

SRN46 Net Zero Carbon Technical Annex

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**Southern
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About this Document

This paper sets out our net zero ambitions and outlines our delivery plan.

We published a Net Zero Plan in 2021¹, in line with the Water UK Public Interest Commitment² of reducing operational emissions to net zero by 2030. We see this as an interim target in our long-term strategy to reach net zero by 2050. We recognise that this ambition comes with significant challenges given the shifting macroeconomic environment. However, it is important that we and the water sector play a role in reducing emissions, while balancing this with the need to provide our services at an affordable price to our customers.

In particular, this paper explains why we believe that our net zero target should align with national government targets, why our action on net zero needs to encompass both operational and embedded emissions and why we should prioritise the reduction of Greenhouse Gas (GHG) emissions before using offsets.

Additionally, this paper is also intended to explain how we have developed our action plan, what is included in it, and why we believe it is our best approach.

¹ Southern Water, Net Zero plan, https://www.southernwater.co.uk/media/4931/5585_net_zero_report_a4_v10.pdf

² Water UK, Public interest commitment, <https://www.water.org.uk/wp-content/uploads/2019/04/Public-Interest-Commitment.pdf>

1. What is Net Zero and Why is it Important to Act Now?

The UK government has made a legally binding commitment to reduce emissions to net zero by 2050, compared to 1990 levels, with an interim target to reduce emissions by 78% below the 1990 baseline, by 2035³. This ambition aims to contribute to the Paris Agreement, which outlines long-term goals that guide governments towards limiting the global temperature increase to well below 2°Celsius, while pursuing efforts to limit the increase even further to 1.5°Celsius⁴.

Exceeding the critical threshold of a 2°Celsius rise above pre-industrial levels may lead to sea level rise, coastal flooding, beach erosion, salinization of water supplies and other impacts on humans and ecological systems. Further, limiting warming to 1.5°Celsius would minimise risks⁵. To facilitate the transition to net zero the UK government has set a carbon budget. A carbon budget is a concept used in climate policy to help set emission reduction targets in a fair and effective way. It places a restriction on the total amount of greenhouse gases the UK can emit over a 5-year period⁶.

In a bid to support the government and to protect against the physical threats of climate change, companies across the nation are working to develop and implement plans to manage risks associated with mitigating and adapting to a net zero state, in line with sector specific carbon budgets set by the UK government. While there are no carbon budgets specific to the water sector, there are carbon budgets for other sectors that impact our activities, and to which water companies can contribute to help reduce emissions, such as agriculture⁷.

In 2019, the water companies in England embarked on a mission to reduce their operational carbon footprint to zero by 2030. Since then, companies in Scotland and Wales have committed to achieving carbon neutrality across all emissions by 2040, with a pledge from Northern Ireland to deliver the same target by 2050⁸.

Along with other water companies in England, we developed a plan to deliver the operational net zero ambition, by 2030. We published our Net Zero plan in 2021 and set out our intention to achieve the target by improving energy efficiency, purchasing renewable energy, supporting sequestration and offsetting any remaining emissions responsibly.

However, we have since revised our approach in response to regulatory and legislative targets and have revised our net zero ambition to be net zero by 2050. This is aligned with the net zero principles and key

³UK Government, Net zero transformation: Industry and Regulators Committee report, <https://lordslibrary.parliament.uk/net-zero-transformation-industry-and-regulators-committee-report/#:~:text=1.-.Net%20zero%20target,also%20set%20net%20zero%20targets.>

⁴ The Paris Agreement is a legally binding international treaty, aimed at tackling climate change. It entered into force on 4 November 2016 and has 194 Parties (193 Country states plus the European Union). United Nations, The Paris Agreement, <https://www.un.org/en/climatechange/paris-agreement>

⁵ Intergovernmental Panel on Climate Change (IPCC), Synthesis Report of the IPCC Sixth Assessment Report, Climate Change 2023 Synthesis Report, https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_LongerReport.pdf

⁶ UK Government, Carbon Budgets, <https://www.gov.uk/guidance/carbon-budgets>

⁷ UK Government, Carbon Budget Delivery Plan 2023,

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1147369/carbon-budget-delivery-plan.pdf

⁸ Water UK, The water industry is playing its part in tackling climate change, <https://www.water.org.uk/protecting-environment/climate-change#:~:text=In%202019%2C%20water%20companies%20in,the%20same%20target%20by%202050.>

areas that are crucial to the achievement of net zero that Ofwat highlighted in the recent net zero position paper:

- An expectation on companies' plans to align with national government net zero targets,
- Companies action on net zero to address operational and embedded emissions in parallel, and
- Companies to prioritise the reduction of GHG emissions before the use of offsets, as set out in the GHG Management Hierarchy⁹.

⁹ Ofwat, Net-zero principles-position-paper, https://www.ofwat.gov.uk/wp-content/uploads/2022/01/Net_Zero_Principles_Position_Paper_Jan_2022.pdf

2. Our Story

In 2021 we committed to reducing our operational emissions and stated a number of activities, as part of our route map, which would help us to achieve this. We designed a plan to tackle scope 1 and 2 emissions using a market-based approach in accordance with the Water UK guidance¹⁰ and in line with others in the industry. Central to this plan was improving efficiencies across the business and sourcing green energy, both of which we believe still have a significant role to play in our journey towards net zero moving forward.

2.1 Southern Water's operational carbon emissions (2022-23)

We have been recording operational emissions since 2012-13. In 2022-23 our gross operational emissions, calculated using a location-based approach, were 185 ktCO₂e, which is a 36% drop since records began.

The main source of our operational emissions come from the use of electricity to power our pumps, operate our treatment works and to a lesser extent, to light our offices. While the use of electricity contributes to the total carbon dioxide emitted by us, emissions from our water and wastewater treatment processes, contribute to our process emissions. Process emissions primarily account for our methane (CH₄) and nitrous oxide (N₂O) emissions, both of which have a significantly higher global warming potential than carbon dioxide (CO₂)¹¹. However, to maintain consistency, emissions from all our sources are accounted and reported as carbon dioxide equivalent. Carbon dioxide equivalent or CO₂e is a measurement of the total greenhouse gases (GHG) emitted, expressed in terms of the equivalent measurement of carbon dioxide. As such, all emissions reported in this document have been expressed as CO₂e.

Emissions from the use of electricity, in 2022-23, accounted for 45% of all our operational emissions. Electricity is the largest source of our emissions and is considered a scope 2 source. Scope 2 emissions, also known as indirect energy emissions, encompass GHG emissions that are released into the atmosphere as a result of an organisation's consumption of purchased electricity, heat, steam, and cooling. These emissions are categorised as indirect as they originate from sources beyond ownership or control.¹²

Process emissions on the other hand are our largest source of scope 1 emissions. Scope 1 emissions are direct GHG emissions that arise from an organisation's own operational activities and are produced from sources that are owned or controlled by an organisation¹³. This type of emissions accounted for 31% of all our operational emissions. A detailed list of our operational emissions by source are as below:

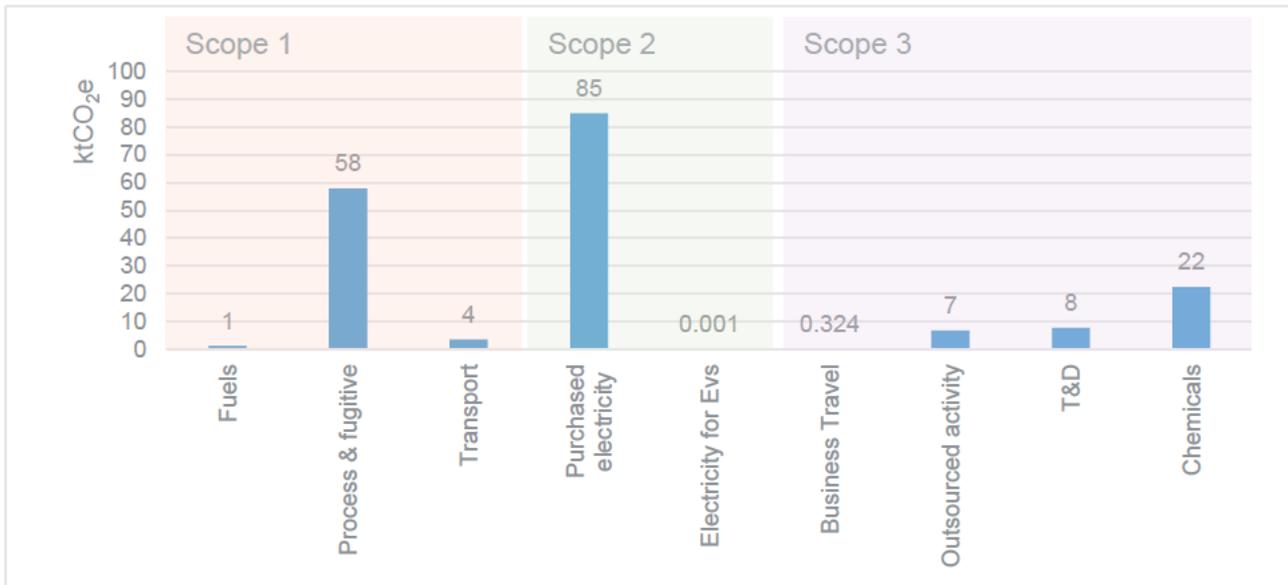
¹⁰ Water UK, Net Zero 2030 routemap, <https://www.water.org.uk/routemap2030/wp-content/uploads/2020/11/Water-UK-Net-Zero-2030-Routemap.pdf>

¹¹ Greenhouse Gas Protocol, Global Warming Potential Values, https://ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf

¹² Ofwat, PR24 operational greenhouse gas emissions performance commitment, https://www.ofwat.gov.uk/wp-content/uploads/2023/04/Performance-commitment-definition-Operational-greenhouse-gases-Water_-30-March-2023-final_May-change.pdf

¹³ Ofwat, PR24 operational greenhouse gas emissions performance commitment, https://www.ofwat.gov.uk/wp-content/uploads/2023/04/Performance-commitment-definition-Operational-greenhouse-gases-Water_-30-March-2023-final_May-change.pdf

Figure 1: Southern Water operational emissions by source



Note: The chart above shows gross emissions by source in the year 2022-23 calculated using a location-based approach

2.2 How we measure our emissions

Using consistent parameters when measuring, monitoring, and reporting emissions data is critical in enabling us to make carbon conscious decisions and helps us in delivering cost and efficiency benefits, to our customers and for the environment. We use the Carbon Accounting Workbook (CAW) to assess and measure emissions from different sources¹⁴. While we recognise that the industry will need to work together to evolve the CAW, as well as develop a congruous reporting approach for embodied or embedded emissions¹⁵, this approach allows us to consistently measure, monitor, and report emissions data and helps us track progress against our ambition. Using the CAW to assess and measure emissions is in accordance with Ofwat’s guidance for Price Review 2024 (PR24)¹⁶. It is also in line with the annual performance report’s (APR) data collection and reporting methodology, employed since 2012-13, when we started recording emissions data¹⁷. Further, we have also been using this approach to gauge which of our net zero actions are delivering benefits to the expected levels.

However, Ofwat has mandated the use of version 17 of the CAW for measuring and reporting operational GHG emissions going forward, to maintain consistency across the industry. As such, we have reviewed the main changes between CAW version 16 and 17 and summarised how we aim to address the gaps in order to maintain compliance. This has been detailed below:

¹⁴ UK Water Industry Research Ltd (UKWIR) Carbon Accounting Workbook, version 17, 2023, <https://ukwir.org/Carbon-accounting-workbook>

¹⁵ World Resource Institute, Sector Supplement for Measuring and Accounting for Embodied Emissions in the Built Environment, https://ghgprotocol.org/sites/default/files/2023-03/wri-embodied-emissions-sector-supplement-2022_1.pdf

¹⁶ Ofwat, Consultation on PR24 operational greenhouse gas emissions performance commitments definitions Response document, https://www.ofwat.gov.uk/wp-content/uploads/2023/04/GHG-PCs-definition-consultation-response-document-30032023-Final_May-changes.pdf

¹⁷ Ofwat, IN 23/03 Expectations for monopoly company annual performance reporting 2022-23, https://www.ofwat.gov.uk/wp-content/uploads/2023/04/IN-2303-Expectations-for-monopoly-company-annual-performance-reporting-2022-23_updated0206.pdf

- **Scope 1 emissions – Disposal of sludge:** Under CAW version 17, disposal of sludge¹⁸ on a company's own land must now be reported, and associated emissions disclosed as a scope 1 emission. Whereas, when disposing of sludge on a third party's land, companies must continue to report associated emissions under scope 3¹⁹. This change is not likely to impact us. As we currently only dispose of digested sludge to third party land and accordingly reports associated emissions under scope 3.
- **Scope 2 emissions – Purchased electricity:** As per CAW version 17, emissions from purchased electricity must now be reported using average grid emissions factors²⁰. This method of reporting emissions generated from the use of purchased electricity is known as a location-based approach. Additionally, as per the revised CAW, reduced emissions factors associated with Renewable Energy Guarantees of Origin (REGOs)²¹ must not be considered when reporting. Except where the REGO certificate, associated with onsite renewable generation, is retained. Only in this case can the reduced emissions factors, from the associated REGO, be accounted for in emission reporting. This revision in the CAW does impact us and we have taken appropriate measures to ensure emissions from purchased electricity are reported correctly.
- **Scope 3 emissions – Value chain emissions:** In CAW version 17, there is an increased emphasis on reporting scope 3 emissions. This includes reporting emissions from chemicals using CAW emission factors. And limiting the use of inset sequestration²², to 1% of gross emissions produced. We have taken necessary measures to comply with these revised guidelines.

In addition to reporting through the CAW, from 2022-23 we will also report on the emissions associated with built infrastructure, commonly referred to as embedded emissions. These emissions are currently calculated using internal estimating tools as outlined in our Capital Carbon Management Framework. This framework has been developed in line with the PAS 2080 principles²³.

2.3 Our journey so far

Our net operational emissions between 2012-13 and 2022-23 also dropped by 36%. This drop in emissions recorded by us over the decade can be attributed to a combination of internal and external factors. Chief

¹⁸ Sludge is the biproduct or waste generated from the wastewater treatment process.

¹⁹ Scope 3 encompasses emissions that are not produced by the company itself, and not the result of activities from assets owned or controlled by them, but by those that it's indirectly responsible for, up and down its value chain. Ofwat, PR24 operational greenhouse gas emissions performance commitment, https://www.ofwat.gov.uk/wp-content/uploads/2023/04/Performance-commitment-definition-Operational-greenhouse-gases-Water_-30-March-2023-final_May-change.pdf

²⁰ The grid emissions factor provides estimates of emissions associated with electricity consumption based on emissions during its production. In the UK this is the 2022 fixed National Grid emissions factor published by the government. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1083857/2022-ghg-cf-methodology-paper.pdf

²¹ The Renewable Energy Guarantees of Origin is a government scheme that provides transparency to consumers about the proportion of electricity that suppliers source from renewable sources. This guarantee is provided in the form of a certificate called the REGOs. [https://www.ofgem.gov.uk/environmental-and-social-schemes/renewable-energy-guarantees-origin-rego/renewable-energy-guarantees-origin-rego-electricity-suppliers-and-generators#:~:text=Renewable%20Energy%20Guarantees%20of%20Origin%20\(REGOs\)%20certificates%20allow%20electricity%20suppliers,was%20produced%20from%20renewable%20sources.](https://www.ofgem.gov.uk/environmental-and-social-schemes/renewable-energy-guarantees-origin-rego/renewable-energy-guarantees-origin-rego-electricity-suppliers-and-generators#:~:text=Renewable%20Energy%20Guarantees%20of%20Origin%20(REGOs)%20certificates%20allow%20electricity%20suppliers,was%20produced%20from%20renewable%20sources.)

²² Insets or Insetting refers to the financing of climate protection projects along a company's own value chain that demonstrably reduce or sequester emissions and thereby achieve a positive impact on the communities and ecosystems associated with the value chain. Greenhouse Gas Protocol, Carbon Removals and Land Sector Initiative, <https://ghgprotocol.org/sites/default/files/GHG%20Protocol%20-%20Carbon%20Removals%20and%20Land%20Sector%20Initiative%20-%20Overview.pdf>

²³ British Standards Institution, Revised PAS 2080:2023, <https://pages.bsigroup.com/1/35972/2023-04-05/3t5zsjc>

amongst the external factors is the decarbonisation of the electricity grid, whose efficiency factor reduced from 535 gCO₂ to 214 gCO₂, between 2008 and 2023, representing a 60% reduction in carbon intensity²⁴. As a result of which the emissions from the use of electricity (our largest source of emissions) have improved significantly.

While our operational emissions have reduced over time due to external factors like the decarbonisation of the electricity Grid, we have also made significant progress in implementing measures to further the transition. These include the use of REGO-backed electricity, a scheme that guarantees electricity has been generated from renewable sources. Increased on site generation of renewable energy, both solar energy and biogas. And the implementation of energy efficient solutions like smart meters and leakage detection technologies. We have also been working on trialling process emission monitors across some of our wastewater treatment sites to measure and monitor hard to abate emissions more accurately. The combined impact of these measures is illustrated in *Figure 2: Southern Water's operational emissions journey*.

2.4 Success stories – operational and energy efficiency

We have also put in place process and operational efficiencies across the business. In treatment works, in the offices, across operations and network management. The implementation of these measures has additionally reduced our emissions further.

Some of the process and operational efficiencies that have enabled us to reduce our emissions so far have been highlighted below.

Green Energy

In 2018, we began selecting electricity from energy providers that had a greater proportion of renewable power. We also increased the proportion of renewable power that we generate on-site and use to power our treatment processes. In 2022-23, over 33% of our own energy use was generated on-site. A lot of this was through the generation of 'power from poo', where biogas is generated from biosolids. These biosolids are created during the wastewater treatment process and the resulting biogas is used as a fuel to generate electricity and heat. Biogas is principally methane gas which is produced from the treatment of our wastewater biosolids. In 2022-23 we generated over 120 GWh of power from our biogas CHP (combined heat and power) plant and 3 GWh from our solar photovoltaics.

Demand reduction and energy efficiency

We are working with customers to save water, through our Target 100 programme, which supports customers reduce their daily water use to 100 litres per person per day. We have been raising awareness about water efficiency and scarcity, installing smart meters, and providing incentives. Reducing water consumption helps our customers save money, helps the environment, and contributes to net zero, by reducing the overall demand. Improving efficiency through reducing water supply leakage is also a key part of our efficiency programme, as it is directly proportional to a reduction in energy demand and thus emissions. We have been investing in new technologies such as the advanced pressure management solution, to help reduce leaks. We want to halve leakage by 2050. To help reduce leakage, so far, we have installed 7,400 acoustic loggers on our network which help to quickly detect possible leaks and have completed 20,000 leak repairs.

²⁴ Climate change committee, The Sixth Carbon Budget - Electricity-generation <https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Electricity-generation.pdf> , and National Grid ESO, ESO's Carbon Intensity Dashboard, Snapshot date: 31st August, 2023, <https://www.nationalgrideso.com/future-energy/our-progress-towards-net-zero/carbon-intensity-dashboard>

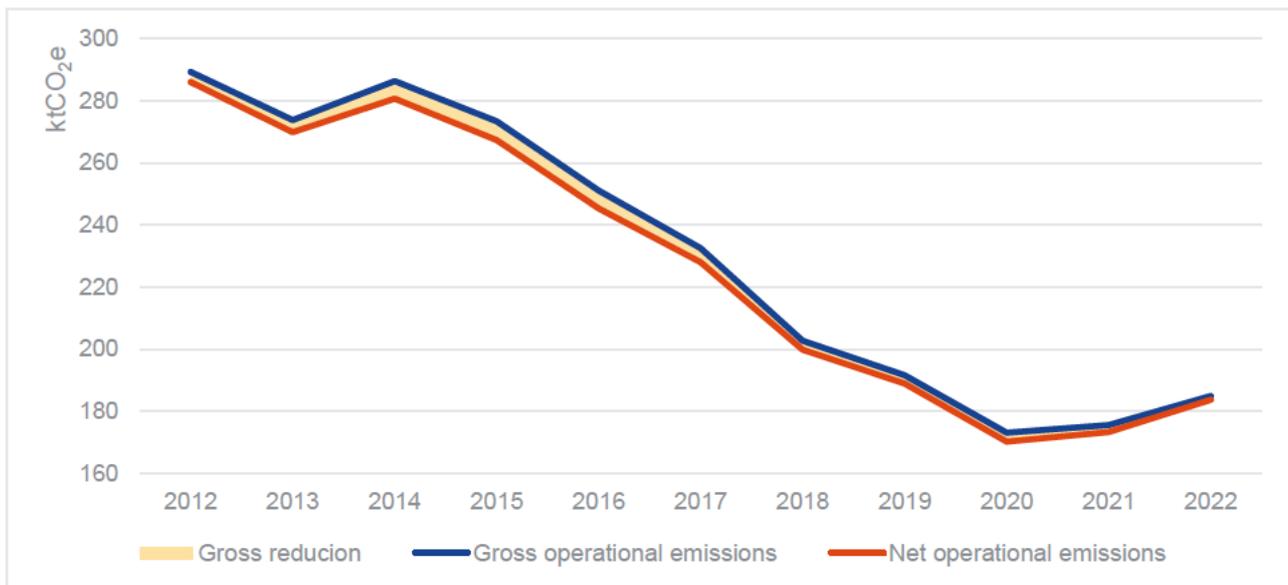
Baselining process emissions

In the process of treating wastewater and biosolids, greenhouse gases are emitted which we refer to as process emissions. These emissions are mainly methane (CH₄), and nitrous oxide (N₂O). Process emissions are harder to abate than carbon. To date, process emission data from wastewater treatment works, in the UK, have largely been theoretical. Developed on the basis of data modelling and assumptions. However, there is a pressing need to understand the actual emissions from these processes, using the most appropriate and cost-effective methodologies to do so for the long-term. This could include borrowing methodologies where possible from work in other sectors (e.g., cement and steel) and countries (e.g., the Netherlands, Denmark, and Switzerland). To try and capture process emission data accurately, our Bluewave innovation team, in conjunction with industry partners [REDACTED], have installed N₂O (N₂O, a GHG 300 times more potent than CO₂) sensors at some of our wastewater treatment works. These sensors are allowing us to capture process emission data. We will use this data to develop an emission model that can be deployed across all of our operations to monitor impact in real time. This trial was initiated in 2022 and is expected to run for 18 months up to January 2024

2.5 Our net operational emissions

Our net operational emissions reduced by an average of 3.7 ktCO₂e per year between 2012-13 and 2022-23. Apart from the decarbonisation of the grid, use of renewable energy and process and operational efficiencies have significantly contributed to the reduction of emissions from our operations.

Figure 2: Southern Water’s operational emissions journey



Note: The chart above shows emissions per year calculated using a location-based approach, Nb. Years refer to first year in fiscal year in line with CAW reporting i.e., 2012 represents 2012-13

3. Looking Forward – Our Journey to 2050

We have made significant progress in furthering our operational net zero ambition, as explained in the previous chapter. However, on examining our journey so far and reflecting on the uncertainties and challenges we have already encountered, we believe it is important to revise the Net Zero plan so that it allows us to achieve net zero by 2050. Also, to help us support the Government in meeting its legally binding 2050 net zero commitment, while continuing to carry on the work on reducing our operational emissions.

Whilst we forecast that our operational carbon emissions from water activities by 2029-30 will increase by 33% from the baseline 2021-22 and improve to be 30% by 2034-35, showing a significant step up in our emissions, this is essentially due to our sizable PR24 business plan, the expected growth of our business between 2022-23 and 2039-40 and the activity in both WINEP and WRMP required to meet other regulatory obligations to improve both water security and environment standards.

3.1 How we developed our plan

In 2022, we assessed its Net Zero plan to deliver the 2021 public interest commitment of becoming operationally net zero, by 2030. This was done to check whether the 2021 plan was well placed to help us meet the government's 2050 net zero target, and if it was in line with Ofwat's guidance to focus on a location-based approach to account for scope 1, 2, 3 and embedded emissions. The assessment identified that the plan to deliver the 2021 commitment would be insufficient to help us meet the target set by the government, using the approach outlined by Ofwat. As such, certain gaps were identified within the Net Zero plan that would make it less effective for the longer term. These gaps identified included:

- **Use of carbon offsets:** The 2021 plan leveraged the use of carbon offsets as a measure to reduce our operational emissions as a last resort solution, and
- **Focus on operational emissions only:** The 2021 plan focused on reducing our operational emissions only, i.e., scope 1, 2 and 3 emissions. While this was a reasonable place to start monitoring, measuring, reporting, and reducing emissions, it is not sufficient to help meet the government's 2050 net zero target.

Building on our 2021 plan we developed a net zero strategy that would help us reach our revised emission reduction goal. While the revised strategy retained focus on reducing operational emissions, we bolstered the same by shifting to a location-based approach²⁵. We deprioritised the use of offsets to reduce our operational emissions. Instead, we have focused on solutions such as, on-site renewable generation, catchment management, bio-gas generation, and insets. We also scaled up our ambition to address hard to abate emissions, process emissions, through industry engagement and innovation. Additionally, we devised a plan to tackle scope 3 emissions from our third-party service providers, by setting up a fit for purpose AMP8 procurement framework; and developed a plan to mature our carbon culture to help take carbon conscious decisions and reduce embedded emissions from capital projects. Lastly, we ensured our strategy would help develop a revised plan that was flexible and could adapt to external stimuli, including macroeconomic drivers and triggers such as technological advancements, climate change and population

²⁵ The location-based approach reflects the average emissions intensity of grids on which energy consumption occurs (using mostly grid-average emission factor data).

growth, by aligning it to our long-term delivery strategy approach²⁶. The revised strategy considered 3 alternative options that could be adopted; these were:

Table 1: A summary of the 3 strategic options considered

Strategic options	Emissions reduction plan	Balanced plan	Balanced plus plan
Plan description	Reducing operational GHG emissions by 2030	Being net zero by 2050	Stretching to meet the 2050 net zero ambition
Focus area 1. Research and Development	1. Conducting R&D (Bluewave innovation team) on hard to abate process emissions	1. Conducting R&D (Bluewave innovation team) on hard to abate process emissions, and 2. Collaborating with the wider industry to identify new nature-based solutions and sequestration markets	1. Accelerating partnerships with the wider water sector to address hard to abate process emissions 2. Accelerating collaboration with the wider industry to develop new nature-based solutions and markets
Focus area 2. Carbon culture	1. Implementing a companywide carbon culture to embed carbon conscious decision-making	1. Developing a procurement framework with carbon embedded in it, to encourage supply chain partners to provide sustainable and carbon conscious solutions	1. Maturing the companywide carbon culture across all parts of our business and the supply chain
Focus area 3. Efficient technologies	1. Transitioning to efficient technologies (e.g., Low carbon transport) in asset management period 8 and 9 (AMP8 and 9) through the PR24 process, as enhancement expenditure	1. Transitioning to efficient technologies in AMP8 and 9 (e.g., Low carbon transport) using a spend to save approach	1. Transitioning to efficient technologies in AMP8 through the PR24 process, as enhancement expenditure
Focus area 4. Renewable generation	1. Exploring the deployment of renewable generation and bioresource transformations through the PR24 process as enhancements	1. Exploring alternative delivery routes (non-regulated or non-appointed approaches) to deploy some renewable generation or bioresource transformations where regulatory and financial constraints may limit action	1. Exploring a non-regulated approach to deploy some renewable generation or bioresource transformations where regulatory and financial constraints may limit action
Expected Outcomes	Enable us to address the short to medium-term actions required to reduce operational emissions	Enable us to: 1. Align our net zero ambition with our long-term delivery strategy 2. Address both operational and embedded emissions, and 3. Maintain flexibility and adaptability to deliver tangible change under all possible futures	Enable us to maximize our net zero delivery efforts in AMP8, giving us a head start to explore new options to deliver change in AMP9

²⁶ Our long-term delivery strategy sets out a five-year business plan for PR24 in the context of a 25-year long delivery strategy, outlining outcomes, and approach given a range of plausible futures. Details of our Long-term Delivery Strategy can be found in SRN12 Long-term Delivery Strategy Technical Annex.

Further, we tested the three plans with senior members of our operational, business and strategy teams outlining key choices and trade-offs of choosing one plan over another.

Southern Water board and senior team members reviewed the net zero options, and the findings are below:

Table 2: Summary of the key stakeholder findings

Strategic options	Implication of deploying the strategic option
Net zero plan	The “emissions reduction plan” focused on operational emissions and only looked to tackle emissions in the short to medium-term. As such, it was rejected by our senior team members.
Balanced plan	The “balanced plan” was found to deliver the best value, as it allowed us to tackle emissions in the short to medium-term head on; whilst in parallel allowing us to undertake further research and development in conjunction with the wider water sector, in order to tackle harder to abate emissions in the longer term.
Balanced plus plan	While the “balanced plus plan” looked at stretching our ambition, it was estimated to be unaffordable at greater than 2x the cost of “A balanced plan” which represented the least cost.

Thus “A balanced plan” was selected to become our revised 2050 net zero plan. This plan gives us the ability to re-set our net zero strategy and ensures a high degree of deliverability through the PR24 process. While this plan looks to implement net zero measures through base expenditure and does not explore enhancement action, our board has approved funding of £1.5bn to tackle hard to abate emissions (such as process emissions) through AMP9, 10,11 and 12. At which time we expect to be in a better position to tackle them. Further details of this funding allocation can be found in our SRN12 Long-term Delivery Strategy Technical Annex.

3.2 Ensuring confidence in our plan.

We tested our revised 2050 net zero plan – A balanced plan, with stakeholders throughout Southern Water, including the Executive Committee and Board, as well as industry professionals, and subject matter experts with an abundance of experience across the water sector. All the while collecting and reflecting the feedback we received into the plan. The plan has also been aligned with Ofwat guidance, as well as previous views that have been collected from our customers, as outlined in a later chapter. (*Chapter 5: We engaged our customers and listened to what they had to say*) This has given us the confidence that the plan proposed is the most appropriate to help us deliver our net zero ambition.

3.3 What is included in our 2050 Plan

Our net zero plan focuses on the six areas outlined below to help deliver our ambition:

- **Greening our energy demand** – This includes improving energy efficiency to reduce energy demand and source renewable energy from onsite or adjacent sources to meet our energy needs.

- **Decarbonising our fleet** – In line with the government’s target²⁷, we will transition our fleet of cars and vans to electric vehicles by 2035 and investigate low carbon fuels such as biodiesel and hydrogen to decarbonise our HGVs by 2040.
- **Improving efficiencies in our bioresource processes** – This will be done by developing new infrastructure (e.g., Advance Anaerobic Digestion), implementing new technologies and solutions (e.g., Advance Thermal Conversion), and recycling our waste into biogas that can be used by others across the country.
- **Focusing attention on process emissions** – We are concentrating our efforts on researching and developing ways in which process emissions can be monitored and reported in the short-term. In the medium term we will build on the trials being undertaken by our Bluewave innovation team to further research and development in to reducing process emissions. We believe this approach will help us identify or develop cost effective technologies and solutions that can be implemented in the medium to long-term to deliver emission reduction benefits.
- **Implementing a holistic approach to scope 3 emissions and capital carbon** – This involves developing a procurement framework with carbon embedded in it, to encourage our supply chain partners to provide sustainable and carbon conscious solutions. We will also mature our companywide carbon culture, to embed carbon conscious decision-making throughout our business. This will allow us to improve the coverage, scope, and quality of capital programmes.
- **Exploring natural carbon stores** – We believe nature-based solutions and sequestration will play a part in helping us to manage our carbon footprint, restore our natural environment, and provide multiple benefits to our customers and the wider community. As a result, we are investigating ways in which we can better manage our own land and the catchments we operate in. This includes working with the [REDACTED] to identify habitat restoration and creation opportunities and participating in local partnership projects to support and test new sequestration markets.

We believe, focusing on the six areas illustrated above will allow us to progress against our 2050 ambition and contribute to carbon reductions of other sectors, against their government allocated carbon budgets.

3.4 The challenges ahead

We believe our plan is comprehensive yet flexible to accommodate the changing macroeconomic environment. We recognise the path to net zero by 2050 will be riddled with uncertainty. These include:

- **Technological advancements** – We are advocates of adopting technology to improve existing processes relating to energy, operational and process efficiencies. As technology develops over the coming years, we expect it to deliver benefits across our businesses and operations. However, we are also conscious it will disrupt the way we conduct our business today²⁸ and we will need to be flexible and adaptive to incorporate them into our business to fully realise its benefits including those that will help alleviate emissions. We aim to do this through research and development in innovative solutions in conjunction with the wider sector.

²⁷ The UK government has set out targets to phase out the sale of petrol and diesel cars and vans by 2030, to enforce all new cars and vans to be zero emission at the tailpipe by 2035, to phase out new non-zero emission heavy goods vehicles (HGVs) weighing 26 tonnes and under by 2035, and for all new HGVs sold in the UK to be zero emission by 2040. UK Government, <https://www.gov.uk/government/news/government-takes-historic-step-towards-net-zero-with-end-of-sale-of-new-petrol-and-diesel-cars-by-2030>

²⁸ British Water open letter to Ofwat, published in September 2022

- **Growth in demand** – The UK’s population is expected to grow²⁹. A fair amount of this growth is expected to be concentrated in the south and southeast of the country where we operate³⁰. We are cognisant of the increased pressure this puts on our infrastructure and operations. An increase in demand could equal a proportional increase in operational and embedded emissions. Resulting from a need to do more to operate and maintain existing infrastructure optimally, while also building new infrastructure to meet the rising demand. Additionally, the uncertainty around scale and rate of change in population that will necessitate a change in our way of working, requires us to be cognisant of potential trigger points and manage long-term planning in a flexible and adaptive manner, to meet our emission goals and provide uninterrupted services to all our customers. As such, we have already started taking measures to ensure we are able to provide quality service to our customers by maturing our carbon culture across the business and are developing a carbon led procurement framework for our partners.
- **Increase in climate change related extreme weather events** – The UK is facing more extreme weather events than we did over the last decade. These extreme weather events such as droughts, floods, coastal erosion and others, impede our ability to serve our customers³¹. We are building and evolving our business now to handle future extreme weather events. However, like in the case of growth in demand, an increase in extreme weather events may lead to an increase in operational and embedded emissions, resulting from a need to do more to operate and maintain existing infrastructure optimally, while also building new infrastructure to meet the requirements of the changing climate. Some of the planned interventions, based on policy levers and detailed in our PR24 business plan, such as stormwater overflows, environmental programmes, bioresources, climate hazards, water resource management and drainage and wastewater management, are likely to significantly increase whole life carbon emissions due to the construction activities involved and reliance on energy intensive processes. Furthermore, given the uncertainty surrounding the scale and frequency of climate-related challenges, we will need to be vigilant of external trigger points and proactively implement adaptive measures.
- **Tackling process emissions** – For most water companies process emissions are their most significant scope 1 emission³². In 2022-23 process emissions accounted for 92% of our scope 1 emissions and 31% of our overall operational emissions. As mentioned in *chapter 2: Our story*, emissions from our water and wastewater treatment processes, contribute to our process emissions. Process emissions primarily account for our CH₄ and N₂O emissions, both of which have a significantly higher global warming potential than CO₂. While significant progress has been made across sectors and countries to combat CO₂ emissions, not as much progress has been realised with respect to process emissions. Given their warming potential, not being able to reduce these emissions could pose a significant challenge in meeting emission reduction goals for both the water sector and the UK. Some progress has been made in reporting and to an extent tackling process emissions in other sectors (e.g., cement and steel) and countries (e.g., the Netherlands, Denmark, and Switzerland)³³, however, these solutions are not directly transferable to the water and wastewater sector. As such, current solutions are still in their infancy and not economically feasible.

²⁹ Office of national statistics, National population projections: 2020-based interim, <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2020basedinterim>

³⁰ Construction Industry Training Board, The skills construction needs, <https://www.citb.co.uk/media/acbnbn5t/csn-national-report-final-report.pdf>

³¹ Met Office, UK Climate Projections, 2022, https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18_headline_findings_v4_aug22.pdf

³² Water UK, Water industry joins forces in global call for investment to tackle process emissions, <https://www.water.org.uk/news-views-publications/news/water-industry-joins-forces-global-call-investment-tackle-process#:~:text=Mikkel%20Holmen%20Andersen%2C%20Chief%20Technology,scope%201%20water%20sector%20challenge>.

³³ Ofwat, Net Zero Technology Review, https://www.ofwat.gov.uk/wp-content/uploads/2022/08/Net_Zero_Technology_Review.pdf

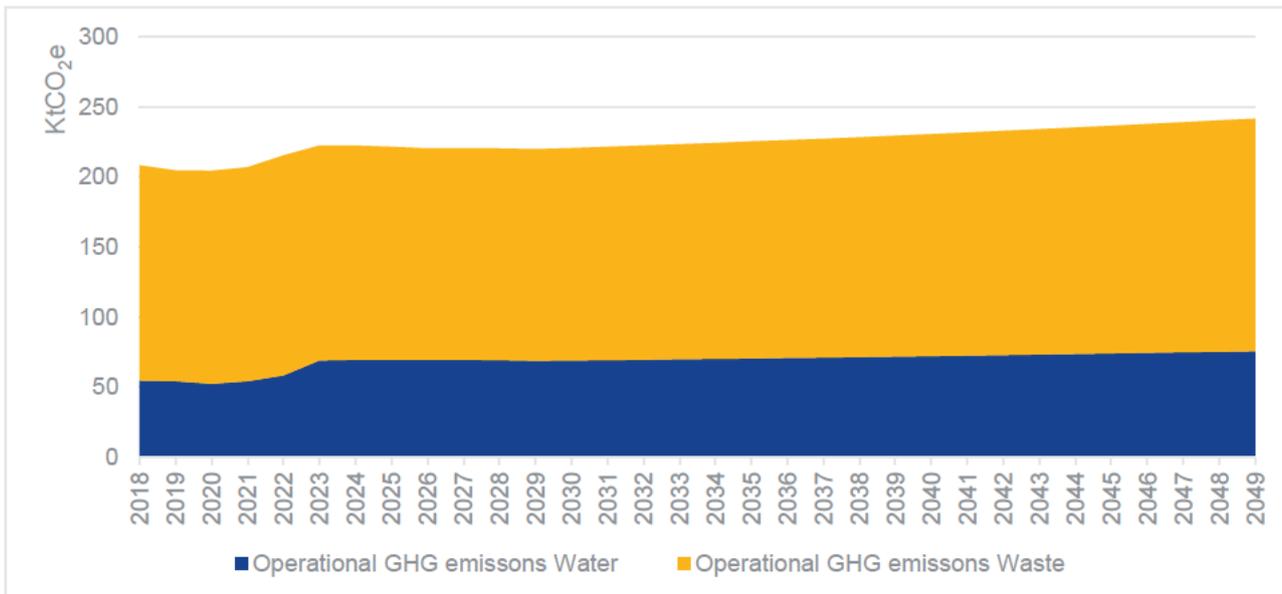
Further research and development in collaboration with the wider water sector and across sectors is needed to bridge this gap. Uncertainty around the rate of technological progress, efficacy of future solutions and the potential alterations to reporting baselines will make tackling process emissions a significant challenge.

3.5 How we intend to manage and monitor our progress

We will continue to use the CAW to assess and measure emissions from different sources, in line with Ofwat guidance.

Additionally, we have also reviewed our historical emissions and growth trends, to forecast an emissions baseline up to 2050. This baseline, as illustrated in *Figure 3: Southern Water baseline emissions for water and wastewater*, provides a directional view of how we expect our operational emissions to evolve over time and does not account for the impacts of the PR24 enhancements, net zero interventions or external factors (such as the decarbonisation of the electricity grid).

Figure 3: Southern Water baseline emissions for water and wastewater



Note: This chart above shows Southern Water's baseline emissions for water and wastewater. It does NOT include the impacts of the PR24 enhancements, net zero interventions or the decarbonisation of the grid. It shows emissions per year calculated using a location-based approach and the UK government fixed national grid emissions factor for 2022, Nb. Years refer to first year in fiscal year in line with CAW reporting i.e., 2018 represents 2018-19

Further, as we are committed to reducing our operational emissions, we have developed performance commitments in line with Ofwat's ask for PR24 to track our progress. To develop our water and wastewater operational GHG performance commitments for PR24 we have superimposed our emissions baseline up to 2050 with all our PR24 (WINEP, WRMP and other) interventions. We have analysed the expected carbon impact of all the interventions that either add to or reduce our emissions to arrive at the emission level we expect to achieve in AMP8 and beyond.

As such, we forecast our operational carbon emissions from water activities by 2029-30 will increase by 33% from the baseline 2021-22 and improve to be 30% by 2034-35. Our emissions from wastewater activities by 2029-30 will be 5% higher than in the baseline year 2021-22 and improve to be 3% higher by 2034-35.

Table 3: Our proposed targets for operational GHG emissions

Unit: ktCO ₂ e	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2034-35	2049-50
Water PCL (ktCO ₂ e)	54	58	69	70	71	72	72	73	72	71	72
Wastewater PCL (ktCO ₂ e)	153	157	153	153	152	151	151	153	160	157	170

Note: PLC – Performance commitment level, the PLCs above include emission projections from base and enhancement activities, the emissions above have been calculated using a location-based approach and the UK government fixed national grid emissions factor for 2022

Table 4: Operational GHG emissions target build up

Unit: ktCO ₂ e	Water 2029-30	Wastewater 2029-30
Emissions from base activities	69	151
Emissions from enhancement activities	3	9
PCL	72	160

Note: PCL = emissions from base + emissions from enhancement, the emissions above have been calculated using a location-based approach and the UK government fixed national grid emissions factor for 2022.

The tables above, *Table 3: Our proposed targets for operational GHG emissions* and *Table 4: Operational GHG emissions target build up* are estimated using Ofwat’s guidance of using a location-based approach and a fixed grid emissions factor (for the year 2022). They show a significant step up in our emissions owing to our sizable PR24 business plan and the expected growth of our business between 2022-23 and 2039-40. However, our net zero intervention (some of which do not form a part of our PR24 business plan) and external factors such as the decarbonisation of the grid allow us to go further to achieve our emission reduction ambition, in line with the government’s 2050 net zero target. This is outlined in *Table 5: The GHG ambition*, below.

Table 5: The GHG ambition

Unit: ktCO ₂ e	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2034-35	2049-50
Emissions from base and enhancement	207	215	222	222	223	222	223	225	232	227	242
Emissions reduction from net zero action and decarbonisation	-34	-30	-38	-33	-47	-67	-81	-87	-94	-122	-147
Operational emissions	173	185	184	189	176	155	143	138	138	106	95

Note: The table above summarises the emissions expected from base, enhancement, and net zero interventions (including grid decarbonisation), the emissions above have been calculated using a location-based approach.

What we intend to do to reduce our emissions is explained in *chapter 6: Our net zero plan and route map*. How we have calculated and forecasted our emissions are detailed in *Appendix 1: Our carbon accounting methodology*. Going forward, we will measure actual emissions against the performance commitments to track and monitor our emission reduction progress. Our overall operational emission ambition up to 2050 is illustrated in figure 15, in *chapter 7: Our commitments*.

Moreover, as monitoring and reporting of embedded emissions evolve, and more clarity is provided by Ofwat on what is covered, we will extend this approach to track and monitor performance of embedded emissions. In the interim we will continue to track and monitor the performance of embedded emissions using our Capital Carbon Management Framework, that has been developed in line with the PAS 2080 principles. This framework consists of five stage gates, following the lifecycle of a project from cradle-to-grave. It aims to help record embedded emissions consistently to facilitate informed decision making.

4. How We Intend to Deliver Our Net Zero Ambition – Our Principles

We will adopt four principles to maximise our potential to deliver our net zero plan. These principles will be considered throughout all decisions made in relation to net zero and will complement the delivery of our long-term strategy.

Maturing our carbon culture

We will ensure carbon is a key focus by instilling carbon conscious decision-making and processes into the Southern Water culture. This will allow us to consider carbon benefits alongside cost and performance and create a consistent approach. This approach will be supported by strong leadership and governance to ensure carbon remains a top priority for us.

Targeting innovation and R&D

We will participate in trials, research, and innovation with the wider sector. This will allow us to assess hard to abate emissions such as process emissions and implement suitable solutions in successive AMPs. We have already started engaging stakeholders in cross-sectoral R&D. Our Bluewave innovation team, in conjunction with industry partners [REDACTED], are piloting N₂O sensors at Southern Water wastewater treatment works. We believe this pilot will result in the development of an emission model that can help us monitor N₂O impact in real time.

Collaborating with industry

We will collaborate with adjacent sectors in the industry. This will allow us to identify alternative options for tackling emissions, such as habitat restoration and new markets for sequestration. We have worked with the [REDACTED] across the South East to identify habitat restoration and creation opportunities on our own land. We are also actively involved in local partnership projects to help support and test new markets for storing carbon in coastal and marine ecosystems as they emerge.

Remaining adaptive to evolving regulation, policy, and macroeconomic shifts

We will adopt an adaptive approach, in alignment with our long-term delivery strategy. This will allow us to respond to external factors such as climate change, technological development, and consumer demand. It will also allow us to assess how changes in regulation and government policy affect our strategies in the future. This means that Ofwat can be more confident that investments made now will deliver environmental and societal benefits going forward.

5. We Engaged Our Customers and Listened to What They Had to Say

Our commitment to our customers, stakeholders, and the environment

We are committed to mitigating and adapting to climate change and protecting the environment and enhancing our natural resources. We will deliver on this commitment by focusing on the long-term, driving improvement efficiencies and innovations, reflecting a clearer understanding of customers and communities, and delivering greater environmental and social value. We believe this will help us manage affordability concerns and the rising expectations on water companies.

5.1 What our customers are saying

In December of 2022, we conducted a panel discussion to understand what our customers thought about net zero. The panel had representatives of our household customers (residential customers who currently have a household account for water and wastewater services with us), business customers (non-residential customers who currently have a business account for water and wastewater services with us) and future customers (customers who currently do not have an account for water or wastewater services with us but will have one in the future). At this panel we discussed the governments legally binding commitment to be net zero by 2050, the water sector's public interest commitment to be operationally net zero by 2030 and what net zero means for Southern Water. Further details of our engagement can be found in our SRN14 Customer Insight Technical Annex.

Through this panel discussion we found that net zero is a familiar and positive term to our customers. However, it is not fully understood by them. A summary of what we have heard from our customers is as below:

What all our customers are saying: Our customers feel net zero is something that governments and companies need to work towards. Given this perception of responsibility, its relative priority to other Southern Water services is generally low. Initiatives, such as transitioning to electric vehicles or reducing emissions, are thought to be part of the day to day and is expected to be met by legislation and the natural adoption of ways of working. As a result, we have seen limited support for any increase in funding through bills to support enhancement of net zero. As customers feel they already pay for enabling net zero through taxes and behaviour change programmes.

“This will happen anyway with vehicle manufactures being forced to change by government, thus there is no benefit in accelerating the programme.” – Household customer

What our informed customers are saying: On exploring further (e.g., exploring the energy use of water companies) we found that more informed customers recognise and acknowledge the importance of reducing carbon, especially for future generations. They were pleasantly surprised to learn that the water sector has agreed to meet government targets early and they support this ambition. However, customers do question why the net zero target is being given pre-eminence to be achieved quicker than priority areas, such as leakage. Especially since leakage reduction is expected to take longer and only reduce by 50% by 2050. Further, in order to achieve the net zero ambition, customers want the targets to be met through the right long-term solutions rather than quick fixes. More specifically, offsetting of carbon is not supported by our customers as it does not address the root cause.

“Southern Water should remain committed to Net Zero, but that commitment should be part of a balancing act on future needs. They are acknowledging leakage and other issues, so I think the ‘date stamp’ attached to Net Zero is very unrealistic. – Household customer

What our most informed customers are saying: Our most informed customers and stakeholders recognise the role carbon plays in a water company’s operational and development activities. They cite that improved performance in areas such as leakage can reduce carbon. Stakeholders indicate that carbon intensity should be considered in decision-making processes, where applicable, to identify the right solutions for us. Specifically in areas of infrastructure, our customers want these to be designed and built in a way that protects the environment by being sustainable and scalable for the future.

“I think the balance would come together. If you’re not polluting or wasting your harmfulness to the environment would come down naturally.” – Household customer

What our future customers are saying: Future customers are more demanding of our carbon targets. For them, the environment is central to everything we do. They do not agree with the trade-offs bill payers make between the environment and the economy. They agree that new infrastructure must be designed and built in a sustainable way. However, they will not support a programme that isn’t making environmentally conscious choices.

“I would love to live in a society that prioritises economic and social equality and a more sustainable way of living that aligns with the environment.” – Future customer

5.2 How are we addressing their concerns

We listened to our customers. While our customers think net zero is a positive term, they do not see it as a top priority for us. For example, our customers expect that the decarbonisation of fleet (transport) will be driven by government policies and a subsequent economy level response to these policies. As such they do not see any merit in us accelerating the transformation of transport to low carbon alternatives. On the other hand, our customers expect us to continue to provide water and wastewater services in an efficient and sustainable manner by reducing leakage and pollution. They believe this will help us reduce our overall emissions. As such, we are looking to focus on improving our operations over the longer term, not only in terms of performance and cost but also in terms of carbon.

To address our customers views on the transformation of transport to low carbon alternatives, where possible we are implementing low carbon and energy efficient solutions to improve our carbon footprint at no additional cost to our customers.

To provide our customers with an efficient and sustainable service we are:

- Implementing a carbon culture across our business to ensure carbon led decisions are taken when carrying out operations and when building new infrastructure,
- Setting up a procurement framework to encourage our supply chain partners to provide carbon conscious solutions where practical,
- Participating in trials and demonstrations of new technologies, to identify ways in which hard to abate emissions can be properly measured, monitored, and reduced,
- Collaborating with the wider industry through local partnership projects to identify new nature-based solutions that can further help reduce our emission footprint and protect our local environment.

We believe these measures will enable us to make the right decisions for our customers and environmental stakeholders.

6. Our Net Zero Plan and Route Map

A balanced plan – The Southern Water 2050 net zero plan reflects what is achievable in the very short-term to start delivering our ambition. This includes:

- Developing a procurement framework with carbon embedded in it, to encourage our partners across the supply chain to provide sustainable and carbon conscious solutions; and maturing our companywide carbon culture to embed carbon conscious decision-making,
- Partnering with the wider water sector to progress R&D on hard to abate process emissions and collaborating with the wider industry through local partnership projects to identify new nature-based solutions and new sequestration markets,
- Transitioning to efficient technologies using a spend to save approach, and
- Exploring a non-regulated (outsourced) approach to deploy some renewable generation or bioresource transformations where regulatory and financial constraints may limit action.

This plan allows us to lean on technological growth and industry level research and development to further action.

Additionally, this aligns our net zero plan with our long-term delivery strategy, with a scope that includes both operational and embedded emissions, to deliver tangible change. The alignment with the long-term strategy also promotes adaptability and flexibility to address external drivers.

6.1 Location-based approach

There are two methods of reporting emissions related to electricity consumption. These are called market- and location-based reporting and are defined via the Greenhouse Gas Protocol³⁴. The market-based approach shows emissions a company is responsible for through its purchasing decisions, such as a renewable energy contract. While the location-based method reflects the average emissions intensity of grids on which energy consumption occurs (using mostly grid-average emission factor data).

A market-based approach calculates emissions from electricity that companies purchase. It is intended to support the use and reporting of green energy tariffs³⁵ via Renewable Energy Certificates (REC)³⁶ and Guarantees of Origin (REGO). Whereas the location-based approach calculates emissions from electricity used by companies based on the average emission intensity of the power grid. That is the UK grid emission factor published by DEFRA.

³⁴ Greenhouse Gas Protocol provides standards and tools that help countries and cities track progress toward climate goals.

<https://ghgprotocol.org/>

³⁵ Green energy tariffs are electricity tariffs or prices set by suppliers that buy renewable electricity and it is accompanying REGO certificates directly from renewable generators. [https://www.ofgem.gov.uk/environmental-and-social-schemes/renewable-energy-guarantees-origin-rego/renewable-energy-guarantees-origin-rego-electricity-suppliers-and-generators#:~:text=Renewable%20Energy%20Guarantees%20of%20Origin%20\(REGOs\)%20certificates%20allow%20electricity%20suppliers,was%20produced%20from%20renewable%20sources](https://www.ofgem.gov.uk/environmental-and-social-schemes/renewable-energy-guarantees-origin-rego/renewable-energy-guarantees-origin-rego-electricity-suppliers-and-generators#:~:text=Renewable%20Energy%20Guarantees%20of%20Origin%20(REGOs)%20certificates%20allow%20electricity%20suppliers,was%20produced%20from%20renewable%20sources)

³⁶ Renewable Energy Certificates (RECs) are market-based instruments that track clean electricity and its environmental benefits. Each REC represents 1 MWh generated by a renewable power plant and includes essential information about that unit of electricity, including the date, technology, and place of production. [https://www.ofgem.gov.uk/environmental-and-social-schemes/renewable-energy-guarantees-origin-rego/renewable-energy-guarantees-origin-rego-electricity-suppliers-and-generators#:~:text=Renewable%20Energy%20Guarantees%20of%20Origin%20\(REGOs\)%20certificates%20allow%20electricity%20suppliers,was%20produced%20from%20renewable%20sources](https://www.ofgem.gov.uk/environmental-and-social-schemes/renewable-energy-guarantees-origin-rego/renewable-energy-guarantees-origin-rego-electricity-suppliers-and-generators#:~:text=Renewable%20Energy%20Guarantees%20of%20Origin%20(REGOs)%20certificates%20allow%20electricity%20suppliers,was%20produced%20from%20renewable%20sources)

Intrinsically the market-based method for Scope 2 GHG accounting allows companies to report Scope 2 emissions based upon a financial transaction that does not alter its actual consumption of energy or the emissions physically associated with its operations or assets. Emissions that are physically associated with a company's electricity consumption are better represented by a location-based average grid emission factor as the electrical energy on a grid is undifferentiated and undifferentiable with respect to its origin.

As such, we have moved away from a market-based approach to emissions accounting and have adopted a location-based approach across all emission categories in our 2050 plan. The location-based accounting method reveals what GHGs we as a company are physically putting into the atmosphere as a result of our operations. This approach is in line with Ofwat guidance and expectations to deliver net zero emissions by 2050. And we believe the location-based approach will allow us to focus on building, managing, and maintaining infrastructure to conduct our operations in a carbon conscious manner.

6.2 Long-term plan to net zero in 2050

We have developed an adaptive approach to delivering our net zero ambition. An adaptive approach is a strategic technique that allows companies to move between different planned scenarios in response to external triggers. This is done by considering activities that are dependent on certain circumstances, and activities that are required in most future scenarios. Thereby allowing companies to develop strategies based on an optimised profile of key interventions across circumstances and time. This approach ensures that key decisions are taken in a timely fashion and risk of stranding assets is minimised³⁷.

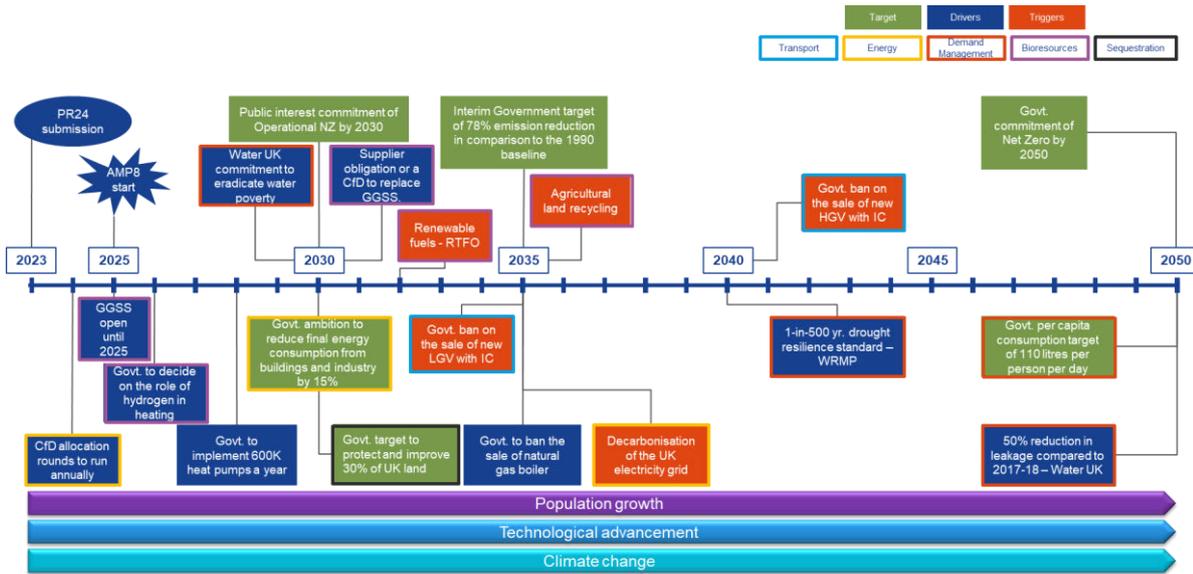
We believe this approach will allow us to consider the external targets, drivers, and triggers out to 2050 and align our delivery plan with government targets and legislation across all emissions. This approach is in line with our long-term delivery strategy (details of which can be found in the SRN12 Long-term Delivery Strategy Technical Annex) and provides our revised plan the ability to ramp up or ramp down action in response to change in external stimuli when needed. Additionally, it allows us to identify no-regret decisions, decisions that can be implemented to help deliver emission reduction outcomes under all possible future scenarios, such as implementing a carbon conscious business culture, or the implementation of carbon data measuring, monitoring, and reporting frameworks.

It also helps us identify and implement change in response to external triggers that could alter possible futures, such as technological advancements, climate change, or growth in population.

Some of the key triggers, drivers, and government targets we have based our revised plan on are in *Figure 4: Timeline of external triggers, drivers, and government targets*, illustrated below.

³⁷ Ofwat, PR24 and beyond: Final guidance on long-term delivery strategies, https://www.ofwat.gov.uk/wp-content/uploads/2022/04/PR24-and-beyond-Final-guidance-on-long-term-delivery-strategies_Pr24.pdf

Figure 4: Timeline of external triggers, drivers, and government targets



Note: The above is an illustration developed based on publicly available information only

6.3 Our route map to 2050

In this section we have outlined the six areas our net zero plan focuses on, why we believe they are the main drivers of change and how we believe they will enable us to reduce our emissions to 2050.

6.3.1 Our planned approach to achieving operational net zero

We have used our emissions data, as explained in *chapter 3.5 How we intend to manage and monitor our progress*, and our planned interventions to outline how we intend to reduce operational emissions to net zero. Our modelled data that looks at emissions from source, emissions reduction from action, and the costs associated with these actions have enabled us to better understand which of our planned interventions are the most impactful, how they will impact our baseline emissions and by when we can expect to see their impact on our carbon footprint.

However, our modelled data only provides us a directional view out to 2050. Beyond a point we believe the uncertainty around, government policy (i.e., the Government’s position on hydrogen gas), regulatory guidance (i.e., Ofwat’s guidance on whole lifecycle carbon assessments in AMP 11 and 12) and wider shifts in macroeconomic factors (i.e., speed at which the decarbonisation of the electricity grid impacts the wider market) makes the modelled data less useful. Thus, we have supplemented our data model with a strategic assessment of longer-term actions, details of which can be found in *chapter 6.3.2: Achieving net zero carbon by 2050*. Our planned actions to achieve net zero operational emissions are as follows.

6.3.1.1 Purchased electricity and energy efficiency

Energy accounts for 46%³⁸ of all our operational emissions. We have a two-pronged approach to tackle this source of emission. The first is to reduce our overall electricity and energy demand by employing new technologies that improve our process and operational efficiencies, reduces energy demand, and improves energy efficiency. The second is to increase our use of renewable electricity either by directly sourcing it from

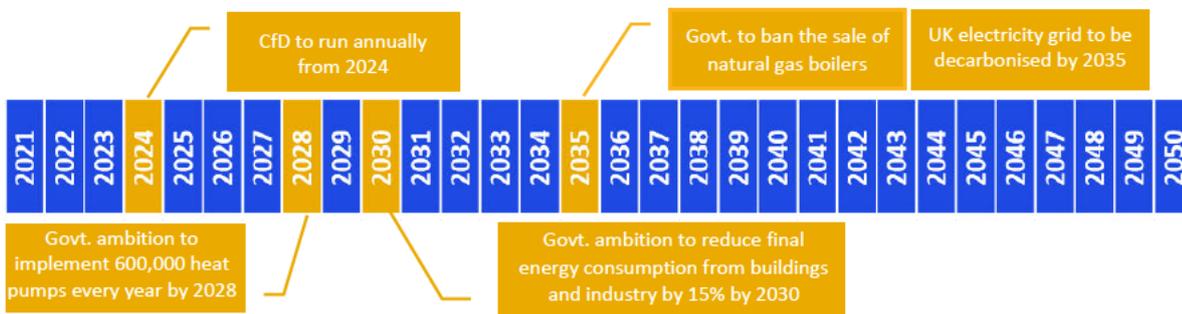
³⁸ This includes Southern Water’s scope 1 emissions from fuels (1%) and scope 2 emissions from the use of purchased electricity (45%), as of 2022-23, calculated using a location-based approach.

the electricity grid to benefit from it decarbonising over time or by sourcing it from local generators or Southern Water onsite locations.

External drivers

- 1) **Technological advancement** – Technology is expected to be a significant driver in the improvement of energy efficiency moving forward. The International Energy Agency (IEA) have indicated that in 2022 the global economy used energy 2% more efficiently than it did in 2021, a rate of improvement almost four times that of the past two years³⁹.
- 2) **Government** –The UK government announced in March 2023 a new Energy Efficiency Taskforce, which has a clear target to support cutting energy use in the UK down by 15 percent by 2030, from 2021 levels⁴⁰.
- 3) **Grid decarbonisation** – The UK government has committed to fully decarbonising the electricity system by 2035⁴¹.
- 4) **Renewable generation** – Renewables offer an alternative approach to offset hard to abate emissions. The government’s annual issuance of wind and solar Contracts for Difference⁴² (CfD) contracts is expected to continue to support the growth of renewable generation⁴³.
- 5) **Environmental protection and planning** – The National Planning Policy Framework explains that while communities have a responsibility to help increase the use and supply of green energy, this does not mean that the need for renewable energy automatically overrides environmental protections and the planning concerns of local communities⁴⁴

Figure 5: Timeline of external triggers, drivers, and government targets associated with the use of energy



Note: The above is an illustration developed based on publicly available information only

³⁹ IEA, Global energy efficiency progress is accelerating, signalling a potential turning point after years of slow improvement, <https://www.iea.org/news/global-energy-efficiency-progress-is-accelerating-signalling-a-potential-turning-point-after-years-of-slow-improvement>

⁴⁰ UK Government, Energy Efficiency Taskforce, <https://www.gov.uk/government/groups/energy-efficiency-taskforce>

⁴¹ UK Government, Plans unveiled to decarbonise UK power system by 2035, <https://www.gov.uk/government/news/plans-unveiled-to-decarbonise-uk-power-system-by-2035>

⁴² The Contracts for Difference (CfD) scheme is the government’s main mechanism for supporting low-carbon electricity generation. CfDs support low-carbon electricity generation by offering long-term price stability by bridging the gap between contract and market prices. UK Government, Contracts for Difference, <https://www.gov.uk/government/publications/contracts-for-difference/contract-for-difference>

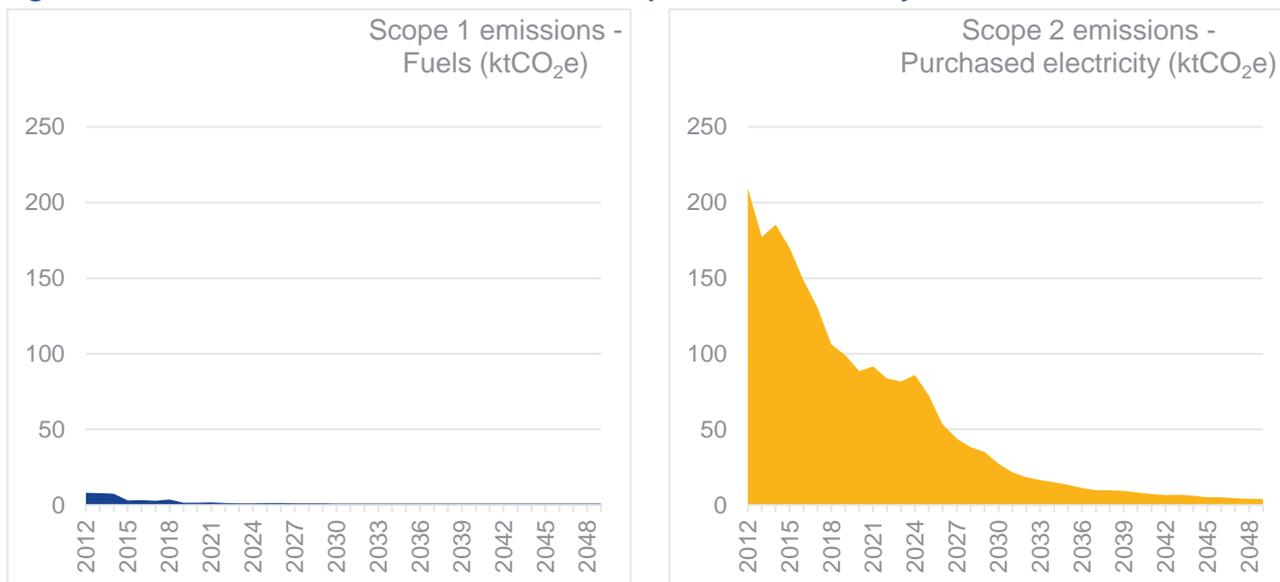
⁴³ UK Government, Energy security boost with multi-million backing for renewables, <https://www.gov.uk/government/news/energy-security-boost-with-multi-million-backing-for-renewables>

⁴⁴ UK Government, National Planning Policy Framework , <https://www.gov.uk/government/publications/national-planning-policy-framework-2>

Southern Water’s plan for action

- 1) **Leveraging the scale of impact** – Energy efficiency measures across all business functions, water, wastewater, and administration can help to reduce emissions. We will leverage the scale of positive impact energy efficiency measures can deliver through the implementation of new and innovative technologies and processes (e.g., incorporating principles of ISO 50001- Energy Management System) to reduce energy demand across the business.
- 2) **Comprehensive spend to save plan** – We are adopting a spend to save approach to only purchase efficient technologies that optimise our operations and helps us reduce energy demand and thus our emissions (such as low carbon heating solutions for our offices). At no additional cost to our customers.
- 3) **As-a-service approach** – In the short-term we are looking to outsource renewable generation to a third party (developer or affiliate), to allow us to access renewable energy, using the renewable electricity procurement hierarchy⁴⁵. We believe, this approach in conjunction with the decarbonisation of the electricity grid will help us reduce emissions significantly. At no additional cost to our customers. However, beyond 2035, we will need to continue to purchase renewable electricity through Power Purchase Agreements⁴⁶(PPAs) to green hard to abate operations while the decarbonised grid supports the remainder of our operations.

Figure 6: Southern Water emissions from fuel and purchased electricity



Note: The charts above refer to the emissions associated with the baseline, base expenditure, and net zero interventions, they show emissions per year calculated using a location-based approach, Nb. Years refer to

⁴⁵ The GHG Protocol identifies a hierarchy of different types of qualifying contractual instruments from which emission factors can be derived. This covers any type of supplier-provided emission data or contract, provided it meets the Scope 2 Quality Criteria and can include: 1. Unbundled energy attribute certificates, e.g., Ring fenced REGOs, 2. High-quality green tariff products from energy suppliers, and 3. Power Purchasing Agreements (Corporate or On-site) with energy generators – for renewable, nuclear or fossil-fuel based energy. UK Green Building Council, Renewable Energy Procurement & Carbon Offsetting - Guidance for net zero carbon buildings, <https://www.ukgbc.org/wp-content/uploads/2021/03/Renewable-Energy-Procurement-Carbon-Offsetting-Guidance-for-Net-Zero-Carbon-Buildings.pdf>, and, Ofwat, Net Zero Technology Review, https://www.ofwat.gov.uk/wp-content/uploads/2022/08/Net_Zero_Technology_Review.pdf

⁴⁶ A power purchase agreement, or renewable electricity power agreement, is a long-term contract between a renewable electricity generator and a customer, usually a utility, government, or company. PPAs provide sellers with revenue certainty and a direct buyer relationship. <https://www.rwe.com/en/products-and-services/our-services/power-purchase-agreement/?startDate=29.08.2023&endDate=31.12.2023>

first year in fiscal year in line with CAW reporting i.e., 2012 represents 2012-13, data from 2023-24 are forecasts

6.3.1.2 Transport

Transport accounts for 2%⁴⁷ of all our operational emissions. We have a two-pronged approach to tackle this source of emission. The first is to transition our Light Goods Vehicle (LGV) fleet to electric over the AMP8 and 9 periods (in line with our customers' expectations, as explained in *chapter 5: We engaged our customers and listened to what they had to say*), before shifting our focus to Heavy Goods Vehicles (HGVs). The second is to implement a carbon conscious procurement framework to help encourage our suppliers to move to electric or other renewable transport solutions.

External drivers

- 1) **Government** – Government and policy will play a significant role in delivering change within the transport sector. In July 2021, the UK government announced that new cars and vans exclusively fuelled by diesel and petrol will no longer be sold from 2030, and that all new cars and vans must be fully zero emission at the tailpipe from 2035⁴⁸. Additionally, the government have also committed to accelerating the rollout of high-powered chargers on the strategic road network, placing obligation on local authorities to develop charging strategies and to tackle barriers to investment and delivery of public charge points⁴⁹.
- 2) **Scope 3 emissions** – Scope 3 encompasses emissions that are not produced by the company itself, and not the result of activities from assets owned or controlled by them, but by those that it's indirectly responsible for, up and down its value chain. Due to government policy, vehicles are likely to decarbonise over time, including both the fleet of vehicles used throughout our supply chain, but also the direct emissions from our own fleet.
- 3) **Technological advancement** – A key driver of improvement in transport emissions and infrastructure is the advancement in technology. Developments in charging infrastructure and battery life will be a significant driver of change over time, removing concerns such as range anxiety, as well as the accessibility and availability of charging point infrastructure. Hydrogen, along with other green fuels may also play a significant role in the decarbonisation of HGVs⁵⁰.

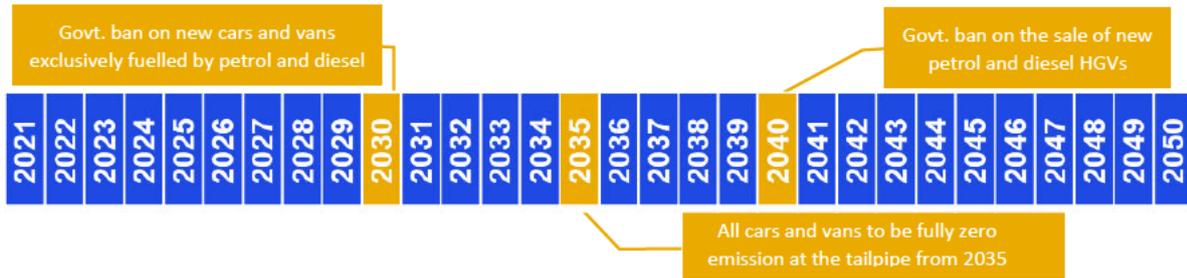
⁴⁷ This includes Southern Water's scope 1 emissions from transport (2%), as of 2022-23

⁴⁸ UK Government, Transitioning to zero emission cars and vans: 2035 delivery plan, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005301/transitioning-to-zero-emission-cars-vans-2035-delivery-plan.pdf

⁴⁹ UK Government, 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

⁵⁰ UK Government, Transport decarbonisation plan, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009448/decarbonising-transport-a-better-greener-britain.pdf

Figure 7: Timeline of external triggers, drivers, and government targets associated with transport



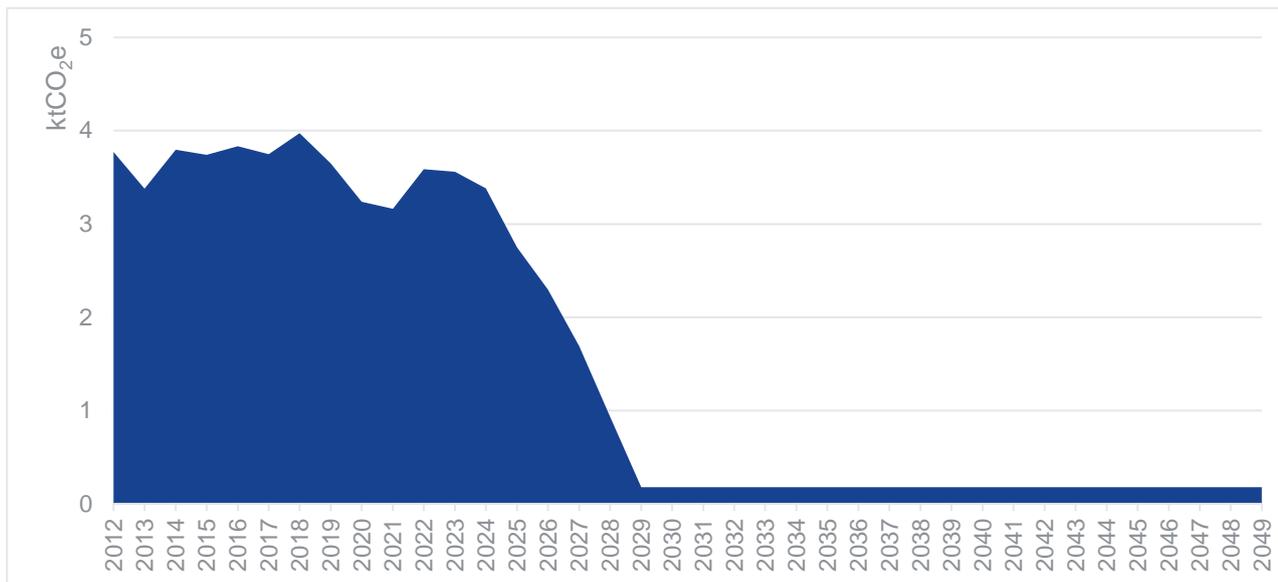
Note: The above is an illustration developed based on publicly available information only

Southern Water’s plan for action

- 1) **Adhering to government mandate** – The sale of new internal combustion LGVs and HGVs are expected to be banned by 2030 and 2040 respectively⁵¹, with vehicle manufacturers already ramping down production of internal combustion engines and therefore we will need to respond accordingly and ensure that our respective fleets are compliant.
- 2) **A spend to save approach** – We will replace end-of-life vehicles with electric vehicles, in line with the governments ambition in this area. For our car and van fleets this means all vehicles will get transitioned to EVs through the replacement cycle within AMP8 and AMP9. This will allow us to cap expenditure and keep abreast of technological developments, while implementing and replacing vehicles at the right time.
- 3) **An adaptive long-term plan for transport** – We will remain adaptive when making decisions to decarbonise our fleet. These decisions will include considerations around green fuels, fast charging infrastructure and the role of batteries. We are undertaking a study to determine the charging needs for our car and van fleets. We have made some allowance for this in our business plan, and we will remain adaptive to ensure we are making the right decisions going forward.
- 4) **Increasing focus on our supply chain** – We have developed our AMP8 procurement framework, setting out a carbon conscious procurement process that focuses on greening our supply chain and tackling the challenge posed by third party transport emissions.

⁵¹ UK Government, UK confirms pledge for zero-emission HGVs by 2040 and unveils new chargepoint design, <https://www.gov.uk/government/news/uk-confirms-pledge-for-zero-emission-hgvs-by-2040-and-unveils-new-chargepoint-design>

Figure 8: Southern Water emissions from transport



Note: The chart above refers to the emissions associated with the baseline, base expenditure, and net zero interventions, Nb. Years refer to first year in fiscal year in line with CAW reporting i.e., 2012 represents 2012-13, data from 2023-24 are forecasts

6.3.1.3 Bioresources

Bioresources are naturally occurring renewable and biodegradable materials and present an opportunity to reduce our emissions. Bioresource operations predominantly occur as a result of wastewater operations and sludge treatment processes. We have a two-pronged approach to tackling this emission source. The first is to reduce emissions from transport, treatment, and disposal of bioresources by employing new technology to improve process, operational, energy and carbon efficiencies. And the second is to increase biogas generation from the treatment process, to help produce sustainable and renewable energy for use across the UK, and therefore decrease carbon emissions. Details of our bioresource strategy can be found in our SRN36 Bioresources Strategy Technical Annex.

External drivers

- 1) **Government support** – There is significant government support to encourage the generation of bioenergy through schemes such as Renewable Gas Guarantees of Origin⁵², Green Gas Support Scheme⁵³ and Renewable Transport Fuel Obligation⁵⁴, all of which are key drivers of bioresources within the water industry.

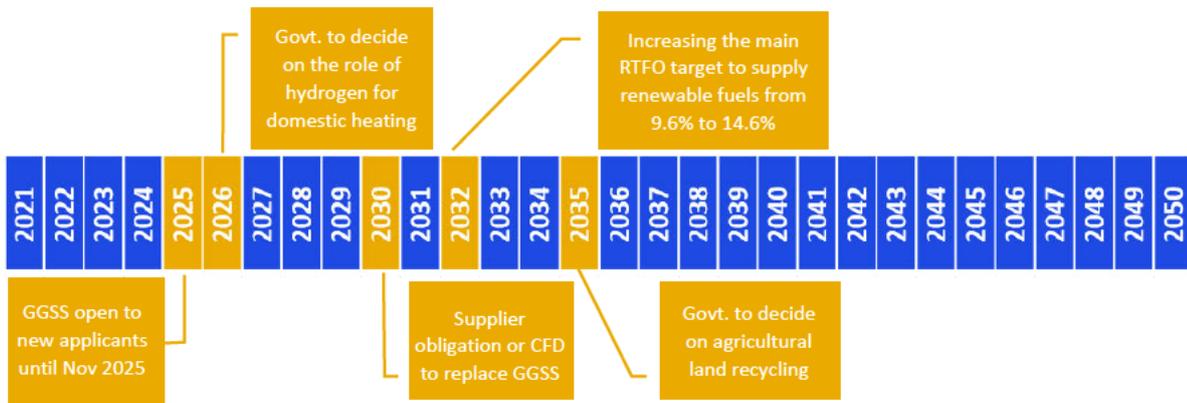
⁵² The Renewable Gas Guarantees of Origin (RGGO) are issued to green gas producers for units of green gas injected into the gas grid, which displace units of fossil gas. They can then be transferred between a variety of counterparties before being retired and allocated to gas consumers, via a green gas tariff. Green Gas Certification Scheme, <https://www.greengas.org.uk/>.

⁵³ The Green Gas Support Scheme (GGSS) encourages the production of biomethane by providing financial incentives to producers. UK Government, Green Gas Support Scheme - Mid-Scheme Review – Consultation, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1145002/green-gas-support-scheme-mid-scheme-review-consultation.pdf

⁵⁴ The Renewable Transport Fuel Obligation (RTFO) is a policy requiring fuel suppliers to include a percentage of renewable fuels in their transportation fuel supply. UK Government, Amending the Renewable Transport Fuels Obligation (RTFO) to increase carbon savings on land, air and at sea, <https://www.gov.uk/government/consultations/amending-the-renewable-transport-fuels-obligation-rtfo-to->

- 2) **Agricultural land recycling uncertainty** – Uncertainty around water companies being able to spread Biosolids (i.e., treated sludge) on agricultural land in the near future⁵⁵, has a direct impact on the contents of the Southern Water Bioresources plan. Receiving clarity on this situation as soon as possible will be a key driver for how the Southern Water bioresources plan develops moving forward and essential for the likely elements that will be contained within it, especially to assess the potential carbon impact.
- 3) **Technological advancement** – Advanced technologies, such as Advanced Anaerobic Digestion, Advance Thermal Conversion (e.g., pyrolysis), Biomethane upgrade and Carbon Capture solutions will improve efficiency and indirectly reduce process emissions and emissions from the processing of sludge. This will be a key development in the processing of bioresources and is likely to play a significant role in helping reduce emissions for us⁵⁶.

Figure 9: Timeline of external triggers, drivers, and government targets associated with bioresources



Note: The above is an illustration developed based on publicly available information only

Southern Water’s plan for action

- 1) **Research and development** – Industry wide collaboration in researching and developing deployable solutions will be essential if the industry is to make the necessary progress in reducing emissions. We aim to play an active role in engaging with the wider water sector to further research and development of bioresource solutions, such as Advance Thermal Conversion (ATC). ATC is an alternative to the very carbon intensive incineration option, and it has the potential to transition water companies to having a net positive impact on emissions as opposed to the current negative state, through carbon sequestration⁵⁷. We believe it is through research and development into solutions such as these that progress and net zero will be achieved.
- 2) **An adaptable plan** – We currently lack the capacity and headroom to implement multiple transformations at once within our bioresource operation, limiting our ability to convert our operation to

[increase-carbon-savings-on-land-air-and-at-sea#:~:text=The%20targeting%20net%20zero%20response.9.6%25%20to%2014.6%25%20by%202032](#)

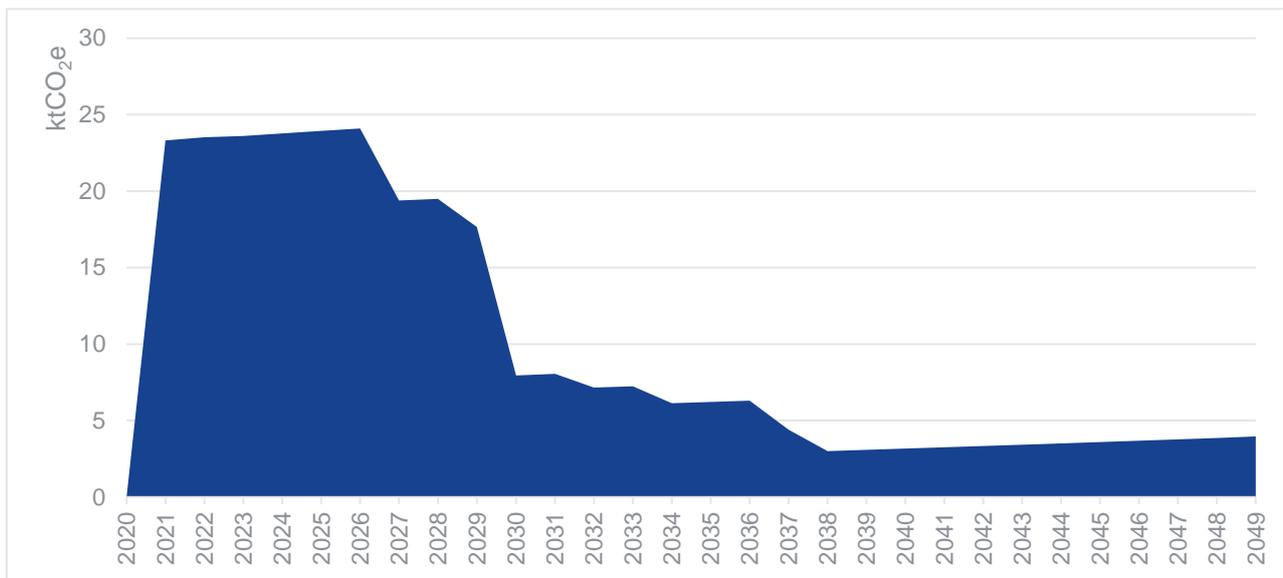
⁵⁵ UK Government, Environment Agency strategy for safe and sustainable sludge use, <https://www.gov.uk/government/publications/environment-agency-strategy-for-safe-and-sustainable-sludge-use/environment-agency-strategy-for-safe-and-sustainable-sludge-use>

⁵⁶ Ofwat, Bioresources Market Review - Jacobs Report, <https://www.ofwat.gov.uk/wp-content/uploads/2021/05/Jacobs-report-Bioresources-Market-Review.pdf>

⁵⁷ UK Water Industry Research, Converting sewage sludge to biochar – A Review of options & feasibility, <https://ukwir.org/converting-sewage-sludge-to-biochar-a-review-of-options-feasibility-0>

more advanced processes (e.g., Advance Anaerobic Digestion) in the very short-term. Therefore, we will be implementing change in a controlled way to ensure our actions do not negatively impact supply for our customers, or the business. Additionally, we will maintain adaptability through regular review to increase ambition should the operational landscape allow. Further details of our bioresource strategy can be found in our SRN36 Bioresources Strategy Technical Annex.

Figure 10: Southern Water emissions from bioresources



Note: The chart above refers to the emissions associated with the baseline, base expenditure and PR24 enhancement expenditures, it shows emissions per year calculated using a location-based approach, Nb. Years refer to first year in fiscal year in line with CAW reporting i.e., 2020 represents 2020-21, data from 2023-24 are forecasts

6.3.1.4 Process emissions

Process emissions include emissions from the chemical transformation of raw materials and fugitive emissions. In the process of treating wastewater and biosolids, greenhouse gases are emitted which we refer to as fugitive emissions. These emissions are mainly methane (CH₄), and nitrous oxide (N₂O). Process emissions are harder to abate than carbon. This is because process emissions are much harder to measure and there is a great deal of uncertainty around their scale. Achieving reductions against an uncertain baseline can make the case for investment difficult to justify and difficult to evidence progress against. As such, process emissions solutions across the industry are still in their infancy and significantly more expensive. However, we have developed a plan to participate in trials and research and innovation with the wider sector to further action.

External drivers

- 1) **Maturity of current solutions** – Process emissions solutions across the industry are still in their infancy. A significant coordinated effort across the industry is expected to further progress⁵⁸. Through collaboration and close engagement, the water industry will be able to share knowledge to make progress towards tackling a challenge that affects all companies.

⁵⁸ Water UK, Water industry joins forces in global call for investment to tackle process emissions, <https://www.water.org.uk/news-views-publications/news/water-industry-joins-forces-global-call-investment-tackle-process>

- 2) **Expense** – Water UK have set out a number of ways the industry could reach net zero in its route maps within their Net Zero 2030 Route map document. Process emission solutions were explored, but found to be an expensive undertaking⁵⁹, especially if done using the mass deployment of technologies available today.
- 3) **Future challenge** – Process emissions are likely to become the greatest source of operational emissions. AMP8 trials and monitoring solutions are expected to help understand the scale of the problem (through measurements), which should lead to the issue being tackled as early and as effectively as possible⁶⁰. Putting appropriate measuring and monitoring in place now, will help to mitigate the difficulty of tackling process emissions further down the line.
- 4) **Reporting** – While the sector is working on establishing standardised processes to measure and monitor process emissions, there is a risk that once this process has been established, we may find that process emissions from operations are significantly higher than current projections. This potential significant increase (either based on the IPCC emission factor, which is likely to be adopted by UKWIR⁶¹ / CAW, or through efficiency factors developed by the sector⁶²) in our baseline due to the reassessment of these emissions, will necessitate us to identify ways in which to mitigate the discrepancy and manage consistent reporting at scale.

Southern Water's plan for action

- 1) **Adaptive approach** – The nascency of the technology (in the UK) and the cost of the current process emission abatement solutions make them unviable for immediate large-scale deployment. However, having a flexible and adaptive plan, which is sensitive to external drivers such as technological development will allow us to react quickly and maximise the benefits associated.
- 2) **Short-term actions** – Most options available to us to address process emissions currently involve investigations and trials (including the ones being undertaken by our Bluewave innovation team) to understand potential mitigation actions. As such, we will look to monitor and measure process emissions across certain operational sites to gain the necessary knowledge to then implement appropriate solutions over time.
- 3) **Long-term actions** – We will collaborate with partners and other water companies through industry working groups to align interests and develop an industry-wide solution. To further this ambition, we have allocated £1.5bn in funding for the reduction of our process emissions in AMP9 and beyond. Further details of this funding allocation can be found in our SRN12 Long-term Delivery Strategy Technical Annex.

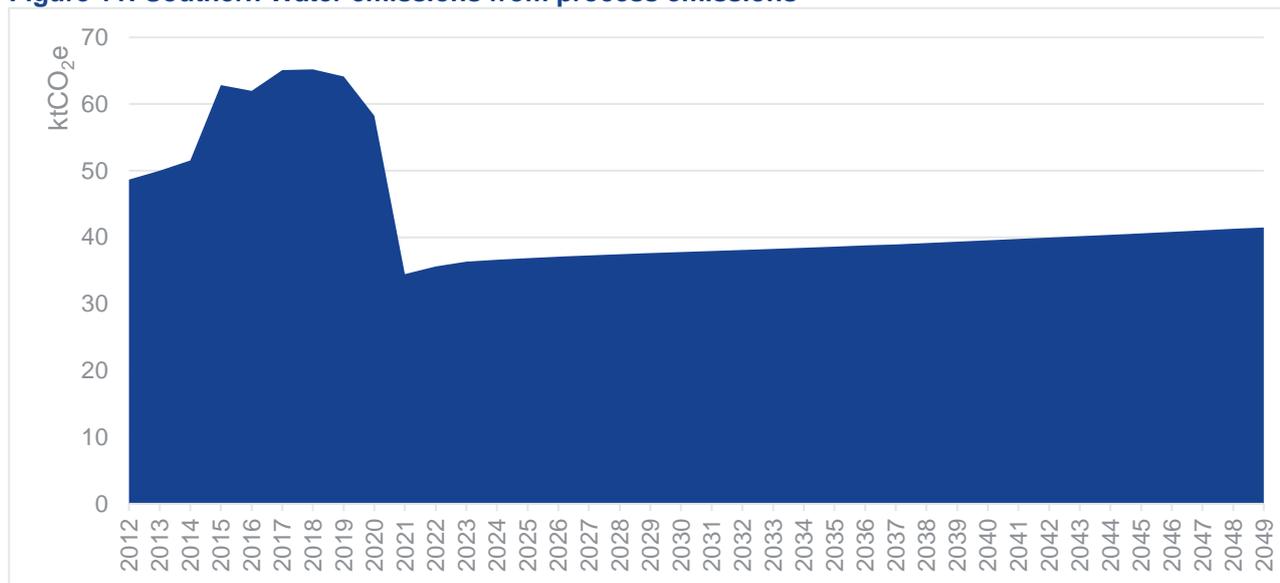
⁵⁹ Ofwat, Relative risk analysis and beta estimation for PR24, https://www.ofwat.gov.uk/wp-content/uploads/2022/07/KPMG_and_WaterUK_Relative_risk_analysis_and_beta_estimation_for_PR24.pdf

⁶⁰ Ofwat, Net Zero Technology Review, https://www.ofwat.gov.uk/wp-content/uploads/2022/08/Net_Zero_Technology_Review.pdf

⁶¹ UKRI or UK Water Industry Research developed a standardised workbook for estimating operational greenhouse gas emissions, the Carbon Accounting Workbook (CAW)

⁶² Ofwat, Consultation on PR24 operational greenhouse gas emissions performance commitments definitions, https://www.ofwat.gov.uk/wp-content/uploads/2023/02/EA_GHG_Emissions_Definition_Consultation_Response_March_2023.pdf

Figure 11: Southern Water emissions from process emissions



Note: The chart above refers to the emissions associated with the baseline, base expenditure, PR24 enchantment expenditures (bioresource strategy) and net zero interventions (bioresource strategy), it does NOT show emission reduction achieved from the £1.5bn investment planned between AMP9-Amp12, Nb. Years refer to first year in fiscal year in line with CAW reporting i.e., 2012 represents 2012-13, data from 2023-24 are forecasts

6.3.1.5 Scope 3 emissions and Capital carbon

Our supply chain (purchased goods and services) represents up to 20%⁶³ of our scope 1, 2 and 3 emissions. Additionally, operational emissions associated with the implementation of our PR24 capital programme is expected to have a significant impact on our emissions from 2025-26, as shown in *Figure 13: Southern Water Scope 3 emissions and emissions from capital programmes*. Both these sources of emissions represent a significant challenge. However, we have a two-pronged approach to tackle hard to abate scope 3 and capital carbon emissions. The first is to develop and deploy our new AMP8 procurement framework that has carbon embedded in it. This we believe will encourage our suppliers to provide sustainable and carbon conscious solutions. The second is to make carbon a key focus, by instilling carbon conscious decision-making and processes into our way of working. This will allow us to improve the coverage, scope and quality of capital programmes and advance reporting.

External drivers

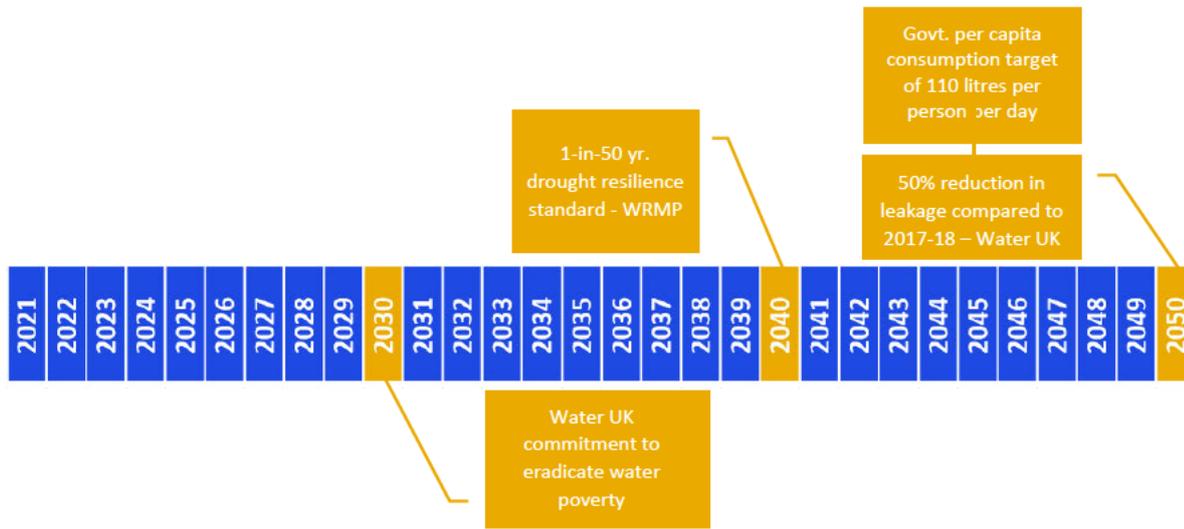
- 1) **Government** –The UK has made a legally binding commitment to be net zero by 2050 with an interim target to reduce emissions by 78% below the 1990 baseline, by 2035. Due to the significant percentage that capital carbon and embedded emissions represent, adhering to these government targets will require an increased effort from across the sector.
- 2) **Population change** – The growth in the UK’s population will have a significant impact on the water sector’s ability to abate emissions as it grows to meet the demand by building new infrastructure. There is likely to be increased pressure on operations. And both carbon and process emissions related with infrastructure upgrades will need to be assessed and considered in decision making.
- 3) **Climate change** – The physical risks of climate change include an increase in floods and droughts, coastline depletion and lower water tables. These events are expected to stretch the water sector and

⁶³ This includes Southern Water’s scope 3 emissions excluding inset sequestration (20%), as of 2022-23.

increase strain and stress on existing infrastructure. Or require new infrastructure. Increasing energy usage and emissions due to increased maintenance and construction.

- 4) **Technological advancement** – New and advanced technologies are expected to be crucial in helping water companies transition from using traditionally carbon intensive products like concrete and steel to green alternatives produced using advanced solutions such as green hydrogen.

Figure 12: Timeline of external triggers, drivers, and government targets associated with emissions from scope 3 and capital programmes

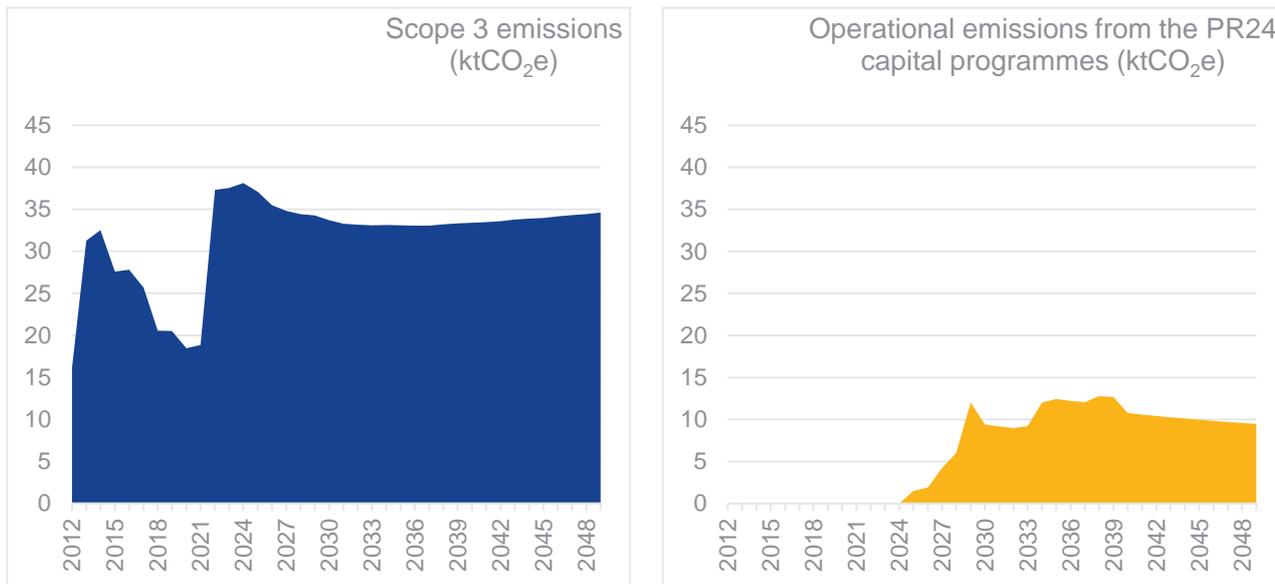


Note: The above is an illustration developed based on publicly available information only

Southern Water’s plan for action

- 1) **Implementing a carbon culture** – We are maturing our companywide carbon culture and decision-making processes. This will enable us to take carbon benefits into account, as well as cost and performance, when making decisions.
- 2) **Measuring and reporting data** – Using consistent parameters when measuring, monitoring, and reporting data is critical in enabling us to make carbon conscious decisions that drive cost efficiency benefits. We are implementing processes and solutions to allow us to accurately gather a clear picture of the current landscape, underpinned by the necessary data, to help inform decisions.
- 3) **Collaboration** –We will collaborate with the supply chain to encourage the use of sustainably sourced materials (e.g., low carbon concrete) and consider how materials can be reused when assets reach end of life. This will also involve the consideration of nature-based solutions e.g., habitat restoration and sequestration where possible, to lower carbon. Additionally, we will collaborate with others in the sector to share vital infrastructure (e.g., Water for Life Hampshire, where Southern Water share a reservoir with Portsmouth Water).
- 4) **An adaptive long-term plan** – Our approach will provide flexibility to consider all possible solutions holistically and adapt wherever possible to respond to new information to solve problems.

Figure 13: Southern Water Scope 3 emissions and emissions from capital programmes



Note: The charts above refer to the emissions associated with the baseline, base expenditure, PR24 enhancement expenditures and net zero interventions, they show emissions per year calculated using a location-based approach, Nb. Years refer to first year in fiscal year in line with CAW reporting i.e., 2012 represents 2012-13, data from 2023-24 are forecasts, the chart on scope 3 emissions does not include inset sequestration, the chart on Operational emissions from the PR24 capital programmes does not include bioresource enhancements

6.3.1.6 Sequestration

Carbon sequestration is the process of capturing, removing, and storing carbon from the earth’s atmosphere. We are developing a nature-based approach for our own estate that includes woodland, wetland, and grassland restoration, this allows us to deploy local solutions through insetting while accounting for emissions using a location-based approach. It also maximises the emission reduction benefits of sequestration. We are working with water sector colleagues to understand the range of opportunities available and the scale to deliver carbon benefits.

External drivers

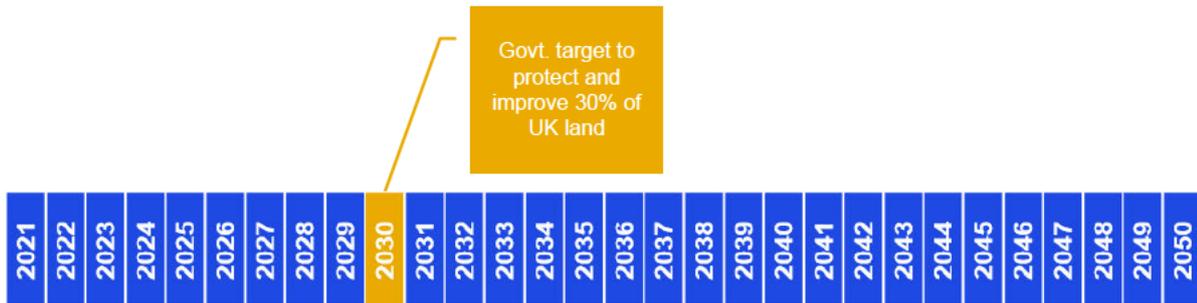
- 1) **Government** – The government’s 10-point plan, published in 2020, calls out the need to improve and protect the land in the UK and proposes a target to protect 30% of land by 2030 accompanied by funding⁶⁴. The existing National Parks, Areas of Outstanding Natural Beauty and other protected areas already comprise approximately 26% of land in England. An additional 4% – over 400,000 hectares, will be protected⁶⁵, under this ambition to support the recovery of nature and the natural sequestration of carbon emissions and we must therefore be aware of how this might impact our land and how we may contribute to or benefit from it.

⁶⁴ UK Government, The Ten Point Plan for a Green Industrial Revolution, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf

⁶⁵ UK Government, PM commits to protect 30% of UK land in boost for biodiversity, <https://www.gov.uk/government/news/pm-commits-to-protect-30-of-uk-land-in-boost-for-biodiversity>

- 2) **Other government support** – The UK’s carbon capture utilisation and sequestration (CCUS) sector received a £20bn funding boost from the Spring Budget in March 2023⁶⁶, demonstrating the support and confidence in sequestration.
- 3) **Timing of solutions** – Nature based solutions have a significant lead time so do not often realise benefits immediately⁶⁷ e.g., the planting of trees to absorb carbon would be a natural solution that water companies can look to implement to harness the benefits of sequestration in the medium to long-term. As such, a continuously developing plan is required to ensure the redevelopment of woodlands, wetlands, and efficient management of catchments that can act as effective sinks to offset emissions.

Figure 14: Timeline of external triggers, drivers, and government targets associated with sequestration



Note: The above is an illustration developed based on publicly available information only

Southern Water’s plan for action

- 1) **Location-based approach** – Trees and restored land can act as carbon sinks once they have matured, absorbing emissions from the atmosphere. We are exploring nature-based solutions like woodland, wetland and grassland restoration and creation on our land as a means of tackling emissions (insetting).
- 2) **Ensuring the long-term plan is adaptive** – We are prepared to ramp up action in grassland restoration and blue carbon⁶⁸ (utilising wetland, saltmarsh, seagrass, and kelp available to us). We have worked with the [REDACTED] [REDACTED]⁶⁹ across the South East to identify habitat restoration and creation opportunities on our own land which provides greater confidence in using this within the plan due to the external validation and clear benefits.
- 3) **Carbon codes** –Carbon codes⁷⁰ for blue carbon and grassland restoration are expected to be setup shortly. Once the market gap is bridged, we will adapt and respond to the new market standards to account for the emission reduction achieved through these insets.
- 4) **Potential new markets** – We have made provisions to tap into new markets, such as storing carbon in coastal and marine ecosystems. These new markets offer us great future potential (e.g., habitat

⁶⁶ UK Government, Powering Up Britain: Net Zero Growth Plan, <https://www.gov.uk/government/publications/powering-up-britain/powering-up-britain-net-zero-growth-plan>

⁶⁷ UK Government, Forestry commission, The benefits of woodland creation, Woods and Carbon, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1084680/FC_Fact_Sheet_Carbon_FINAL_14062022.pdf

⁶⁸ Blue carbon is the carbon stored in coastal and marine ecosystems. The Blue Carbon Initiative, <https://www.thebluecarboninitiative.org/>

⁶⁹ [REDACTED]

⁷⁰ Carbon Codes or Woodland Carbon Code is based on trees’ natural ability to absorb carbon dioxide. By providing the framework for measuring and certifying the volume of carbon dioxide stored in a woodland, it also provides the mechanism for offsetting carbon dioxide emissions elsewhere. <https://carbonstoreuk.com/the-carbon-codes/>

restoration and new markets for sequestration). We are actively involved in local partnership projects to help support and test these new markets as they emerge.

6.3.1.7 Our operational emission reduction plan on a page

Table 6: A one page summary of our plan to be operationally net zero

Principles / Planned area of focus	Maturing our carbon culture	Targeting innovation and R&D	Partnering & collaborating with industry	Adaptive plan
1. Purchased electricity and energy efficiency	Improve carbon efficiency by improving process and operational efficiencies	Deploy a spend to save approach to implement new low carbon technologies		Green hard to abate emissions beyond 2035 using renewable PPAs
2. Transport	Adhere to government mandate and transition fleet to EVs	Deploy a spend to save approach to implement new low carbon technologies		Maintain flexibility to quickly adopt new low carbon technologies
3. Bioresources			Partner with industry to progress R&D of new solutions, such as ATC	Maintain adaptability to increase ambition as technology and processes mature
4. Process emissions		Focus on trials and demonstrations to baseline emissions and identify mitigation actions	Partner with industry to develop solutions to reduce emissions	Ensure the plan is adaptive and flexible to react to technological developments across the sector
5. Scope 3 emissions and Capital carbon	Adapt our capital programme to incorporate carbon and nature-based solutions	Develop processes to measure and report emissions in line with industry standards and regulatory requirements	Partner with the supply chain, industry bodies and internal stakeholders to assess issues, identify solutions and take action	Retain flexibility to move between different approaches as business needs and external drivers evolve
6. Sequestration	Explore nature-based solutions on Southern Water owned land		Collaborate on local partnership projects to help develop new markets	React to new market opportunities, such as carbon codes and blue carbon

6.3.2 Our long-term strategy to achieving net zero carbon by 2050

We have cautiously built out our longer-term net zero strategy, due to uncertainty regarding data, technology, and the rate and pace of climate change, amongst other external factors that will have a

significant impact moving forward. Additionally, we have ensured our strategy is flexible and is able to adapt to the external environment and to react to drivers and triggers as they occur. These drivers could be shifts in the UK climate, a rapid drop in technology costs, or a change in government or regulatory guidance or legislation.

We have identified the following core areas that will help us succeed in delivering our 2050 net zero goal irrespective of other external changes. We are now pursuing these with the aim to ramp up or down action in the future as and when required.

6.3.2.1 Scope 1 emissions

With the decarbonisation of the Grid, process emissions from water and wastewater treatment processes are expected to become our greatest source of operational emissions. As such we are collaborating with technology-partners and other water companies to align interests and develop an industry-wide solution to tackle these emissions collaboratively. However, there is a risk that once standardised solutions and process for measuring and monitoring process emissions have been established, we may find that our process emissions from operations are significantly higher than current expectations. We do not expect solutions to be developed and commercially available till the end of AMP8 and we have identified £1.5bn in funding for the reduction of our process emissions between AMP 9-12. This funding allocation is in our SRN12 Long-term Delivery Strategy Technical Annex.

6.3.2.2 Scope 3 emissions

As mentioned earlier, scope 3 encompasses emissions that are not produced by the company itself and that are not the result of activities from assets owned or controlled by them, but by those that it's indirectly responsible for throughout its value chain. Due to the government's policies on energy efficiency, zero emissions vehicles and net balance of zero emissions, we are developing an AMP8 procurement framework that has carbon embedded in it. This framework will cover our capital programme delivery and infrastructure management. The aim of the framework is to set out a carbon conscious procurement process that focuses on greening our supply chain and tackling the carbon challenge posed by third party emissions.

Chemicals, supplied by our third-party partners, have a high carbon footprint, due to their energy intensive production process. In line with Ofwat guidance, from 2022-23, we have started reporting carbon emissions associated with chemical use in water and wastewater processes. We will estimate these emissions based on the CAW emissions factors. While it is possible that, over time, the carbon footprint of chemicals falls with the decarbonisation of the electricity grid. We aim to start working with industry leaders to understand how we can reduce our dependence on chemicals, especially in our wastewater process, by adopting chemical free solutions, such as Enhanced Biological Phosphorus Removal, Electro-coagulation, Wetland technology and will explore new innovative technologies, such as Algae reactors and Microvi⁷¹.

6.3.2.3 Capital Carbon

At Southern Water we are looking to further develop a carbon conscious culture throughout our business and operations. We need to track carbon and ensure it is a key focus for our company. This is so we take carbon conscious decisions when deciding on capital carbon investments that are best value for our customers and the environment. To facilitate this, we are working on developing the best way to measure capital carbon where possible throughout our business, operations, and our supply chain, including steel, concrete, and cement. We will monitor these emissions going forward so that we are able to report against our

⁷¹ Ofwat, Net Zero Technology Review, https://www.ofwat.gov.uk/wp-content/uploads/2022/08/Net_Zero_Technology_Review.pdf

performance and take action where necessary in an informed manner with respect to carbon, costs, and performance.

Our Water for Life Hampshire Strategic Resource Option (SRO) scheme is being used as a test bed for our carbon management process. The learnings from this scheme are being shared with our engineers across teams. Greater engagement with delivery partners is helping us improve the quality of our carbon data and in the future, it will enable us to draw insights for improvement.

The scale of new infrastructure requirement is substantial and is expected to grow over the future asset management periods (AMPs), as our customer base and their demands evolve. We are positioning ourselves now to embed a carbon culture throughout our business, so we are able to:

- optimise where possible (i.e., by selecting the low carbon solution that is also least cost and delivers the best value),
- deploy nature-based solution where applicable (i.e., nature-based solutions that capture carbon), and
- defer new infrastructure builds to the future where practicable and beneficial (i.e., deferring the development of energy intensive solutions to a later AMP, by when the decarbonisation of the grid is more likely to bring down its overall carbon footprint).

This we believe will help us reduce the overall growth in our embedded emissions over future AMPs.

6.3.2.4 Bridging the long-term gap

We have identified that current technologies and solutions, especially those aimed at reducing hard to abate emissions such as process emissions, are not sufficient to help us reach net zero by 2050. Thus, we are:

- Trialling innovative alternatives that will help us monitor and reduce process emissions in future AMPs,
- Partnering and collaborating with other water companies, our supply chain, the wider water sector, and other stakeholders to develop new technologies and to identify new solutions, and
- Monitoring the Water UK projects for technology pathfinders and participating in Ofwat's net zero innovation fund.

These initiatives will allow us to keep abreast of key technological developments. They will also allow us to adopt them into our processes as soon as practicable.

While we aim to use the period between 2024-25 to 2029-30 to understand, test, and help develop novel solutions that can help us, and the wider water sector reduce emissions, we have identified that we may require up to £1.5bn to reduce to net zero. This estimate has significant elements of Optimism Bias and Cost Methodology Risk associated with it, given that the commercial solutions are not yet available. However, our board has approved the deployment of the £1.5bn between AMP9-12 to tackle hard to abate emissions. At which time we expect to have access to technologies and solutions that are sufficient to help us reach net zero by 2050.

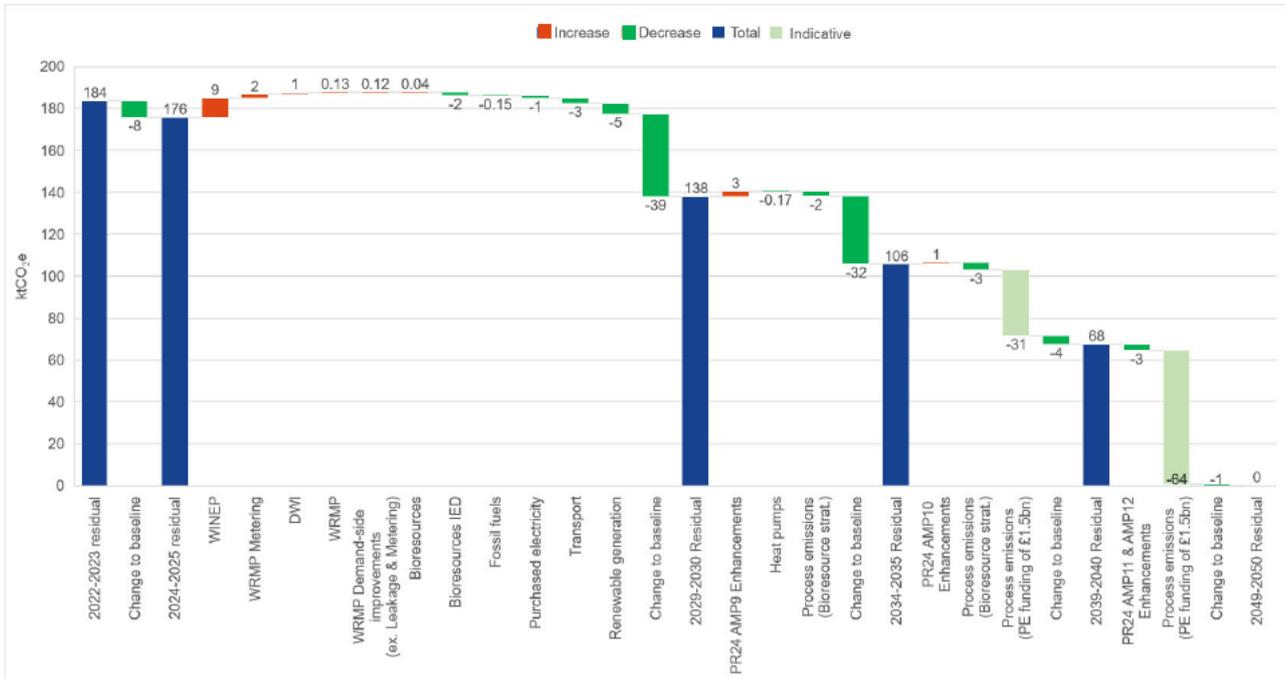
In conclusion, net zero will not be possible without focusing attention on these harder to abate emissions such as process emissions, scope 3 emissions, including emissions from chemicals, and capital carbon emissions, and therefore we will prioritise this moving forward.

7. Our Commitments

Our revised net zero plan aligns with national government targets, encompassing both operational and embedded emissions, and prioritises the reduction of GHG emissions. Illustrated in *Figure 15*. It is also aligned with the AMP8 common performance commitments regarding operational greenhouse gas emissions for both water and wastewater. It has been developed using data and insights from within the business and the sector. Further it has been assured by our board and reviewed by our peers and customers. As such we believe our plan is well-rounded and will help us work towards achieving our net zero ambition.

- Our 2050 ambition – We aim to be net zero by 2050.

Figure 15: Southern Water 2050 net zero route map



Note: The chart above refers to the emissions associated with the Southern Water emissions baseline, PR24 base expenditures, PR24 enhancement expenditures, net zero interventions and the investment of £1.5bn to tackle process emissions in AMP9 and beyond by period.

Table 5: The GHG ambition in Chapter 3.5 How we intend to manage and monitor our progress said that we will only be able to reduce our operational emissions to 95 ktCO₂e by 2050 due to technological limitations and macroeconomic uncertainties (as explained in Chapter 6.3 Our route map to 2050). However, we believe we will be able to bridge this gap and achieve net zero by 2050 provided there is sufficient regulatory support and market stimuli to adopt and adapt to change, as explained in Chapter 6.3.2.4 Bridging the long-term gap and shown in Figure 15, above.

Appendix 1 - Methodology

Introduction

Southern Water (SW) have engaged [REDACTED] to forecast their operational carbon equivalent emissions until 2050. As part of their performance commitment, SW are required to report their emissions baseline. This document describes the methodology used by [REDACTED].

