

UUW37

Our strategy to net zero 2050

October 2023

Chapter 6 supplementary document

This document sets out our framework for delivering bold GHG emissions ambitions, including the low regrets approach we'll take to 2030 and beyond, to achieve net zero 2050.

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1. Our strategy to net zero 2050

1.1 Key messages

- **The management of GHG emissions is integrated throughout our PR24 business plan and long term delivery strategy** – we have produced an ambitious and adaptive strategy to achieve net zero in scopes 1, 2 and 3 greenhouse gas (GHG) emissions by 2050, including our most advanced and comprehensive plan for strong action on emissions and essential enabling activities in AMP8. Our proposed plan aims to reduce emissions by around 43 per cent during AMP8.
- **We build on our strong track record** – our focus on green energy has enabled us to outpace growth pressures and reduce scope 1 and 2 emissions by more than 70 per cent since 2010. We are now moving beyond the most commercially attractive options and have expanded action to all areas of our emissions. We are working towards our six carbon pledges on areas of immediate priority, which include the first independently verified science-based targets (SBTs) in the sector.
- **We are minimising large growth pressures** – through efficiency, innovation and collaboration, our AMP8 business plan has around 40 per cent fewer emissions than it would have; greatly reducing the emissions impact of extending assets and services to meet latest treatment standards and serve the growing population. Further collaboration is central to our plan, including working with customers to use less, and with policy makers in striving for frameworks that value carbon and support sustainable outcomes in the round.
- **We are reducing operational emissions and creating wider benefits** – by applying the GHG intervention hierarchy we have optimised cost-effective and technically feasible emissions reduction activities in relevant base and enhancement programmes in AMP8. Critical to maintaining a science-based trajectory, we propose a £196 million net zero enhancement programme to deliver immediate reductions in AMP8 and enable more than 2 million tonnes of emissions benefits by 2055. We have prioritised low regrets, strong value projects that deliver complementary benefits for water quality, water resource, cost efficiency, nature, and public health from improved air quality and recreation.

1.2 Structure

1.2.1 This document is structured as follows:

- Section 2 provides the context in which we've developed our new plan.
- Section 3 describes our GHG emissions plan to 2030.
- Section 4 details our long term adaptive strategy to net zero 2050.

1.2.2 We have included footnotes throughout, with further information in appendices and links to references and further information on our strategy to net zero 2050.

1.3 Key terms

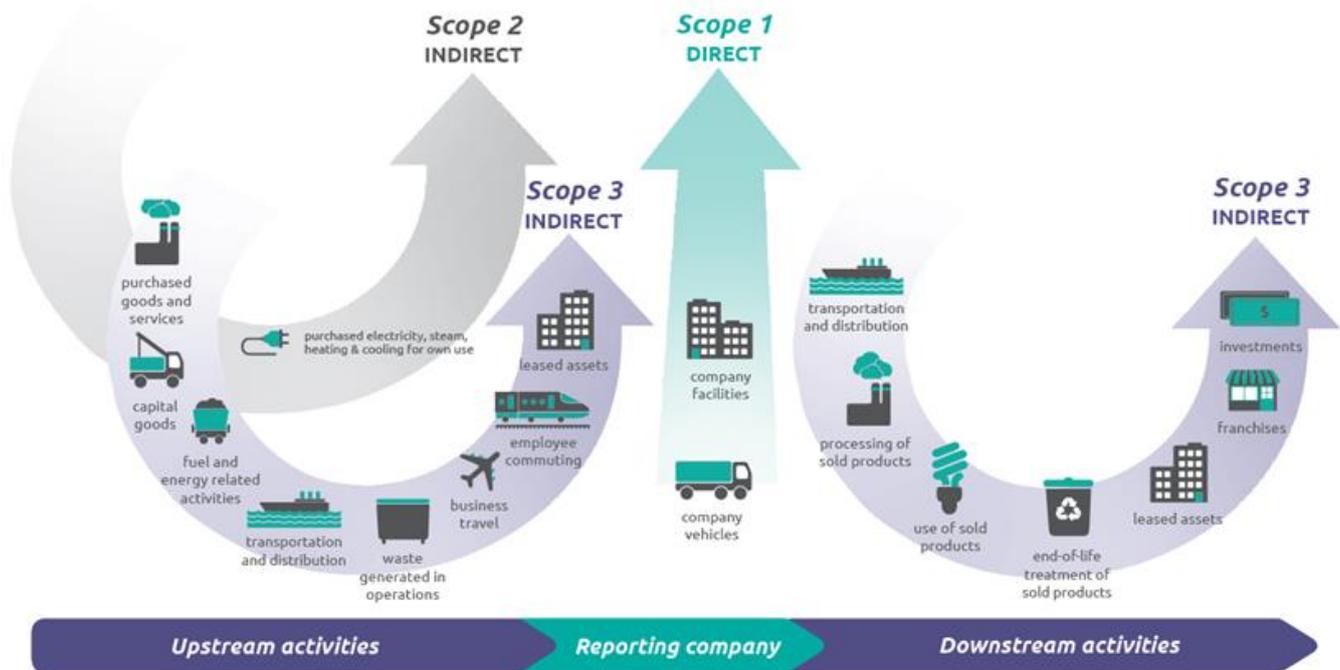
This section describes essential terms used in this document. A technical glossary is in Appendix A.

Greenhouse gas (GHG) emissions are those that contribute to climate change. Often referred to as a ‘carbon footprint’.

The GHG Protocol is the global best practice framework for the quantification and reporting of GHG emissions, including the definition of scopes and two methods for considering the emissions from purchased electricity:

- **Scope 1 emissions** are those resulting directly from activities the organisation owns or controls;
- **Scope 2 emissions** are those from electricity and heat purchased by the organisation;
- **Scope 3 emissions** are those that occur elsewhere in the organisation’s value chain;
- **Market-based method** quantifies scope 2 emissions based on the organisation’s electricity procurement choices, such as green tariffs; and,
- **Location-based method** quantifies scope 2 emissions based on the average intensity of the local grid, in Great Britain this is the National Grid and thereby recognises the organisation’s electricity efficiency.

Figure 1: The three scopes of GHG emissions



Source: Global best practice GHG Protocol: Corporate Accounting and Reporting Standard

Operational emissions are those that result from our core service delivery, including all of scope 1 and 2, and specified scope 3 emissions (see Appendix A). The water sector’s traditional boundary for operational emissions has been expanded in Ofwat’s definition for the proposed new GHG common performance commitments (PCs), e.g. adding chemicals and sewage sludge recycling.

Capital emissions are those that result from the creation, refurbishment and end of life treatment of an asset. We define these emissions using GHG Protocol scope 3, category 2, and capital goods.

Embodied or embedded emissions are those that result from all activities involved in creating or maintaining a built asset, including extraction and transport of materials and capital emissions.

Avoided emissions are those that were likely to have occurred in response to latest business needs, but which are no longer expected to occur, now or in the longer term, because of our option selection process. For example, a need has been resolved through innovative no-build or leaner solutions.

Deferred emissions are those that were likely to have occurred in AMP8 but have been pushed back to future AMPs through our decision-making process, for example by undertaking monitoring to identify efficient approaches to resolving needs. Deferred emissions are more likely to be lower in the future than they would be in AMP8, or perhaps avoided completely, due to industry decarbonisation and future innovative technologies.

Science-based targets (SBTs) are the global best practice method for an organisation to provide a clearly defined pathway to the global goal of the Paris Agreement, helping to prevent the worst impacts of climate change.

Emissions factors are values that represent the GHG emissions from a unit of activity data.

Scope boundaries, reporting methods and emissions factors are used to define a carbon footprint, with different approaches depending on the purpose. Figure 2 summarises the three approaches we refer to in this document.

Figure 2: Reporting methodologies used within this document and supporting assessments

		Operational emissions forecast 	Ofwat's Performance commitment definition 	UU Science-Based Targets 	
Scope boundaries and definitions using GHG Protocol terminology	Scope 1 Activities organisation owns or controls • Fossil fuel use • Processing • Company vehicles	Operational emissions	Operational emissions	SBT 1 Scope 1 & Scope 2 absolute emissions	
	Scope 2 Purchased electricity, steam, heat or cooling			SBT 2 renewable electricity	
	Scope 3 Remainder of organisation's value chain, including both upstream and downstream emissions			Scope 3 emissions from core service	SBT 4 Scope 3 absolute emissions
				Category 2: Capital Goods	SBT 3 Category 2 supplier engagement
	Other scope 3 emissions		SBT 4 Scope 3 absolute emissions		
Methods and emissions factors used in forecasts	UK water industry specific methodology and emission factors	Carbon Accounting Workbook (CAW) v17 (2023)	CAW 17 (2023)	CAW 17 (2023) When re-baselined will use new methods as applicable.	
	Standard emission factors	Variable 2022 baseline Applying rates of change from Climate Change Committee (CCC) 6 th Carbon budget advice report.	Fixed 2022 values UK Government GHG conversion factors for company reporting	Target year 2030 values Applying rates of change from CCC 6 th Carbon budget advice report.	
	Scope 2 calculation method	Location based	Location based	Market based	

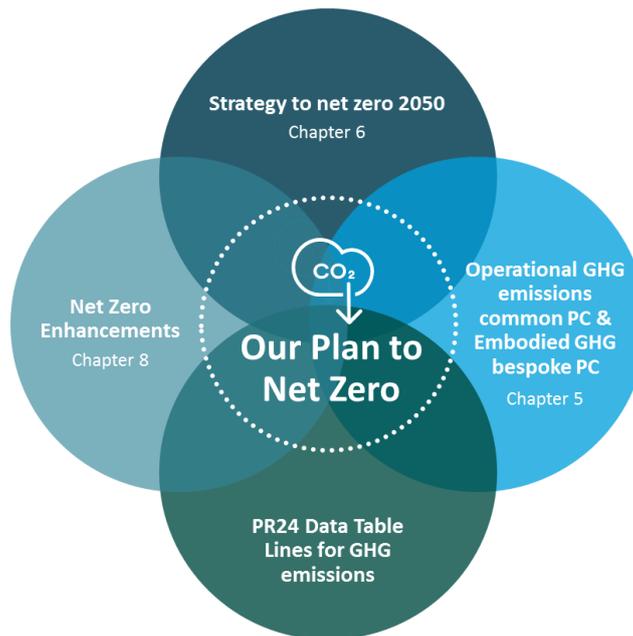
1.4 Overview

1.4.1 Our strategy to net zero 2050 sets out our framework for delivering bold GHG emissions ambitions, including the low regrets approach we'll take to 2030 and beyond.

Net zero is a priority in our PR24 business plan

1.4.2 We have produced an ambitious strategy to reach the national legal requirement for net zero in scopes 1, 2 and 3 greenhouse gas (GHG) emissions by 2050. This is a priority to us and customers because the affordability and resilience of our operations and services fundamentally rely on a stable climate and a healthy natural environment. Figure 3 summarises how we have integrated the management of GHG emissions throughout our PR24 business plan. This document provides an overview of our low regrets plan to 2030 in the context of our adaptive plan to net zero 2050.

Figure 3: Our plan to net zero, integrated throughout our PR24 business plan



Managing growth pressures and embracing opportunities

1.4.3 Our plan builds on the progress we've already made by deploying cost effective solutions, such as investment to build new renewable energy facilities and moving to use only certified green electricity throughout our operations. This has reduced our operational emissions by more than 70 per cent since 2010, assessed using the best practice market-based method. We are well on our way to delivering our six ambitious carbon pledges on areas of priority action. Our pledges include our Science-Based Targets (SBTs), which follow international best practice climate trajectories towards net zero 2050.

1.4.4 Over the past decade, our focus on green energy has enabled us to outpace growth pressures and reduce scope 1 and 2 emissions. However, it is now significantly more challenging for us to achieve net zero with the large increase in investment needed to comply with latest legal and regulatory requirements. The new Environment Act will make it much harder to deliver further absolute reductions in the face of substantial growth in emissions from building new infrastructure and the energy and chemicals required to achieve higher treatment standards.

1.4.5 The pace and scale of change in policy expectations was not visible when setting our SBTs only a few years ago. Continuing changes in the policy landscape also presents uncertainty we strive to manage and respond to. Despite the challenges, we have innovated and optimised to minimise emissions growth where we can, and we have identified options to further reduce emissions at the same time as providing wider benefits. However, we cannot entirely mitigate the substantial growth pressures and achieve required emissions reductions within existing base allowances.

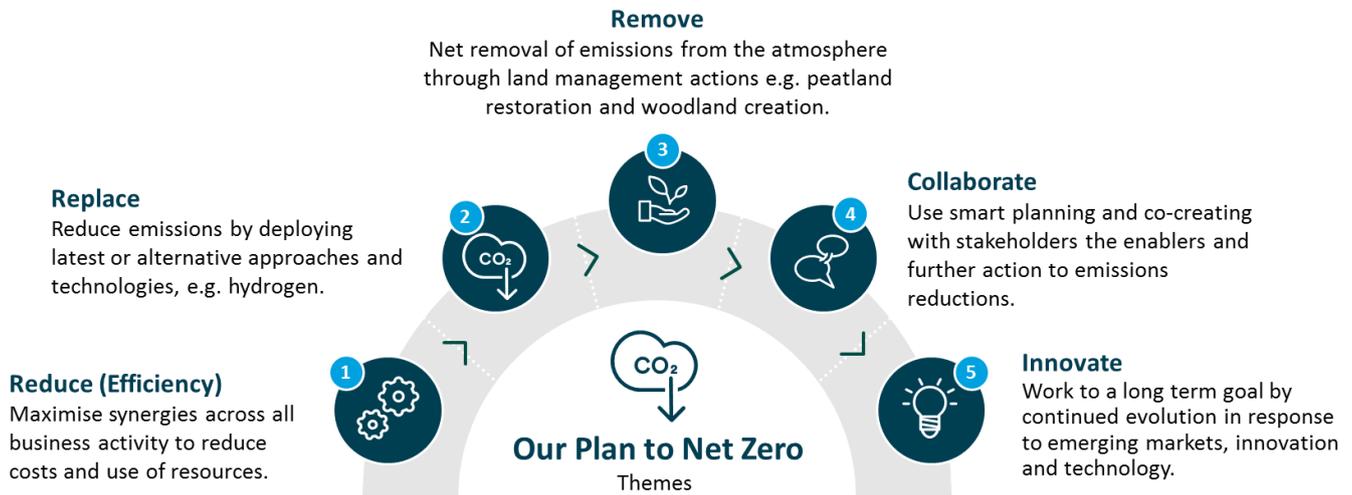
Our AMP8 plan

- 1.4.6 Our new plan to manage and reduce GHG emissions is our most advanced and comprehensive yet. Our approach to GHG emissions is fully integrated in our overall business plan to deliver a wide range of substantial improvements in water and wastewater services in the most sustainable ways. Measured using global best practice GHG reporting methods our proposed plan will:
- Reduce operational emissions by around 43 per cent during AMP8; mitigating growth pressures and going further to deliver overall reductions to support our operational emissions SBT;
 - Avoid and defer approximately 858,000 tCO₂e of operational and embodied emissions during AMP8, reducing the emissions of our plan by nearly 40 per cent from what they would have been without our focus on efficiency and innovation;
 - Deliver essential enablers for further reductions in the longer-term, enabling more than 2 million tCO₂e benefits by 2055;
 - Inform the new best practice standard for the measurement, reporting and management of emissions which are challenging to the whole sector, including innovative proposals for process emissions and a bespoke performance commitment (PC) for scope 3 emissions from many large infrastructure projects; and,
 - Enable wider complementary benefits for: water; resource and cost efficiency; public health improvements from better air quality and recreation; and nature.
- 1.4.7 We will work with our partners and strive to go even further during delivery in AMP8.
- 1.4.8 Our integrated approach achieves these outcomes through two inter-related areas of focus:
- **Optimising GHG emissions throughout our business plan** – We applied our GHG emissions assessment framework with support from expert third parties to forecast, reduce and avoid emissions by valuing them throughout our decision making. With substantial new legal requirements and other factors, there are many upward pressures on emissions. However, we have focused on efficiency and innovation to keep emissions as low as possible while maintaining and further improving infrastructure and services for customers. For example, we expect emissions reductions from base and enhancement programmes for sludge treatment, biosolids recycling, leakage reduction, demand management and measures to help customers be water efficient. We have embraced nature based approaches, surface water removal and hybrid solutions where they have lower emissions than traditional solutions.
 - **Focusing specifically on GHG emissions through our net zero enhancement programme** - To retain a science-based trajectory in AMP8 and beyond will require transformation and substantial investment beyond our historic base allowances. We have developed a £196.3 million net zero enhancement programme that, if approved, will prioritise the most cost effective deployable projects with emissions reduction as the primary driver, and which would also deliver many wider benefits. As well as immediate reductions by 2030, this programme provides essential enablers to longer-term benefits that will accelerate decarbonisation for us and the sector, as we are committed to sharing our learning from new innovations and ways of working.
- 1.4.9 We are continually exploring latest options to recover more value from under used resources by embracing the principles of the circular economy. As part of our clean energy strategy, and in light of the UK Government's new Biomass Strategy (August 2023), we have been reviewing the financial and technical viability of creating biomethane to grid plants at two of our largest sludge treatment centres. We have not yet included this specific option in our plan to net zero while we continue to work up detailed plans, but our initial analysis has shown strong potential to unlock this sustainable source of low carbon energy that has many applications and benefits. However, Ofwat's methodology for the common operational GHG PC provides a financial disincentive for this type of action, and this is an area we would like to review in the spirit of effective regulation that supports the most sustainable long term

solutions for society. We discuss this opportunity further in the supplementary document *UUW58 - Bioresources business plan* (see section 4.8, particularly 4.8.8 – 4.8.13).

- 1.4.10 We have rigorously applied the GHG intervention hierarchy to optimise further emissions reductions as we strive to keep our emissions on a science-based trajectory despite the substantial growth pressures. We are pursuing a wide range of opportunities, using offsetting only as a last resort, as summarised in Figure 4 below.

Figure 4: Our plan to net zero themes



- 1.4.11 **Reduce, replace and remove** - Our AMP8 plan includes delivery of:

- Additional efficiency measures to reduce energy use;
- Increased renewable capabilities;
- Fuel switches to lower emission alternatives on our sites (e.g. diesel to biogas);
- A 100 per cent green fleet, further reducing use of fossil fuels;
- Increased sludge processing capacity;
- Better monitoring and management of process emissions across wastewater and bioresources; and
- Restored peatland and new woodland to remove emissions from the atmosphere.

- 1.4.12 **Collaborate and innovate** - Delivery of our net zero plan relies on collaboration with regulators, policy makers and other stakeholders to innovate together to go even further in pursuit of the most sustainable approaches in the round. For example:

- **Customers** - We are increasing how we support customers towards more sustainable behaviours in their use of water and wastewater services and the wider water environment;
- **Government and regulators** - National policy decisions have a strong influence and are currently driving substantial emissions growth pressures. We work to inform effective water sector policy with evidence and suggestions to encourage approaches that fully value GHG considerations alongside other priorities;
- **Supply chain** - We are working with a range of partners using traditional and innovative approaches in pursuit of the most efficient and effective path to desired outcomes for our organisation and the sector; and
- **Investors** - We continue to explore how investors can help fund upfront investment requirements, as we have done with projects to create new renewable energy assets.

- 1.4.13 Our plan includes a stretching target in the operational GHG PCs that Ofwat is introducing for water and wastewater in AMP8, as well as an innovative and challenging bespoke PC for embodied emissions.

1.4.14 Using Ofwat’s methodology for the common PCs, our plan shows a 12 per cent decrease in water and 11 per cent increase in wastewater operational emissions in 2029/30 from a 2021/22 baseline. Ofwat’s methodology for these PCs is different to our standard reporting approach that aligns to international best practice, for example it uses static emissions factors to avoid reporting changes associated with GHG accounting updates. This means that emissions reported using the PC methodology will increasingly diverge through AMP8 from ‘actual’ emissions in our company GHG reporting and will require careful communication to stakeholders. We are keen to work with Ofwat and the sector to align reporting methodologies where possible.

Our long term adaptive strategy

1.4.15 Our plan in AMP8 is the next stage of a long term adaptive strategy to net zero 2050 for scopes 1, 2 and 3, striving to maintain a science-based trajectory despite large growth pressures. To ensure an efficient and effective approach, we focus on low regrets action in AMP8 to reduce emissions where feasible, sustainable and most cost-effective. Our work in AMP8 also includes essential enabling activity that will unlock large further benefits and accelerate our decarbonisation plans beyond 2030, for example with improvement to our estate growing emissions benefits over time.

1.4.16 Our long term strategy to net zero aims to maintain and advance the progress made to date and in our AMP8 plan by expanding and accelerating action across all sources of our emissions while maximising wider benefits for customers. Our strategy remains underpinned by the GHG intervention hierarchy and the themes we outlined in our AMP8 plan, and is expected to go much further through focus on areas such as:

- Embracing substantial complimentary opportunities in our strategies for bioresources, energy, land, water use and sewers. This enables ongoing focus on resource efficiency as a first preference. We have already started large scale, long term programmes to use circular and partnership approaches to produce more clean energy from sewage and solar, along with emerging innovations in battery storage and hydrogen. We will continue to partner on landscape-scale action on our estate to store carbon and protect water quality;
- Our advances in AMP8 are expected to set the water industry standard for the long term operational evolution and asset transformation needed to tackle process emissions; and,
- Supply chain collaboration will help us deploy emerging developments in low carbon materials such as concrete and steel, and low carbon solutions such as nature-based approaches. Collaboration will also help us avoid or minimise interventions altogether for example through digital technologies for remote and automated monitoring and controls.

1.4.17 We have assessed a range of scenarios to consider the potential effects of a complex array of variables which influence our approach and present both reduction opportunities and growth pressures, including our new water, wastewater and bioresources adaptive plans. With national policy choices for the water sector having a strong influence on our emissions and investments, our latest analysis shows the need for on-going and growing net zero enhancements to meet the challenge of delivering more service at the same time as reducing emissions. Our strategy therefore includes ongoing collaboration for holistic decision making that fully values GHG emissions alongside other priorities for sustainable approaches in the round.

1.4.18 We will review our plan cyclically each AMP to ensure we’re always acting in the short term with clarity and confidence. We will evolve the plan over time to always act on latest national policy, climate science and the technical feasibility and cost-benefit of potential interventions.

1.4.19 Our long term adaptive plan to net zero is summarised in section 6 of this document, and more detail on our other long term plans can be found in *UUW12 - Long Term Delivery Strategy*.

2. The context in which we've developed our new plan

2.1 Our climate change mitigation strategy

2.1.1 Responding to climate change is a long term priority that we have been working towards for decades. Having achieved previous targets ahead of schedule, in 2020 we refreshed our climate change mitigation strategy by defining four overarching policy pillars and committing to follow a science-based approach to net zero 2050. A science-based approach or trajectory is one which follows global best practice and the international targets agreed to help prevent the worst impacts of climate change. Our strategy embraces the widely recognised best practice GHG intervention hierarchy in which emissions reductions are pursued as far as possible before removals or offsets. Our strategy is summarised in Figure 5.

Figure 5: The four policy pillars of our climate change mitigation strategy



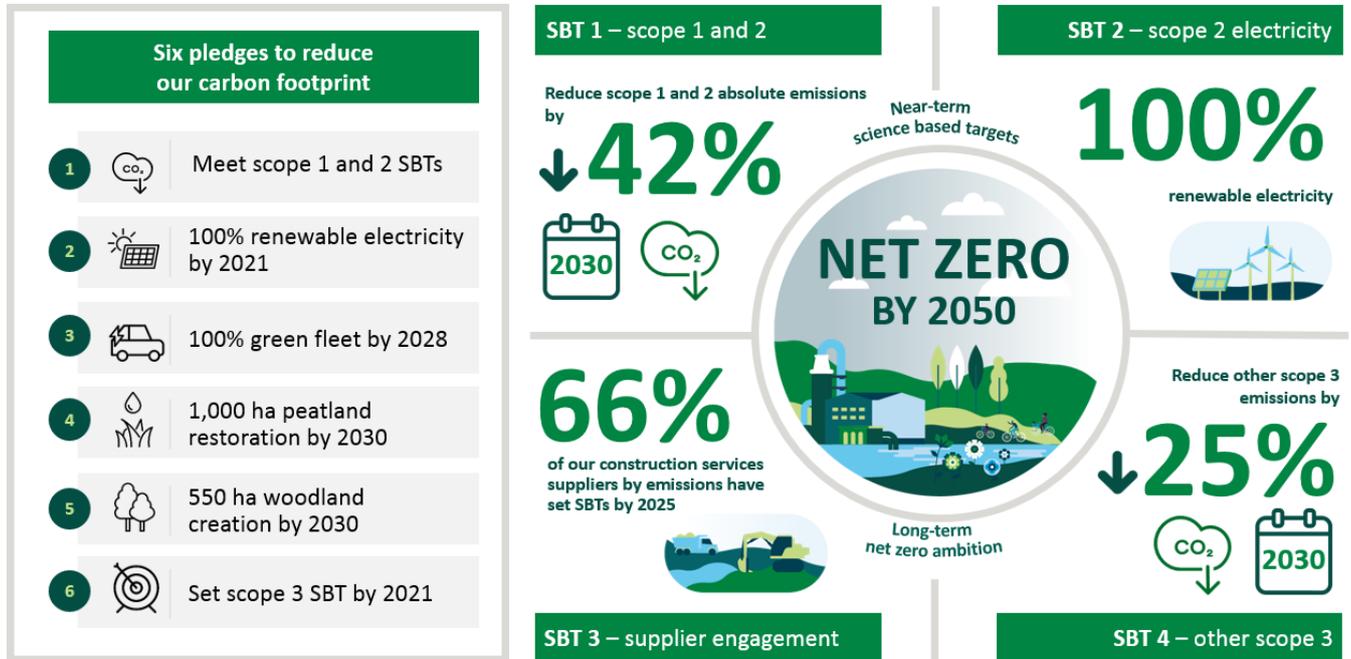
Source: UUG Annual report and financial statements 2023

- 2.1.2 We are integrating in our planning processes the consideration of GHG emissions alongside other areas of priority because holistic decision making is critical to achieving the most sustainable approaches in the round and for the long term. We have embraced this approach in developing our PR24 business plan, measuring and managing GHG emissions throughout.
- 2.1.3 We are creating a culture for change through innovation and challenging standards which is led by our board and it's ESG Committee. We govern progress towards our climate change mitigation strategy through an executive steering group and cross business working groups that lead the delivery and continual improvement of our priorities across this complex and evolving agenda. Our approach to net zero is agile as we continually respond to latest external policy, science and technological developments, which can all be strategically significant to our emissions and options.

2.2 Our carbon commitments

2.2.1 Our strategy is underpinned by six carbon pledges that include our science-based targets (SBTs). Delivering on pledge 6, we were the first UK water company to have SBTs approved by the global best practice Science-Based Targets initiative (SBTi). Our six pledges and four SBTs are summarised in Figure 6.

Figure 6: Our six carbon pledges and four Science-Based Targets (SBTs)



Source: UUG Annual report and financial statements 2023

2.2.2 Our pledges relate to several near term priorities as part of our strategy that covers every part of our emissions to provide a comprehensive and continually improving transition plan to net zero. Our approach complements and goes further than the water industry Public Interest Commitment (PIC) for net zero scope 1 and 2 emissions by 2030.

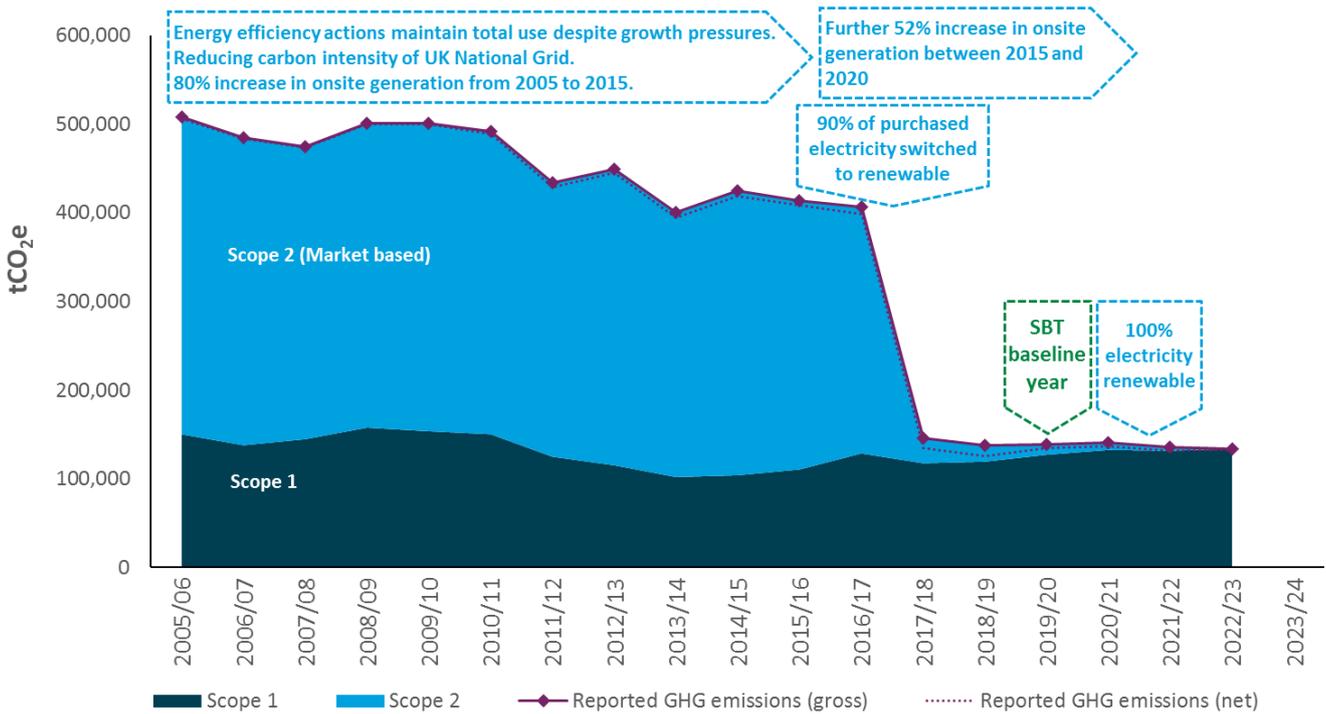
2.2.3 We were the first in the UK water sector to validate SBTs with the SBTi. Since then, in late 2021, SBTi launched a Net Zero Standard which we will consider alongside other developments in best practice when we seek to revalidate our SBTs in the next few years.

2.3 Our track record for leading disclosures and reductions

2.3.1 Acting on the pillars guiding our strategy, we have published independently assured GHG accounts for many years, covering both operational and embodied emissions along with details of our progress and plans. We were an early adopter of the Taskforce for Climate-related Financial Disclosures (TCFD), and in our latest annual report we were an early adopter of the emerging requirements to publish long term transition plans. We have independently benchmarked our performance for many years through international indices, for example we scored a leading “A-” rating in the CDP last year.

2.3.2 Figure 7 shows we have reduced scope 1 and 2 emissions by more than 70 per cent over the ten years from 2010. We did this by implementing no and low-cost opportunities which secured multiple benefits and complemented our strategies for bioresources, energy and land.

Figure 7: Our track record of reducing scope 1 and 2 GHG emissions



Source: UUW analysis on historic GHG emissions data, using market based method

- 2.3.3 It was an early priority to decarbonise our use of electricity as this was our single largest source of emissions. We have expanded to work across all sources of our emissions, for example introducing the first fully electric vehicles into our fleet, engaging with our supply chain, and working in partnership to restore peatlands and plant woodlands.
- 2.3.4 Since starting monitoring operational emissions in 2005/06, we have generally been able to deliver reductions that have more than countered growth pressures inherent in extending services to the growing population and delivering increased treatment standards. The graph shows there were some more challenging years with increasing emissions, but a clear long term trend for substantial reductions. Having already deployed the most attractive options, radically different approaches are now needed to maintain this progress and further reduce emissions to outrun even faster emissions growth linked with new legislative requirements and deteriorating climate change.
- 2.3.5 International understanding of how to measure and manage emissions in a supply chain is relatively immature and an area of growing focus for us and many others. By their very nature, an organisation has less control over scope 3 emissions and has to collaborate to reduce them. Continually striving to lead by example, we were the first in the UK water sector to set SBTs on scope 3 emissions. We have been improving our measurement and management as a critical enabler, introducing an annual disclosure of a full scope 3 inventory in 2020.
- 2.3.6 As a regulated infrastructure operator, scope 3 emissions typically mirror our five year investment cycle and are proportional to our business activities. This will be more prominent than in the past as we substantially increase the scale of investment in AMP8 and beyond to meet new legal and regulatory requirements. Collaboration and innovation is a priority in our plan to decarbonise infrastructure investments.
- 2.3.7 Find more on our progress and strengths to date, and how are working to go even further in AMP8 and beyond, in Sections 3 and 4 of this document.

2.4 Responding to customer priorities and legal requirements

2.4.1 Customer and stakeholder priorities

- 2.4.2 We integrated net zero into the consultation, engagement and customer research we undertake to shape our plans and decisions. We included a series of qualitative and quantitative research studies that ensured specific examination of support and relative priority for our action to reduce GHG emissions, integrated within the context of our overall business plan. A clear majority of customers confirmed that achieving net zero is important and supported our plans.
- 2.4.3 In our continual tracking of customer priorities we have seen a growth in environmental priorities; shown the strongest by future customers. In quantitative customer priorities research in 2021, a diverse mix of more than 3,000 customers ranked a top three priority the need to ‘play our part in protecting the environment (e.g. reducing carbon footprint)’. In 2022, we asked customers about net zero and the vast majority of participants felt action should be taken towards achieving it. When given a list of priorities for UU, participants ranked GHG emissions as a ‘tier 1’ concern.
- 2.4.4 In 2022, as part of our wider Bioresources customer research we asked customers about net zero knowledge and views, to engage with them on our potential future pathways. When given a list of different UU priorities, participants ranked carbon emissions as a concern of most importance (alongside harm to human health, microplastics/heavy metals, and river pollution and food chain contamination).
- 2.4.5 In 2023, customer research to test long term ambitions concluded that achieving net zero is really important, and to avoid a ‘chaos’ scenario in the future action needs to be taken sooner rather than later. A study exploring customer perceptions of our bespoke PC on embodied emissions found our proposal was important, impactful, relevant and fitted with expectations. Other quantitative studies found that a clear majority of customers agreed investment to reduce GHG emissions was important: 69 per cent of household customers agreed, 64 per cent of non-household customers, and 71 per cent of future bill payers.
- 2.4.6 Affordability and acceptability testing in 2023 sought customer feedback on our plan for GHG emissions and our overall AMP8 business plan. Feedback was generally positive and customers saw a 40 per cent reduction as acceptable movement in the right direction. Household customers’ feedback suggested UU’s 2030 reduction target across scope 1 and 2 emissions is fitting for the size of the organisation
- 2.4.7 Further detail of our approach to customer research and engagement is detailed in Chapter 3 of our business plan and the supplementary document *UUW21 - Customer research methodology*.

2.4.8 Legal and regulatory requirements

- 2.4.9 In 2019, the government amended the Climate Change Act to require the UK to achieve net zero by 2050. This approach aligns to the global goal of the Paris Agreement to limit temperature rises to well below 2°C above pre-industrial levels, the target agreed by the international community. The Act requires the government to set legally-binding carbon budgets over five-year periods. The fifth carbon budget will start in 2025 and requires a 57 per cent reduction below 1990 levels by 2030. The sixth budget requires a 78 per cent reduction by 2035¹. This legal framework provides a guide to the ambition that is likely to be required by the water sector in the short and long terms.
- 2.4.10 Ofwat and Environment Agency guidance to the water sector for PR24 confirmed that water companies should comply with the national legal duty and prioritise action on net zero in AMP8 as part of long term plans. The government’s strategic priorities for Ofwat² published by Defra in 2022, stated that “water

¹ The Climate Change Committee: <https://www.theccc.org.uk/about/our-expertise/advice-on-reducing-the-uks-emissions/>

² The government’s strategic priorities for Ofwat, Defra, 2022: <https://www.gov.uk/government/publications/strategic-policy-statement-to-ofwat-incorporating-social-and-environmental-guidance/february-2022-the-governments-strategic-priorities-for-ofwat>

companies should also have regard for the policies and proposals set out in the Net Zero Strategy, which shows how all parts of our economy can contribute to our national target of net zero greenhouse gas emissions by 2050”.

- 2.4.11 Ofwat’s Regulatory framework and net zero³ response stated *“For PR24 we expect all companies’ plans to make substantial progress towards national governments net zero targets and want to see concerted action to address both operational and embedded emissions in parallel. We therefore expect all companies to not only deliver further improvements through everyday expenditure during 2025-30, but to also identify additional actions and activities that will further reduce GHG emissions where these are appropriate and evidenced as best value.”*
- 2.4.12 In its Water Industry Strategic Environmental Requirements (WISER) technical document⁴ the EA states: *“Water companies are expected to continue to contribute to the government’s emission reduction targets during PR24. Water companies, where possible, should aim to go beyond scope 1 and 2 operational emissions and include scope 3 embedded emissions in their net zero targets as per the Greenhouse Gas (GHG) Protocol. However, focus should be on emissions reductions, before considering GHG removals, where possible.”*
- 2.4.13 In addition to net zero, we also have a range of regulatory and legal duties that require operational and asset investments that traditionally increase GHG emissions with new infrastructure, energy and chemicals. This is one of the factors we consider in the next section, and throughout our plan to net zero.

2.5 Challenges and opportunities

- 2.5.1 A complex mix of fast evolving challenges and opportunities are shaping our approach to net zero, with our latest analysis summarised in Appendix B. We have considered how best to manage these factors to ensure a low regrets plan of action to 2030, as the next part of our adaptive long term plan to net zero 2050. An adaptive and cyclically updated planning approach is essential to respond efficiently and effectively to this fast moving environment, for example with emerging technologies and changing cost-benefit positions. Our newly updated short and long term plans are described in the following sections of this document.
- 2.5.2 The need to more than counter long standing and new emissions growth pressures is a fundamental challenge to our and the water sector’s ability to meet net zero. This cannot be achieved within existing base allowances because we have already deployed many of the low cost solutions. However, there are also a range of opportunities to enable our transition to net zero by 2050 following a science-based trajectory. While absolute reduction is the ultimate requirement for the transition to net zero, it will also be important to recognise our comparative emissions performance on a like-for-like basis to reflect the enhanced level of service being delivered to society.

³ Ofwat’s Regulatory framework and net zero, 2022: <https://www.ofwat.gov.uk/wp-content/uploads/2022/08/BEIS-commission-Net-Zero-response-August-2022.pdf>

⁴ Water industry strategic environmental requirements technical document, Environment Agency, 2022: <https://www.gov.uk/government/publications/developing-the-environmental-resilience-and-flood-risk-actions-for-the-price-review-2024/water-industry-strategic-environmental-requirements-wiser>

3. Our GHG emissions plan to 2030

3.1 Introducing our new plan

- 3.1.1 Our new plan to manage and reduce GHG emissions is our most advanced and comprehensive yet. Our approach to GHG emissions is fully integrated in our overall business plan to deliver a wide range of substantial improvements in water and wastewater services in the most sustainable ways. Our overview in Section 1 set out the highlights which are described in more detail here.
- 3.1.2 Maintaining a science-based trajectory is key to playing our part in national legal climate targets up to 2050, and collaborating to stabilise the climate that water and wastewater services rely on. Our low regrets AMP8 plan will enable this, including the success of our full net zero challenge programme. However, with the growth pressures we will now face, it has become much harder to deliver absolute emissions reductions that follow a science-based trajectory and SBTi best practice standards. Our plan follows the principles of the GHG intervention hierarchy, as set out in Figure 8 below.

Figure 8: Our plan to net zero themes



Source: UUW visual of net zero themes

- 3.1.3 To deliver our AMP8 plan, we will be working with the supply chain, policy makers and customers to ensure our services are efficient and reduce GHG emissions where possible. We are working with customers to improve water efficiency and use of sewers through campaigns, advice, education and free water saving devices. This helps to prevent waste and reduces emissions associated with water and wastewater treatment and remedial works to blocked sewers.
- 3.1.4 Research, innovation and collaboration with our supply chain is central to our strategy as we look for new solutions and learning to reduce emissions. For example, we have started monitoring process emissions at our treatment works as a priority area of emerging understanding for the sector. Our plans focus on collaboration and innovation with decision makers to strive for policy and regulation that supports the most sustainable long term approaches in the round, considering all priorities including social affordability, GHG emissions and the need to further improve the water environment.
- 3.1.5 We have forecast our emissions as UU Group using global best practice including the GHG Protocol and PAS 2080. This AMP8 plan section focuses on our regulated business, United Utilities Water (UUW), using our 'operational emissions forecast' method. An exception is where we refer to the new common GHG PCs and our net zero enhancement proposals where we align with Ofwat's methodology for the common GHG PCs which has areas of difference including the use of static emissions factors.

3.1.6 In designing our AMP8 plan, we have pushed the boundaries to embrace alternative solutions that help reduce emissions. We are pursuing a range of opportunities across all emission sources as set out in our case studies below.

3.2 Case study examples of priority areas of focus

Case study: Energy efficiency

Strategic focus: Reduce use of electricity and fossil fuels

We have an integrated energy and GHG emissions reduction programme focusing on people, systems and technology. This is delivered by a specialist team of energy engineers working with operational staff. Our in-house energy standard sets a common approach for benchmarking performance and developing action plans to optimise energy and GHG emissions. We have delivered over 3,000 sub-meters to support performance improvements on our high energy intensity plant and equipment to validate and sustain benefits. We have completed hundreds of efficiency measures from low energy lighting to process improvements on our water and wastewater assets. For example, new controls for secondary treatment and pump control optimisation. We have developed several training courses to engage and develop colleagues across the business. Energy efficiency is a primary focus of our capital programme and also integrated into our dynamic network management (DNM) capability to ensure our asset base is as efficient as possible.

Our AMP8 ambitions are to drive further efficiencies across our estate and capital programme, supported by our net zero enhancement proposals across key property and operational sites to reduce fossil fuel use.



Case study: Zero carbon energy

Strategic focus: Deploy more renewable energy generation and supply

Since AMP6 we have focused on increasing renewable generation from our treatment sites by optimising existing systems and investing in new assets and processes. For example, hydro power was installed as part of our recently completed West Cumbria water supply project. As well as generating power from water, we have developed an extensive portfolio of solar and wind projects that provide renewable energy directly to our operations. 25 per cent of our large electricity consumption is now generated at our operational sites. Since October 2021 we also purchase only certified green electricity for the remaining 75 per cent, achieving our pledge and SBT to use 100 per cent green electricity.



There are further opportunities to drive decarbonisation, ranging from new ways to use our biogas and evolving electricity supplies. As well as exploring options to install more solar on our sites or embrace other clean energy solutions such as battery storage, we're also investigating new forms of power purchase agreements direct with renewable generators to enable new green generation investment. To manage risk and unlock investment in new renewables we are experienced at collaborating to find the best ways to deploy the strengths of UUW, UU Group and experienced third parties.

Working in partnership and with internationally cutting edge advances developing here in the North West, we are delighted to have secured £3.2m of national innovation funding to develop biogas conversion to graphene and hydrogen. We have also worked on commercial innovation to determine how we might support development of the hydrogen economy and carbon capture markets.

Our AMP8 ambitions are to develop new energy supply agreements that deliver further decarbonisation and maximise the GHG emissions benefits of diversifying how we utilise the biogas from our sewage sludge treatment.

Green fleet

Strategic focus: Eradicate use of fossil fuels in company vehicles

Electrification is currently the main low carbon alternative to fossil fuels. We have deployed the first EVs in our car and van fleet. We also continue deploying essential enabling work to support our transition to a green fleet, improving telematics and installing charging points.

Technologies are still maturing to market viability for large vehicles like our tankers. We are collaborating and trialling options with the supply chain. We were the first in the sector to trial electric HGVs, working with Innovate UK. Alternative fuels may be more appropriate for certain applications and we have trialled hydro-treated vegetable oil (HVO) and compressed natural gas (CNG) in our largest vehicles. We are exploring the option to buy vehicles that will operate from our Manchester Bioresources Centre to use biomethane generated from our own treatment process rather than fossil fuel to reduce GHG emissions as well as reducing air pollutants.

Our work in AMP7 has enabled us to develop a mature plan to decarbonise our transport operations in AMP8 through cost effective and technically feasible actions with low regrets. If approved, our proposed net zero enhancement programme will deliver bold progress in this area.



Process emissions from wastewater and bioresources

Strategic focus: Set the industry standard for measuring and managing methane and nitrous oxide releases

It is a national and international priority to improve the measurement and management of process emissions, with emerging scientific understanding of their significance to the footprint of water and wastewater service. Sector collaboration is critical alongside specific action to drive the agenda.

We are a lead partner in collaborating with the water sector to define improved good practice in process emissions. Alongside this we are investing over half a million pounds to trial new monitoring techniques and explore how to reduce formation of process emissions. We are the only company to trial the drone based quantification of both methane and nitrous oxide emissions in the UK. This allows us to quantify and prioritise our process emissions, supporting leak detection and repair for methane and our in-plant monitoring and modelling of nitrous oxide. Through this work and development of our net zero plan we recognise that reducing process emissions aligns with our approach to energy efficiency needing an integrated approach covering people, systems and technology. To support this we have developed two in-house training modules for operational GHG emissions reduction including process emissions.

To continue from our progress in AMP7, we have created an ambitious AMP8 programme for process emissions reductions. Central to realising our ambition is securing support for our two submissions to Ofwat's net zero challenge fund. Both seek to deliver and showcase innovation that will reduce emissions and provide wider learning we can share with the sector. In parallel, in base we will continue to drive improvement through evolution of programmes such as maintenance excellence and integration of operational GHG emissions reduction into our energy efficiency programme, referenced above.



Land management

Strategic focus: Grow carbon storage and opportunities for renewables

Carbon storage: Through innovation and partnership over recent decades, we have improved peatlands, woodlands and other habitats across our upland reservoir catchments. Using natural solutions and our Catchment Systems Thinking (CaST) approach, such as in the Petteril sub-catchment, we have delivered water quality improvements at reduced costs at the same time as bringing benefits for nature, public health and carbon storage. Carbon storage forms a key pillar of our carbon plan for AMP8 and long term. Our net zero enhancement programme proposes more woodland and peatland restoration for the benefit of GHG emissions, delivered in partnership including 50 per cent shared funding.



Clean energy production: We are facilitating energy production and storage solutions on our estate which requires partnership to maximise value which we will accelerate during AMP8 (see the renewables case above).

Chemicals

Strategic focus: Reduce use of high emission chemicals

We have been one of the sector leaders in developments to reduce or mitigate chemical use for phosphorus removal and other improvements to wastewater standards to protect the water environment. We see on-going growth in chemical consumption and therefore GHG emissions, if action is not taken. We continue to drive innovation ranging from optimisation of new technology we have introduced, such as Nerada. We are investigating innovative approaches for reducing chemical use at small works through use of natural coagulants and reactive media, and the production of biopolymers from sewage sludge. We drive efficient use of chemicals, for example by optimising dosing rates and chemical changes to drive lower consumption through more effective coagulation. We are also working to find alternatives for alkalinity correction.

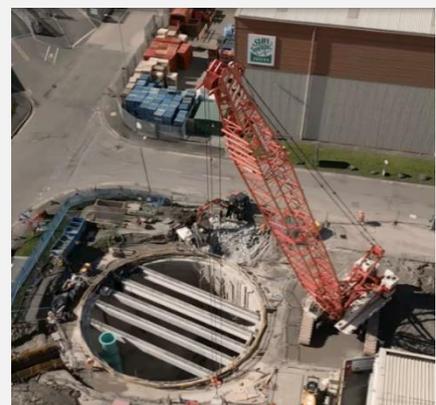


During AMP8 we will continue to reduce chemical consumption where possible. For our large phosphorus schemes we are exploring opportunities such as enhanced biological phosphorus removal (EBPR) solutions potentially including our novel plant-based media technology, Mobile Organic Biofilm. The second phase of our net zero enhancement programme recognises this area for potential investment in late AMP8.

Supply chain emissions

Strategic focus: Collaborate and innovate to reduce scope 3 emissions

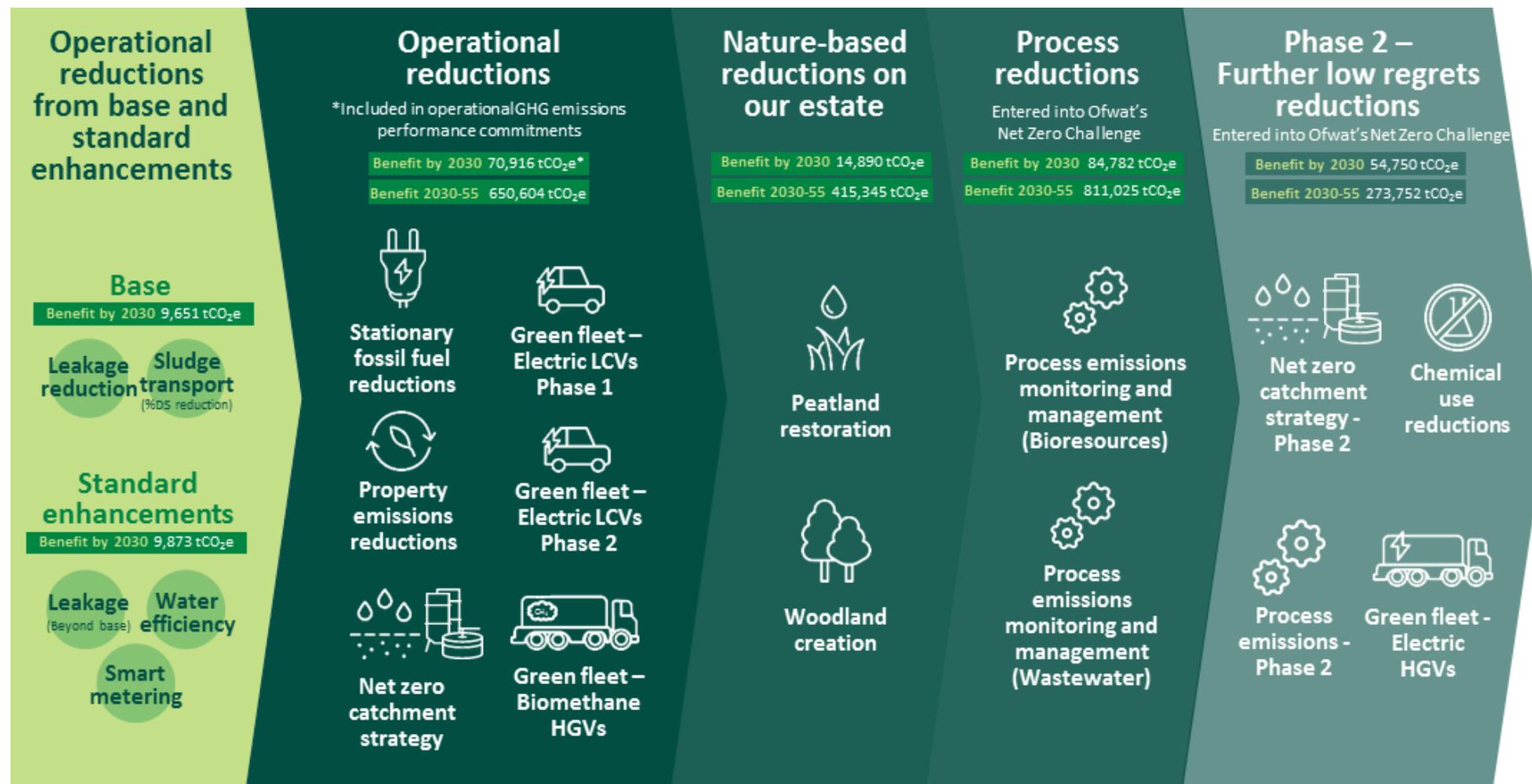
Our largest source of scope 3 emissions are from construction and network maintenance activities. We have a long track record of embracing innovative solutions to reduce cost and emissions in these areas. For example, in a scheme at Runcorn wastewater treatment works (WwTW) we used a membrane-lined pond instead of a traditional concrete tank and at our Forton WwTW we avoided building a traditional concrete road by using a geocell material. We are continually improving how we fully value GHG emissions throughout our decision making systems and processes including supported by the development of our AMP8 embodied PC. Collaboration is critical to reducing emissions and we engage through our United Supply Chain forum for improvement. We're working to improve data quality with suppliers and have engaged chemical manufacturers to improve accuracy and availability of emissions data of their products.



3.3 Delivering reductions in operational emissions

3.3.1 Figure 9 summarises the emissions benefits from base, standard enhancements and from our net zero enhancement programme, which we discuss next.

Figure 9: Emissions reductions throughout our business plan



NB: %DS – percentage dry solids

3.4 Operational reductions from base and standard enhancements

- 3.4.1 During AMP7 we have escalated our focus on efficiency and will go even further in AMP8, in order to maximise the potential opportunity for our GHG emissions goals and wider benefits for cost savings and innovation. We continually strive for energy efficiency, and have managed to hold consumption broadly stable over recent years despite substantial growth pressures. We have already introduced ongoing internal and external engagement campaigns to support the desired behavioural and cultural change.
- 3.4.2 In designing our plan to 2030, GHG emissions have been valued throughout our decision making to secure the most sustainable long term solutions. We have worked to reduce emissions across all programmes and avoid emissions in design and decision making, for example by selecting nature-based solutions where permit requirements allow. Figure 9 on the previous page shows key areas of the business plan that support emissions reductions.
- 3.4.3 We have worked hard to develop a plan in which we forecast operational emissions to reduce during the next planning period despite the growth pressures resulting from the extensive new legal requirements for further improvements to the water environment. This includes Environment Act targets, phosphorus drivers to improve water quality, an extensive overflow activation reduction programme and changing regulatory incentives. Even with radical increases in the use of blue-green solutions this programme also requires emissions intensive capital investment involving large scale use of concrete and fuels in construction, and commits us to energy and chemical intensive operations for decades.
- 3.4.4 Rising energy costs and market volatility present a challenge. The rising costs of green electricity will make it difficult for us to maintain our commitment for 100 per cent green electricity and we will regularly check if this is still best value or if the ongoing investment could deliver better emissions reductions elsewhere. These challenges create an increased need for energy efficiency in the future, in-house energy generation and close partnerships arrangements such as power purchase agreements (PPAs). These cost challenges may also cause an increase to our investment needs for GHG emission improvements in the future, to prevent emissions from rising further.

3.5 Our net zero enhancement programme

- 3.5.1 To achieve a transformational change in GHG emissions will require substantial investment beyond historic base allowances and the approaches integrated into our base and standard enhancement activities. At the heart of our plan to 2030 and net zero by 2050 is an ambitious enhancement programme aiming for immediate reduction opportunities and enabling activities to support longer term reductions. Our programme targets GHG emissions reductions as the primary objective along with substantial wider benefits at the same time. Undertaking this programme in AMP8 is vital to our low regrets, adaptive long-term strategy to reach the ambition for the national legal requirement for net zero 2050 following a science-based trajectory that supports the national legal five year carbon budgets. Our proposed programme is summarised in Figure 9 on the previous page and more detail is provided in *Enhancement Case 25 – Carbon Net Zero* in UUW67.
- 3.5.2 Our proposed net zero enhancement programme would see £196.3 million invested to deliver benefits across all aspects of our operational emissions plus essential enablers to future action and longer-term emissions benefits. Every area of focus in our programme delivers strong benefits in AMP8, and the cost benefit improves in the longer term with even more benefits growing over time, targeting a total emissions benefit of over 2 million tCO₂e by 2055.
- 3.5.3 Without this enhancement programme we are at serious risk of not being able to maintain a science-based trajectory, or deliver essential enablers for our long-term duty to net zero by 2050.
- 3.5.4 This programme has been optimised from an initial 26 identified projects with GHG emissions reduction as the primary driver. These were challenged and consolidated to 10 projects in the first phase of the

programme, to start immediately in AMP8. In addition, more opportunities will be further developed ready for delivery with confidence in phase 2, later in AMP8.

- 3.5.5 **Operational reductions** – With cost-effective and technically feasible options in the near term, it is a priority to greatly reduce our use of fossil fuels at key treatment sites and throughout our fleet by switching to latest available alternative technologies. By funding the cost difference from base budgets, we can switch vehicles and operational processes to use electricity and other alternatives to fossil fuels. We can also switch a proportion of our heavy goods vehicles (HGVs) to run on biomethane from our operational processes, further embracing the circular economy.
- 3.5.6 In addition, we are pursuing a unique and time limited opportunity linked to the large development of St Cuthbert's Garden Village in and around Carlisle to produce a truly integrated and strategic approach to clean, surface and wastewater that can generate innovation and set the standard for replication elsewhere. To protect customers from uncertainties we propose a two phase approach. The first phase will see collaboration and investigation to develop a multi-agency vision, masterplan and other critical enablers for the goal of a low GHG emissions and sustainable community development, focused on water-related priorities. This will inform if, how and when more substantial work can take place in a potential second phase.
- 3.5.7 **Nature-based reductions on our estate** - We want to secure further emissions benefits in AMP8 and for the long-term by creating more woodland on our land, and going further than regulatory schemes in our WINEP to restore even more peatland. These projects also deliver benefits for resilience of water services, public health and nature.
- 3.5.8 **Process reductions** - It is critical to us and the sector to better understand and control wastewater and bioresources process emissions. We propose two projects in our net zero enhancement programme to make real progress (E00001338 and E00001339). We will continue to share our learning with other companies, for example continuing to engage through the UK and Irish Community of Practice of which we were a founding member, through working with Jacobs who are globally recognised in the field, and a Process Emissions Liaison Group of various wastewater companies and Water UK.
- 3.5.9 Nitrous oxide (N₂O) process emissions from our wastewater treatment works are estimated to be circa 270, 000 tCO₂e a year when we use the best available emission factor, from the most recent Intergovernmental Panel for Climate Change (IPCC) Guidelines. This is a significantly larger estimate than in the sector's current standard accounting methodology, increasing these emissions by circa 230,000 tCO₂e per year and making nitrous oxide our single largest source of operational emissions.
- 3.5.10 We are therefore proposing an ambitious and sector leading nitrous oxide and methane (CH₄) emissions reduction programme that is innovative and focused on driving a low cost for delivery (£/tCO₂e) using approaches which are based on best global science and proven mitigation outcomes. This does not include costly speculative technologies for which poor evidence exists. Our extensive due diligence, supported by sectoral and recent DEFRA work, highlights the potential for high mitigation, low cost options making best use of our existing asset base. The wastewater solution for nitrous oxide goes well beyond any current international programme and is forecast to provide a GHG emissions reduction of circa 62,000 tCO₂e using the IPCC emissions factors across 17 wastewater treatment works (representing circa 64 per cent of wastewater process emissions).
- 3.5.11 For the methane programme in Bioresources, our proposal includes the use of new technology to extract more biogas from the treated sewage sludge which would otherwise be lost to atmosphere. By delivering this project, we expect to be able to reduce emissions by circa 22,000 tCO₂e by 2030.
- 3.5.12 These two net zero enhancement projects build on our work to date and support our strategy for process emissions. This initially focuses on better understanding and monitoring of our emissions from our treatment processes, then deploys this for rapid mitigation at high opportunity sites, enabling us to move to a methodology linked to our monitored data and processes using actual emission data to move beyond existing industry and IPCC population equivalent based emission assessment. This move, over

time, will support best value mitigation across our entire asset base, the implementation of changing technologies and the improvement of sector-level emissions assessment.

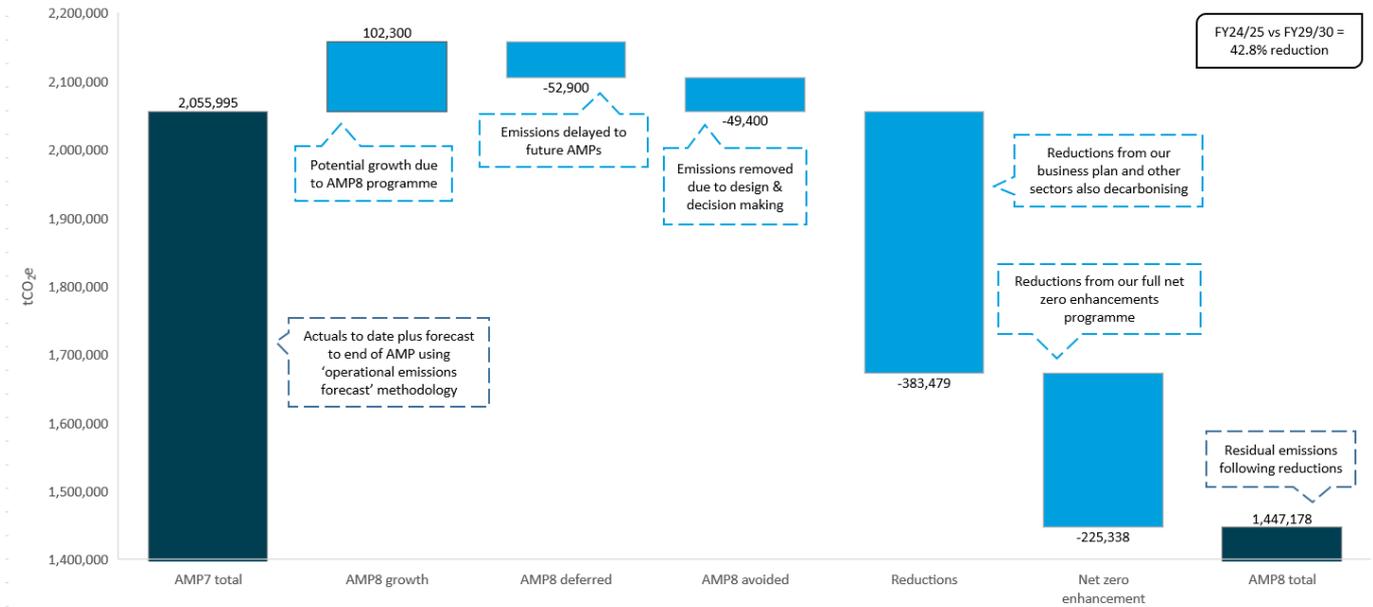
- 3.5.13 We are entering these two process emissions projects into Ofwat's net zero enhancement challenge.
- 3.5.14 **Phase 2: further low regrets reductions** - With a fast moving external environment, there is uncertainty in how innovation and associated cost-benefit and deliverability will evolve between now and the latter years of AMP8. Our programme includes an adaptive second phase of activity to help protect customers from this risk at the same time as pushing boundaries to ensure the required rate of emissions reduction to achieve a science-based trajectory.
- 3.5.15 Building on our on-going assessment, this second phase would deploy latest cost-effective and technically feasible options to address more areas of operational emissions. For example, we are exploring further opportunities from the advances in the process emissions and net zero catchment strategy projects mentioned above. We are exploring how to decarbonise essential chemicals and go further with the HGVs in our fleet which remains a global challenge with rapidly evolving technological developments. Other options may come to light as part of our adaptive and low regrets approach that remains agile to ensure we deploy the right approaches at the right times and in the right places.
- 3.5.16 We are entering the phase 2 proposal into Ofwat's net zero enhancement challenge.
- 3.5.17 Our whole net zero enhancement programme has the primary benefit of GHG emissions reduction, but this programme will also deliver secondary benefits for efficiency, biodiversity, water quality improvement and flood management. For full technical detail see *Enhancement Case 25 – Carbon Net Zero* in *UUW67* and PR24 data tables CW21 and CWW22.
- 3.5.18 **Renewable energy** - We have not included options for renewable energy in our net zero enhancement programme. There are fewer opportunities available to us having been early adopters of renewable energy, including private wire, solar, wind, hydro electricity generation and our biogas combined heat & power plants (CHP). The methodology for the operational GHG emissions common PCs means that we are at a disadvantage in its incentive mechanism, compared to companies with less mature renewables strategies already built in to their emissions baseline. We continue to explore options to grow our portfolio of renewables outside the net zero enhancement programme, with further detail in the case study in Section 3.2 and the role of UU Group in Section 3.10.

3.6 Emissions profiles to 2030

- 3.6.1 We have evaluated the total emissions impact to both future operational emissions and embodied emissions from delivering our business plan to 2030. The operational forecast emissions are calculated using our 'operational emissions forecast' methodology:
- Our plan to 2030 has been developed from our forecast position at 2024-25 of circa 399,099 tCO₂e. This is based on actuals to date and forecast to the end of AMP7 using a consistent methodology.
 - By 2029-30 these GHG emissions are forecast to be circa 227,532 tCO₂e, representing a 43 per cent decrease over AMP8.
 - By 2034-35 GHG emissions are expected to be circa 160,137 tCO₂e, representing an additional 30 per cent decrease over AMP9.
 - Reductions are a result of our AMP8 plan, countered by growth from our AMP8 WINEP becoming operational.
- 3.6.2 The expected impact of our emissions reduction activities and the net result of our business plan are summarised in Figure 10 for operational emissions and Figure 11 for embodied emissions.
- 3.6.3 Despite being able to reduce our operational emissions during AMP8, the scale of capital investment required to meet new water environment requirements will see our embodied emissions increasing in the period. The AMP8 WINEP is our largest ever and is expected to increase operational emissions

towards the end of AMP8 and beyond, when new schemes become operational. For example, in Wastewater Network Plus, more chemical dosing will be required to meet the technically achievable limits (TAL) for phosphorus, this in turn causes an increase in chemical and energy use and increase in sludge produced. The processing of this additional sludge also increases operational emissions. We also see this trend at the end of AMP7 and start of AMP8 with the AMP7 WINEP, but on a smaller scale proportionate with the size of the current investment programme.

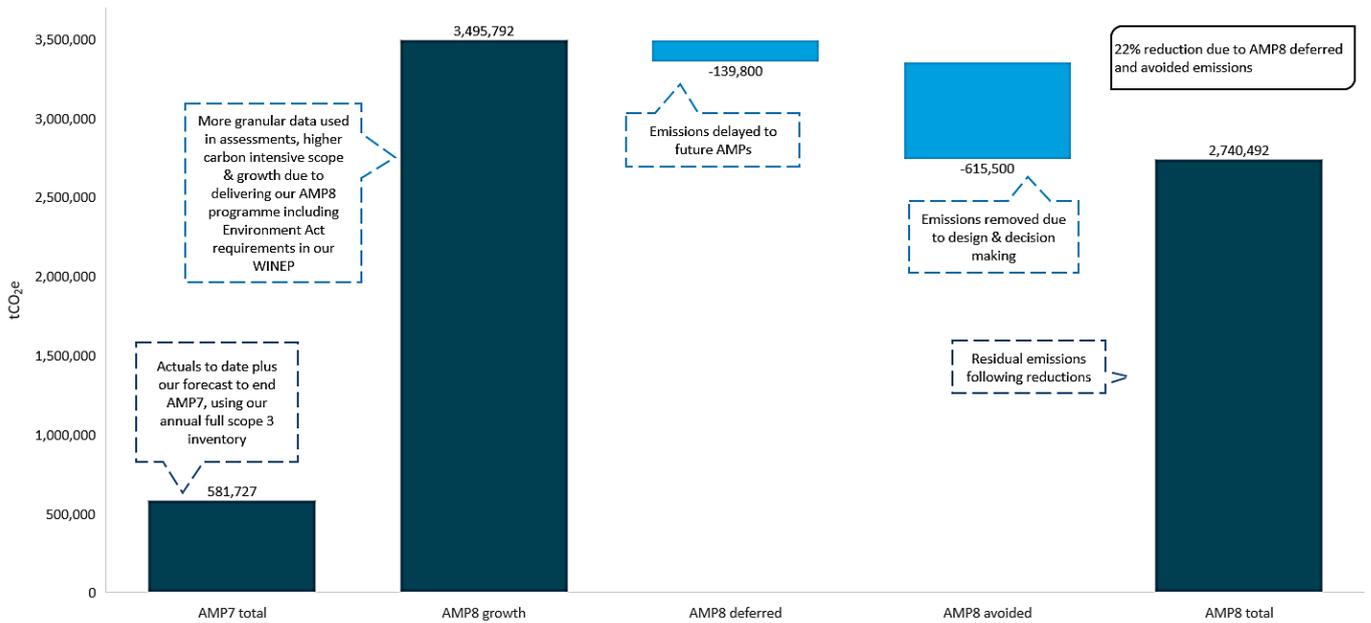
Figure 10: The profile of operational emissions to 2030



Source: UUW analysis of PR24 forecast operational emissions calculated using operational emissions forecast methodology

3.6.4 We have improved the granularity of the embodied emissions assessments. Our total embodied emissions during AMP8 are expected to be circa 2,740,500 tCO₂e. This is over five times greater than our AMP7 emissions and linked to the scale of the water environment programme. We estimate the embodied emissions associated with our AMP8 WINEP will be circa 1,192,300 tCO₂e. These equate to almost double our capital goods emissions from our 2019/20 baseline in each year. Other programmes will also generate an additional circa 1,548,200 tCO₂e of embodied emissions. These increases could have been even larger, however, our design and decision making framework has helped avoid and defer circa 858,000 tCO₂e across operational and embodied emissions from AMP8. This is shown in Figure 11.

Figure 11: The profile of embodied emissions to 2030, showing a large increase in the capital programme

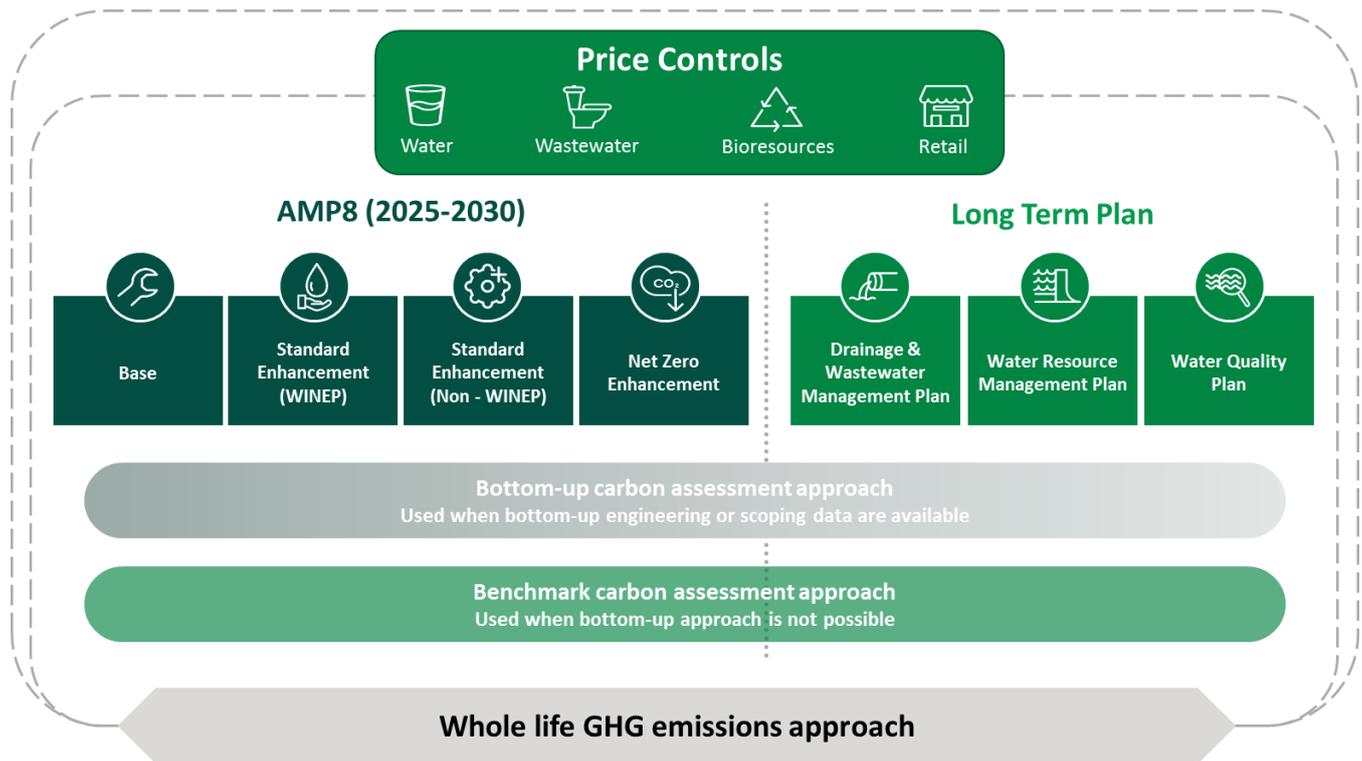


Source: UUW analysis of forecast embodied emissions

3.7 GHG emissions assessment framework and methodology

- 3.7.1 Figure 12 provides an overview of the GHG emissions assessment framework we have applied throughout our PR24 submission and long term delivery plans to quantify emissions and consider them alongside other priorities in our decision making. This is summarised in Appendix C.
- 3.7.2 We have optimised plans by reviewing all base and enhancement projects across water, wastewater and bioresources to assess the emissions impact to both embodied emissions as a result of project delivery and any subsequent future operational emissions. Some areas have not been included in the assessment where current reporting methodologies do not show the effects of design choices, such as with process emissions which is currently assessed using population equivalent. However, we include all process emissions in our total forecast and are working to improve reporting in this area, as discussed in the case study in Section 3.1.

Figure 12: Our GHG emissions assessment framework



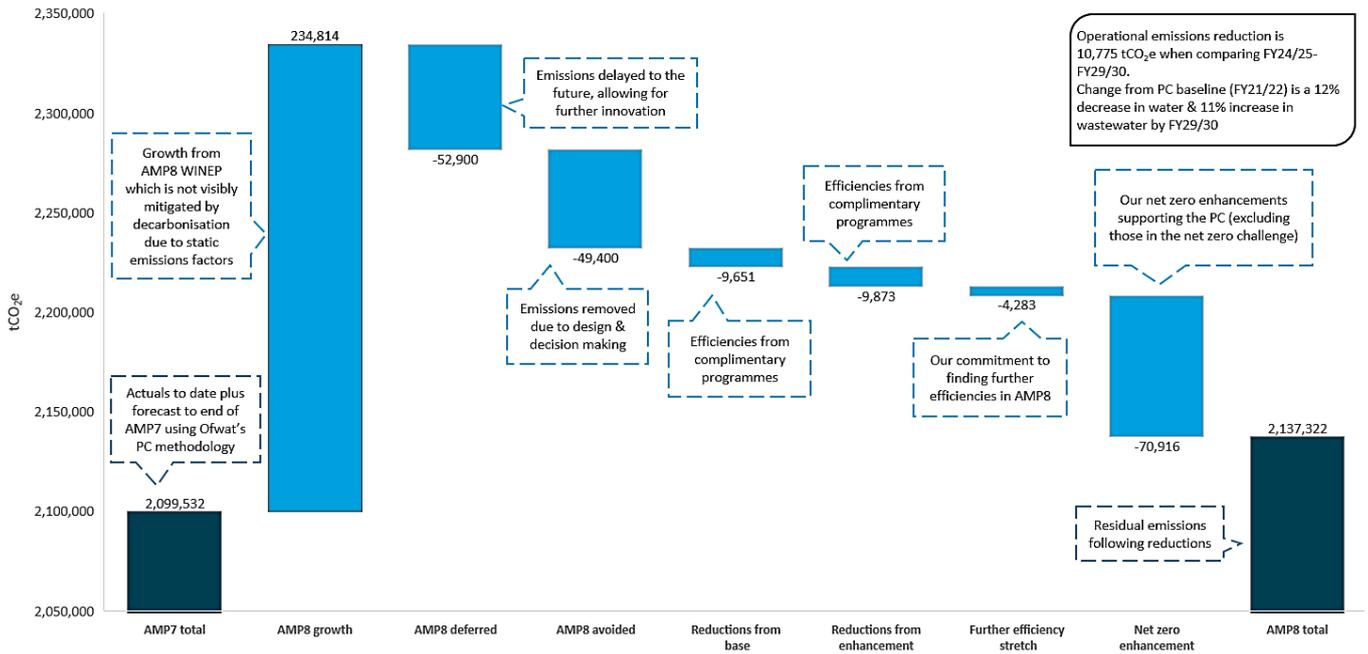
Source: UUW visual representation of our GHG emissions assessment framework

3.8 Operational GHG emissions common performance commitment

- 3.8.1 From 2025-2030 we have two new common PCs for operational GHG emissions, one for water and one for wastewater. Ofwat is introducing these PCs to further incentivise companies to track and reduce GHG emissions. Our plans incorporate our approach to these commitments, detailed in Chapter 5 and supplementary document *UUW30 – Performance commitments technical document* and developed in alignment with Ofwat’s PC definition documents.
- 3.8.2 Ofwat suggests a baseline year of 2021/22 and the following scope of emissions:
- scope 1 emissions from fossil fuel use, process emissions and owned transport;
 - scope 2 emissions from purchased electricity, heat and electric vehicles; and,
 - scope 3 emissions from fuel and energy, business travel, outsourced activities purchased goods and services (chemicals only) and waste generated in operations (including sewage sludge disposal).
- 3.8.3 Ofwat’s PC methodology uses the location-based approach which excludes the benefits of certified green electricity and includes new areas of scope 3 emissions that expands the water industry’s traditional focus on operational emissions. In this new definition, we expect operational emissions to be 429,684 tCO₂e by 2024-25. By comparison last year’s emissions using this methodology were 415,647 tCO₂e. We expect these emissions to reduce by circa 11,000 tCO₂e by 2029-30, but increase by a further circa 22,000 tCO₂e by 2035, as the effects of AMP8 WINEP become operational.
- 3.8.4 We propose the performance commitment levels (PCLs) should be based on the estimated emissions position in each year of the 2025-2030 period as a result of delivering all of the interventions between now and 2030 including the stretch we have added and the growth we are managing. This has been proposed in draft in this document and in our PR24 data tables but will need to be reviewed and updated before the start of the 2025-2030 period to align with the Final Determination (FD).
- 3.8.5 Using Ofwat’s methodology for the common PCs, our plan shows a 12 per cent decrease in water and 11 per cent increase in wastewater operational emissions in 2029/30 from a 2021/22 baseline. The PCLs

and associated 2021/22 baseline has been verified by a suitably qualified third party. They can be verified again by a third party at final determination, when the detailed scope of our AMP8 plan has been finalised with Ofwat.

Figure 13: The profile of operational emissions to 2030



Source: UUW analysis of PR24 forecast operational emissions calculated using Ofwat’s performance commitment definition methodology

3.8.6 We are continually exploring latest options to recover more value from under used resources by embracing the principles of the circular economy. As part of our clean energy strategy, and in light of the UK Government’s new Biomass Strategy (August 2023), we have been reviewing the financial and technical viability of creating biomethane to grid plants at two of our largest sludge treatment centres. We have not yet included this specific option in our plan to net zero while we continue to work up detailed plans, but our initial analysis has shown strong potential to unlock this sustainable source of low carbon energy that has many applications and benefits. However, Ofwat’s methodology for the common operational GHG PC provides a financial disincentive for this type of action, and this is an area we would like to review in the spirit of effective regulation that supports the most sustainable long term solutions for society. We discuss this opportunity further in the supplementary document *UUW58 - Bioresources business plan* (see section 4.8, particularly 4.8.8 – 4.8.13).

3.8.7 We propose the marginal benefit and incentive rate for this PC is aligned to the latest government values, published in 2021 and showing a relevant extract in

- 3.8.8 Table 1 on the next page. Our proposal is to use the low value (sensitivity) from 2025 (£130/tCO₂e). This will help reduce the perverse incentive created from the PC static emissions factors which has the potential to over incentivise projects related to the use of some renewables, more so than market factors as these take into account the decarbonisation of the grid.

Table 1: UK Government carbon prices (£) per tCO₂e

Year	Low series	Central series	High series
2025	130	260	390
2026	132	264	396
2027	134	268	402
2028	136	272	408
2029	138	276	414
2030	140	280	420

Source: <https://www.gov.uk/government/publications/valuing-greenhouse-gas-emissions-in-policy-appraisal/valuation-of-greenhouse-gas-emissions-for-policy-appraisal-and-evaluation>.

- 3.8.9 Our PR24 submission, baseline and annual PC reporting is audited by a suitably qualified third party. Please see Chapter 5's supporting technical document for detail aligned to PR24 data tables OUT 1, OUT2, OUT4, OUT5 and OUT7.
- 3.8.10 There are differences between Ofwat's PC methodology and global and sector best practice that we use for our annual company GHG reporting. We plan to report using the new PC methodology in our Annual Performance Report, and continue our corporate GHG emissions and SBT reporting in our Annual Report and Financial Statements. In our corporate annual reporting, we will continue to report our net and gross emissions for scope 1, 2 and 3 for both location-based and market-based emissions. We will also continue to be use the most recent version of the carbon accounting workbook to reflect latest emissions factors and other improvements to GHG estimation methods. We will endeavour for careful communications and signposting to provide customers and stakeholders with clarity of what the different reporting methods are showing.

3.9 Embodied GHG emissions and our bespoke performance commitment

- 3.9.1 In response to the large growth in embodied emissions we explain above, we have developed a bespoke PC to compliment the two common PCs for operational GHG emissions. Our bespoke PC supports our, Ofwat's and the sector's aim to better understand and consistently measure and report embodied emissions associated with the delivery of capital programmes. The PC will incentivise the reduction of GHG emissions (expressed in tCO₂e) from construction activities from some of our most emissions intensive wastewater treatment, non-infrastructure projects in the WINEP. The proposed programme reflects £693 million of our total proposed WINEP, circa 184,000 tCO₂e of embodied emissions and 38 per cent of our total wastewater WINEP programme embodied emissions (excluding storm overflow projects).
- 3.9.2 Customer research undertaken in 2023 showed a strong level of support for this bespoke PC, with customers valuing the reduction of embodied GHG emissions as 'important' and that the perceived impact of the PC would be 'high' for customers across the region.
- 3.9.3 Our focus will be on working with our supply chain partners to manage and reduce emissions in line with the GHG reduction hierarchy, including the avoidance and minimisation of emissions through, for example, re-use of assets and optimisation of existing processes. As well as supporting the improved management of emissions in the short and long term, this compliments our on-going focus on financial and resource efficiency through innovation and collaboration. The PC will focus on efficient material usage, design optimisation and switching to low carbon alternatives, where technology and innovation allows. We will collaborate with, and incentivise, our supply chain partners to support the delivery of UU's strategic themes for the AMP8 capital programme, including our net zero transition plan and the proposed PC.
- 3.9.4 By sharing the learning, our approach to this PC will support the development of a related common PC in AMP9.

- 3.9.5 More detail on our management and innovation for scope 3 emissions can be found in our case studies in Section 3.2.

3.10 The role of United Utilities Group

- 3.10.1 United Utilities Water (UUW) is the organisation that serves water and wastewater services to the people and businesses across the North West. This is the largest part of United Utilities Group (UUG). We are experienced at taking value from other parts of the Group to play important roles in our overall route to net zero. For example, we established a renewable energy business that invested to build new clean energy assets while protecting water customers from the upfront costs, investment risk and volatile energy prices in the market.
- 3.10.2 We are now moving into a new phase of our clean energy strategy to further support net zero, building on the large portfolio of renewables we have established over the last decade across the North West. To date, much of this has been delivered outside the regulated utility business while still providing clean energy and emissions benefits to it. We are currently working on the potential to create substantial new renewable generation capacity by 2030, and more beyond. This programme is working on a combination of solar, wind and battery storage to generate and balance clean energy, reduce emissions, and further improve operating and financial resilience.

3.11 Protecting customers

- 3.11.1 We recognise that substantial ongoing investment is required to decarbonise water and wastewater services. In striving to support the legal goal for net zero 2050, we are committed to providing the lowest cost and best value approach for customers at the same time as seeking to protect customers from potential risks in a complex and fast moving area. We do this through a number of ways, including:
- **The GHG intervention hierarchy** (see the earlier Figure 8) - We prioritise resource efficiency as the first preference, and seek synergies for complimentary benefits in other activities. As outlined throughout our AMP8 plan, this helps us deliver additional value such as cost savings and waste avoidance. In addition, we recognise that carbon offsets currently involve emerging techniques and markets which are yet to mature. We are keen to support the development of well governed carbon offset approaches because we see potential for genuine benefits and good value, but we will not buy offsets at scale before 2030 at the earliest in order to protect customers.
 - **Adaptive planning** techniques help ensure a low regrets approach, prioritising the most cost effective and technically feasible options in the short term and collaborating and innovating towards the enablers needed for the longer term. For example, our net zero enhancement programme proposes an agile second phase of work in late AMP8 ('Phase 2 – AMP8 Innovation'), designed to help us manage in a controlled way the rapid advancement in knowledge, technology and markets addressing climate change. Our phase 1 net zero enhancement programme delivers GHG emissions reductions in an agile way to adapt to the most appropriate low regrets pathway during AMP8 and our proposed phase 2 includes a series of potential interventions that require further investigation and developments and therefore will be defined during AMP8 as knowledge, technology and markets evolve.
 - **Third party collaboration** is essential to deploy the best expertise for the best results and keep costs as low as possible. We can also collaborate within our Group of companies to help insulate customers from risk, as discussed in Section 3.10.
 - **Cyclical review** - Our long-term planning activity recognises the uncertainty associated with diverse issues such as climate change, population growth, changing policy and emerging technologies and the need for our strategy to net zero 2050 to be flexible. We will undertake a cyclical review to update our long term plans each AMP in response to latest internal and external circumstances, ensuring that short term action and investment is always on the basis of latest understanding.

4. Our long term strategy to net zero 2050

4.1 Overview

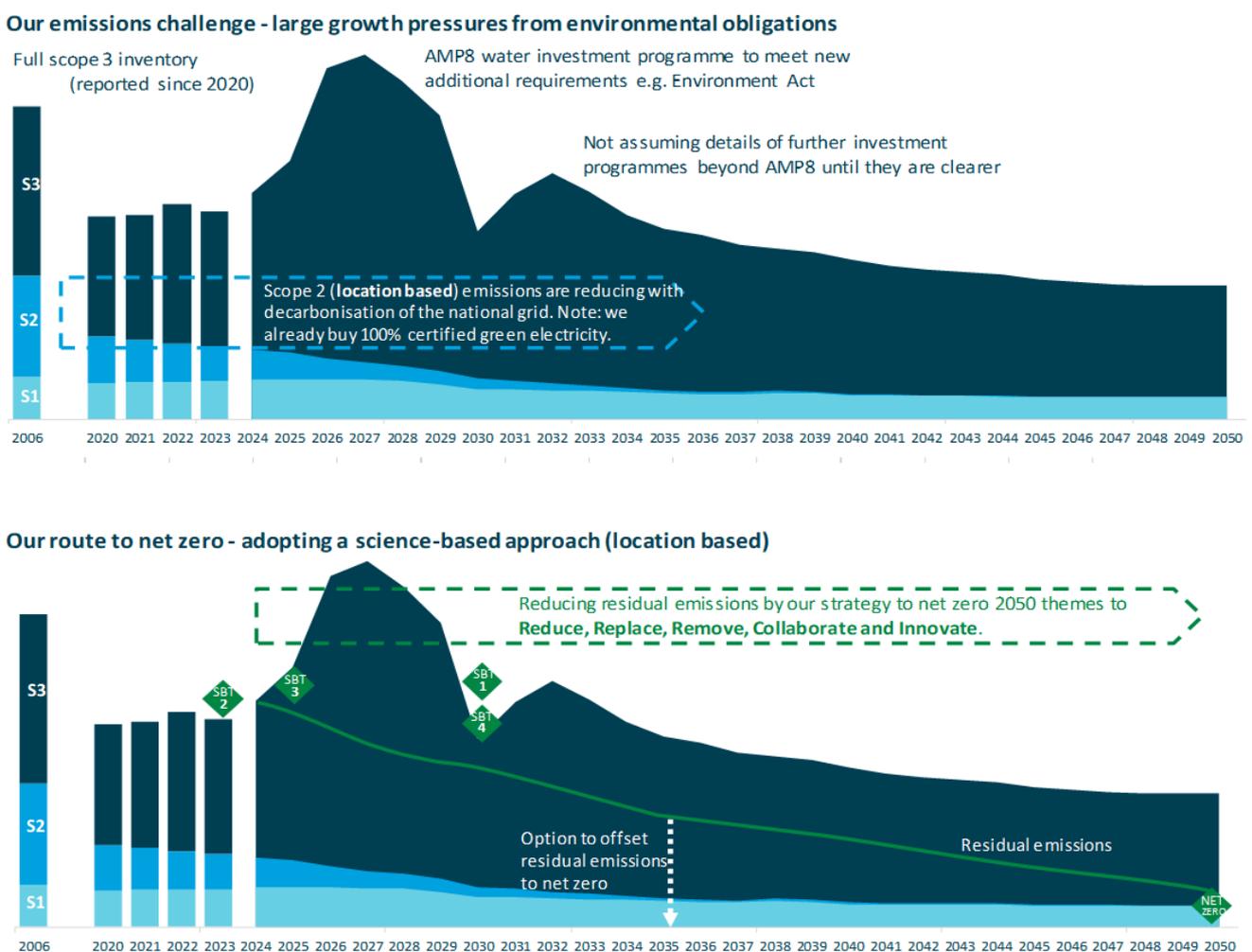
- 4.1.1 Our AMP8 plan, described in section 3, is the next stage of our long term adaptive strategy to net zero, focused on low regrets activities we can take with confidence of lasting benefits and strong value. In this section we describe how we have built on that detailed plan to develop an ambitious strategy that will regularly evolve to overcome substantial growth pressures to achieve the national legal requirement for net zero in scope 1, 2 and 3 GHG emissions by 2050. Our strategy also strives for a science-based trajectory to support the national legal carbon budgets every five years to 2050.
- 4.1.2 Our adaptive strategy is based on the GHG intervention hierarchy used in our AMP8 plan, summarised earlier in Figure 8. We will continue to pursue efficiency as the first priority, making the most of emerging innovation and technology. We will champion the sustainable use of natural resources, increased application of the waste hierarchy, and the principles of a circular economy in our processes and physical infrastructure. We will enable, encourage and reward action to protect and enhance the natural environment and promote the value of ecosystem services across our business and supply chain.
- 4.1.3 To ensure an efficient and effective approach, we focus on interventions that reduce emission at the same time as enabling multiple benefits for customers. There is often alignment between emission reduction and several other business strategies to secure benefits for service resilience, cost efficiency, recreation (public health) and nature.
- 4.1.4 In the long term we are likely to retain a proportion of residual emissions. For example, it is highly challenging to entirely eliminate emissions from biological treatment processes integral to water and wastewater services and associated asset investment. Our strategy prioritises options to reduce these emissions as far as possible, including asset transformation over time. In the long term we will consider the most effective ways to offset residual emissions as the last resort, as referenced in section 3.11.1.
- 4.1.5 Looking to 2050, we predict that our environmental challenges and growth pressures will continue to increase and net zero regulations will heighten as more stakeholders and customers experience the increasing impacts of climate change. As a provider of essential public services, our customers and stakeholders will rightly continue expecting the highest standards from us. We are committed to further reducing our environmental footprint by delivering our AMP8 plan and going even further in AMP9 and beyond. We predict the need for on-going net zero enhancements in future AMPs to meet the growing challenge of delivering more service at the same time as reducing emissions.
- 4.1.6 As a regulated service provider and infrastructure operator, there are risks to the success of our long term strategy that are outside of control. Our short and long term ability and approach to net zero is ultimately determined by national policy frameworks that are the single largest factor determining both the emissions growth pressures we need to counteract and the level of investment we can prioritise to emissions reductions. To achieve a science based trajectory requires large and ongoing investment that is reliant on incentives and funding mechanisms with GHG emissions as the primary driver. Furthermore, legislative duties such as the new Environment Act, fundamentally influence the pace and scale of our GHG emissions reductions. Our strategy includes an ongoing engagement programme to inform effective policy that fully values GHG emissions to support sustainable development in the round, for example by providing ideas, data, evidence, case studies and pilot trials.

4.2 Our long term transition plan

- 4.2.1 We published our first net zero transition plan in our recent Annual Report and Financial Statements (ARFS), ahead of the upcoming new national requirements. We have updated this work with the assessments and plans produced for PR24, showing AMP8 impact in our transition plan in Figure 14 .

- 4.2.2 The first graph shows our emissions challenge with strong growth pressures, particularly in scope 3 with investments to protect the water environment. This also adds ongoing pressure to our scope 1 and 2 emissions in operating new assets to higher standards for decades to come. In planning for PR24 we've innovated and optimised to minimise emissions but we cannot entirely mitigate the increased emissions from legal and regulatory requirements and other substantial growth pressures.
- 4.2.3 The second graph shows our route to net zero, adopting a science-based approach. Our four near term SBTs are shown in the green diamonds, and explained in section 2.2. To best reflect our expected emissions in reality, these long term plans incorporate latest CCC projections for decarbonisation across all sectors which are part of our supply chain. In doing so, these reflect expected improvements across sectors, such as further decarbonisation of the national grid.
- 4.2.4 Scope 2 emissions are shown here using the location-based reporting method to align with the focus in most of this document. In our group annual report and financial statements we show the market-based method to align with our current SBTs, recognising the emissions benefits of our certified renewable electricity. The difference almost entirely disappears around 2035 with further decarbonisation in the national grid.

Figure 14: Our emissions challenge and our long term route to net zero



Source: UUW analysis of PR24 forecast emissions calculated using operational emissions forecast methodology with embodied emissions

- 4.2.5 We have developed a short, medium and long term action plan to 2050, aligned to the themes of the GHG intervention hierarchy (see the earlier Figure 8). Headlines of the plan are shown in Table 2.

Table 2: Our GHG emissions action plan to 2050

Action plan	Short term (including recent progress)	Medium term	Long term
Reduce through the efficient use of resources	<ul style="list-style-type: none"> • Colleague campaign 'Use Less, Save More' • Achieved ambitious targets for percentage of waste to beneficial reuse 	<ul style="list-style-type: none"> • Optimise wastewater processes for GHG • Careful delivery of environment improvement programmes 	<ul style="list-style-type: none"> • Continual search for efficiency opportunities
Replace processes and resources with more sustainable alternatives	<ul style="list-style-type: none"> • Renewable electricity sourcing • Substantial renewable energy generation capacity and capability • 60per cent + sludge processing by low GHG advanced digestion • Electric vehicles rollout and trials for HGVs 	<ul style="list-style-type: none"> • Grow further renewables capabilities and capacity • Bioresources planning and investment to increase sludge processing capacity • 100 per cent green fleet supported by our net zero enhancement programme 	<ul style="list-style-type: none"> • Replace fossil fuels with alternatives e.g. hydrogen • Nutrient recovery initiatives • Continual stretch for sustainability informed by latest innovations
Remove GHGs from the atmosphere	<ul style="list-style-type: none"> • Woodland creation – planning and first planting schemes • Peatland restoration – schemes started 	<ul style="list-style-type: none"> • Land management for GHG emissions supported by our net zero enhancement programme • Pledges for 550ha woodland creation and 1000ha peatland restoration 	<ul style="list-style-type: none"> • Growing benefits from created woodlands • Carbon capture, use and storage
Collaborate to tackle emissions in the supply chain	<ul style="list-style-type: none"> • Comprehensive scope 3 reporting • Encourage SBTs for capital delivery partners 	<ul style="list-style-type: none"> • Inform national approach to water environmental improvements • Enriched sustainability criteria for suppliers • Quantify emissions using product/activity data 	<ul style="list-style-type: none"> • Collaborate to decarbonise our infrastructure programmes and wider supply chain
Innovate to address current technological or market gaps	<ul style="list-style-type: none"> • Carbon categories in United Utilities Innovation Labs • 'CEO Challenge' improvement projects on carbon 	<ul style="list-style-type: none"> • Low-carbon capital delivery options e.g. nature-based solutions and low-carbon concrete • Process emissions monitoring • Nutrient recovery research 	<ul style="list-style-type: none"> • Transformation in water and wastewater processing e.g. nature-based solutions • Opportunities for circular economy • Eradicate use of remaining fossil fuels

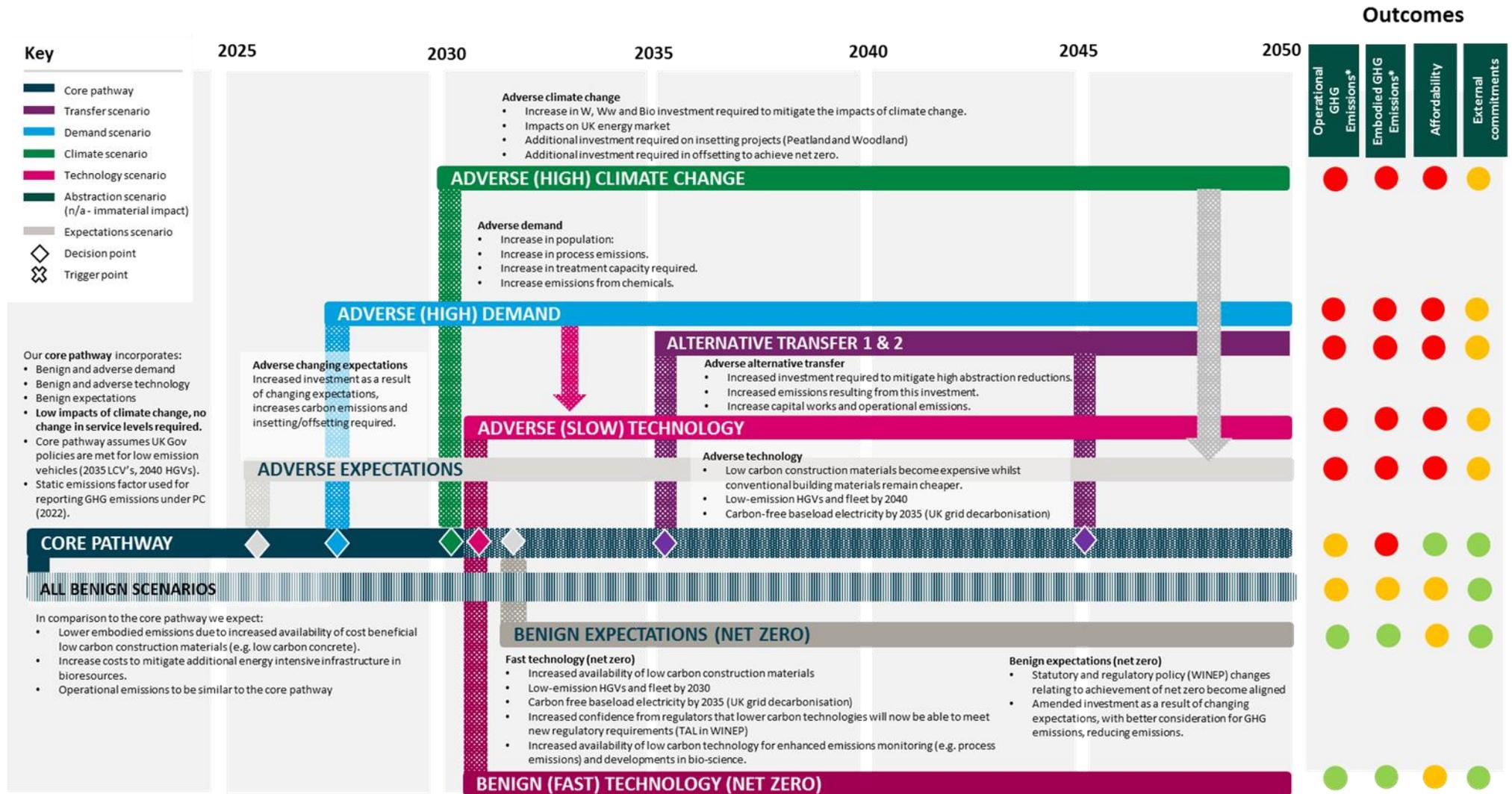
Source:UUG Annual report and financial statements 2023

4.3 GHG emissions in our Long Term Delivery Strategy (LTDS)

- 4.3.1 As part of our Long Term Delivery Strategy (LTDS) we have ensured a holistic and integrated approach by assessing the range of potential impacts on GHG emissions from our water, wastewater and bioresources core and adaptive plans. We have assessed a range of scenarios to consider the potential impacts of a complex mix of variables shaping our approach, including those set out by the Climate Change Committee (CCC). Figure 15 summarises our assessment of these scenarios and pathways for GHG emissions and the goal for net zero. In our LTDS core pathway it shows us seeking to manage substantial growth pressures in embodied and operational emissions. Our low regrets AMP8 plan strives to keep us on track to 2030, but to maintain a science-based trajectory to net zero 2050 will need substantial ongoing adaptation. This will be achieved through transformational innovation and investment for GHG emissions reduction as a primary driver, and the full valuation of GHG emissions throughout national policy frameworks to secure sustainable approaches in the round.
- 4.3.2 In the long-term strategy data tables (LS3 and LS4) we have summarised the cost to mitigate the change in GHG emissions as a result of delivering the core pathway alongside adaptive pathways for water, wastewater and bioresources.
- 4.3.3 These take an estimated operational GHG emissions impact (tCO₂e) for each pathway. This is then multiplied by the government emissions value for the relevant year (£/tCO₂e) to give a cost for mitigating the emissions impact of each pathway⁵. This shows a long term cost to mitigate growth in GHG emissions of circa £71 million for the water core pathway and circa £867 million for the wastewater core pathway. Figure 15 shows that we are likely to need alternative investment pathways to confidently meet net zero in the longer term, beyond AMP8.
- 4.3.4 In the long-term strategy data tables, costs range from £64 million to £151 million to mitigate growth in GHG emissions from water adaptive pathways and £862 million to £895 million to mitigate growth in GHG emissions from wastewater adaptive pathways.
- 4.3.5 To support our adaptive planning to net zero we have undertaken assessments of two benign pathways for changing expectations and fast technology, specifically with a view to meeting net zero 2050 targets. These pathways are favourable for GHG emissions, with increased costs from the core pathway. These additional costs would be to deliver further net zero enhancement programmes, beyond AMP8, to enable us to meet net zero. These costs are not reflected in the LS data tables.
- 4.3.6 The GHG impacts of our LTDS and our adaptive pathway to net zero is shown in Figure 15. Full technical detail can be found in *UUW12 – Long Term Delivery Strategy* and in PR24 data tables LS1-4.

⁵ BEIS (2021): <https://www.gov.uk/government/publications/valuing-greenhouse-gas-emissions-in-policy-appraisal/valuation-of-greenhouse-gas-emissions-for-policy-appraisal-and-evaluation>

Figure 15: The GHG impacts of our LTDS and our adaptive plan to net zero



Source: UUW visual representation of the GHG impacts of our LTDS and our adaptive plan to net zero

- 4.3.7 In our long term planning for net zero we have forecast our expected position against the new AMP8 common PCs for operational GHG emissions which are shown in LS1 and LS2. By 2049-50 GHG emissions are expected to increase using the PC methodology by circa 59,163 tCO₂e or 14 per cent from 2029-30. Our bespoke PC for embodied emissions programme is only applicable within AMP8 so performance has not been forecast beyond 2030. However, the learning gained could be applied to a common or future bespoke PC beyond AMP8.
- 4.3.8 Aligned to SBTi requirements we intend to re-baseline our SBTs towards the end of AMP7. This will incorporate changes as a result of our AMP8 plan and enable us to set long term SBTs targeting emissions reduction for the next 25 years across all three emission scopes aligned to SBTi's corporate net zero standard. It is likely that this will require a reduction of at least 90 per cent in GHG emissions by 2050. This aligns with our transition plan (Figure 14) to meet UK government carbon budgets aligned to the UK Climate Act.
- 4.3.9 We will review our plan cyclically each AMP to ensure we're always acting in the short term with clarity and confidence. We will evolve the plan over time to always act on latest national policy, climate science and the technical feasibility and cost-benefit of potential interventions.
- 4.3.10 For more detail on our long term plans, please refer to *UUW12 - Long Term Delivery Strategy*.

Appendix A Key terms and references

A.1.1.1 The table below describes the key terms and references used throughout this document.

Key term	Definition	Reference
Greenhouse gases (GHG)	Gases that absorb and emit radiation and when in the atmosphere raise the surface temperature of the planet. Greenhouse gas emissions are usually defined as the six gases listed in the Kyoto Protocol: carbon dioxide (CO ₂ e); methane (CH ₄); nitrous oxide (N ₂ O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); and sulphur hexafluoride (SF ₆).	Intergovernmental Panel on Climate Change (IPCC) The Greenhouse Gas (GHG) Protocol (2015): A Corporate Accounting and Reporting Standard
The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard	Provides standards and guidance for the preparation and reporting of a GHG emissions inventory.	WRI/WBCSD: The Greenhouse Gas (GHG) Protocol (2015): A Corporate Accounting and Reporting Standard
Scope 1 emissions	Direct GHG emissions from sources that are owned or controlled by a company.	The Greenhouse Gas (GHG) Protocol (2015): A Corporate Accounting and Reporting Standard
Scope 2 emissions	GHG emissions from the generation of purchased electricity.	The Greenhouse Gas (GHG) Protocol (2015): A Corporate Accounting and Reporting Standard
Scope 3 emissions	Indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.	The Greenhouse Gas (GHG) Protocol (2015): A Corporate Accounting and Reporting Standard
Scope 3 emissions categories	15 defined categories, shown in Figure 1 of this document.	Corporate Value Chain Accounting Reporting Standard
Direct emissions	Emissions that occur from sources that are owned or controlled by a company.	The Greenhouse Gas (GHG) Protocol (2015): A Corporate Accounting and Reporting Standard
Indirect emissions	Emissions that are not owned or controlled by a company, including emissions associated with the generation of purchased electricity (scope 2) and other indirect emissions (scope 3).	The Greenhouse Gas (GHG) Protocol (2015): A Corporate Accounting and Reporting Standard
Avoided emissions	Emissions that were likely to have occurred in response to latest business needs, but which are no longer expected to occur, now or in the longer term, because of our option selection process. For example, a need has been resolved through innovative no-build or leaner solutions.	UUW internal definition

Key term	Definition	Reference
Deferred emissions	Emissions that were likely to have occurred in AMP8 but have been pushed back to future AMPs through our decision-making process, for example by undertaking monitoring to identify efficient approaches to resolving needs. Deferred emissions are more likely to be lower in the future than they would be in AMP8, or perhaps avoided completely, due to industry decarbonisation and future innovative technologies.	UUW internal definition
Operational emissions (UK Water Sector)	Direct and indirect emissions of greenhouse gases from operational activities. The regulated operational emissions boundary in the water sector includes scope 1 emissions, scope 2 emissions, scope 3 emissions from the following activities: Business travel on public transport and private vehicles used for company business, Outsourced activities (where emissions would be scope 1 and 2 if not outsourced), and Purchased electricity: extraction, production, transmission and distribution, Purchased heat: extraction, production, transmission and distribution, Purchased fuels: extraction, production, transmission and distribution, Chemicals, Disposal of waste.	Ofwat PR24 operational greenhouse gas emissions performance commitment definitions for water and wastewater
Capital carbon	GHG emissions associated with the creation, refurbishment and end of life treatment of an asset. NB: For simplicity we map this as the same as Scope 3 Category 2 (Capital goods) emissions.	UKWIR (2022) Calculating Whole Life/Totex Carbon PAS 2080:2023 Carbon Management in Infrastructure
Embodied or embedded emissions	Embodied or embedded emissions are those that result from all activities involved in creating or maintaining a built asset, including extraction and transport of materials and capital emissions.	UKWIR (2022) Calculating Whole Life/Totex Carbon
Location-based method	A method to quantify scope 2 GHG emissions based on average energy generation emission factors for defined locations, including local, subnational, or national boundaries.	Greenhouse Gas (GHG) Protocol: Scope 2 Guidance
Market-based method	A method to quantify scope 2 GHG emissions based on GHG emissions emitted by the generators from which the reporter contractually purchases electricity bundled with instruments, or unbundled instruments on their own.	The Greenhouse Gas (GHG) Protocol: Scope 2 Guidance

Key term	Definition	Reference
Emissions factors	Emissions factors are values that represent the GHG emissions from a unit of activity data.	The Greenhouse Gas (GHG) Protocol (2015): A Corporate Accounting and Reporting Standard
Global Warming Potential	A factor describing the radiative forcing impact (degree of harm to the atmosphere) of one unit of a given GHG relative to one unit of carbon dioxide.	The Greenhouse Gas (GHG) Protocol (2015): A Corporate Accounting and Reporting Standard
Climate Change Act 2008	UK legislation which includes a requirement for the UK Government to set legally-binding carbon budgets for the country to achieve net zero by 2050.	Climate Change Act 2008
UK carbon budgets	It is a requirement of the Climate Change Act that the UK Government sets carbon budgets to net zero 2050. These budgets put a cap on the amount of greenhouse gases emitted in the UK over a five-year period. 4th budget covers 2023 to 2027 (max of 1,950 MtCO ₂ e) 5th budget covers 2028 to 2033 (max 1,725 MtCO ₂ e) 6th budget covers the period 2033-2037.(max 965 MtCO ₂ e)	Climate Change Committee in response to Climate Change Act 2008 - ⁶
Climate Change Committee (CCC)	Independent, statutory body established under the Climate Act 2008.	Climate Change Act 2008
Science-Based Targets (SBTs)	Targets that are in line with what the latest climate science says is necessary to meet the goals of the Paris Agreement – to limit global warming to well-below 2°C above preindustrial levels and pursue efforts to limit warming to 1.5°C.	SBTi Corporate Net-Zero standard Version 1.0 (2021)
Science-Based Targets initiative (SBTi)	SBTi is a partnership between CDP, the United Nations Global Compact, World Resources Institute (WRI) and the World Wide Fund for Nature (WWF) that define and promote best practice in emissions reductions and net-zero targets in line with climate science.	Sciencebasedtargets.org
PAS2080 : 2023	Publically available standard for managing carbon in buildings and infrastructure.	PAS2080 : 2023 Carbon management in buildings and infrastructure

⁶ theccc.org.uk/about/our-expertise/advice-on-reducing-the-uks-emissions/

Appendix B Challenges and opportunities shaping our plans to net zero 2050

B.1 Our net zero challenges and opportunities

B.1.1 A complex mix of fast evolving challenges and opportunities are shaping our approach to net zero, with our latest analysis summarised in Table 3. The table focuses on the increasing growth challenges which are fundamentally influencing our emissions and ability to meet net zero. We also recognise some of the many opportunities which are developing to reduce GHG emissions over the short and long term.

Table 3: Net zero challenges and opportunities

Challenges and opportunities	Summary impact and position
Growth pressure from legal and regulatory requirements	<p>As a regulated service provider and infrastructure operator, our emissions and approach to net zero is heavily influenced by national policy. New duties require substantial investment that often results in GHG emissions from both the construction of new assets and throughout their operational life with extra demand for energy and chemicals. Actions needed to achieve higher wastewater treatment standards are particularly important, for example the new Environment Act presents large emissions growth pressures that were unforeseen only a few years ago when setting our initial SBTs.</p> <p>We support outcomes that protect the water environment, and work hard to innovate for solutions that optimise benefits for both the water environment and GHG emissions. Continued collaboration is part of our plan to net zero, for example engaging with regulators and the supply chain to maximise deployment different of behavioural change and nature-based solutions.</p>
Population growth	<p>Further emissions growth pressure stems from our need to extend our infrastructure and services to the growing population. Latest data from the Office for National Statistics and regional plans suggests we will need to provide wastewater services to around 1 million more people in the North West by 2050, a 14 per cent increase from 2020. Population growth has resulted in a fairly constant emissions growth over recent years, which we have largely been able to outperform through our focus on electricity. However, total growth pressures are higher than they have been in the past when the various factors are combined. Regional plans suggest concentrations of growth in communities such as Carlisle and Manchester, which are expected to require substantial infrastructure investments. Large scale infrastructure needs may also present opportunities for innovation, for example in our net zero enhancement proposal to co-create a sustainability master plan for the development of St Cuthbert’s garden city. Here we want to work with others to showcase sustainable development for low carbon water and wastewater services.</p>

Challenges and opportunities	Summary impact and position
Climate change adaptation	<p>Our increasing need to adapt assets and operations to climate change presents further emissions pressure increasing over time. More common and severe droughts and storms will require extra infrastructure capacity and operational use of energy and chemicals to pump and treat more water and wastewater. The less global society curbs climate change, the greater the need for adaptation. This is one reason why we strive to lead by example, and bring others with us, in reducing GHG emissions.</p> <p>We have proposed many options which support both mitigation and adaptation, such as programmes of water efficiency, rainwater management, and peatland restoration.</p>
Increasing costs and complexity	<p>We have already undertaken many of the most commercially attractive options to reduce GHG emissions while increasing efficiency in operations and energy management. It will be more costly to maintain these reductions and go further. For example, renewable energy tariffs have recently increased in cost, and are projected to continue in an upward trajectory. To achieve the transformational change to net zero will require substantial investment with GHG emissions reduction as a primary driver, both for immediate reduction opportunities where they exist, and for the enabling activities to support our longer-term reductions.</p> <p>For optimal low regrets action to 2030, our net zero enhancement programme proposes 11 projects based on our latest assessment of viable options and their cost-benefit. We have proposed options that deliver the best return on investment, some of which include payback within their asset lives to offer long term resource and cost savings.</p>
Improved measurement and reporting, of process emissions	<p>Process emissions are complex to measure accurately because they are highly variable depending on factors such as process types, flow volumes and the weather. Site level and process unit level approaches are being delivered in Europe, and this could be developed for the UK context to improve sector emission factors and inform management plans.</p> <p>Latest international research suggests that process and fugitive emissions are much higher than currently estimated and reported. Improved measurement and monitoring is a priority, but also presents a relative growth pressure if increasing reportable emissions.</p> <p>It will be important to carefully manage how reporting improvements are communicated, and associated incentives are ensured to remain fair and meaningful.</p> <p>The process emissions case study in Section 3.2 summarises the innovative monitoring programme we have introduced. Our net zero enhancement programme proposes projects to improve the measurement of process emissions.</p>

Challenges and opportunities	Summary impact and position
Increasing stakeholder expectations and support	There are increasing expectations for our delivery of best practice GHG emissions disclosures and management. As outlined in Section 2.4, multiple studies confirmed a clear majority of customers support our net zero proposals in AMP8, and long term ambition. We also observe growing investor interest and expectation.
Transport	<p>There has been uncertainty in the UK's transport market to aid delivery of the electrification of vehicles. A briefing document released by the Climate Change Committee in 2020⁷ outlined the current barriers to a transition by 2030 including insufficient charging infrastructure, restricted network capacity and cost of upgrades.</p> <p>In 2022 the UK government released a strategy titled "taking charge: the electric vehicle infrastructure strategy"⁸ which includes plans to support the vision and accelerate the rollout of the charging network.</p> <p>Latest technologies support our goal for a 100 per cent green fleet with mainstream options for cars and vans, and rapidly emerging innovations for the more challenging heavy goods vehicles. However, this remains a transitioning space with a cost premium and technical challenges. Our net zero enhancement programme includes proposals in this area. See Section 3.5 for details.</p>
Carbon capture and storage	The nature of our assets and operations may provide opportunities for CO ₂ e capture and storage projects at some of our WwTW. CO ₂ e is typically vented to atmosphere during the upgrade of biogas to biomethane, however this biogenic CO ₂ e can be captured and transported for injection into geological formations for long term storage. There is also an emerging market for voluntary offsets.
Heat	While the growth pressure outlined above will increase the amount of processing required at our wastewater treatment sites, and sludge produced, it can also present an opportunity to take value from currently under used heat. For example, using the heat generated from biogas and biomethane conversion.
Low carbon capital delivery options including resource efficiency & circular economy	Through the design and construction of our capital delivery programme we have an opportunity to avoid and reduce embodied and operational GHG emissions. This could be through optimising resource efficiency and circularity, use of low carbon concrete and steel, or delivering nature-based solutions.
Customer engagement	We have an opportunity to further prevent water and energy wastage and promote water efficiency through campaigns, advice, education and free water saving devices for customers.

⁷ Climate Change Committee (2020) The UK's transition to electric vehicles. <https://www.theccc.org.uk/wp-content/uploads/2020/12/The-UKs-transition-to-electric-vehicles.pdf>

⁸ HM Government (2022) Taking charge: the electric vehicle infrastructure strategy. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1065576/taking-charge-the-electric-vehicle-infrastructure-strategy.pdf

Challenges and opportunities	Summary impact and position
Land management	As a large land owner we have a track record of land management. Our peatland and woodland areas provide both opportunity to store carbon and have the potential emit emissions. Our work to restore peatland and create woodland provides opportunities to manage the land for emission benefit. More detail can be seen in our case studies in section 3.2 and our net zero enhancement programme in 3.5 proposes schemes in AMP8.

Appendix C PR24 GHG emissions assessment framework

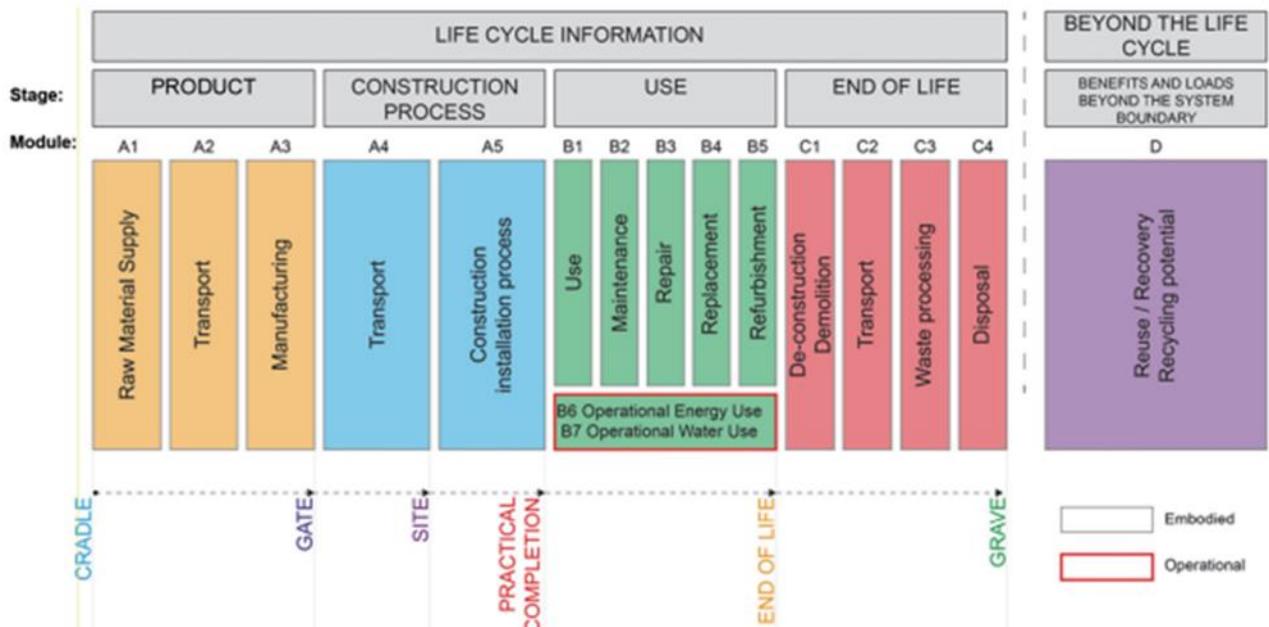
C.1.1.1 Table 4 provides an overview of our PR24 GHG emissions assessment framework. For all GHG emissions assessments related to the common operational GHG emissions PCs, we have aligned to the PC definition documents issued by Ofwat.

Table 4: PR24 GHG emissions assessment framework⁹

	Embodied GHG emissions – materials, transport, construction & waste	Replacement GHG emissions – emissions from replacement of assets during operational life	Operational GHG emissions – chemicals, electricity, fuel, sludge transport	Operational GHG emissions – process emissions	Sequestered GHG emissions – land use change resulting in capture, removal & storage of CO₂e	Whole-life GHG emissions
GHG emission Assessment Methodology – where project detail is available	<p>Calculated on a scheme by scheme basis using a bottom up assessment based on asset types (and accompanying codes) required by each scheme.</p> <p>Covering BS EN 17472 modules A1-5 (materials, transport, construction & waste).</p> <p>Carbon curves will be used to assess carbon impact of the scheme. These are totalled at a programme level.</p> <p>Preference has been to use third party PR24 carbon curves.</p>	<p>Replacement of all assets during operational life to be forecasted on a scheme by scheme basis over a 30 year period.</p> <p>Represents BS EN 17472 modules A1-5 (materials, transport, construction & waste) under module B4 (replacement).</p> <p>Carbon curves will be used to assess carbon impact of replacements of assets per scheme. These are totalled at a programme level.</p> <p>Preference has been to use third party PR24 carbon curves.</p>	<p>Forecast chemical, electricity and fuel use per scheme to be calculated by asset type.</p> <p>Covering BS EN 17472 modules B2; B6-B8 (maintenance; power, chemicals, sludge transport).</p> <p>Carbon curves will be used to assess carbon impact of the scheme on an annual basis. These are totalled at a programme level. Annual figures are multiplied by 30 to give a 30 year view.</p> <p>Preference has been to use third party PR24 carbon curves.</p>	<p>To include Ww and Bio process emissions only.</p> <p><u>For Ww emissions</u></p> <p>Follow ‘the best science’ approach for emissions factors.</p> <p><u>For Bio emissions</u></p> <p>Follow ‘the best science’ approach for emissions factors using impact from treatment type.</p> <p>Both assess GHG emission impact of the scheme on an annual basis. These are totalled at a programme level. Annual figures are multiplied by 30 to give a 30 year view.</p>	<p>Excluded apart from where specific programme requirements e.g. WINEP</p>	<p>A calculation based on the sum of total embodied carbon, total replacement carbon and 30 (or specified by submission requirement) years of operational carbon.</p> <p>Sequestered carbon taken away from the above total if calculated.</p>
Benchmark GHG emission Assessment Methodology – where project detail is not available	<p>Extrapolation, ideally from other projects within the same programme. If extrapolated from other programmes, preferably from programmes where the asset base is similar (similar assets → similar emissions profile).</p> <p>This should ideally be from similar asset types or if not possible a tCO₂e/£ can be calculated from the proportion of the programme with a bottom up assessment. This tCO₂e/£ value should then be applied to the remainder of the programme.</p> <p>If this is not possible, extrapolate from projects in other programmes within PR24.</p>					

⁹ See Figure 16 below for a diagrammatic representation of the EN 17472 life cycle modules.

Figure 16: BS EN 17472 life cycle modules (adapted from BS EN 17472)



C.2 How we have created an efficient and optimised net zero plan

- C.2.1 Our methodology summarises the emissions across all water, wastewater and bioresources programmes to be delivered from base, standard enhancements and net zero enhancements.
- C.2.2 Our approach is efficient and effective by undertaking a thorough process to review both the AMP8 and whole life GHG emissions impact of all submitted solutions. We have assessed the emissions impact to both embodied GHG emissions as a result of project delivery and any subsequent future operational emissions, often felt beyond 2030.
- C.2.3 We have developed the GHG emissions framework, shown in Table 4 which has been applied to all of our PR24 submission. This takes a best practice emissions approach across our operational and embodied emissions using expert third party support from our technical partners. Our approach uses bottom up data where available and the creation of benchmarks where it is not. This is aligned to industry best practice and well known standards such as PAS 2080 and has been internally and externally verified. The external assurance report stated that:

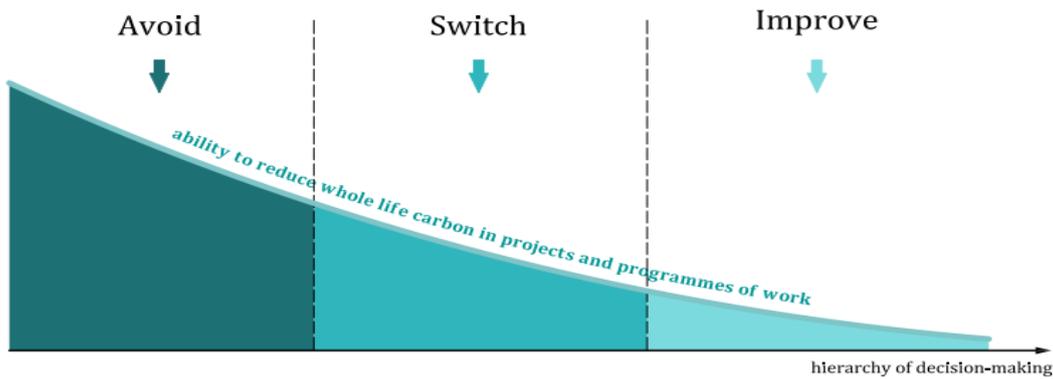
“UUW has considered and consistently applied appropriate methodologies for the PR24 operational carbon forecasts, including the operational carbon performance commitment forecast, and did not identify material misalignment or issues. [They] also observed good evidence the team has reflected Ofwat’s methodology in calculating its operational GHG performance commitment.”

“[They] have observed good evidence that UUW has pioneered the development, and consistently applied, valid approaches for the estimation of embodied carbon emissions. The approach is comprehensive.”

C.3 GHG emissions assessment methodology

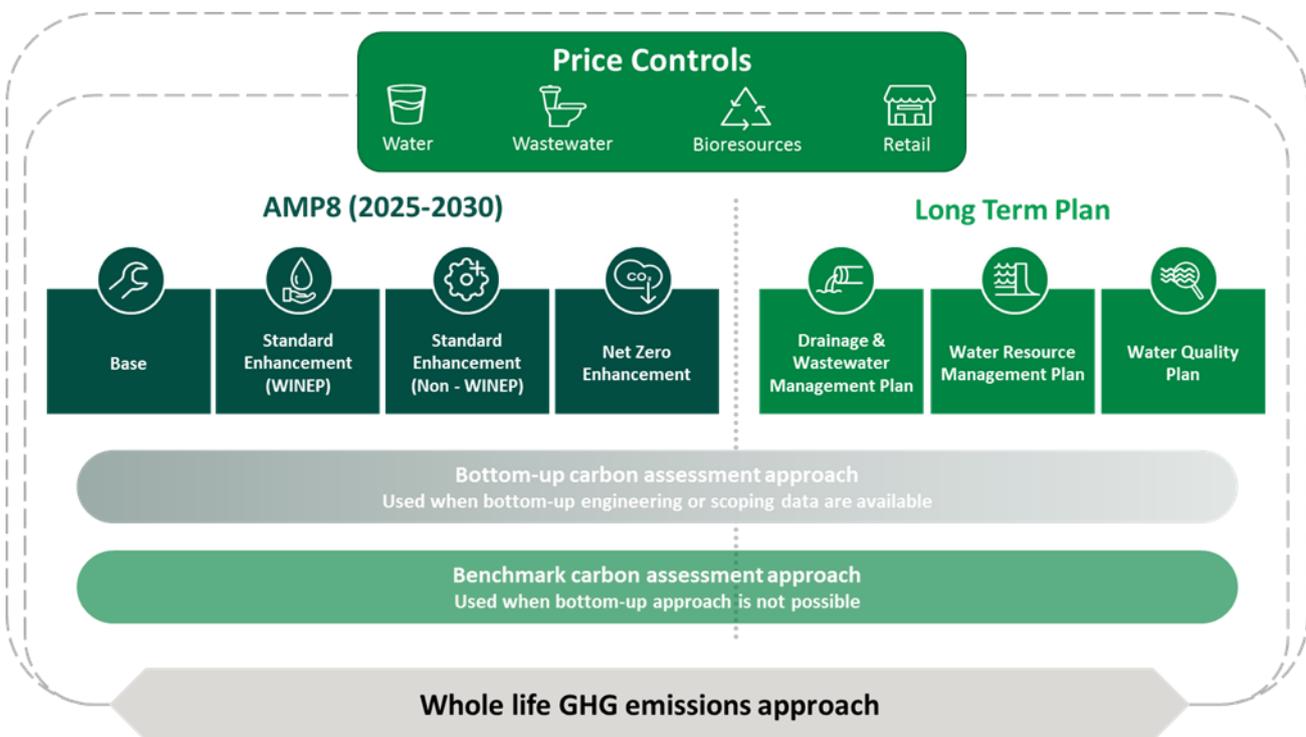
- C.3.1 Our GHG emissions assessment framework, applied across our PR24 programme, is aligned to the best value methodology through its calculation methodology, terminology, boundaries and key assumptions.
- C.3.2 Following assessment we have challenged the projects to look for emission reduction opportunities for both operational and embodied emissions. It is well established within PAS 2080 that the earlier the carbon impacts of a project can be estimated, the greater the ability to influence and reduce these impacts. This concept is illustrated in Figure 17.

Figure 17: Conceptual diagram showing ability to influence carbon reduction as a project progresses along the hierarchy of decision making¹⁰.



C.3.3 GHG emission assessments have been completed across all short and long term planning horizons as is shown in Figure 18.

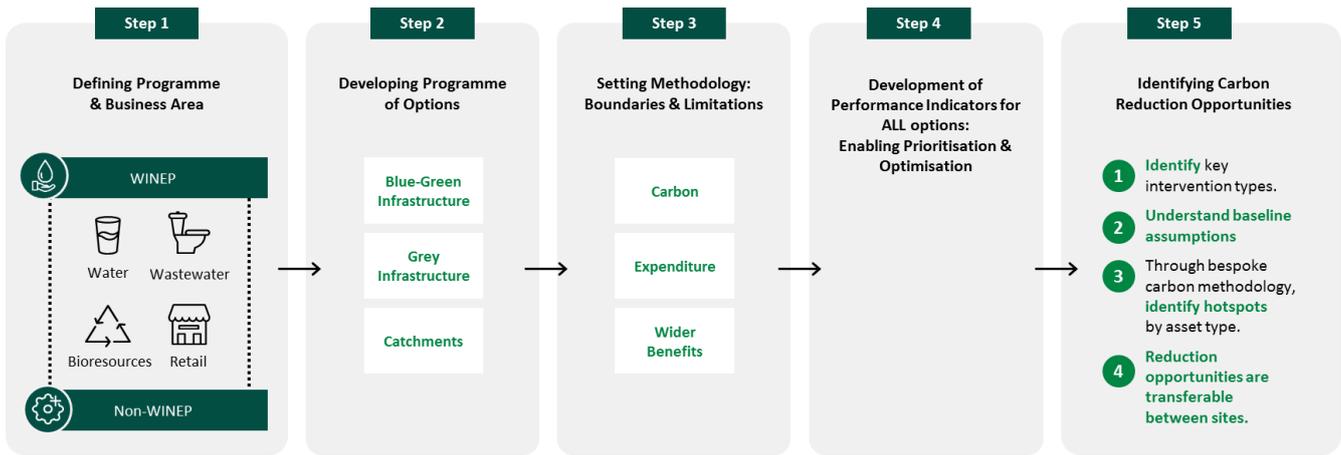
Figure 18: Our GHG emissions assessment framework.



C.3.4 Our GHG emissions assessments, where possible, use a bottom up approach taking into consideration the project type, assets included in the build, the assessment boundary and the baseline. This is represented in Figure 19. As described above, where programme data is insufficiently granular, relevant benchmarks are applied.

¹⁰ Figure 5 in PAS 2080: 2023 – Carbon Management in Buildings & Infrastructure

Figure 19: Bottom up GHG emissions assessments process flow, applied to short term plans



C.3.5 Where a programme has a GHG emission methodology specified (e.g. WINEP or operational GHG emissions common PC) we have applied the specified requirements. Where no methodology is specified, we have used our PR24 GHG emissions assessment framework summarised in Table 4. We have documented detailed methodologies for operational and embodied emissions for each programme area.

4.3.11

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