

SRN54 Innovation Technical Annex

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from
**Southern
Water** 

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1. Introduction

This continues to be a time of change and challenge in the water sector, arguably the most significant we have ever seen. We see innovation as essential to meet the challenges of the future. We believe we can bring our preferred future to life faster and more efficiently if we are open to new ideas, new ways of working, new technologies and new practices.

Innovation can be described as the ‘the development, implementation, and exploitation of a novel idea, service, scheme, system, process or formula’. This means that innovation extends well beyond just new technology. Innovation extends from research, through to testing new ideas quickly, failing fast, iterating and importantly, spreading and scaling what works (2050 Water Innovation Strategy).

We describe innovation as the creation of a new offering that solves a new challenge for the business or meets a new stretching target for a known problem. We recognise that change activities are taking place all over our business, with strategies and plans defining the change we desire. However, true innovation is often about exploring the spaces not easily reached by traditional change activities, to identify high value opportunities amongst uncertainty.

We know improvement and innovation is important to our stakeholders. ‘Always Improving’ is one of our core values. We are always improving our services, taking advantage of new technologies and innovative ideas, wherever they may come from. There are many benefits of delivering innovation, but some key reasons we aim to innovate in our AMP8 delivery are;

- Drive efficiency, to do more with less – ensuring we achieve value for money across every area of our business, which in turn ensures affordability for our customers
- Achieving ambitious performance targets across the business over the AMP8 period – performance the likes of which we have never delivered before
- Pre-empting and avoiding future challenges. Innovation will help us address our long-term priorities as part of LTDS (see [SRN02 Long-term Delivery Strategy Chapter](#)) – these priorities are developed with consultation from customers (see [SRN03 Customer Acceptability Chapter](#))

We know innovation is important to our customers. Our customer insight activities tell us that customers think that new technology and innovation will play crucial roles in the future of our resources, infrastructure and services we provide. Using technology is well received by customers and helps explain big investment and counteract perceptions of crumbling infrastructure.

Customers also want us to be the instigators of change and show that we are prepared to act and show credible actions we have taken to deliver change now and in the future. They recognise expertise from the sector and stakeholders in decision making but want to see us take the lead, so they have the reassurance and confidence in investments for the future. It is proactive and shows we have a long-term focus that is changing with the times.

This Annex describes how we have developed our ability to innovate over the previous AMP and illustrates how we will continue to use innovation to help us deliver for our customers and the environment, keep bills affordable and adapt to new challenges.

2. Our journey: What We Said We Would Do in BP2020-25

Our business plan 2020-25 framed a journey to a better business. Innovation was already happening in the company but as a key theme for 2020-25 plan we established several activities to enhance our ability to exploit innovation.

Table 1 Progress against Business Plan 2020-25

Business Plan 2020-25	Progress
<p>To create Bluewave, a new approach to transformational and radical innovation at Southern Water. Bluewave would combine lean start-up and design-thinking approaches in a dedicated, physical innovation space.</p>	<p>We created Bluewave, the dedicated Southern Water innovation, research and development team. The Bluewave mission is “to create value for our customers, communities and company by exploring and introducing new ideas, technologies and ways of working”.</p> <p>Bluewave is a truly multidisciplinary team and brings experience from inside and outside the water sector to focus on solving priority problems through principles of innovation for Southern Water. Within Southern Water’s organisational structure Bluewave combined with our R&D team to ensure great alignment between activities from research (including academia) into innovation and then exploitation.</p> <p>Importantly, Bluewave thrives on the diversity within the team. Knowledge and competence in the Bluewave team currently includes Environmental management, Wastewater science / engineering, Product design, Product management, Social psychology, Consumer behaviour, Digital strategy, and Business management. This diversity ensures we have the ability to solve problems with broad, novel and creative solutions.</p>
<p>To ensure our research and development (R&D) team continue to work on game-changing solutions and monitor emerging technologies with the greatest potential payoff</p>	<p>During AMP7 we combined our existing R&D team with our newly established Bluewave Innovation team. This was to ensure that we created a continuous flow of ideas and solutions from our R&D enablers, through innovation projects into our business and operational delivery. We continue to monitor and facilitate research to enable transformation across our business. As an example, we continue to use our strategic relationship with the University of Portsmouth to work collectively on wastewater treatment research at our unique Petersfield Environmental Technology Field Station (see ‘How do we plan to deliver and enable innovation’ Figure 2).</p>
<p>Roll out a collaborative innovation platform, supported by an ongoing internal marketing</p>	<p>We learned lessons from an inherited R&D process whereby all colleagues could email ideas for</p>

<p>campaign with incentives to encourage participation</p>	<p>improvements and new technology to trial – the key barrier to innovation was not a lack of ideas or willing collaborators, but a process by which we can filter and prioritise these ideas before testing in a consistent, systematic way. Instead of a platform and the costs associated, we defined a process of prioritisation against target business benefits, created simple ways for colleagues to engage and the team to respond effectively. We have been refining the processes of governance for innovation in the business and have recently assessed ourselves against the ISO standard for Innovation Management (ISO 560002) and continue to use this standard as best practice to shape our innovation capability and enablers</p>
<p>To deliver incremental innovation through a relentless discipline of being customer focused and brilliant at the basics to drive continuous improvement. At the same time, develop and implement “transformational” innovation through new programmes, approaches and technologies. Finally, invest in assessing “radical” innovation, looking far into the future for long-term changes that will change the way we do business and searching across global geographies and industries for new ways of working to respond to radical change</p>	<p>We have continued to address a balance of core, transformational and radical innovation during AMP7. Not only have we focused on and developed specific novel solutions to bounded problems, but also driving innovation across entire programme / problem areas to embed new ways of thinking across the business. Our Target 100 (T100) programme of work, is a good example of how we use research and innovation to underpin and enable the transformation we are looking to achieve. T100 is the blueprint by which we intend to create a culture where people are consciously using less water).</p>
<p>To make a Totex investment of £20-25 million in innovation in AMP7 and expect this to deliver in excess of £50 million in benefits in the 2020 to 2025 timeframe</p>	<p>We admit that we find it hard to track some of the total benefits associated with our innovation investment in AMP7 this far. This is both because benefits of innovation are not always solely financial (eg natural capital), but also because it is challenging to track the final benefits of early stage experimentation through into our CAPEX delivery projects. We are continuing to improve our internal innovation management and wider business casing approaches so that we can better track this over the final years of the AMP, and into AMP8.</p>

3. What We Have Achieved

Taking a retrospective look at innovative activities in AMP7 helps set the context for innovation in AMP8. The following illustrates activities of innovation that have been taking place in AMP7 across a range of business areas and priorities. Case studies of our innovation efforts can also be found throughout the wider Business Plan.

To simplify the content here we have split the achievements into three key areas; Customer Focus, Environment and Asset Technology/Operations.



Customer Focus

T100

In our WRMP19, we planned to reduce average per capita consumption to 100 litres per head (person) per day (l/h/d) by 2040 as part of our Target 100 (T100) initiative. Our WRMP24 has been refined to consider things we've learned, the unprecedented impact of the pandemic and new government-led targets. Innovation has been a core part of the T100 programme, taking the lead on lean testing new and innovative concepts to address consumption, identified from horizon scans, ideation and workshops.

- What we've done:
 - Used innovation design sprint methods to set the aims, ambition and approach for the T100 programme of work – broadening the programme scope from a focus on Household consumption to all consumption as Household is only a portion of usage
 - Conducted ethnographic research to understand actual customer behaviours within two target customers segments that both consume a lot of water and are open to changing their behaviours given the right motivations. This research provided a detailed understanding of usage within the household and the underlying motivations and/or habits that inform these behaviours
 - Produced a list of solution options and opportunities to trial, based on horizon scans, ideation and workshops - this spans communications and hardware to be attached at a device level within the home
 - We commissioned an expert behavioural and decision science consultancy, Dectech, to rapidly test a wide range of behavioural messaging with 2000 customers to understand what really works to encourage customers to change their behaviour around water usage. Applying a specialist consumer decision making approach to test multiple message types provides insight on perceptions, likelihood of behaviour change and purchase of efficiency products. The methodology accurately predicts message effects on propensity to change behaviour which is very difficult to assess qualitatively. Key insight included effect of different messenger types, how to better communicate the magnitude of the problem, effect of different calls to action and best motivators (virtue signalling and comparison to self).
 - Established a community of employees – known as the Water Warrior community – as a primed, cost-effective initial testing cohort for in-home water saving products. The intent is:
 1. to practice what we preach by ensuring our own staff are ambassadors for water efficiency within their communities
 2. to speed up the testing process by having access to willing participants, testing concepts in a lean way to prove initial feasibility and gain a level of user feedback before deciding whether to instigate further trials/engagement with customers
 3. to ensure that by the time products reach customers they have been tried and tested, using feedback to improve and adapt how we design and develop solutions if they're suitable for scale
- What it achieved:
 - Rapidly tested a wide range of behavioural messaging with 2000 customers to understand what really works to encourage customers to change their behaviour around water usage. On average, the tested messages impact predicted potentially reducing water consumption by 27 litres per person per day
 - Our T100 media campaign, called 'Save a little water, make a lot of difference'. This campaign is focused on supporting and encouraging customers to reduce their water use and launched on TV, radio, music streaming platforms, YouTube, social media, billboards and across our website.

- The Bluewave team have identified over 100 technologies and begun trialling the most promising solutions. These include;
 - Toilet odour neutraliser tablets called Wizso with a trial of 36 participants, enabling a significant water reduction within our sample (7884 litres of water was saved during the 2-week testing phase compared to the previous 2 weeks)
 - Aguardio smart flush counter and leak sensor. The Aguardio device can detect the number of times a toilet is flushed each day to around 85% accuracy, providing a tool to count flush numbers and assess the impact of interventions to reduce toilet flushing
 - A digital shower timer was tested in combination with messaging around water scarcity to test the impact of the timer on reducing shower duration. Across the whole group, the average shower time went down from 7 minutes 15 seconds to 5 minutes 45 seconds. An average reduction of 1 minute and 30 seconds. The results also indicate that the introduction of additional messaging was effective in driving change, when compared to the control group. Time in the shower was reduced by roughly 20% in the control group and 30% in those who received the additional messaging.

Affordability

With the cost-of-living increasing drastically during this AMP, many people are struggling financially for the first time in their lives – not everybody knows help exists or is comfortable claiming. While we do our very best to support all of our vulnerable and low-income households, it is a challenge reaching everyone who is eligible for support.

- What we've done:
 - Funded in partnership through the Ofwat Innovation Fund we created a pioneering cross-industry expert group and investigated a novel technical approach which applies both AI and machine learning to work out the financial affordability and benefit eligibility of households.
 - The exploratory proof-of-concept project used anonymised household level data, along with open-source data providers to indicate eligibility for a range of benefits and support, not just water company support but other essential areas such as pensions credits and energy grants
- What it achieved:
 - We identified that around 10% of the households included in the data set were eligible but not claiming for one benefit or more
 - We found that on average, over a fifth of pensioners in 'severe financial difficulty' are not receiving the benefits they are eligible for
 - Exploring these solutions enables us to give even more proactive, targeted and tailored support to our most vulnerable customers while developing a more advanced and effective means to engage utilising Smart data.

Environment

Wetlands feasibility tool

We wanted to identify more efficient, cheaper and greener solutions for nutrient permits. However, we needed to improve our confidence in nature-based solutions to deliver the long-term compliance we need, specifically testing the viability of wetlands in innovative ways.

- What we've done:
 - Collaborating with key stakeholders in the business we gained a greater understanding of the requirements for the AMP8 business plan and used these to identify uncertainty in the current design application of wetlands. From that we created a defined list of focus areas which would enable us to compare wetlands against traditional end-of-pipe solutions

- We distilled current best practice and academic literature into a matrix tool which provides a user with guidance on whether such a solution would be feasible for long term permit compliance compared to end of pipe solutions.
- What it achieved
 - Hard benefits - £3m of assumed savings across AMP8 based on the matrix identifying five feasible options for wetlands development.
 - Soft benefits – Alternatives to end-of-pipe treatment bring benefits of natural capital: protecting rivers, increasing biodiversity, and reduction in our carbon footprint.

Slow Drain Water Butts

We launched our pathfinder programme with the aim of learning how we could identify, target, design and deploy sustainable solutions that have a significant impact on the use of storm overflows. In order to accelerate the reduction in the use of storm overflows across the South East, we have been investigating solutions to reduce rainwater run-off from household or domestic roof areas.

- What we've done:
 - To slow the flow of rainwater and reduce the likelihood of combined sewer overflows in specific catchment locations
 - Standard water butts, while they may be suitable for water efficiency, offer limited support for drainage – if the butt fills up one day, it requires manually opening a tap to create capacity on subsequent days
 - The solution we developed is a modified a water butt with an additional tap installed half-way up, so the bottom half can be used for watering the garden and the top half will slowly drain into the network over five hours leaving 100litres capacity for the next rainfall event.
- What it achieved
 - We have had a 70% reduction in the local pumping station overflow due to the Havenstreet trial
 - We've since expanded our pilot work to install a further 1000 slow-drain water butts across Gurnard IOW, Whitstable Kent and Fairlight East Sussex.

Assets Technology / Operations

Sewer Lining Repairs

We know that around 25% of storm overflow releases are due to groundwater getting into the system, which we know from our work investigating sustainable solutions have a significant impact on the use of storm overflows. Around 40% of the contributing sewer network is privately owned. We believe excess water from these sewers is getting into the public sewers, leading to an increase in storm overflow releases in some areas across our region and requiring increased tankering services to minimise flooding.

- What we've done:
 - Bluewave investigated a number of 'no dig' solutions looking at novel approaches and solutions
 - We trialled a technology (Tubogel) to refurbish the pipe and prevent leaks that was widely used in Europe but hadn't been used in the UK
 - In total three trials were held, two at Alfriston, and one at Firle. Comparison of pre and post CCTV footage of the trialled sections of pipe showed that any identified defects were sealed by the treatment
 - Once the process was understood it was expected that several of these treatments could be done in the same day with the same application of chemicals, saving significant time and money – effectively sealing a network rather than just fixing individual pipes
- What it achieved:
 - The sewers have since been further inspected to assess longevity in the sealing achieved with positive results

- Early indications are positive, with fewer tankers sent to the Pan Parishes site this year in areas where we've been carrying out the lining pilot. However, ongoing monitoring is in place and further surveys and lining installations are planned
- We were the first UK water company to use Tubogel and we have presented our trials at the United Kingdom Society for Trenchless Technology and several other WASCs are now actively looking to trial it.

Sewer Digitalisation

The vast majority of sewer blockages are caused by 'unflushables' like wet wipes and plastics, as well as fat, oil and grease, gathering in pipes. These blockages can lead to flooding of homes and properties and damage to the environment. Tackling this issue is a priority for us. With low cost sensors we can detect signs of blockages before they even start to be a problem.

- What we've done:
 - We investigated whether we could identify, test and evaluate new, low-cost sensor technology that can be deployed at scale in our sewer network
 - A product scan identified a number of potential sensors which were then tested in a series of pilots
 - 23,000 sensors have been deployed across high-risk areas of the 39,500km sewer network, communicate digitally with our Operational Control Centre, where technicians are warned about potential blockages forming long before any risk of a pollution spill from a manhole, or flooding directly into homes, schools, businesses or any other property.
- What it achieved
 - Our analysts then interpret the results before mobilising our sewer crews to clean the sewers and clear the blockages. It's a more proactive way of working, making it easier to plan ahead, as well as being more efficient and cost-effective.
 - This innovative technology is expected to cut pollution incidents by up to 40%. That's around 500 fewer internal floods between now and 2025, and about 7,000 fewer external floods during the same period

4. Looking Ahead – PR24 Innovation Themes

As we began to consider innovation in the AMP8 plan there was a need to identify areas of agreed innovation focus for the business. The idea of creating themes to start planning innovation meant that we could use these as handrails for conversations to engage the business. The themes were developed to be solution agnostic. Each theme defines the 'what' we should focus on, with details of a programme to deliver against the theme (when), resources (who) and innovation practice (how) to be outlined as part of subsequent plans.

Creating themes to think about innovation in the business allowed us to;

- Draw attention to specific areas in the business
- Build on short/med term roadmaps and de-risk our long term strategies
- Align and further build our existing innovation programme
- Define more meaningful targets and measures to assess the impacts of our innovation efforts/investment
- Establish gaps in technology / capability around improvement and change.

At the same time, focus on themes helped us to avoid:

- Claiming that all change is innovation, and instead recognise the need to build on business-as-usual 'improvement'

- Boiling the ocean – we can't outline every innovation effort taking place
- Duplication of effort and silos – both those already existing and those that may develop

5. Our Four Innovation Themes for PR24

To generate areas of innovation focus;

- We aligned with the needs and demands of customers, regulators, our industry and the pressing concerns facing society, including climate change, public commitments and performance commitments made
- This included mapping potential themes against the sector's 2050 Water Innovation Strategy and Ofwat's four strategic innovation themes¹
- Each theme needed to present a broad enough opportunity to drive an innovation programme for the next five years
- Identified efforts and capability across the whole of SWS, not just the Bluewave Innovation team
- Tested against the business definition of innovation - a new challenge for the business and/or meets a new, stretching target to a known problem - a clear need for innovation to help deliver against them
- We refined - making a conscious decision not to focus our themes on 'cross-cutting' strategic or macro themes such as "carbon" or "data", as these act as both inputs and outputs to our four themes given their prominence

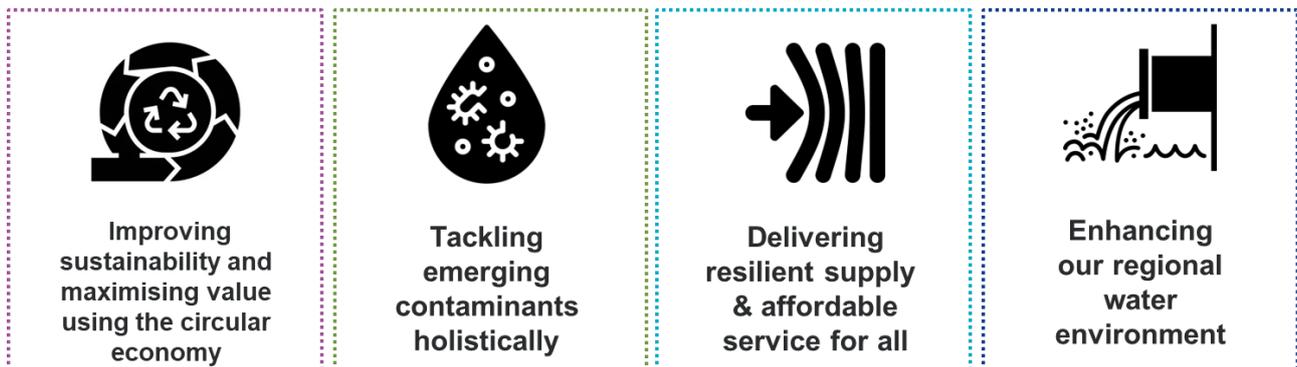


Figure 1 Our four innovation themes for PR24

¹ <https://spring-innovation.co.uk/2050-water-innovation-strategy/>

6. Proposed AMP8 Innovation Portfolio

Using the innovation themes as a starting point we have conducted workshops and engagement exercises across the business to identify options for innovation-driven activities for AMP8. We have also engaged across the sector and continue to identify new and novel delivery options through technology watch and horizon scanning activities.

As such, we have identified a portfolio of innovation that we will seek to develop and exploit through AMP8. Importantly, we also have a series of AMP7 projects that are paving the way for innovation in AMP8 (and then later into AMP9), thus creating an enduring pipeline of research and innovation for the organisation.

However, we must not assume that the world of innovation is predictable or that clear paths can be charted too far in advance. Common reasons for this are;

1. Technological solutions can develop and mature quickly – rendering some innovation opportunities obsolete overnight, but also opening new opportunities just as quickly. ChatGPT is a good example of how solutions can be transformed within a short space of time, thus changing the scope and scale of an innovation opportunity more quickly than could have been predicted².
2. True innovation is a process that has uncertainty and risk associated with it. It is not possible to create transformation with a conservative perspective on managing risk and new uncertainties. Some things we try will not immediately succeed, but we will learn from failures and move forward.
3. We want to follow fast where others are innovating against different priority areas. We will continue to seek insight and collaboration both within the sector and outside the sector. Where others succeed in innovation we can quickly adopt and scale solutions that are appropriate in our business. Likewise, we will share lessons and successes with others. The Ofwat Innovation Fund is a great source of innovation that we will continue to engage and exploit.

For these reasons we recognise that as we enter into process of deeper diligence and discovery around prospective projects within AMP8, the detail of our plans may change. What we are doing at this stage is planning to innovate, and prioritising opportunities within the business plan. What we are not trying to do is explain exactly what the solutions will be at this stage. We are confident that if we continue to invest in processes of innovation we will continue to yield positive outcomes and benefits for the business.

We note that the benefits of innovation can be diverse, won't always be focused on financial return on investment and may include;

- increased ability to manage uncertainty;
- reduced costs and waste, and increased productivity and resource efficiency;
- improved sustainability and resilience;
- increased satisfaction of users, customers, citizens, and other interested parties;
- engaged and empowered people in the organisation;
- enhanced reputation and valuation of the organisation;

² OpenAI's ChatGPT has revolutionized the world by bringing advanced language processing capabilities to a broader audience. Its ability to generate coherent and contextually relevant responses has transformed various industries and applications. From customer service chatbots to language translation services, content generation, and even assisting in research and education, ChatGPT has opened up new possibilities for human-computer interaction.

- facilitated compliance with regulations and other relevant requirements³.

7. AMP8 Proposed Innovation Portfolio Content

Our innovation themes have helped identify some key innovation opportunities plans aimed at driving efficiency, supporting our customers and protecting our environment.

 <p>Improving sustainability and maximising value using the circular economy</p>	<ul style="list-style-type: none"> ■ Novel technologies, energy-efficient practices, and stringent emission control measures (process and fugitive greenhouse gas emissions) ■ Alternative pathways for converting wastewater bioresources into renewable energy and valuable by-products, including nutrient recovery
 <p>Tackling emerging contaminants holistically</p>	<ul style="list-style-type: none"> ■ Ensure emerging contaminants are dealt with effectively, proactively and collaboratively; including consideration of (but not limited to) Cypermethrin, PFAS, PFOS, Microplastics, Antimicrobial resistance
 <p>Delivering resilient supply & affordable service for all</p>	<ul style="list-style-type: none"> ■ Behavioural science and ethnography to drive engagement with our customers on key topics and areas for collaborative impact ■ Promote water efficient behaviours and new technology solutions that reduce household and non-household consumption ■ New charging structures and seasonal tariffs ■ Identifying, supporting and protecting our most vulnerable customers ■ Advanced leak detection technologies, such as satellite detection, aerial surveys and artificial intelligence based acoustic sensors ■ No-dig technologies, such as in-situ pipe replacement and lining technologies

³ Taken from the ISO standard for Innovation Management <https://www.iso.org>



Enhancing
our regional
water
environment

- Technological advancements and novel treatment technologies to better understand persistence, degradation pathways, and potential impacts of nutrients and pollutants (existing and emerging)
- Identify more efficient, cheaper and greener solutions for nutrient permits. Wetlands are one of those solutions that could help to reduce our reliance on end of pipe solutions



Improving
sustainability and
maximising value
using the circular
economy

Process and Fugitive Emissions

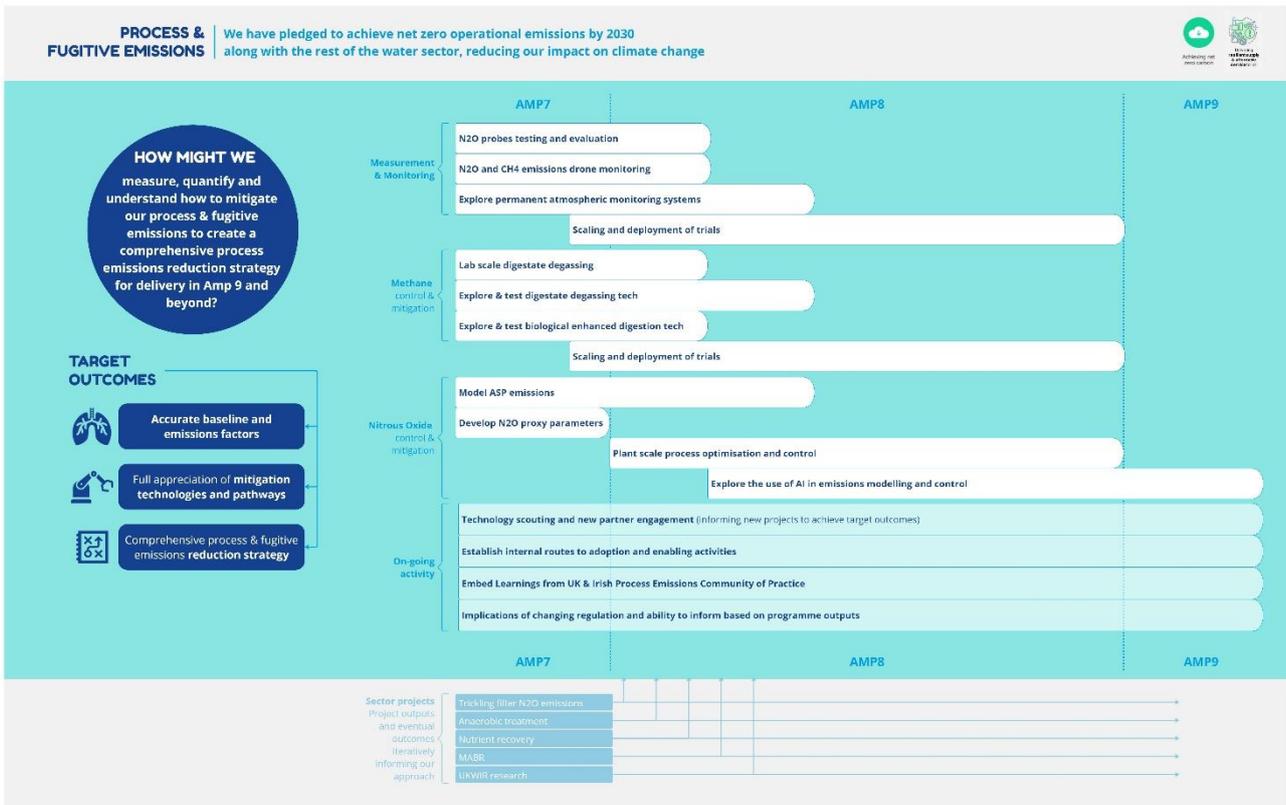
Process emissions from wastewater treatment processes have a significant impact on the environment, human health, and climate change. The imperative to reduce these emissions is driven by the need to protect air quality, mitigate climate change, safeguard human health and safety, comply with regulations, improve energy efficiency, and build positive relationships with communities and stakeholders. By adopting innovative technologies, energy-efficient practices, and stringent emission control measures, we can pave the way for a more sustainable and responsible wastewater treatment industry, ensuring the preservation of our precious water resources for future generations.

Wastewater treatment process emissions, particularly methane, are potent greenhouse gases (GHGs) that contribute to climate change. Nitrous Oxide is approximately 300 times more potent than carbon dioxide in the atmosphere. By minimizing the release of N₂O and other GHGs from wastewater treatment processes, we can make significant strides towards mitigating climate change and its associated consequences.

In line with our Net Zero plan and environment strategy we already have AMP7 activity to implement, develop and mature technologies to measure, monitor and control N₂O emissions that are currently in their infancy. We are implementing on site WTW assessment through installation of nitrous oxide sensors, with testing of operational interventions to understand their impacts on fugitive emissions. In AMP8 we will quantify emissions reduction potential from current and emerging assets and will use insights to develop a comprehensive process emissions reduction strategy.

The roadmap below gives an overview of our current thinking and planned areas of exploration to reduce process emissions. Though this visual suggests a linear sequence to this work innovation is iterative in nature, and open to new technologies as they emerge and mature over time. What we want to share is our

starting position, areas of focus, on-going activity and awareness of trials/projects across the sector that will inform how we achieve the target outcomes.



Resource Recovery / Biorefinery

Our wastewater treatment plants offer immense potential for resource and nutrient recovery. In Amp 8 we will further investigate and understand the innovative technologies and approaches available to maximise the value of our wastewater by turning it into a valuable resource, enabling our transition towards a sustainable circular economy.

A key element of our innovation work in Amp 8 will be understanding the various possibilities for resource recovery from our wastewaters and developing a holistic and optimised plan for resource recovery to enable us to maximise the value and sustainability of our wastewater treatment processes. This will involve a comprehensive assessment of the composition and characteristics of wastewater, as well as an evaluation of available technologies and their feasibility in resource extraction. One approach that we will investigate, for incorporation into this plan, is the **biorefinery** concept, which utilises various technologies to convert organic waste materials and inorganic constituents, into a range of valuable products and energy.

A holistic approach is necessary to ensure the integration of different resource recovery strategies. For instance, combining phosphorus recovery with biogas production from anaerobic digestion can create a symbiotic relationship, where the by-products of one process become the feedstock for another. Such integration maximizes resource efficiency and minimizes waste.

Once the resource possibilities are identified, we will evaluate the available technologies and their suitability for resource extraction. This may involve considering advancements in technologies like advanced anaerobic digestion, nutrient recovery techniques, thermal conversion processes, or innovative membrane technologies

for water reuse. Assessing the economic viability, energy requirements, and environmental impacts of these technologies will be key focal points in the development of our optimised plan.

Innovation in **market development** for recovered products will require multifaceted approach involving market analysis, product development, awareness building, and collaboration with various stakeholders. We will collaborate with stakeholders such as agricultural organizations, industrial partners, government agencies, and environmental organizations to identify market opportunities, address regulatory challenges, and establish partnerships for distribution, product certification, and market access.

In addition to considering the long-term potential and viability of resource recovery in the biorefinery model we will continue our Amp 7 work in **heavy metal and phosphate recovery** and will explore new opportunities for **nitrogen and ammonia recovery**. In AMP 7 one of the key priorities for our collaboration with the University of Portsmouth was the evaluation of solutions for phosphorus removal at small wastewater sites where conventional approaches do not scale down well, both technically and economically. We also tested **Zinc, Nickel, Copper and Cadmium recovery** in adsorptive media column trials at Lidsey WWTW. We will build on this work in Amp 8.

By embracing innovation in the various possibilities for resource recovery, evaluating suitable technologies, and adopting a holistic approach, we will transform our wastewater treatment plants from conventional waste treatment facilities to resource recovery centres. This shift will begin with exploratory work in Amp 8 and develop into full implementation in Amps 9 and 10 and will improve the sustainability of our wastewater operations and contribute to the circular economy by reducing waste, conserving resources, and creating new economic opportunities.

Bioresources

Innovative technologies and approaches are increasingly becoming available to maximize the value of our wastewater bioresources while addressing emerging challenges such as restrictions on landbank use and emerging contaminant contamination. Innovation in the bioresources space will promote sustainable waste management, contribute to our carbon neutrality objectives, and enhance the generation of renewable energy and valuable by-products.

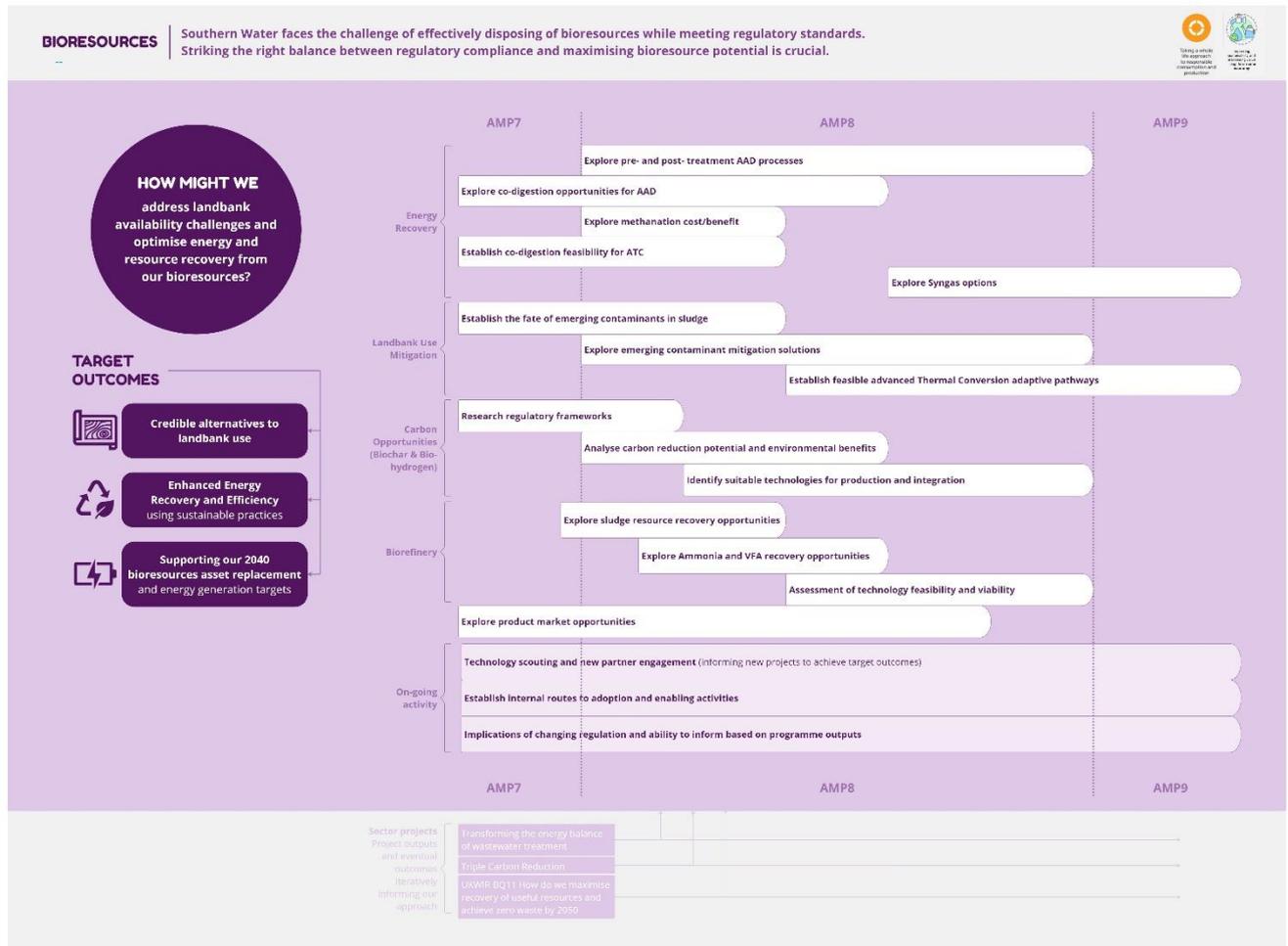
A significant driver for our work in this area in Amp 8 is restrictions on landbank use, which will limit the availability of land for spreading treated wastewater solids, creating challenges in managing and utilizing wastewater bioresources effectively. The approach we are taking to address this involves the conversion of biosolids into value-added products, reducing the need for land application. By employing advanced technologies like anaerobic digestion and thermal conversion, these solutions transform wastewater solids into renewable energy and potentially into valuable biochar, mitigating the need for expansive landbank use and creating sustainable alternatives for bioresource management.

Our Amp 8 bioresources innovation programme will focus on enabling the roll out of the best possible solutions for Southern Water as part of our Amp 8 strategy, and the development of these and related technologies to yield greater benefits in Amp 9 and beyond:

- The implementation of advanced anaerobic digestion forms the basis of Southern Water's approach to bioresources management in Amp 8 and beyond. Innovation work in support of this will involve the study of co-digestion, where additional organic feedstocks, such as food waste or agricultural residues, are mixed with wastewater solids to enhance the anaerobic digestion process. This approach diversifies the feedstock composition, improves process stability, and increases biogas production. We will also undertake work into the incorporation of pre- and post-treatment processes, such as hydrolysis and nutrient recovery, to optimize organic matter conversion and improve overall system efficiency.

- As part of our wider work on emerging contaminants, we will study the fate of emerging contaminants in wastewater sludges, possible mitigation technologies and the impact of emerging contaminants on the future use of landbanks. We will incorporate innovative research, technological advancements and innovative treatment technologies into our work to better understand their persistence, degradation pathways, and potential impacts on soil and groundwater, with the ultimate goal of enabling informed decision-making and facilitating the safe and sustainable utilisation of wastewater sludges in land applications.
- **Advanced Thermal Conversion (ATC)** technologies offer an alternative pathway for converting wastewater bioresources into renewable energy and valuable by-products, and eliminating emerging contaminants from wastewater sludges, and forms the most probable Southern Water route to bioresources beneficiation beyond Amp 8. Thermal processes like pyrolysis and gasification transform wastewater solids into syngas, bio-oil, and biochar. Innovation in this space will focus on the maximising energy recovery, minimising emissions, and optimising the production of valuable by-products. By harnessing the potential of thermal conversion, we can diversify our energy portfolio and achieve greater resource recovery from wastewater bioresources.
- **Biochar** is a carbon-rich material produced through pyrolysis that holds significant potential as a soil amendment for agriculture and as a carbon sink for carbon sequestration. Offering a sustainable solution for nutrient recycling and carbon management, biochar improves soil fertility, retains moisture, reduces greenhouse gas emissions, and enhances overall soil health. Production and use of biochar will form a focal point of our innovation research and development in Amp 8 and will inform our bioresources strategy for Amps 9 and 10. By integrating biochar production into wastewater treatment processes, Southern Water can promote circular economy principles, reduce waste, eliminate emerging contaminants, and contribute to sustainable agriculture

Our work on innovation in wastewater bioresources management is critical for Southern Water's sustainable development and energy transition. By innovating with advanced technologies like advanced thermal conversion, and biochar production, we can maximize the value of wastewater bioresources while mitigating our carbon impact and restrictions on landbank use. The below roadmap illustrates the work to be done against AMP timings, but again we will look to approach trials and testing in as lean and agile an approach as possible without compromising essential project outputs and outcomes.



Sustainable consumption reduction

With hotter summers and less rainfall, the water in our rivers, aquifers and reservoirs gets topped up less often. And a growing population in our region means we have more people and less water to go round. While we are working hard to increase our storage capacity and reduce leakage, we should all look to use less water where we can. As outlined in our Water Resources Management Plans, we continue to work with our customers and other stakeholders to promote water efficient behaviours and trial new technology solutions that reduce consumption sustainably.

Initial ethnography research undertaken by the Bluewave Innovation team in AMP7 provided invaluable, nuanced understanding of actual customer behaviours around toilet and shower usage, and ethnographic research will be at the heart of the T100 programme on-going. To shift behaviours we need deep



understanding of our customers – prevailing attitudes, awareness of water resources as an environmental issue and the subsequent need for decreased individual usage. We need to use behavioural science expertise to our advantage to bridge the gap between actual and claimed behaviours, closing the 'intention-action gap' between a desire to reduce usage and actually reducing usage, that so many of our customers experience.

We have worked with a small network of behavioural specialists to inform research and trials with best practice, building internal capability with bespoke tools to drive consistency. We will continue to lead internal behavioural science capability by further developing our external network and capability within Bluewave, working closely with our Smart programme to establish trials that evidence impact of individual interventions (nudges and other), and importantly the cumulative effects. There is great dependency across the WRMP and Smart Programme upon the ability to drive down household consumption, and innovation will play a leading role to establish:

- The most effective interface for usage data and behavioural nudges, informing tech requirements as a feed to Smart rollout
- The part context (such as weather/seasonality, media and brand reputation, combined customer behaviours across utilities) plays to determine best approaches and a plan to sustain comms activity
- What part product and service design with external, enabling partners needs to play in sustainable reduction along-side awareness and timely communications, to ensure tried and tested products can be scaled to a wider customer base than we have been able to engage with previously" i.e. beyond just that small sample who have a home visit

Bluewave will work with the Smart programme to establish a measured testing environment to determine optimal combination of messaging, hardware and other interventions to sustainably deliver reduction in customer consumption. Bluewave will continue to lead on regular horizon scanning to keep abreast of new water efficiency products on the market and will engage with partners and/or the regional student base where we identify gaps in the market to brief student design teams with problem statements.

Finally, the opportunity for new approaches to Tariffs as a mechanism to drive down consumption will be an area for trials and lean testing – building an evidence base to inform Tariff framing, customer communications and importantly prove efficacy with regards to sustained reduced water usage in the home.

Affordability

It is important that bills remain affordable for all customers and that current and future customers pay a fair amount relative to the services they consume and when they consume them. We will continue to take every opportunity both to keep overall bills low and to ensure fairness between today's and future customers. Our affordability plan hinges on an innovative charging structure designed to make bills fairer for householders while increasing the sustainable use of water at the same time. It will focus on removing discounts for large users, and introducing seasonal tariffs so that bills for the majority of our customers will be more affordable and those using water efficiently will be rewarded (See [SRN08 Affordability Chapter](#)).

Our plan to look after the vulnerable is based on adopting a continuous, proactive practice of seeking out customers we think might be struggling (or soon will). Once we have identified them, we will offer support that is compassionate and tailored to their personal circumstances. The unprecedented combination of a Global pandemic and National cost-of-living crisis has seen an increase in customers experiencing vulnerability, and as a business we are committed to providing as much support as possible to those in need. Being available and with tailored services, tariffs and wider support is fundamental for customers who have both short term and long-term vulnerabilities.

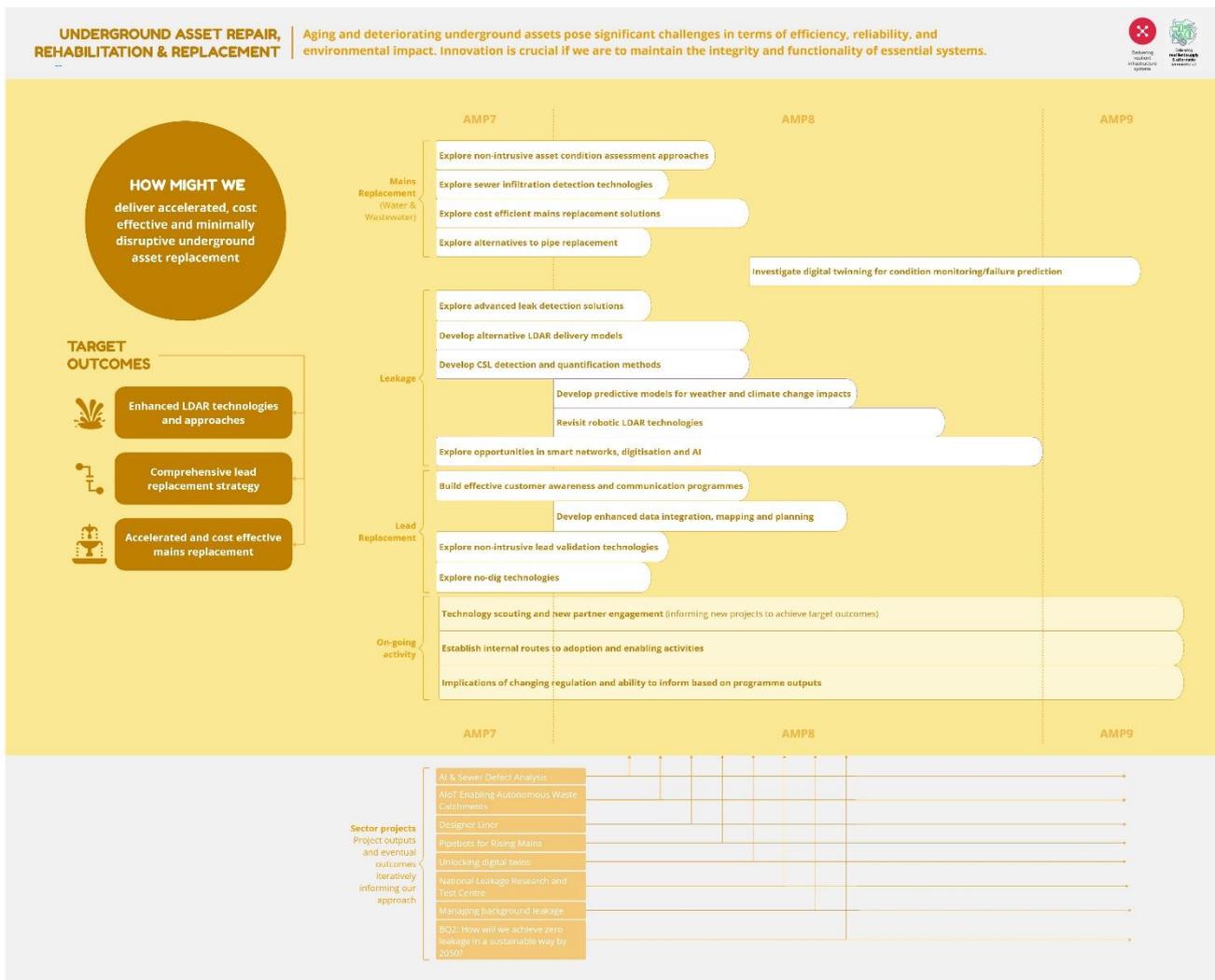
In this AMP we have investigated a novel approach to supporting our most vulnerable customers. This was achieved through leading the Ofwat Water Breakthrough Challenge 'Water4All' project. This project used a range of data sources, such as age, household composition and income, to attempt to determine whether a customer is eligible for additional financial support. In AMP8 we will continue to investigate and deploy approaches using data processed lawfully, fairly and in a transparent manner that helps support and engage vulnerable customers, including those that find themselves financially vulnerable for the very first time.

Water & Wastewater underground asset repair, rehabilitation, and replacement

Innovation in water and wastewater underground asset repair, rehabilitation, and replacement is crucial for maintaining the integrity and functionality of these essential infrastructure systems. Aging and deteriorating pipelines and other underground assets pose significant challenges in terms of efficiency, reliability, and environmental impact. Through asset deterioration modelling we estimate that we need to replace 250km of network a year to offset deterioration in leakage. Advancements in technology and practices are continuously emerging to address these challenges effectively. In AMP7 we investigated innovative lining solutions for wastewater infrastructure that are now being used in several capital projects across the business. In AMP8 we will continue to investigate and implement technologies that will:

- Rapidly assess mains condition
- Enable a targeted approach to mains replacement
- Predict degradation and failure
- Drive cost-effective mains and service
- Connection refurbishment / replacement solutions
- Investigate lining solutions for clean water pipes that will increase the lifespan of pipes & reduce leakage.

This roadmap seeks to illustrate the specific underground assets and/or processes we're looking to affect with the innovation process – discovering and trialling new ways of working and new technologies to minimise disruption for our customers and improve environmental performance. Once again, the process will be more iterative than the visual indicates, but highlights key parts of the design thinking process: Empathise, Define, Ideate, Prototype and Test:



Leakage

One of the most significant challenges facing Southern Water is the reduction of leakage from our water networks. Leakage reduction impacts so many aspects of our core work, such as catchment and environmental protection, reducing customer bills, and asset resilience, that it forms one of the foundational aspects of our innovation programme.

We have made a commitment to 50% reduction in leakage by 2050 from 2017–18 baseline (%). Our Water Resources Management Plan outlines how we intend to achieve this through mains replacement, communication pipe replacement and through the employment of enhanced find and fix, smart metering and digital/smart networks. We also intend to investigate and implement innovative solutions that accelerate our journey to improved leakage performance.

Our Amp 8 leakage reduction innovation programme will focus on:

- **Smart networks** and using digitisation and **AI** to run calmer networks, identify leaks more effectively, predict bursts, prioritise interventions and reduce operational response times.
- **Advanced leak detection technologies**, such as satellite detection, aerial surveys and AI based acoustic sensors, to detect and pin-point leaks more effectively, maximising the impact of limited resources and reducing cost.



- Alternative **leak detection and repair delivery models**, focussing on efficiency of repair outcomes to reduce cost.
- **Customer side leakage** (CSL) detection and quantification, to establish the extent to which CSL contributes to overall demand and PCC, and how much leakage goes unmeasured due to consumption meters under reading at low flowrates.
- Understanding the role of **weather and climate change** on underground asset health, long-term asset resilience, burst frequency and water loss in the Southern Water operational area.
- Exploring **robotic leak detection and repair technologies** and developing our approach to this technology for adoption in Amp 9 and beyond.

Through advancements in technology and innovative approaches, we are witnessing the potential for transformative solutions that are revolutionising the way we manage networks and detect, prevent, and repair leaks. We will harness pioneering innovations in Amp 8 to reduce water loss and optimise network efficiency paving the way for a more sustainable future, ensuring the responsible stewardship of our valuable water resources.

Lead Replacement

Lead communication pipes in water networks have long been a concern due to the potential health risks associated with lead exposure. As we strive for safer and healthier water systems, innovative solutions are emerging to address the challenge of replacing these pipes.

The main lead replacement challenges that we have identified in our networks and management systems are the relative lack of data on where lead pipes are, field lead pipe validation, non-intrusive pipe replacement and how to achieve zero lead in a network.

Our Amp 8 lead replacement innovation programme is aimed at creating a suite of efficient and cost optimised enabling technologies and approaches that will focus on:

- Building effective **customer awareness and communication programmes** to provide effective support and guidance to our customers through the transition away from lead.
- Efficient and systematic replacement of lead communication pipes requires accurate **mapping and planning**. Innovative approaches using smart mapping technologies, Geographic Information Systems (GIS), and data analytics will transform the planning and execution of our pipe replacement projects. By integrating data on lead pipe locations, water quality monitoring, and infrastructure conditions, we can prioritize areas for replacement based on risk assessment and maximise the impact of limited resources. These technologies will enable us to make data-driven decisions, optimize project timelines, and minimize disruptions to water supply and community services.
- Innovative **non-intrusive lead validation** technologies, such as ground-penetrating radar (GPR), electromagnetic induction (EMI) and acoustic techniques detect and map underground lead pipes accurately with minimum disruption to customers. These technologies facilitate efficient and precise identification of lead pipes without the need for excavation, minimising cost, reducing disruptions, and expediting the validation process, facilitating the replacement of lead pipes and ensuring safer water systems.
- Employment of **no-dig technologies**, such as in-situ pipe replacement and lining technologies, obviate the need for excavation, minimising cost, reducing disruptions, and expediting the replacement of lead pipes.

Replacing lead communication pipes in water networks is a crucial step towards ensuring safe and healthy drinking water for our communities. Through innovative approaches, we will implement transformative solutions to tackle this challenge. By adopting these innovative strategies and fostering collaboration among

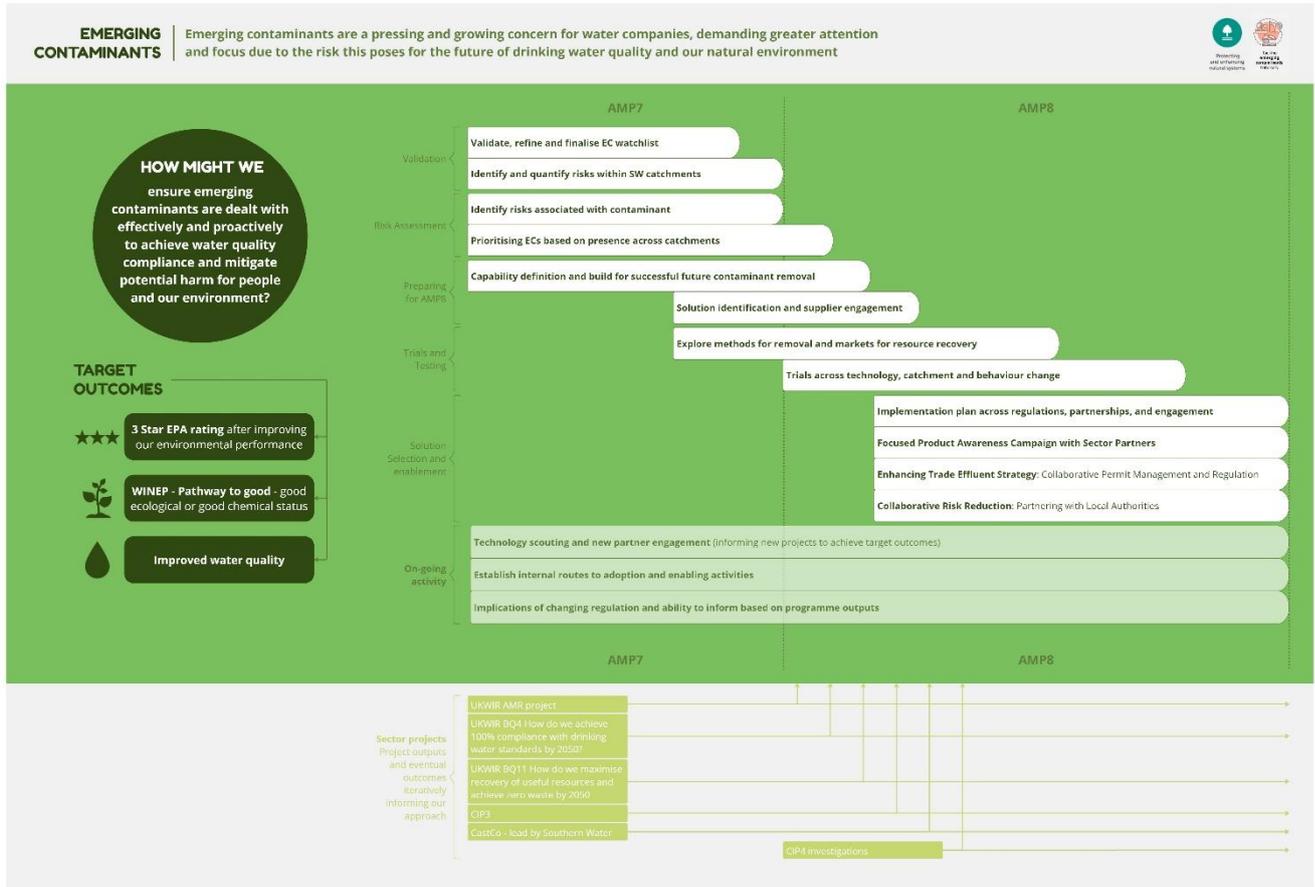
stakeholders, we can accelerate the replacement process, mitigate health risks, and create sustainable water systems that prioritize the well-being of communities.



Emerging Contaminants

As human activities evolve and new substances are engineered and introduced into the environment, we face a challenge in understanding and mitigating the potential risks they pose. New and emerging contaminants encompass a wide range of substances, including pharmaceuticals, personal care products, pesticides, industrial chemicals, and microplastics. These substances find their way into our waterways through various pathways. What makes these contaminants particularly concerning is their potential to harm aquatic ecosystems and human health. While traditional pollutants have been regulated and monitored for years, new contaminants often go unnoticed until their effects become evident. They can disrupt the balance of aquatic ecosystems, harm marine life, and bioaccumulate through the food chain, posing risks to human consumption. We are focusing on proactive innovation to address this challenge and will promote research and innovation to develop effective treatment technologies. In AMP7 we conducted research to understand emerging contaminants and prioritise which should be addressed. Including consideration of (but not limited to) Cypermethrin, PFAS, PFOS, Microplastics, Antimicrobial resistance. Traditional wastewater treatment processes may not be equipped to remove these contaminants, and therefore in AMP8 we will conduct exploration of advanced and innovative treatment methods. We will also explore how to engage sectors that are responsible for creating these contaminants and introducing them into the environment.

Below is a roadmap of the programme of work planned, but once again our approach will be iterative as part of the innovation process: understanding the problem and defining opportunities > identifying potential solutions > testing at small scale to prove feasibility, desirability and viability > design and engagement for scaled adoption.



8. How do We Plan to Deliver and Enable Innovation

We recognise the enablers for an innovative sector that have been identified by Ofwat. Enablers for innovation are pivotal to driving progress and transformative change in both organisations and societies. These catalysts are crucial for several reasons and play a fundamental role in shaping our innovation culture and the landscape in which we operate. We also note that our customers want us to demonstrate leadership and they want us to be the instigators of change and show that we are prepared to act and show credible actions we have taken to deliver change now and towards the future. Our customers want to see us take the lead, so they have the reassurance and confidence in investments for the future, so we have to develop enablers for innovation.

Ofwat's identified enablers for innovation⁴

- **Collaboration:** building and strengthening collaboration and partnerships across companies, the supply chain and outside the water sector.
- **Openness:** to sharing data, insights and ideas within the water sector and with other sectors.
- **Adaptability:** flexibility and openness to trying out new ways of working.
- **Innovation risk management:** delivering value from all innovation projects, particularly more experimental projects, even if they fail.
- **Scalability and Deployability:** improving the ease of scaling up and rolling out of proven innovations within the sector.
- **Long-term view:** taking both a longer-term and broader perspective to better meet the evolving needs of customers, society, and the environment.

Using these enablers as a structure the following sections describes more about how we plan to build on AMP7 progress and deliver more innovation in AMP8

1. Collaboration

Building and strengthening collaboration and partnerships across companies, the supply chain and outside the water sector

Everything is a two-way relationship and we intend to be seen to do our part. Collaboration is key with regulators, neighbouring water companies, local authorities and other organisations on what is right.

Bluewave, our innovation team, acts as the gateway into the sector's innovation ecosystem, including access to the Ofwat Innovation Fund. We also expect collaboration across internal teams to ensure we take a holistic approach to solving challenges. Our customers want us to use our expertise and make decisions go over and above. Our breadth and depth of internal expertise is enhanced through collaboration and knowledge sharing.

As a particular example of collaboration, specifically aimed at enhancing R&D and Innovation, we have developed an enduring partnership with University of Portsmouth (UoP) to work with academic subject matter experts on wastewater challenges. It encompasses a rolling series of trials based around the test-bed facilities at the Environmental Technology Field Station at Petersfield Wastewater Treatment Works (WTW), which aims to identify and assess novel technologies or solutions that can be applied to emerging challenges for us. This unique facility has extensive laboratories and testbeds where pilot plants can be operated with wastewater from various different stages of the works and intensively monitored onsite, saving significant time in travel and sampling. In addition, there are more specialist laboratories and analytical equipment available at the main University campus to support the investigations.

⁴ <https://www.ofwat.gov.uk/regulated-companies/innovation-in-the-water-sector/water-innovation-competitions/>

In order to meet more challenging phosphorus permit levels below 0.5 mg/l, UoP and SW joined to support a match funded PhD which focused on absorptive media for phosphorus (P) removal. The research project found that the tested commercially available media reduced the total phosphorous to levels consistently below 1 mg/L but also provided an in-depth analysis into media physical characteristics, process configuration, process parameters and its influence on other water parameters post-treatment. The knowledge generated allowed the selection of Polonite reactive media to be integrated in a new treatment process at East End WWTW to meet the AMP7 Phosphorus limit.

More recently the Hub has been undertaking trials to determine the most appropriate sorbent materials for removal of heavy metals and also assessing the use of bioaugmentation products to increase methane production from anaerobic digestion. The latest project is now investigating how managing wastewater process gas emissions can contribute to the Net Zero targets of the water sector.



Figure 2 University of Portsmouth Innovation Hub at Petersfield Waste Water Treatment Works

Our University of Portsmouth collaboration isn't only beneficial for Southern Water – the Innovation Hub also helps to provide an improved experience for students at the University. The Hub allows students hands on experience in the water sector, which provides a much better understanding of the processes than that they can get solely from the classroom. That better understanding then translates to better graduates with more industrial skillsets and awareness of the water industry. We have also grown working relationships with other academic institutions to develop topics for PhD thesis and this has resulted in enduring relationships with PhD post-doctorate researchers joining SWS as permanent staff.

2. Openness

Sharing data, insights and ideas within the sector and with other sectors

Sharing data is crucial for innovation as it accelerates the exchange of knowledge and insights. When diverse sources of information are made accessible, researchers and businesses can collaborate, uncover patterns, and devise novel solutions. The primary focus in AMP7 for Data and Analytics within our core IT capability has revolved around elevating data and analytics proficiency across five principal domains: strategy, business enablement, analytics capability, platforms, and data governance. A pivotal aspect encompassed the centralisation of data management, consolidating it within a 'lakehouse' and an enterprise data catalogue. Concurrently, efforts were directed toward fostering self-service analytics capabilities, a trajectory intended for significant expansion in anticipation of AMP8. An instrumental shift to Microsoft Azure's cloud platforms was embraced, promising augmented agility and access to diverse services and technologies. To cater to these goals, dedicated teams providing business analytics, data engineering, data science, and data governance were strategically assembled. Notably, a central data governance team was instituted to design overarching frameworks for federated data governance units and to provide indispensable support for the successful delivery of data and analytics products. In AMP 8, the focus for Data and Analytics is on leveraging the

foundations set in AMP 7 to optimise data utilisation for our stakeholders. This entails valuing data as an exploitable asset, including open data sharing and collaboration with other water companies for innovation and transparency, while also ensuring compliance.

We will continue to engage with our peers in innovation teams across the sector through informal and formal collaboration opportunities (eg Spring, H2Open, UKWIR, Sector Conferences, etc) reducing the cost of exploiting novel solutions and maximising impact across the sector. We do this with the view to join resources and come up with creative solutions to the big challenges facing water companies, society, and the environment. As part of this process, it is important to capture ideas from sprints, workshops and horizon scans from across the sector. Allowing organisations beyond purely water companies and core framework partners to explore new ideas.

We will continue to explore opportunities with SMEs, universities and international innovators within the fund. With Bluewave, Southern Water's core innovation team acting as an enabler to organisations approaching the business. Beyond the innovation fund, we remain open to partnering with organisations beyond the innovation fund, for instance through Innovate UK and UKRI funding, subject to the stage of research and partners involved.

Importantly, we are better at listening and acting on what our customers tell us than ever before. Five years ago, in October 2018, we launched our Customer Participation Strategy. The strategy was developed with our Customer Challenge Group from PR19. Previously, customer insight was something we did as part of a price review, consultation or as a one-off. Now as a continuous, business as usual engagement activity this has created a step change in how the voice of the customer drives change in the business. With this rich insight we are now able to have a much greater impact on the services our customers receive and how we deliver our operations.

We will continue to seek opportunities to work with the Ofwat Innovation Fund to explore and exploit novel and innovative capabilities. This includes both bidding for funding, but also tracking and exploiting outputs from across the Fund, maximising impact of Ofwat investment in sector innovation. Our journey with the Ofwat fund to date involves a mix of projects ranging from small scale proof of concept developments, through to larger scale bids. Given the fund is still in its relative infancy, in the majority of bids to date we have chosen to partner with our peers across the sector, with the exception being our flagship Water4All project. The fast follower style approach has allowed us to apply our resources across multiple topic areas along with subject matter experts from across the business. It remains vital that stakeholders from across the organisation remain engaged with this process, ensuring we remain at the forefront of innovation and change in the sector.

Based on our current experience with the Fund, we have identified areas where minor adjustments will be made to ensure maximum value is realised from our customers' contributions.

Firstly, we have recognised the importance of ensuring that both the knowledge and tangible outputs from projects are clearly visible to stakeholders across the sector. Not only our peers and regulators, who have a vested interest in the developments of a project, but also our customers, relevant bodies (e.g. environmental and customer groups), plus where appropriate, stakeholders outside the water sector where knowledge transfer could bring wider societal benefits.

Secondly, how as a company, we overcome challenges associated with integrating the learnings achieved from projects into our strategic planning activities for future AMP cycles. There is an opportunity even before the conclusion of a project to improve our operations across multiple areas, accelerating the rate of change and adoption of products and services across the organisation as part of our long-term investment process.

Additionally, the role of support functions to enable innovation and change across the organisation has become more prominent. Legal, procurement, as well as central data teams can all aid the transition towards

more collaborative style projects, with an emphasis on sharing assets, knowledge and data. Bringing relevant stakeholders from multiple facets of the organisation into the fold can streamline activities, especially critical in complex, multidimensional projects.

Moving ahead into PR24, we will use our learnings and experience in previous iterations of the fund to maximise the strategic value leveraged for our customers and shareholders. In particular, we will look to emphasize projects which:

1. Focus on issues specific to our region, for instance topics around water scarcity and water efficiency, CSOs
2. Are forward thinking and address upcoming/future challenges for the sector, allowing us to capitalise on innovation prior to regulatory change
3. Challenge business as usual activities and present risks in terms of disruption to current value chains

3. Adaptability

Flexibility and openness to trying out new ways of working

Adaptability stands as a cornerstone for successful water company transformation due to the dynamic and unpredictable nature of the sector and environment in which we operate. As industries around us evolve at an unprecedented pace, if we can swiftly adjust our strategies, operations, and services we are better positioned to perform. Adaptability enables us to seize new opportunities, respond to changing customer preferences, and effectively navigate disruptive futures.

By embracing adaptability, we become proactive rather than reactive, gaining an edge in a landscape where agility and innovation drive success. To achieve this we will continue to foster a culture of learning and openness to change, enhancing employee engagement and innovation.

In the final years of this AMP we have a people plan that ensures we become more a diverse and inclusive work place, that develops talent across a career lifecycle. This diversity helps drive openness to try new things. As an example Bluewave, our innovation team, thrives on the diversity within the team. Knowledge and competence in the Bluewave team currently includes Environmental management, Wastewater science / engineering, Product design, Product management, Social psychology, Consumer behaviour, Digital strategy, and Business management. This ensures that our innovation team is well-placed to bring new ideas and thinking into the organisation and problem solving.

Moreover, adaptability fosters resilience, allowing organizations to bounce back from setbacks and failures more effectively. We will be agile in our approach to delivery, building and releasing a continuous flow of valuable capabilities. We will create a delivery environment that can be receptive to new solutions and emerging opportunities. We are committed to challenging our own decisions, operations and supply chain to drive value and spend every pound wisely.

Through our Turnaround Plans we are already improving processes, such as buying/procuring goods and services and making this easier for people, whilst also ensuring we get the best value for money. This continues into AMP8 as we drive stronger collaboration with our suppliers and supply chain, ensuring we

build value, innovation and efficiency together throughout the AMP. There are three key elements that we are using to enable transformation and innovation with our supply chain;

1. The supplier Balanced Scorecard tracks our priorities and drives the supply chain to assist towards their achievement, with payments linked to performance. Suppliers are held to account to enable us to achieve our ambitions in delivering value for the customer. And specifically ensuring commitment to efficiency, long term social value and water quality
2. A Continuous Improvement Plan is to be submitted at tendering, and will be progressed through routine governance. It encourages each supplier to commit to making improvements and innovations in everything it is doing. This will, for example, ensure suppliers are identifying innovations and or the emergence of relevant new technologies/processes and how these might be incorporated into the works and services they deliver for us
3. There is a gainshare incentivisation that enables a supplier to invest in new ideas and technologies (spend to save) and get payback of any financial efficiency benefit for us (providing that the gainshare proposal would not have the effect of lowering the quality of the works)

4. Innovation risk management

Delivering value from all innovation projects, particularly more experimentation projects, even if they fail

We understand that managing risk for innovation is crucial to navigate the uncertain terrain of new ideas and ventures. Our innovation team, Bluewave, both delivers a portfolio of innovation projects for the business, but also helps teams across the organisation think differently about problem solving and innovation. We firmly believe in using principals of lean testing to take calculated risks, increase speed of development and learn from failures.

A good example of one approach to innovation risk management is seen in our T100 activities (see [SRN27 Water Resources – Demand](#) Enhancement Business Case). We have thought laterally, creatively, and scientifically to come up with novel and effective ways of working that will bring about the progressive behaviour change we need for a shift in lifestyle to hit water consumption targets. Prototyping and testing allow for early detection of flaws, saving time and resources in the long run. Bluewave, feeds the behavioural insights from our ethnographic studies through the ideation phase to come up with the best and most cutting edge water-saving products, services, and technology ideas. Bluewave has partnered with local innovation hubs and university research bodies, to ‘horizon-scan’ for the future of water-efficient products and technologies, so we are at the cutting-edge of water efficiency. Once an idea has been formed, it’s put to the test. Importantly, to achieve lean testing at pace we use our own staff to test solutions for us and provide feedback, before the need to engage customers. The feedback on these solutions then goes on to inform further activities or communications plans. We will continue to use lean testing and prototyping to manage risk and accelerate development of new solutions in the business.

Our risk and value (R&V) process supports our asset lifecycle process and comprises of a series of check points and decision gateways to drive a collaborative and multidisciplinary approach to address our risks and deliver best value for customers adopting an integrated team approach. We have also embedded robust governance structures which ensure the effective management of resilience risks across our business. We have been continuously developing this process to yield more innovative outcomes, by ensuring the process is open to diversity of thinking, encourages psychological safety and doesn’t rush to the first obvious solution.

5. Scalability and deployability

Improving the ease of scaling up and rolling out of proven innovations within the sector

Innovation's ease of deployment is a pivotal factor in determining the success of new ideas, processes or technologies. A well-considered design and deployment process expedites the transition from concept to practical implementation, minimizing disruptions and maximizing the benefits. Delivering change will focus on the business priorities and is easier, faster and cheaper to achieve.

We see two key activities in being able to scale and deploy innovation at pace during AMP8;

1. Have the right business enablers to support successful innovation

As we prepare for the next AMP we have been refining our innovation governance to ensure that we are addressing areas of priority and maximising the impact of innovation across the business.

To do this we are creating alignment within the business to the ISO standard for Innovation Management (ISO56002). To assist with developing the maturity of our innovation capability and innovation enablers, within AMP7 an innovation capability assessment was carried out across existing business strategy, processes, and programmes of work to identify current capabilities and opportunities for improvement. This assessment was completed through survey, interviews, and documentation review and was baselined against the ISO Innovation Management standard to allow for systematic evaluation in widely accepted good practice methodology.

The assessment was divided into three sections to cover each of the framework area appropriately. These sections were:

- Right leadership & culture (Leadership, Vision, Strategic fit & Culture)
- Right problems (internal & external context, and internal and external collaboration)
- Right environment (planning, processes / do, evaluation, improvement, support)

We have already implemented new triage processes and portfolio management within our innovation team, Bluewave. We will continue to develop processes and enablers to maximise the impact of innovation. We will continue to create a culture of innovation in Southern Water ensuring every part of the business knows how to play its part in enabling innovation and transformation.

2. Create the foundations

Innovations and new solutions are easier and quicker to deploy and scale up if the foundations are already in place – getting the basics right first. Whether this is people, process or technology. In order to provide the foundations for digital technologies we have a particular focus in our Turnaround Plans to ensure our digital and technology environment is fit for the future. The Digitalisation and technology plan is about supporting the business to embed new technologies and get the right insights from the data to make effective decisions. It also focuses on enhancing how the IT team is set up to support the business – in particularly looking at moving contractor resources to permanent staff – so that we have the skills internally to meet our needs, rather than having to buy-in expensive resources for IT work. This digitalisation of the enterprise not only provides immediate gains associated with things like data and visibility of our water and wastewater networks, but also creates the foundations for increasingly transformative digital innovations such as artificial intelligence. Our sewer monitoring sensors are a good example new technology creating the foundations for further innovation. 23, 000 sensors have been deployed across high-risk areas of our sewer network, and

communicate digitally with our Operational Control Centre, where technicians are warned about potential blockages. The architecture of these sensors also feed into broader studies to create a blueprint for autonomous waste catchments. That is catchments that are more efficient, spill and flood less, and can self-identify maintenance requirements, for example.

As a further example, our smart metering roll out (see [SRN24 Smart Metering Enhancement Business Case](#)) will also provide technology foundations to support further insight and innovation. The benefits of smart meters are threefold: their presence and the insight they provide successfully reduces consumption of water, they help identify leaks and they enable more accurate bills for customers. In addition, our current meter stock is beginning to fail and nearing the end of its operational life, as such a replacement programme is needed by the end of AMP8.

6. Long-term view

Taking both a longer-term and broader perspective to better meet the evolving needs of customers, society and the environment

We know that our customers want the best value for the long term, not just the cheapest / short term solution [see Customer Acceptability Chapter]. In the next 25 years climate change and population growth will radically alter the world we live in. Water and wastewater services need to be in the vanguard to adapt to these changes and to ensure that these essential services continue to deliver for the UK. This will not be easy and it will require new approaches to solve these challenges. It is essential that our planning processes anticipates the uncertainties we could face and we are able to make decisions at the right time to ensure the delivery of our critical infrastructure when it is needed.

Our Long Term Delivery Strategy (LTDS) sets out our priorities for 2050 and protecting and improving the environment is one of these. LTDS recognises the need to exploit innovation – with technology and innovation being one of the identified enablers – to meet the challenges of the future. Importantly, we know we need to start considering future challenges early in order to mitigate risks and inform change plans.

Our innovation team, Bluewave, works closely with teams working on LTDS and Environment strategy, for instance, to provide support to longer term strategies for understanding, tracking and exploiting innovation on a longer time frame.

As an example, we are taking the lead in the UK Water Industry by challenging the use of plastic within the business operations head on. 'Plastic reduction' sits within a risk theme within our Environmental Strategy. We were the first water utility provider to publish its Plastics Policy in 2018 and have committed within that to beating the national target of eliminating avoidable plastic waste before the end of 2042. As part of the journey to achieve that goal, in 2022 we commissioned a comprehensive and innovative plastics audit and help establish a current position within the business. The goal of the work was to understand the utilisation, flow, and disposal of plastics within and throughout our business across all parts of our supply chain and processes. The report highlighted that we need to do more to collect more detailed data on our plastic usage but using the learnings, we're focussing on five themes to help create a Responsible Plastic Use Plan ahead of AMP8. This plan will inform areas for innovation to eliminate avoidable plastic waste, and improve 'trade-offs' between carbon and plastic management decisions, as they may lead to the investigation and implementation of alternate solutions through AMP8 and beyond. Responsible Plastic Use Plan areas of focus;

1. Collecting fit for purpose information on plastic flows through the company and its delivery partners
2. Eliminating single use plastics

3. Seeking sustainable plastic alternatives
4. Reduce necessary plastic use
5. Plastic recycling optimisation

Another example of longer term view on innovation is our work in 'emerging contaminants and pollutants'. This also sits within a risk theme in our Environmental Strategy and our innovation team has been taking the lead in understanding the scale of this challenge. Emerging contaminants (EC) are any trace contaminants that are not currently regulated, including microplastics, various pharmaceuticals and pesticides. As they are found in trace amounts and are potentially more difficult to break down, once regulated, the costs for removal are likely to be high, complex and require additional treatment methodologies that will require research, trials and innovation. By collaborating with external suppliers and academic partners to validate a list of emerging contaminants, we have started to understand which contaminants we focus on and address. The project allows SWS to mitigate potential penalties, governmental pressure, and impacts on water quality, while also preparing for future challenges. By leveraging the expertise of the service partners, SWS can develop targeted treatment strategies, optimize resource allocation, and maintain its reputation as a trusted provider of safe and high-quality drinking water. With a longer term view on contaminants we believe we can improve compliance, enhance water quality, ensure long-term resilience, foster innovation, and align with circular economy and bioresources goals. Our emerging contaminants activities have begun in AMP7 and will continue to inform activities in AMP8.

We continue to grow our relationship with academic institutions, including our University of Portsmouth (see [SRN06 Wholesale Wastewater \(Costs and Outcomes\) Chapter](#)). Joint work with academia helps to provide an improved experience for students at the University. The Innovation Hub at our Petersfield wastewater treatment works, for example, allows students hands on experience in the water sector, which provides a much better understanding of the processes than that they can get solely from the classroom. That better understanding then translates to better graduates with more industrial skillsets and awareness of the water industry. We have also grown working relationships with other academic institutions to develop topics for PhD thesis and this has resulted in enduring relationships with PhD post-doctorate researchers later joining us as permanent staff. This is important in growing the talent pool for the future.

9. Realising the Benefits of Innovation

We believe that innovation is the whole process, and that adoption is key. Notoriously the most challenging part of the innovation process, success is realising the benefits of a solution or approach at as great a scale as possible across our business. And as the sector continues to collaborate across innovation priorities, we will seek to proactively drive adoption across other Water and Wastewater businesses with the support of Spring.

A key enabler for greater adoption is to be able to articulate benefits of solutions and what it would take to deploy at scale. It is essential that our innovation efforts enable the delivery of our ambitious AMP8 commitments – first and foremost - and inform future investment decisions for AMP9 with increased certainty and risk reduction. Importantly, we have a commitment to customers to ensure value for money across all innovation activity. Across our Innovation Programme we will be quantifying benefits at a number of levels:

- Cumulative value of our programme as ROI to ensure value for money
- Our contribution to performance commitments PCs and ODIs within a Theme and Problem Space

- Benefits of individual solutions as a business case outcome of all work done to promote scale and adoption

Specific Performance Commitments and ODIs we will be targeting as part of aforementioned Themes and Innovation Roadmaps include:

Programme / Tranche	ODI Impact	DWI Improvement
T100	C-Mex Operational GHG emissions Water demand Per capita consumption Non household consumption	Resilience
Water4All	C-Mex	NA

CaSTCo	River water Biodiversity Bathing waters	Climate change
Net Zero	Operational GHG emissions Renewable energy generation	NA

Emerging Contaminants	Compliance risk index (CRI)	Emerging Contaminants
Nitrate removal	Compliance risk index (CRI)	Nitrate
Water Quality	Compliance risk index (CRI) Drinking Water Taste & Odour Drinking Water Appearance C-Mex	NA
Underground Asset Repair, Rehabilitation and Renewal (Water)	Mains Repairs Operational GHG emissions Water demand Leakage	Resilience
Leakage	Mains Repairs Operational GHG emissions PCC Leakage Business Demand	Resilience
Lead Replacement	Compliance risk index (CRI)	Lead

AI Enabled Network (AIoT)	Total pollution incidents Serious pollution incidents Storm Overflows Internal Sewer Flooding External sewer flooding	NA
Underground Asset Repair, Rehabilitation and Renewal (Wastewater)	D-Mex Total pollution incidents Serious pollution incidents	NA

	Sewer Collapses	
CSO Environmental Protection	Total pollution incidents Serious pollution incidents Storm overflows Bathing waters	NA
Process Emissions	Operational GHG emissions	NA
Bioresources (Biosolids)	Operational GHG emissions	NA
Nutrient Recovery (Final Effluent)	Treatment works compliance River water Operational GHG emissions Effluent Reuse	NA
Resource Recovery (Other recoverable resources)	Treatment works compliance Operational GHG emissions	NA
Emerging Contaminants (incl Heavy Metal removal)	Treatment works compliance	NA

Whilst the above seeks to illustrate the quantitative benefits of innovation projects, we believe that non-financial measures are important to support future investments. We will focus on articulating how solutions/approaches are examples of 'Doing the Right Thing' for the customer and the environment, building the Southern Water brand to improve relationships and collaboration with our customer base, and employee engagement.

We will be improving measurement of our innovation processes internally as we prepare for AMP8, with a particular focus on increasing the velocity to increase efficiencies and advance transformation using innovation. Key to increasing pace will be adapting enabling functions such as Procurement and Data Protection to define processes that are fit for the purpose of small-scale trial and minimal business impact.