scrutiny of the associated customer engagement and the drivers of expenditure
- Ensure that the Business Plan fairly represents the views of the company's customers and communities.

The Panel were involved throughout the development of our long-term delivery strategy. As part of this process, they have reviewed and challenged the:

- Development of our strategy, strategic objectives and investment profiles
- Research underpinning our understanding of customer priorities and preferences
- Line of sight between our customers' priorities and our investment choices
- Profile of our investments and fairness between current and future customers.

Due to their ongoing review and challenge of our AMP7 delivery, the Panel are uniquely placed to understand our baseline performance as well as our future plans and ambitions. The Panel have concluded that our LTDS:

- Is built on evidenced customer preferences
- Reflects customer priorities and statutory obligations
- Considers fairness between what existing customers will pay and what is paid for by future customers
- Has been developed in line with Ofwat's guidance and has taken account of its feedback.



For more information see
Report on the PR24 business plan

Ofwat's Quality and Ambition Assessment (QAA)

This document is part of the overall business plan providing key information about our proposals and how it answers the quality and ambition expectations associated with the business plan incentive assessment.

The table below summarises how we have addressed the QAA criteria and sign-posts where these are detailed with this document. The assessment for business plan assurance is included in the 'Data, Information and Assurance' supporting document.

Table 38. Summary of QAA criteria and sign-posts

Minimum expectations	References
The long-term delivery strategy has been developed in line with our guidance and has taken account of any feedback. This includes: • testing how the company's ambition can be met in different future scenarios, including the common reference scenarios; • using this to set out key enhancement activities in terms of core and alternative adaptive pathways, with appropriate use of trigger and decision points; and • ensuring the strategy is supported by robust evidence, including how base expenditure contributes towards meeting the ambition.	PR24 and beyond: Final guidance on long-term delivery strategies [214]

Appendix A1: LTDS monitoring metrics

In this technical annex we provide the detailed monitoring metrics which feed into the LTDS monitoring framework described in the main document. Please refer to 'Our Strategy' section for supporting framework that will operationalise these metrics and support the delivery of our LTDS.

Table 39. Appendix A1: LTDS monitoring metrics

Trigger point metrics		Metric type	Metric definition	Data source
1. Demand Adverse				
PCC		Lead	The percentage reduction of three-year average PCC in litres per person per day (l/person/d) from the 2019-20 baseline – in line with PC definition for PR24	SWW performance data
Roll-out of water labelling policies and low-water product requirements		Support	UK mandatory water efficiency labelling regulation	Defra guidance on mandatory water efficiency labelling
Pace and scope of sustainable building regulations		Support	Potential PCC in new dwellings (in l/p/d)	Part G2 (36/2) of the UK Building Regulations
Penetration of rainwater harvesting		Support	The proportion of new build households with rainwater harvesting solutions installed	SWW data
2. Abstraction Adverse				
River levels		Lead	Tidal level, measured from mean sea level (in m)	River Levels UK, full listing of river level monitoring stations across the South West of England
River flow rates		Lead	Daily, monthly and flood peak measured river flows (in m^3/s)	National River Flow Archive, UK Centre for Ecology & Hydrology
Ecological outcomes – flow regime		Support	The deviation of the yearly flow pattern of the river in a given year, relative to a benchmark year (in m^3/s)	National River Flow Archive, UK Centre for Ecology & Hydrology
Ecological outcomes – water quality		Support	Compliance and monitoring of various chemical determinants in estuarine waters, rivers, lakes, ponds, canals or groundwaters, by region. This includes measurements of nitrates, nitrites, oxygen, pH and chloride, among others.	Defra and EA Water quality data archive for raw water quality
Ecological outcomes – biodiversity and fish habitat		Support	Biodiversity net gain as calculated using the Biodiversity Metric Tool, and as defined by Ofwat's common PC for PR24	Natural England Biodiversity Tool, using SWW data
Ecological outcomes – sediment transport		Support	The extent of sediment transport in a river, with reduced abstraction helping to prevent excessive sediment disposition and erosion.	EA Geomorphological guidelines
3. Local Expectations Adverse				
Greater bathing designations	Government policy agenda Media coverage	Support	Qualitative, to be informed by: Ongoing monitoring of changes or updates to government policy and/or legislation Number of applications for designation	Various, SWW own research

Trigger point metrics		Metric type	Metric definition	Data source
5% sewer flood risk 1-in-50 storm	Customer engagement and research Technological innovation		Ongoing monitoring of media articles and commentary, and the extent of this, from media sources (including social media) Our ongoing engagement programme with customers and stakeholders, ensuring that this is responsive to changing circumstances (including in response to government policy and media coverage above)	
Reduced agricultural demand for sludge	Agricultural demand for sludge	Lead	Tonnes that meet BAS standards and are disposed of to land	SWW data, in line with Defra code of practice for sewage sludge
	Land bank disposal restriction or closure	Support	Ongoing monitoring of changes or updates to legislation	
4. Technology Adverse				
Expected commercial availability		Lead	Changes in expected commercial availability timelines	Supplier/market data
Expected Net Present Value (NPV) of technology		Lead	SWW and/or industry analysis, informed by supplier/market data on unit costs and incremental benefits of technology	
Investment and asset replacement cycles		Lead	Regular monitoring of asset health metrics and capital maintenance expenditures, in line with current Ofwat requirements and guidance	SWW data
Rate of industry adoption		Support	Smart meter roll-out by other companies (%) Smart network capability roll-out by other companies Uptake of wastewater monitoring technologies by other companies (including type)	Industry knowledge sharing
Technological Readiness Level (TRL)		Support	The evaluation of the trends and developments in smart water networks using an appropriate framework, that ensures that: Inputs are gathered from relevant panel of experts and stakeholders in setting objectives for technological take-up., as well as in forecasting future trends in technological innovation Develops a regular, iterative process to build database on relevant emerging technologies, their applications and the timeframes over which they could be implemented	Making use of technology innovation frameworks, such as the Delphi Method and Sourcing Predictive Insights for New Growth (SPRING) programme
5. Climate change adverse				
RCP scenario testing		Lead	Future concentrations of greenhouse gases	Intergovernmental Panel on Climate Change (IPCC) and latest UK Climate Projections (e.g. UKCP18) – Continue to work with the Met Office to understand what this means for us
Rainfall intensity		Inform	The rate at which rainwater falls during a specific time, i.e. the total rainfall amount during a given time period (in mm) divided by the duration of that period (e.g. hour)	UK Met Office, based on data on average annual rainfall and rain days <=1mm
Fluvial / coastal flooding risk		Support	Flood zones, based on a given locations' chance of flooding from rivers or the sea in a given year. The EA defines three zones: Zone 1: Low probability (<0.1% chance of flooding) Zone 2: 0.1%-1% chance of flooding from rivers; 0.1%-0.5% chance of flooding from the sea	EA, flood maps for flood risk from rivers and the sea

Trigger point metrics	Metric type	Metric definition	Data source
		Zone 3: >1% chance of flooding from rivers; >0.5% chance of flooding from the sea	
Pluvial flooding risk	Support	Flood zones, based on a given locations' chance of flooding from surface water in a given year. The EA defines three zones: Zone 1: Very low risk (<0.1% chance of flooding) Zone 2: Low risk (0.1%-1%) Zone 3: Medium risk (1%-3.3%) Zone 4: High risk (>3.3%)	EA, flood maps for pluvial (surface water) flood risk
Sea level rise	Support	Rate of change in the global mean sea level, expressed as a difference from the average for 1993-2010 (in mm)	UK Met Office, sea level dashboard
Coastal erosion	Support	The status of coastal land and the extent of the impact of natural processes such as wave action, currents, and weathering, measured based on position of the coastline over time using aerial photography, satellite imagery and field surveys	National Network of Regional Coastline Monitoring Programmes of England
Raw water quality	Support	Raw water quality pollutant concentrations in raw water (inc. colour, turbidity, phosphate, nitrogen)	CREWW programme of chemical and biological monitoring and sampling River quality monitors Defra water quality data archive