Climate Change Adaptation Report

2024

from Southern Water

Contents

Foreword

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Chief Executive Officer

To date, efforts on climate change, globally and in the UK, have focused on cutting greenhouse gas emissions and moving toward 'Net Zero' targets, but the emissions already in the atmosphere mean we must also prepare for unavoidable climate impacts.

The water sector is on the frontline when considering the effects from the climate emergency; we see growing potential for more severe and more frequent impacts to our critical infrastructure systems. It's therefore vital that we increase our understanding of the impacts of higher temperatures, increased flooding, strains on water quality and availability, and changes to our environment and adapting our business to improve resilience to these impacts.

We're committed to taking action to address these climate change risks to our business and to the services we provide. The impacts faced by our customers are key to our considerations.

This report sets out the approach to, and findings from, the climate change risk assessment (CCRA) we have undertaken to support the fourth round of reporting under the Government's Climate Change 'Adaptation Reporting Power' known as 'ARP4'. It demonstrates how we are meeting the challenge of adapting to climate change and where we have identified opportunities for improvement in our adaptation journey.

Key areas of change in this climate adaption report, since the last report in 2021, include new high risks to infrastructure services from flooding, and from the result of cascading failures (from other interdependent networks, such as energy or equipment suppliers, etc).

> **"The impacts faced by our customers are key to our considerations."**

Executive summary

Our region – risks

We provide water services to approximately 2.7 million customers and treat and recycle wastewater from approximately 4.7 million people in Kent, East and West Sussex, Hampshire and the Isle of Wight. Our region is home to major towns and cities, more than 700 miles of coastline, 84 bathing waters, 3,400km of river, and hundreds more environmentally significant sites.

Figure 1: Southern Water operations

River Itchen, Hampshire

The region we serve is densely populated with unique water environments. The South of England is already water-stressed and subject to drought risks. Climate change brings much greater risk of weather extremes, which place additional strain on our ability to maintain water supplies. Larger volumes of surface water (rainwater) and localised flooding challenge the capacity of our existing sewer networks and demand for water and wastewater services will increase as the population grows.

We rely on iconic chalk streams for our water supplies, particularly in Hampshire and the Isle of Wight and the impacts of climate change are putting these at risk. Increasing temperatures can also impact water quality, changing nutrient levels – making treatment harder and more expensive.

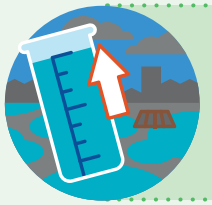
Our region has high levels of population growth, and we expect it to grow by a further 19% by 2050. We estimate demand for water may grow by 70 million litres per day by 2050.

Our region – risks continued

There are four key climate drivers that we're already experiencing the impacts of, and which we expect to increase in severity and/or frequency over the coming years:

Increased temperature and more extreme variations in temperature

Less rainfall or longer dry periods (drought)



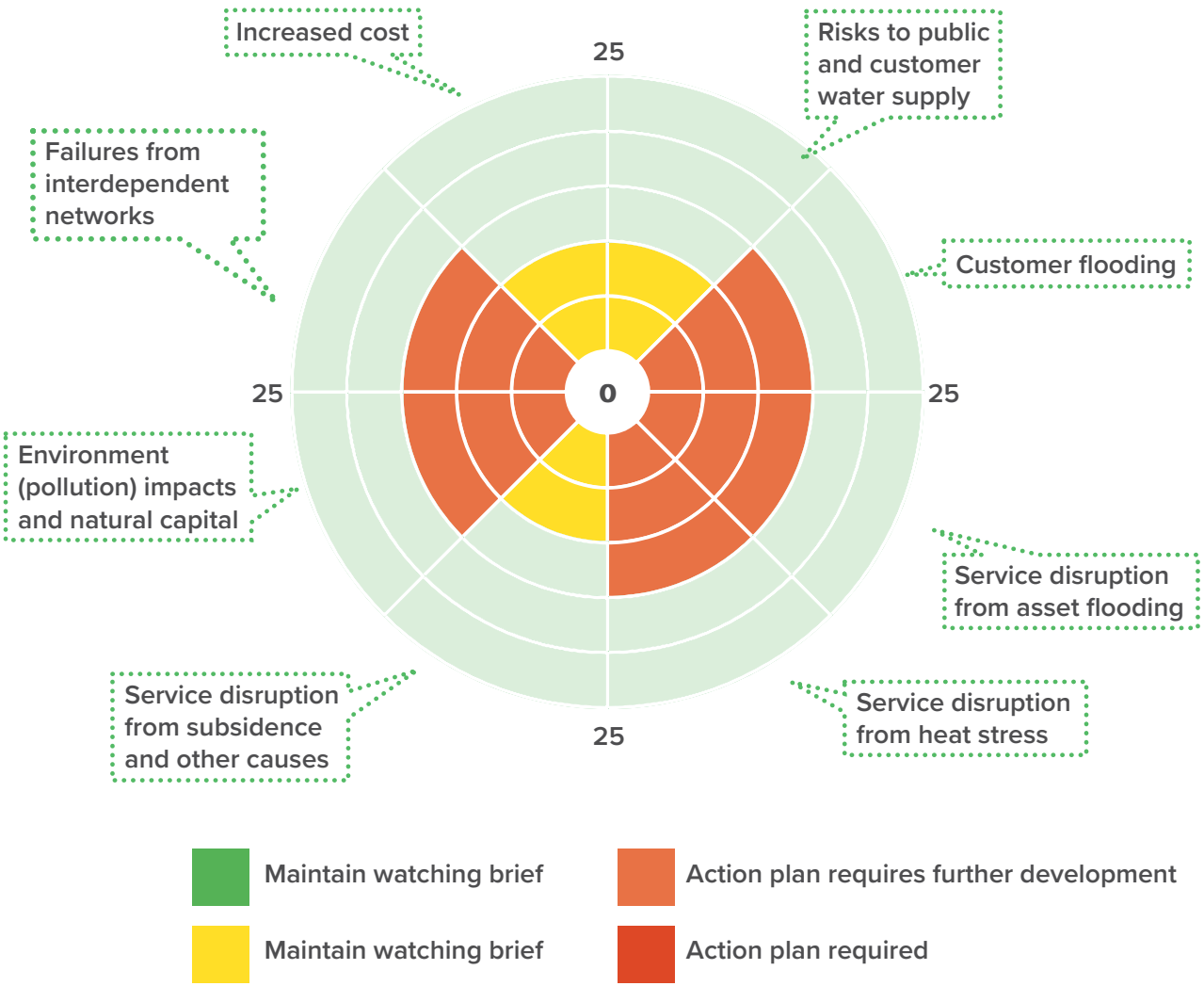
More rainfall, or more intense rainfall (including an increasing number of extreme storms and lightning strikes)

Sea level rise

In 2022 we published our draft Water Resources Management Plan (WRMP), which sets out how we will balance supply and demand for water over the next 80 years and are in the process of confirming our final submission. We also published our first ever Drainage and Wastewater Management Plan, which analyses the key challenges and solutions in each of our drainage catchments over the next 25 years. These detailed technical plans set out how we will deliver our long-term priorities and ambitions.

Our region – risks continued

Figure 2: Our summary of risk exposure at 2050 due to climate change after mitigation



Risks are scored using a 5 x 5 ‘heat map’ in terms of likelihood (of impact) and impact (consequence). This is consistent with the SW enterprise risk assessment approach and criteria and gives a total risk score of between 1 and 25.

Our region – risks continued

Table 1: Key risk changes since 2021

Risk category	Climate/business impact	Down or up	Explanation
Service disruption from subsidence and other causes	Ground movement at coastal sites. Additional investment needed to maintain structures	Up (3 to 6)	Coastal site risk has increased as there is more evidence of subsidence
	Increased lightning strikes. Risk of immediate failure of power for a period of hours or potentially weeks	Up (3 to 9)	Lightening is linked to brown outs, (drop in voltage). In 2021 Margate wastewater pumping station was struck by lightning
Reduced water availability	Change in demographic and water stress	Up (6 to 9)	Mitigation relies on third parties, given the deliverability of schemes relies on many factors such as government intervention
Service disruption – heat stress	Overheating of equipment leading to power failures	Up (4 to 8)	Sites have already seen overheating (5-10 high risk sites)
	Increased algal growth and other microbial action	Up (1 to 4)	Sites already have algae issues (Ardingley)
	Increased algal growth and other microbial action, and increased odour	Up (2 to 4)	Sites already have algae issues (Ardingley)
Service disruption from coastal flooding and erosion	Potential contamination/pollution leading to service disruption	Up (6 to 12)	Sites already flood
	Risk of power failure for a period of hours or potentially weeks	Up (6 to 12)	Sites already flood
	Sea level rise and risk of power failure/shut down	Up (5 to 12)	Coastal erosion occurring, for example at Portobello from deterioration of rock
Environmental (pollution) impacts and natural capital (value from natural resources)	Tightening of permits may affect level of treatment processes required	Up (2 to 12)	Reduced river abstraction already happening (i.e Rivers Test and Itchen)
	Pollution of water bodies due to escapes (WW)	Up (6 to 12)	Low flows lead to issues with discharging
Customer flooding	Less rainfall leading to greater deposition of solids, blockage, and flooding	Up (1 to 6)	Blockages 70% of flooding incidents in 2024
	More rainfall, higher groundwater table and infiltration	Up (3 to 6)	Already happening with groundwater, a significant issue over the 2023-20–24 winter period

Our approach to climate change

Our purpose is to enhance health and wellbeing, protect the environment, and sustain the economy.

Alongside our ethical decision making and modern compliance frameworks, our purpose helps our leadership team, employees and partners make better decisions. Climate change risk is already integrated and embedded into our company risk management and governance frameworks and we'll continue to apply the latest science to support our planning and to build resilience across all areas of our business.

Previous reports have shown that we're already experiencing changes in our climate, and the expectation is that these changes will increase over the coming years and decades. This fourth reporting round requires us to submit our latest adaptation report to government by 31 December 2024. and details the progress we have made since we submitted the last report in 2021.

Figure 3: Our climate-related governance framework

Board of Directors			
Ultimate oversight of climate-related risks and opportunities, strategy, and performance.			
ESG Committee	**Audit Committee**	**Remuneration Committee**	**Nomination Committee**
Oversight of priorities, strategy and plans on environmental and social matters.	Responsible for internal control system, reporting and assurance.	Responsible for our remuneration policy.	Responsible for Board appointments to support our business plan.
Executive Committee (ExCo)			
Day-to-day running of our company by our executives, including matters related to ESG. This includes oversight of ERM risk profile an emerging risks scanning. The executive delegates accountability for certain climate-related matters to its committees.			
Performance Committee	**Investment Committee**	**Environment Steering Group**	
Oversight and challenge of our financial and non-financial performance.	Responsible for investment decision-making including climate considerations.	Cross-business group responsible for environmental strategic issues.	
Independent stakeholder groups			
Strategic advice and challenge, insights on stakeholder priorities, perceptions and feedback on our plans.			
Independent Climate and Environment Group	**Customer and Communities Challenge Group**		
Customer focus groups			

Progress since 2021

The challenges of population growth and climate change mean that the water industry must significantly change the way it operates over the coming years. There are many drivers for change which include the 25-year Environment Plan, the Environment Act, the third UK Climate Risk Independent Assessment, the review of the Water Industry National Environment Programme, the Storm Overflows Discharge Reduction Plan, and our own regulatory planning submissions for 2025–30 and beyond. All of which have been created to meet rising concerns about the water industry's impact on the environment and expectations of customers and stakeholders. Our business plan for 2025–30 considered the results of the carbon impact assessment of our long-term plans and scenario modelling for a changing climate.

Our Long-Term Delivery Strategy

Our Long-Term Delivery Strategy explains how we'll respond to these challenges over the next 25 years.

It integrates our short, medium, and long-term plans into one strategy and sets out how we've used an adaptive planning framework to develop a range of investments that we could need to meet the future challenges. Two of these eight 'adaptive pathways' specifically relate to potential climate change impacts, such as water storage tank and network flow capacity from stormwater surges expected under future climate scenarios. The adaptive approach responds to the guidelines of our regulator, Ofwat, and the results of our scenario testing.

Risks and opportunities

How we manage risk

We're in the process of upgrading our Governance, Risk and Compliance system to track and monitor actions. This will only enhance our existing Enterprise Risk Management process that sets out Risk Control Measures; mechanisms in place that maintain, reduce or eliminate the current level of risk and give assurance that the risk is being managed effectively.

We've reviewed and updated our climate change risk assessment for the fourth reporting period (2024). It was originally prepared for the second reporting period in 2015 (ARP2) and revised for the third reporting period in 2021 (ARP3).

Our assessment identified climate related risks based on a 5 x 5 'heat map' in terms of likelihood of an impact occurring and consequence of an impact occurring. The two scores were multiplied to give a total risk score of between 1 and 25.

Table 2: Risk bands used to assess level of preparedness

Risk band	Risk Score	Comment
Low (green)	1-5	No action plan required. Maintain watching brief.
Low/medium (yellow)	6-10	Action plan in place. Maintain watching brief.
Medium (orange)	11-15	Action plan requires further development.
High (red)	16-25	Lack of risk understanding/no action plan in place - Action required

Climate-related risk

Our physical climate change risks are explained on the following pages:

Water risks

- Droughts: reduced rainfall can lead to water shortages, affecting supply for drinking, irrigation, and industrial use
- Flooding: increased rainfall or sea-level rise can cause flooding, damaging infrastructure and contaminating water sources
- Water quality: higher temperatures can reduce water quality by increasing the growth of harmful algae and bacteria

Business impact

- Accelerated asset deterioration.
- Supply of water fails to meet demand – service disruption.
- Financial penalty and reward position.
- Further investment in infrastructure and incident management.
- Elevated risk to health, safety and wellbeing of colleagues and the public due to elevated pressures to respond, and increased use of water courses to cool off.

What are we doing to mitigate impacts?

- Continuing to work with neighbouring water companies to improve how we move water around the region to where it is most needed.
- Taking a bigger stake in a new reservoir being developed by Thames Water and taking the lead on a new strategic pipeline, which could transfer up to 120 million litres per day into Hampshire.
- Developing a new transfer pipeline from Havant Thicket to Pulborough.
- Strengthening partnerships with farmers, landowners and environmental groups to protect water sources from over abstraction and pollution.
- Creating a smart network by installing more sensors and using machine learning and AI to improve how we manage our networks.
- Building climate change into the design life of capital delivery projects from the outset, including those on the coast.

Case study

Reaching out to our future customers

It's important that our future customers understand the challenges we face in water and wastewater management so that they can help us to mitigate them. Our community team has a school outreach programme to raise awareness about issues such as a water efficiency and blockage prevention. Recent engagement has focused on why CSO's (Combined Sewer Systems) discharge and the natural solutions our Clean Rivers and Seas Task Force is using to prevent this.

Our New Wave education programme which launched in 2023 and includes curriculum-linked modules, assemblies, STEM events, site tours, outdoor learning and mentoring reached 911 schools in 2024 alone, engaging 94,872 young people.

Climate-related risk continued

Wastewater risks

- **Flooding:** overflows from wastewater systems during heavy rains can lead to contamination of freshwater, coastal areas and customer flooding.
- **Rising sea levels:** coastal wastewater treatment plants are at risk from sea-level rise, which can lead to infrastructure damage.
- **Power outages:** extreme weather events (such as overheating) can disrupt power supplies, affecting the functioning of wastewater treatment facilities.

What are we doing to mitigate impacts?

- The Fat Oil Grease and Unflushables team have a regionwide programme of customer education. This includes media campaigns targeted in blockage hot spot areas, working with food service establishments on grease management, and proactive customer surveys.
- We have installed 24,000 sewer level monitors so we can proactively identify blockages and failures.
- To 2025 we are delivering roughly 8km of rising main replacement, alongside a major investment covering 3.5km at Military Road in Thanet. At the same time, have invested in our incident response capabilities, including improvements to our operational control centre, to mitigate the risk of impact from sewer collapses and bursts.
- We are focused on proactive maintenance of critical sewers, with condition surveys carried out at regular intervals.
- We undertook an assessment to understand the resilience risks associated with heat stress on critical assets and found that Kent is worst affected – we are, therefore, investing directly in the River Stour catchment to reduce the level of residual risk posed to our operations from asset heat stress.

Case study

Tackling blockages through education and engagement in Horsham

Throughout December 2022, we targeted customers in the Horsham area with a campaign to help prevent blockages. There have been 1,930 blockages in Horsham over the last five years, 60% of which have been caused by people putting the wrong thing down their sink or toilet.
The campaign includes:

- Whole and half page adverts in the Mid Sussex and Horsham County Times promoting the 'Keep it clear' message and directing people to visit our FOG and Unflushables pages on the website
- Digital display and social dispaly advertising across Horsham and how to avoid blockages
- Visiting local businesses and door-knocking to offer advice on blockage prevention
- A town centre drop-in stand on 15 December 2022
- Direct emails to 43,000 customers setting out the local statistics and promoting the FOG and Unflushables messages.

The campaign is part of a £28 million investment to upgrade the Horsham Wastewater Treatment Works. The programme will improve the efficiency and capacity of the works and help to meet our environmental commitments in the area for years to come. Some of the community aligned benefits include landscaping and habitat enhancements to bring an overall 9% gain in biodiversity within the site.

Climate-related risk continued

Bioresources risks

- **Increased sludge volumes:** Climate change may lead to more frequent and intense rainfall, resulting in greater stormwater runoff and increased wastewater inflow. This can lead to higher volumes of sludge, straining treatment and recycling capacities.
- **Drought and water scarcity:** Prolonged dry periods can reduce wastewater flows, leading to more concentrated sludge. This concentrated sludge can be harder to treat and may require additional resources for effective processing.
- **Higher temperatures and biological activity:** Rising temperatures can accelerate biological activity in wastewater treatment plants, potentially increasing odour issues and impacting the stability and quality of sludge, which can complicate its handling and reuse.
- **Disruptions to recycling pathways:** More extreme weather events, such as floods, can disrupt transportation and access to sites where sludge is recycled (e.g., farmland or composting sites), interrupting sustainable sludge management and increasing disposal costs.
- **Quality of recycled sludge:** Climate change can affect soil conditions, altering the nutrient and contaminant absorption capacity of soils where sludge is applied. This can impact the effectiveness and regulatory compliance of sludge recycling.
- **Regulatory pressure on environmental impact:** As climate change intensifies, there may be stricter regulations on greenhouse gas emissions from sludge treatment and transport, which could require upgrades to treatment technologies to comply with new environmental standards.

What are we doing to mitigate impacts?

During 2023-24, we met our target of 100% compliant sludge disposal. We maintained our Biosolids Assurance Scheme certification for a further 12-month period in July 2023. We are still progressing with the construction of our first advanced anaerobic digestion plant, which will begin to output enhanced quality biosolid products for the use by farmers in Sussex in 2024. We have also improved resilience in the region by purchasing mobile plant, meaning we have been able to treat all sludge.

We have also completed sub-metering installation across our bioresources sites; monitoring consumption in detail to analyse and improve efficiency.

Climate-related risk continued

Natural capital risks

- **Erosion and degradation:** soil erosion due to heavy rainfall and storms can reduce the land's ability to provide ecosystem services, like water filtration and carbon storage.
- **Changes in water cycles:** changing rainfall patterns can impact water availability, affecting agriculture, industry, and ecosystems that depend on regular water cycles.
- **Habitat loss:** extreme weather, droughts, and floods can destroy natural habitats and reduce biodiversity.
- **Pest outbreaks:** climate changes can lead to an increase in pests that affect crops and forests.
- **Temperature stress:** changes in temperature patterns can stress plants and animals, leading to reduced agricultural yields or loss of species.

What are we doing to mitigate impacts?

- Development of a wetlands feasibility tool and we've identified more efficient and greener solutions to meet nutrient permits.
- Maintaining our focus on flow compliance, ensuring we meet all environmental permit requirements.
- Increasing the level of planned operational and engineering maintenance, reducing the need for reactive work.
- Continue developing a stronger data and analytical capability, completing the rollout of new asset maintenance systems.
- Population growth means additional treatment capacity is needed – an enhancement business case for new treatment works is now part of our business plan 2025–30.
- Installing additional ultraviolet disinfection assets to protect shellfish water quality from microbiological contamination. We will install final effluent disinfection at five treatment works to help meet new standards required for shellfish waters.
- We are testing alternative natural treatment and drainage solutions.

Case study

Reducing nutrients in Chichester Harbour

We're working on nutrient neutrality issues in Chichester Harbour where we're:

- Planning to resolve existing infrastructure issues to accomodate future growth projections
- Investigating the potential for nature-based solutions to capture surface water run-off and prevent it from entering the sewers and causing storm overflows
- Working with farmers to reduce nitrate application and run-off from farmland around the harbours
- Working with partners to build beneficial habitats such as hedgerows, reedbeds and wetlands that can capture overland run-off from roads and farmland and remove any excess nutrients prior to entering the harbours. They will also provide beneficial habitats, improving the landscape, helping to manage flooding and capture carbon
- Collaborating to develop a long-term strategy to protect water quality and the important habitats of the harbours through the Harbours Summit.

Climate-related risk continued

These risks are interrelated, as damage to one system (e.g., water supply) often impacts others (e.g., wastewater treatment or natural ecosystems).

Business risks

Business climate change risks encompass a wide range of potential impacts on companies, driven by both physical climate events and transitional risks, such as changing regulations, market expectations, and technological advancements.

Physical risks

- **Infrastructure vulnerability:** Rising sea levels, erosion, and extreme weather can physically damage infrastructure, particularly in coastal and low-lying areas, requiring investment.
- **Increased maintenance:** Aging infrastructure is more susceptible to damage from extreme temperatures and severe weather, increasing maintenance and replacement costs.

Financial and investment risks

Asset devaluation: Physical assets, such as coastal properties or fossil-fuel-intensive operations, may lose value due to climate impacts or regulatory changes. Companies may also face "stranded assets" where long-term investments become unviable under new policies or market shifts.

Increased costs and reduced profit margins: Climate risks can lead to higher insurance premiums, operational costs, and capital expenditure on adaptation. These costs can erode profit margins, if not managed carefully.

- **Credit and financing risks:** Investors and lenders increasingly consider climate risk exposure in their funding decisions, so companies with high climate risks may face higher borrowing costs or challenges accessing capital.

Transition risks

Transition risks refer to a wide range of disruptive impacts associated with the transition to net zero (i.e. to halve emissions by 2030 and to reach net zero by 2050). We've identified the following risks:

- **Technology:** emerging technologies, creating operational risks and opportunities including changes to skills required and changes to operational requirements.
- **Policy and legal:** changes in energy and smart buildings markets and management, including cost increases, decarbonisation of fuel sources.
- **Policy and legal:** changes in transport markets and management, including decarbonisation of fuel and development of no and low carbon fuel infrastructure.
- **Market:** population growth, household composition and appliance efficiency changes driving changes in demand for services.
- **Reputation:** changing customer sentiment on the pace and scale of ambition and solutions.

What are we doing to mitigate impacts?

- Engagement with our partners and supply chain to support delivery of our ambitions.
- Policy Advisory Group tracking policy and government information.
- Energy strategy in business plans; example of switching energy sources from gas to electricity; on-site and near-site renewable energy strategy and plans.
- Monitoring greenhouse gas emissions and target performance.
- Fleet replacement strategy in business plans including transforming vehicles to no or low carbon fuels an engagement with haulage contractors.
- Forecasts modelled and included in business plan 2025–30.
- Engagement with the sector, such as Water Resources South East.

Understanding interdependencies

There are certain climate change risks beyond our direct control that could significantly impact our business, which are services provided by others that we are reliant upon (known as interdependencies). However, by classifying them as indirect risks, we don't mean they are entirely uncontrollable. We recognise that we can still take steps to mitigate these risks.

Below are some of the interdependency risks we've identified.

Energy and telecoms

The use of electricity and telecommunications, which we rely on for the consistency and function of our assets, and which have failed in the past due to severe weather.

Transport

Most of our sites are primarily accessible by road. As climate change leads to more frequent and severe extreme weather events, disruptions to the strategic road network and local routes may occur. This could result from road flooding, surface melting and deformation, sinkholes, or embankment failures.

Agriculture

Farmers' and land managers' potential responses to climate change could negatively impact both water resources and water quality (e.g. use of nitrates and pesticides).

Neighbouring infrastructure – cascading failure

Power Grid and telecommunication failures mean we can lose water treatment and pumping capacity as these sites rely heavily on electricity. Power outages can halt or slow water treatment, reduce water pressure, disrupt wastewater treatment, and even cause untreated sewage to be released into natural waterways. We also depend on digital monitoring, remote controls, and automated systems. A telecommunications outage can limit visibility over infrastructure, prevent real-time adjustments, and delay response times for leaks, contamination, or equipment failures. Supply chain failures can lead to chemical shortages for treatment, and delays to key equipment parts.

Supply chain

We have been doing more in recent years to ensure that we can cope with acute events, especially where there is a risk of cascading failures across several utilities or aspects of critical infrastructure.

What are we doing to mitigate impacts?

- While the electricity grid is decarbonising, we continue to review options to change the source of our energy and currently generate 13.32% of our electricity from renewable sources.
- We are strengthening partnerships with other sectors, for example farmers, landowners and environmental groups, building on existing partnerships. This enables us to address these risks before they occur in conversation with other sectors.

Conclusion

Overall, 61 risks have been assessed across eight climate change risk categories.

Key changes in high risks since 2021

As expected, all the risks from 2021 remain on our climate change risks assessment. There are changes in their relative ranking which reflect both the work that's taken place in the last three years to manage the risks and new information on the potential impacts. Thirteen risks have increased, due to new evidence on baseline, and eight new risks have been assessed. The key (high) risks are:

Table 3: Climate change high risk summary 2024

Scenario	High Risks
Baseline	• Risks to service infrastructure from river, surface and groundwater flooding from increased rainfall **(2 risks)**
2050 No Action (no mitigation in place)	• Risks to bridges and pipelines flooding from increased rainfall **(1 risk)**
	• Risks to infrastructure from Cascading failure/interdependency **(1 risk)**
	• Risks to public water supply **(8 risks)**
Service disruption – coastal flooding and erosion	• Risk to infrastructure from coastal flooding and erosion **(3 risks)**
	• Risk to infrastructure from river, surface and groundwater flooding from increased raifall **(2 risks)**
	• Environmental pollution and natural capital impacts **(1 risk)**
2050 Residual (i.e., mitigation in place)	• None

Red: new risk

Blue: existing ARP3 risk

Challenges and solutions

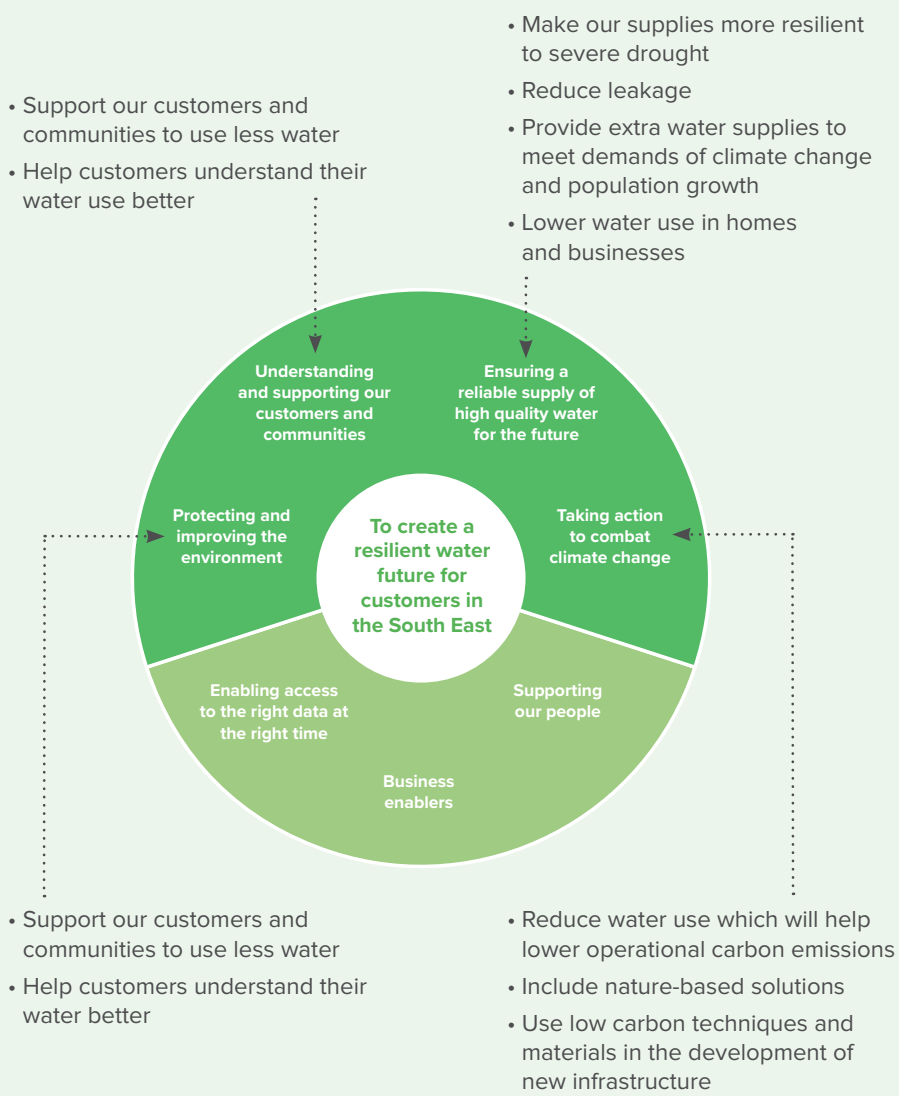
Our assessed climate change risks, and how we tackle these, present several challenges and solutions, as discussed in Table 4.

Table 4: Challenges in addressing our climate change risks

Challenge	Solution/approach
The costs of delivering resilient services will be signifiant	Working with nature (as opposed to going straight to engineered solutions) and our communities to prevent rain entering our sewer networks – and separating stormwater and wastewater sewers.
Affordability and willingness to pay for resilient schemes	More than 25,000 customers spent over 8,000 hours across over 190 different reports telling us what they think to develop our business plan. We combined this with over 10 million data points from sources such as contacts, complaints, social listening and other sources.
The uncertainty/timing of when climate change risks will need immediate action	To make sure we have solutions in place when needed, we use an adaptive planning approach, whereby the timing and scale of reductions trigger decisions in advance. This means we're prepared to leave more water in the environment if we need to, without impacting our customers' services.
Skilled resources to deal with addressing climate change risks	We have STEM/engagement with local learning hubs, apprentices.
Having the right/enough data to be able to understand the risk	Smart meters will give customers near real-time usage information, allowing them to reduce consumption and their bills. The real-time demand data will also help us better identify and fix leaks on our network. We've used a range of growth, environmental destination and climate change scenarios to develop a range of future supply-demand balance situations, and a plan that can be adapted to mitigate them.
Change to regulation/legislation could impact our services	To make supplies more resilient to severe drought, we're strengthening partnerships with farmers, landowners and environmental groups, building on existing partnerships. Our Clean Rivers and Seas Task Force works with local councils and other organisations, such as developers, catchment partnerships and community groups, to separate rainwater our sewer systems, using natural and sustainable drainage systems, such as wetlands and raingardens.
Keeping carbon use low, whilst delivering resilience	As an industry we have committed to reach net zero carbon operational emissions. On a project level, we focus on sustainable solutions that consider carbon reduction and biodiversity net gain/natural capital.

Challenges and solutions continued

Figure 3: Summary of key challenges and opportunities



How are customers involved?

Consultation with customers, and customer education

Conserving water:
Fix leaks and install water saving devices, use less water by turning off taps

Reducing wastewater:
Limit disposal of fats, oils and chemicals down drains

Using rainwater:
Harvesting rainwater for non-drinking purposes like gardening or cleaning

Supporting green infrastructure:
Customers can support initiatives like planting trees, using rain gardens, to support water absorption

Glossary

Term	Description
Adaptation	Process of adjusting to the expected effects of climate change
Net Zero	A state in which the amount of greenhouse gases emitted is balanced by an equivalent amount removed from the atmosphere, with a target to halve emissions by 2030 and achieve net zero by 2050
Mitigation	Actions taken to reduce or prevent the emission of greenhouse gases and enhance carbon sinks, thereby addressing the root causes of climate change. In the context of risk assessment, mitigation strategies aim to lower the overall risk by curtailing future climate impacts and their associated risks
Algal growth	An increase in algae populations in water bodies, often driven by warmer temperatures and nutrient levels, which can impact water quality and infrastructure by causing blockages or requiring additional treatment
Brownouts	A reduction in or restriction of available electrical power, often a temporary condition that can be caused by high demand or events like lightning strikes
Coastal erosion	The gradual wearing away of coastal land due to natural processes like wave action, tides, or rising sea levels, which can threaten coastal infrastructure and lead to service disruptions
Demographic change	Adjustments in population size or distribution in a region, which can increase demand for resources like water and influence planning and infrastructure needs
Groundwater table	The level below which the ground is saturated with water. Fluctuations can impact infrastructure, particularly in flood-prone areas, and influence water resource availability
Natural capital	Resources derived from the natural environment (such as water, air, and biodiversity) that provide essential ecosystem services; their degradation can impact business operations and regulatory compliance

Term	Description
River abstraction	The process of taking water from rivers for industrial, agricultural, or domestic use. Reductions in allowable abstraction rates can affect water availability and operational flexibility
Subsidence	The gradual sinking or settling of the ground, which can damage infrastructure, particularly in areas with high water tables or coastal erosion issues
Cascading failures	A series of interconnected failures in multiple systems triggered by an initial disruption in one area, which can lead to widespread impacts across utilities, infrastructure, and services
Likelihood	The chance of impact occuring
Resilience (to climate change)	Ability to recover from the effect of climate change
Risk	Calculation of consequence times likelihood
Storm overflow	Designed into the sewerage system to discharge storm water from sewage network when it is overwhelmed during heavy rainfall

Appendix – Key changes to ARP3 risk assessment

Table A1: Changes to risks since ARP3

Category	Driver	Impact	Business impact	ARP3 baseline risk	ARP3 2050 no action	ARP3 2050 residual	ARP4 baseline risk	ARP4 2050 no action	ARP4 residual
Service disruption from subsidence and other causes	Increased temperature and more variation in temperature	OC01: Increased wetting/ drying cycles and consequent ground movement (coastal sites)	Additional investment needed to maintain structures	3 (Low)	9 (Low/Med)	6 (Low/Med)	6 (Low/Med)	10 (Low/ Med)	8 (Low/ Med)
	More rainfall, increased storminess	OC03: Lightning strike during storms	Risk of immediate failure for a period of hours or weeks	3 (Low)	9 (Low/Med)	6 (Low/Med)	9 (Low/Med)	12 (Medium)	9 (Low/ Med)
Risks to water supplies from reduced water availability	Increased temperature and more extreme variation in temperature	WS03: Demographic change	Potential increased demand with consequent stress on system	12 (Med)	20 (High)	6 (Low/Med)	12 (Med)	20 (High)	9 (Low/ Med)
Service disruption from heat stress	Increased temperature and more extreme variation in temperature	Overheating of electrical equipment	Risk of immediate failure for a period of hours or potentially weeks	4 (Low)	12 (Med)	8 (Low/Med)	8 (Low/Med)	12 (Med)	8 (Low/ Med)

Category	Driver	Impact	Business impact	ARP3 baseline risk	ARP3 2050 no action	ARP3 2050 residual	ARP4 baseline risk	ARP4 2050 no action	ARP4 residual
Service disruption from heat stress	Increased temperature and more variation in temperature	Increased algal growth and other microbial action	Increased attack from H2S affecting structural condition	1 (Low)	3 (Low)	2 (Low)	4(Low)	9 (Low/Med)	4 (Low)
			Increased odour leading to customer complaints	2 (Low)	9 (Low/Med)	2 (Low)	4(Low)	9 (Low/Med)	4(Low)
Risks to infrastructure services from coastal flooding and erosion	More rainfall, increased storminess	AF01/02: Direct flooding of sites	Potential contamination/ pollution leading to service disruption	6 (Low/Med)	12 (Med)	9 (Low/Med)	12 (Med)	16 (High)	12 (Med)
	Sea level rise		Risk of immediate failure for a period of hours or potentially weeks	6 (Low/Med)	12 (Med)	9 (Low/Med)	12 (Med)	20 (High)	12 (Med)

Category	Driver	Impact	Business impact	ARP3 baseline risk	ARP3 2050 no action	ARP3 2050 residual	ARP4 baseline risk	ARP4 2050 no action	ARP4 (2050 planned action)
Environmental (pollution) impacts and natural capital	Increased temperature and more variation in temperature	EN01: Potential tightening of abstraction and discharge permits	May affect the level of treatment processes required	2(Low)	9 (Low/Med)	2 (Low)	12 (Med)	16 (High)	12 (Med)
	Less rainfall or longer dry periods (drought)	EN06: Pollution of water bodies due to escapes from the wastewater system	Potential contamination/ pollution leading to service disruption	6 (Low/Med)	12 (Med)	2 (Low)	12 (Med)	15 (Med)	6 (Low/ Med)
Customer flooding	Less rainfall or longer dry periods (drought)	CF01: Longer drier periods	Greater deposition of solids and consequent blockage leading to flooding and pollution	1 (Low)	3 (Low)	2 (Low)	6 (Low/Med)	6 (Low/Med)	3 (Low)
Customer flooding	More rainfall, increased storminess	CF02: Higher groundwater table in winter	Increased infiltration (WW)	3 (Low)	5 (Low)	4 (Low)	6 (Low/Med)	8 (Low/Med)	4 (Low)
Risks to infrastructure services from coastal flooding and erosion	Sea level rise	AF04 Direct flooding of sites	Risk of power failure	5 (Low)	15 (Med)	10 (Low/ Med)	12 (Med)	16 (High)	12 (Med)

Table A2: New risks since ARP3 in 2021

Category	Driver	Impact	Business impact	ARP4 baseline risk	ARP4 2050 no action	ARP4 2050 residual risk
Risks to Infrastructure networks from cascading failures	Increase in temperature	Changes in policy as a result of climate change	Diesel engine ban 2035 could result in fleet shortages, service disruption and cost increases for rental vehicles	4 (Low)	6 (Low/Med)	4 (Low)
			The technological risk that shift to hydrogen production via hydrolysis creates additional water demand	4 (Low)	6 (Low/Med)	4 (Low)
			Corporate power failure due to changing energy market – increased risk of outages or power failures as energy markets change	10 (Med)	16 (High)	6 (Low/Med)
			Heating policy ban now bans gas boilers – increased downtime on heating systems could lead to hybrid working, cost efficiencies and co-occupation	9 (Low/Med)	12 (Med)	4 (Low)

Category	Driver	Impact	Business impact	ARP4 baseline risk	ARP4 2050 no action	ARP4 2050 residual risk
		Decarbonisation of the grid is predicted to occur due to climate change	Increased brown outs, power blips and unplanned outages	9 (Low/Med)	12 (Med)	6 (Low/Med)
Risks to bridges and pipelines from flooding and erosion	More rainfall, increased storminess	AF03: Structural damage from erosion or flood impact	Risk of immediate failure for a period of hours or potentially weeks	15 (Med)	20 (High)	12 (Med)
Risks to Infrastructure services due to river, surface water and groundwater flooding	More rainfall, increased storminess	AF02: Direct flooding of sites	Service disruption leading to potential contamination/ pollution	16 (High)	20 (High)	12 (Med)
		AF03: Sewer overflows		16 (High)	20 (High)	12 (Med)

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