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# ESTIMATING SUSTAINABLE ASSET REPLACEMENT EXPENDITURE

Exploring the WICS  
approach in England and  
Wales



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# INTRODUCTION AND EXECUTIVE SUMMARY

1A

## The water sector is re-examining how asset investment should be approached to support long-term resilience and asset health

A key expectation of water customers is to have high-quality and reliable services in the future. To meet these expectations, companies must be sufficiently funded to continually reinvest in maintaining their long-lived assets on a sustainable basis.

The recommendations of the Independent Water Commission (IWC),<sup>1</sup> together with Ofwat's ongoing asset health roadmap,<sup>2</sup> reflect a growing emphasis on ensuring that the long-term asset health and resilience of the water sector are central to any future regulatory framework.

As part of this, the sector is actively considering how best to assess asset investment needs, including bottom-up approaches such as the Network Asset Risk Metric (NARM) methodology used by Ofgem in the energy sector and the approach used by the Water Industry Commission for Scotland (WICS).

Ofwat has engaged with the ICS (which helped develop the approach for Ofgem) to consider the applicability of NARM to the water sector, and the associated opportunities and challenges/risks.<sup>3</sup> Following this work, Ofwat has indicated that it intends to pilot a NARM-style approach for a subset of water and wastewater assets.<sup>4</sup>

To contribute to wider thinking on the best approach to assessing asset maintenance needs, in summer 2025 we worked with six water companies<sup>5</sup> (the participating companies) to: (a) explore the application of the bottom-up approach relied upon by WICS in Scotland; and (b) consider what insights it could provide.

1B

## We applied the WICS approach because it provides valuable information to support sustainable asset investment and is implementable with available data

### The WICS approach can provide valuable information to support sustainable asset investment as part of the future regulatory model

We adopted the bottom-up approach relied upon by WICS to set the most recent determination for Scottish Water.<sup>6</sup> This approach was developed with care by the Scottish regulator facing many of the same considerations and challenges as those present in the water sector in England and Wales. It has also been endorsed by the IWC.<sup>7,8</sup>

The WICS approach reflects companies' costs of replacing all their replaceable assets over the course of their reasonable asset life (and, maintaining 'infinite-life' assets into perpetuity). It defines the

<sup>1</sup> *'Independent Water Commission - Final Report.'* Independent Water Commission (21 July 2025).

<sup>2</sup> *'Enhancing Asset Health Understanding Workstream.'* Ofwat.

<sup>3</sup> *'Network Asset Risk Metrics (NARM) Pilot Exploration.'* ICS (October 2025).

<sup>4</sup> *'Enhancing asset health understanding workshop: Cost assessment & Asset Management Operational Resilience (AMOR).'* Ofwat (15<sup>th</sup> January 2026); slide 17.

<sup>5</sup> *Anglian Water, Northumbrian Water, Thames Water, South East Water, Southern Water and Wessex Water.*

<sup>6</sup> *'Asset Replacement - 2019 Decision Paper: Strategic Review of Charges 2021-2027.'* Water Industry Commission for Scotland (2019).

<sup>7</sup> *'Independent Water Commission - Final Report.'* Independent Water Commission (21 July 2025), page 381.

<sup>8</sup> Alan Sutherland explains in the detail the insights from the WICS approach used in Scotland in his submission to the CMA on the references and statements of case: *'Insights from debates on asset replacement in Scotland.'* Alan D A Sutherland (2025).

long-term sustainable level of asset replacement expenditure for each company as the average annual expenditure required to replace (or indefinitely refurbish) all of their existing water and wastewater assets over the course of their reasonable asset life. As an example, if replacing a 3km mains pipe, which typically lasts 100 years, costs Northumbrian Water £100m, then the required average annual expenditure for that pipe is £1m (= £100m ÷ 100 years).

The WICS approach, like other bottom-up approaches, is inherently more data intensive than top-down approaches. It requires detailed information on companies' asset stocks, asset lives and replacement costs, and alignment across the industry regarding the methodology for assessing these. But, it has two key benefits relative to other bottom-up approaches such as NARM:

- (i) It is relatively straightforward to understand, and implement, avoiding the complexity associated with NARM.<sup>9</sup> As a result, it may be more easily understood by stakeholders (particularly customers) and, therefore, more readily accepted as a basis to assess cost allowances. Thus, the WICS approach provides a proportionate and pragmatic method.
- (ii) It objectively estimates the costs of replacing assets in line with their reasonable asset lives. In doing so, it reduces the need for more subjective assessments, such as on asset condition, which is not currently available on a consistent basis across the industry (especially for below-ground assets). Moreover, the subjective nature of the assessment may carry the same risk of creating an underinvestment cycle, for example if investment in assets is continuously delayed on the basis of asset condition until it is too late.

However, (ii) also means that a key drawback of the WICS approach is that, by focusing only on asset life, it does not reflect other important factors that affect asset replacement and investment needs. For example, it does not take account of asset condition and how the asset is performing within its expected life. Therefore, there may be value in considering these approaches alongside each other, to reach better conclusions on asset investment needs.

## The WICS approach can be implemented in practice with available data

To perform the bottom-up assessment, we engaged with the participating companies to develop a common understanding of their asset stock; asset lives and replacement costs, at the same level of granularity used by WICS. This is based on companies' internal estimates, which we understand are typically used to plan their asset replacement activity, based on varying levels of detailed engineering and costing information informed by their own experience; industry standards; external consultants; etc.

The resulting estimates rely on the quality of the underlying data provided by companies. We understand that the completeness and quality of this data vary between companies and across asset classes. As an example, companies typically have more confidence in asset lives for above-ground assets (such as civil assets) than below-ground assets (such as main pipes). Likewise, replacement costs are more likely to be accurate where the asset has an established history of replacement (and, therefore, sufficient historical data on replacement costs is available).

We were able to work around these challenges for current purposes, through collaboration with participating companies, and by adopting a proportionate and pragmatic approach to collecting the data in a standardised form as well as addressing any gaps. We understand that there is ongoing industry work to develop a common asset classification system and collect more comprehensive asset health data, which would also be relevant to address some of the challenges in implementing

<sup>9</sup> *Network Asset Risk Metrics (NARM) Pilot Exploration*, ICS (October 2025).

the WICS approach in future.



## Our bottom-up assessment indicates the long-term sustainable level of asset replacement expenditure that companies require is materially greater than the PR24 allowances

### Water results

Figure 1 presents our bottom-up estimates of the long-term sustainable level of asset replacement expenditure for *water* for all participating companies (on an annual basis as a % of RCV). To contextualise our estimates, we compare them to Ofwat's PR24 Final Determination (FD) allowances. The closest comparison possible with available data are Ofwat's *implicit base capex* allowances (estimated in line with Ofwat's approach in its financial models). However, in addition to the cost of *replacing* existing assets, this implicit allowance is intended to cover the other maintenance activities such as refurbishment expenditure.<sup>10</sup> It follows that these implicit allowances should be sufficiently high to fund not only the replacement of existing assets, but also the additional (non-replacement) activities.

Our bottom-up estimates of the long-term sustainable level of asset replacement expenditure alone (i.e., the estimates which are directly calculated using the WICS approach and are shown in the darker green bars) are materially greater than Ofwat's implicit allowances (by between 40% and 250%<sup>11</sup>).<sup>12</sup> This indicates that current allowances are below the level required to fund a sustainable level of asset *replacement* expenditure in the long term (even before considering the other non-replacement activities expected to be covered within base capex).

It is also notable that our bottom-up estimates of the long-term sustainable level of asset replacement expenditure appear to be materially higher than the level companies have *actually* been spending on replacing their assets over the last few price controls. For example, Northumbrian has spent an average of £76m per year on replacing its water assets over the last 15 years.<sup>13</sup> This is substantially below our bottom-up estimate of its long-term sustainable level of replacement expenditure for these assets (£172m per year).

If we uplifted our estimates of the long-term sustainable level to capture the costs of the non-replacement activities<sup>14</sup> (as shown in the lighter green bars) for better comparability with Ofwat's base capex allowances, our bottom-up estimates for water would be between 80% and 350% greater than Ofwat's allowances (including any industry-wide and company-specific cost adjustment claims – CACs) at AMP8.

<sup>10</sup> We discuss this in more detail in Section 2D.

<sup>11</sup> We calculate this range by estimating the percentage difference between our bottom-up estimates and Ofwat's implicit allowances for each company and then taking the lower and upper bound across all companies. For example, if Ofwat's allowance for a given company was £100m and our bottom-up estimate for that company was £150m, then we would report the percentage increase for that company as 50% ( $= \frac{£150m - £100m}{£100m}$ ).

<sup>12</sup> The range across individual companies is influenced by a number of factors including: (a) how they plan to allocate their allowances at PR24 (which influences the implicit base capex allowance); and (b) the scope and scale of their assets (which influences the long-term sustainable level of asset replacement expenditure); and (c) the extent to which allowances reflect their replacement costs (which additionally influences the gap).

<sup>13</sup> This is based on historical data provided by Northumbrian, covering the period 2011/12 to 2024/25.

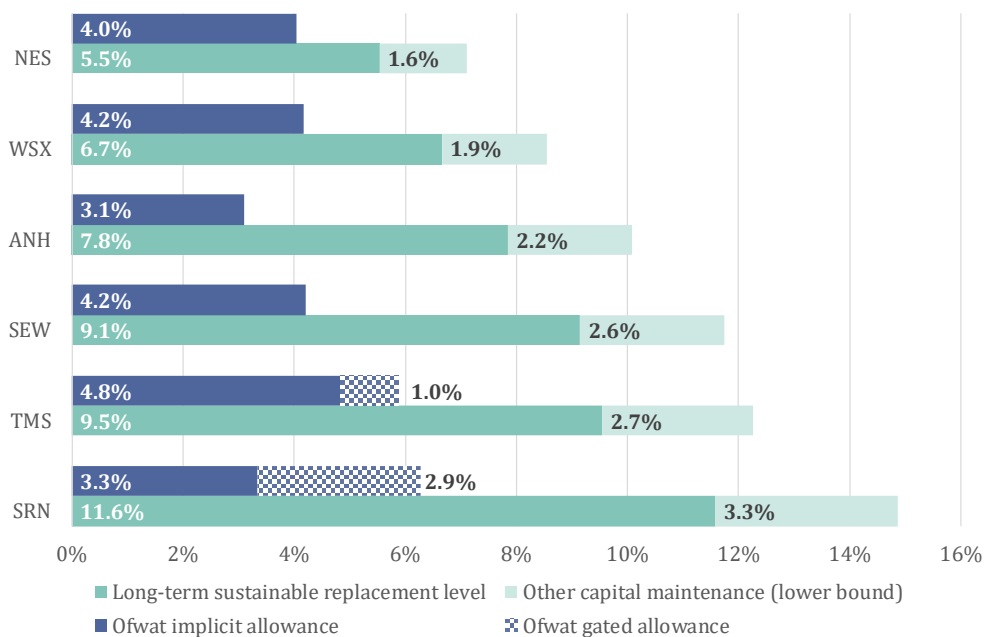
<sup>14</sup> We explain how we calculate this uplift in Section 2D and note that we understand it is likely to be conservative based on company feedback.

When WICS conducted the same exercise for Scottish Water, it found that the long-term sustainable level of asset replacement expenditure was 106% to 156% greater than the asset maintenance allowance it provided at the previous price control.<sup>15</sup> This is broadly in line with the gap between our bottom-up estimates and the PR24 allowances.

Furthermore, as highlighted by WICS when it conducted this exercise for Scottish Water, we consider that these bottom-up results are likely an underestimate of the true requirements (as we explain further in Chapter 3): “*Scottish Water’s assessment of its total asset replacement liability is more likely to understate than overstate the likely requirement.*”<sup>16</sup>

Our estimates are currently based on internal company data. If regulators in England and Wales were to use this approach to set allowances in the future (as WICS does in Scotland), they could be improved through further alignment on estimation methodologies between companies and/or third-party assurance. Nevertheless, our main findings – namely, the material gap between current allowances and our estimates of long-term sustainable level of asset replacement expenditure – are robust to sensitivity checks where we standardise asset lives and/or unit replacement costs across companies (as we describe in Annex 2).

**Figure 1: [Water assets](#) – the long-term sustainable level of asset replacement expenditure (% of RCV)**



**Source:** Economic Insight analysis of data provided by companies, DDR data tables and Ofwat PR24 FD.

## Wastewater results

Figure 2 presents our bottom-up estimates of the long-term sustainable level of asset replacement expenditure for *wastewater* for all participating companies (on an annual basis as a % of RCV).

<sup>15</sup> This is the percentage increase in the asset maintenance allowance at Strategic Review of Charges 2021-2027 relative to similar allowances at the previous price control. We explain how we estimate this in Section 2E.

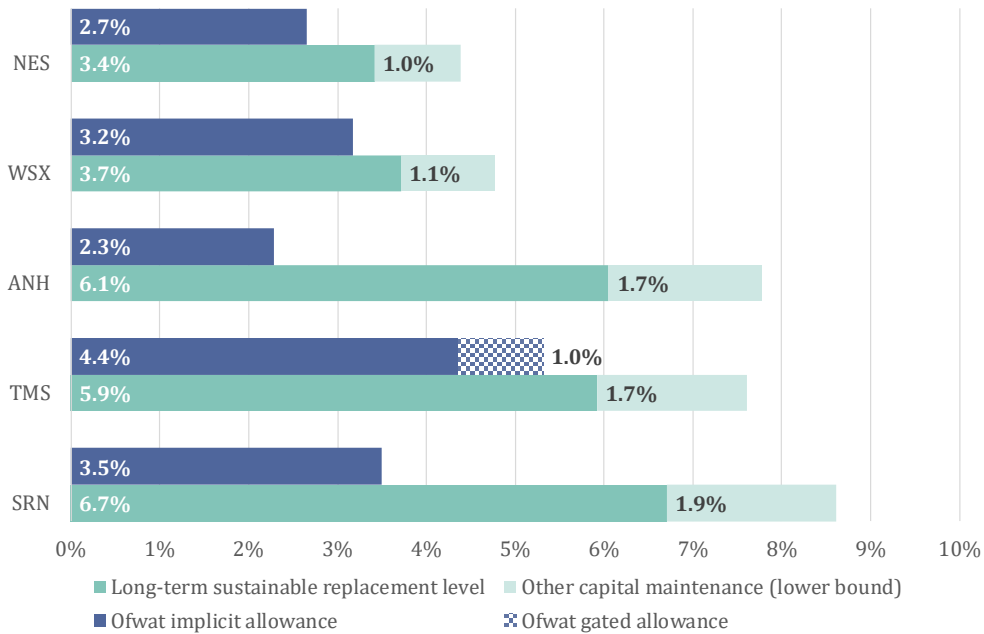
<sup>16</sup> ‘Asset Replacement - 2019 Decision Paper: Strategic Review of Charges 2021-2027.’ Water Industry Commission for Scotland (2019), page 41.

Our bottom-up estimates of the long-term sustainable level of asset replacement expenditure alone (shown in the darker green bars) are substantially greater than Ofwat’s implicit allowances (by between 20% and 170%<sup>17</sup>). This indicates that current allowances are below the level required to fund a sustainable level of asset replacement expenditure in the long term (even before considering the other non-replacement activities expected to be covered within base capex).

It is also notable that our bottom-up estimates of the long-term sustainable level of asset replacement expenditure appear to be materially higher than the level companies have actually been spending on replacing their assets over the last few price controls. For example, Northumbrian has spent an average of £66m per year on replacing its wastewater assets over the last 15 years.<sup>18</sup> This is substantially below our bottom-up estimate of its long-term sustainable level of replacement expenditure for these assets (£118m per year).

If we uplifted our estimates of the long-term sustainable level to capture the costs of the non-replacement activities (as shown in the lighter green bars) for better comparability with Ofwat’s base capex allowances, our bottom-up estimates for wastewater would be between 50% and 240% greater than Ofwat’s allowances (including any industry-wide and company-specific CACs) at AMP8.

**Figure 2: Wastewater assets** – the long-term sustainable level of asset replacement expenditure (% of RCV)



**Source:** Economic Insight analysis of data provided by companies, DDR data tables and Ofwat PR24 FD.

<sup>17</sup> This may be an underestimate (relative to the water results) because WICS classifies sewers as infinite-life assets (rather than replaceable assets like water mains). We understand from companies that, in practice, some sewers are being replaced and that the replacement costs exceed the historical refurbishment expenditure. We discuss this further in Chapter 3.

<sup>18</sup> This is based on historical data provided by Northumbrian, covering the period 2011/12 to 2024/25.

To summarise, the key implications of our work are:

- The WICS approach can provide valuable information for the future regulatory model, and our work demonstrates it is a pragmatic approach that can be implemented with available data.
- The results of applying the approach indicate that there is a material gap between the sustainable level of asset replacement expenditure and current allowances.

To enable the WICS approach to inform the future regulatory model, further work should be undertaken to refine our approach and the underlying data on which it is based (as we discuss in Chapter 3). We understand that there is ongoing industry work to collect more comprehensive asset health data on a consistent basis, which should support this. We note, however, that the scale of the gap between current allowances and requirements implies that greater asset health expenditure (as is expected to be facilitated through Ofwat’s asset health roadmap and cost change process) would be ‘no-regrets’.

## **1D** Report structure

The remainder of the report is structured as follows:

- In Chapter 2, we explain our methodology to estimating the long-term sustainable level of asset replacement expenditure for the participating companies, and present the results and key implications.
- In Chapter 3, we discuss the benefits and drawbacks of the WICS approach relative to other bottom-up approaches and consider how it could be refined for any future analysis (especially if regulatory authorities in England and Wales were to use this approach to set companies’ allowances in the future as WICS does in Scotland).
- In the supporting Annexes, we provide further details on our approach as follows:
  - Annex 1 explains how we estimate the level of base capex implicitly included in Ofwat’s allowances.
  - Annex 2 describes the method we use to estimate the standardised results as a robustness check, and the results of this sensitivity analysis.
  - Annex 3 provides a breakdown of the WICS asset hierarchy, which we use to classify assets for the analysis in this report.

# 2

## METHODOLOGY AND RESULTS

Our estimates indicate that: (i) Ofwat's allowances are materially lower than the level required to support a sustainable level of asset *replacement* expenditure in the long term (even before considering the non-replacement activities); and (ii) the uplift to Ofwat's allowances required to reach the long-term sustainable level is broadly in line with WICS' findings for Scottish Water.

## 2A

## Chapter structure

In this chapter, we describe the methodology we follow to estimate the long-term sustainable level of asset replacement expenditure for the participating companies, and summarise the results and key implications. It is structured as follows:

- In Section 2B, we describe the bottom-up approach that we use to estimate the long-term sustainable level of asset replacement expenditure, and how this compares to the approach followed by WICS.
- In Section 2C, we explain our approach to collecting the necessary data from companies.
- In Section 2D, we explain our approach to comparing our estimates to Ofwat's allowances.
- In Section 2E, we present our bottom-up estimates of the long-term sustainable level of asset replacement expenditure for the participating companies.
- In Section 2F, we summarise the key conclusions.

## 2B

## We follow the WICS approach to provide bottom-up estimates of the long-term sustainable level of asset replacement expenditure

The approach used by WICS in its Strategic Review of Charges 2021-27 (SRC21) for Scottish Water<sup>19</sup> involves taking the stock of companies' assets and spreading the costs of replacing them over their reasonable asset lives. This gives an indication of the average annual expenditure required to replace all of the assets.

More specifically, the approach involves:

- Categorising assets into:
  - (i) replaceable assets (i.e., those which require replacement once they reach the end of their reasonable lives); and
  - (ii) so-called 'infinite-life' assets (i.e., those which are repaired and refurbished in perpetuity, rather than replaced, such as dams, aqueducts and impounding reservoirs).
- Then, for assets that need to be replaced, splitting these assets into asset types, e.g., raw water pumping stations, raw water mains, civil assets at water treatment works (WTWs), etc.
- For each asset type, estimating cost of replacement and the asset life.
- Calculating an estimate of replacement expenditure per year, by spreading the replacement cost evenly over the asset life.

<sup>19</sup> See: *'2019 Decision paper: Asset replacement'*. WICS (July 2019).

- For the infinite-life assets, developing an estimate of annual asset maintenance (i.e., refurbishment and repair) requirements based on historical annual expenditure.
- Summing the estimates of annual replacement expenditure and annual asset maintenance across all assets.

Table 1 summarises how the long-term<sup>20</sup> sustainable level of asset replacement expenditure is estimated in line with the WICS approach.

**Table 1:** Calculation for the long-term sustainable level of asset replacement expenditure

Metric	Description / calculation
Asset life	This is an estimate of how many years, from installation, an asset should be expected to reasonably last before it needs to be replaced.
Asset replacement cost	This is an estimate of how much it costs to replace an asset once it reaches the end of its reasonable asset life.
Average annual maintenance expenditure	This is an estimate of how much companies have historically spent on average each year to repair and refurbish infinite-life assets.
Long-term sustainable level of asset replacement expenditure	<p>For replaceable assets, we calculate this as:</p> $\frac{\textit{Asset replacement cost}}{\textit{Asset life}}$ <p>For infinite-life assets, we assume this is equal to:</p> $\textit{Average annual maintenance expenditure}$ <p>We take the sum of the above across all assets.</p>

**Source:** Economic Insight explanation of the WICS methodology.

The box overleaf describes how WICS used the approach to set Scottish Water’s allowance in practice.

<sup>20</sup> We note that this represents the average companies require each year in the long term to replace their asset base on a sustainable basis. There is necessarily some periodisation, i.e. peaks and troughs, in terms of asset replacement needs for specific assets. For example, when a water treatment work is first built, companies will spend less than the long-term sustainable level on replacing that specific asset.

**Box 1: How WICS used the approach to set Scottish Water's allowance**

Using the approach described above, WICS estimated Scottish Water's long-term asset replacement requirements to be between £620m and £770m per year (in 2017/18 prices) for the existing assets.

WICS then made adjustments of: (i) plus £300m for enhancement and growth; (ii) plus £130-£180m for the replacement of the new assets that enhancement expenditure provides; and (iii) minus £50m-£150m for efficiency improvements. It used this to identify a long-term target range for investment of between £1bn and £1.1bn per year (encompassing both replacement and enhancement expenditure).

WICS concluded that, rather than immediately moving to this long-term level, Scottish Water should transition to this by 2045. WICS identified that short and medium life assets were critical to maintaining service and environmental standards, and that the replacement requirements of these assets needed to be addressed in the interim period (as they were reaching the end of their expected lives in the next 8-16 years).

Consequently, WICS concluded that a transitional allowance of £480m per year for asset replacement was appropriate. This was intended to be sufficient to fully fund the replacement of all short and medium life assets (which WICS estimated to be £430 per year) and partially fund the replacement of long-life assets (for which WICS allowed an additional £50m per year).

WICS acknowledged that, during the transition to the long-term sustainable level of investment, the overall condition of assets would deteriorate, and Scottish Water would have to manage the impact on service levels and make difficult choices about where and when to invest.<sup>21</sup>

In the next section, we describe our approach to collecting the necessary data from companies.

## 2C Companies shared the necessary data in response to our data request

The data required to calculate bottom-up estimates of the long-term sustainable level of asset replacement expenditure using the WICS approach for each company is not publicly available. We therefore worked with companies to understand what data they could provide, developed a data request accordingly, and supported them during the data collection process in order to encourage consistency across companies. The data collection took place during summer 2025. In this section, we describe our approach in more detail.

### Companies were asked to provide the relevant data, categorised according to the Scottish Water asset hierarchy

Under the WICS methodology, a company's asset base must be classified into distinct asset types, as different assets have different replacement costs and asset lives. An appropriate replacement cost and asset life should be used for each asset to ensure the annual replacement costs are reliable.

For comparability, it was important that companies provided data on a consistent basis. This means that asset types needed to be classified in a consistent way across companies. Ideally, this would have been achieved by collecting the data at the most granular level possible (e.g., for each specific type

<sup>21</sup> '2019 Decision paper: Asset replacement.' WICS (July 2019); pages 5-6, 31-33, 35-36, and 41.

and size of valve), as this would have allowed the standardisation process (which we conduct as part of a robustness check in Annex 2) to perfectly account for the characteristics of each asset.

However, agreeing a common asset classification at this level of granularity across all companies would not have been practical. While ongoing industry work towards a common asset classification system should help improve consistency in future, there is currently no consistent expectation for companies to collect the same or similar data on their assets. We, therefore, adopted a proportionate approach and, following discussions with companies, agreed that the asset hierarchy used by Scottish Water in its annual returns provided the most pragmatic solution. Companies therefore mapped their internal data to the most granular level available in this hierarchy. As we present in Annex 3 (which sets out the full hierarchy), this corresponds to the sub asset category level, which represents categories such as: 'Water treatment works civil assets'; 'Wastewater treatment works MEICA assets'; and 'Water distribution mains >300mm'.

As in the case of Scottish Water, these sub asset category levels include several different assets and could even include several different types of assets (e.g., the sub asset category 'Water treatment works MEICA' contains assets such as filters, batteries, generators etc.). Therefore, companies needed to aggregate the asset stock, asset life, and replacement costs to these sub asset category levels. As we set out in Table 2 overleaf, this was done as totals (for asset stock, and replacement costs) or a weighted average based on the replacement costs (for asset life).<sup>22</sup>

We understand that companies provided the relevant variables based on varying levels of detailed engineering and costing information, gathered using historical experience and market testing, which are used internally to plan capex needs. To the extent that this approach is used to set companies' allowances in the future, as is the case in Scotland, these estimates could be improved through independent assurance (as we discuss further in Chapter 3).

However, as we explain in Annex 2, we find that our main conclusions are robust to a range of sensitivity analyses where we standardise asset lives and/or unit replacement costs across companies (including using the asset lives that WICS reported for Scottish Water).

<sup>22</sup> Undertaking the assessment at this more aggregated level is consistent with the approach followed by WICS for Scottish Water. However, this approach results in an underestimate of the true replacement needs relative to undertaking the assessment at the most granular level possible (e.g., equipment level). This follows from [Titu's lemma](#), a known mathematical theorem. The two approaches give the same (similar) results if the asset lives of each asset within a category are the same (similar). This is an assumption that WICS implicitly makes since it determines the asset lives at the category level (e.g., by assuming all MEICA assets have lives of 20 years or all civil assets have lives of 80 years).

**Table 2:** Summary of variables companies were asked to provide

Metric	Description
Average asset life <sup>23</sup>	This is an estimate of how many years, from installation, assets within each category should be expected to reasonably last before they need to be replaced. For each category, this is the weighted average by replacement cost (so that assets with a greater replacement cost have a greater effect on the average for the category).
Total replacement cost	This is an estimate of the total amount it would cost to replace all assets within each category.
Asset stock <sup>24</sup>	<p>This is an estimate of the total number of assets in a particular category. The assets are counted at a level of aggregation equal to level four in Ofwat's asset hierarchy from its 'Roadmap for enhancing asset health' (where, e.g., a tank, valve, fence, filter etc count as one asset each). The exception to this is assets such as water mains and sewers, where length (in km) can be used instead.</p> <p>The unit replacement cost (i.e., the average replacement cost for one asset within a category) can be calculated by dividing the total replacement cost by the asset stock. We use this unit cost for standardisation purposes, as we describe in Annex 2.</p>

Source: Economic Insight.

## We supported companies throughout the data collection process to encourage alignment between companies

We supported companies throughout the data collection process to encourage alignment using the following approach:

- **We issued a regularly updated FAQ document to provide guidance on how to complete the data request.** This document maintained a record of decisions and clarifications made during the data collection process (e.g., where certain assets should be classified; to what level of aggregation the asset stock should be counted; etc). It ensured that all companies had access to the same information, which they could easily refer to. The document also included a mapping file provided by Wessex demonstrating how it had mapped its assets to the WICS asset hierarchy (and the level at which it had counted its asset stock) – this provided a practical example that other companies could follow.
- **We held weekly meetings with the data leads of each company** (those responsible for organising the internal data collection process) to resolve any challenges that arose during the data collection process, particularly where alignment between companies was needed (e.g., if there were questions over where certain assets should be classified).
- **We reviewed the data provided to us and checked for inconsistencies between companies.** For proportionality, we focused on the asset categories that had the greatest impact on the results. Where we identified large inconsistencies between companies (e.g., where asset lives or unit costs were very different from the rest), we discussed these with the

<sup>23</sup> Companies were also asked to provide the average asset age for each sub asset category. For each category, this is the weighted average by replacement cost (calculated in the same way as for asset life). However, ultimately, this information was not used for our analysis.

<sup>24</sup> Companies were also asked to provide an explanation of the level to which they counted their asset stock for each sub asset category (including a list of examples where possible) to enable us to check for consistency across companies. Where possible, we asked companies to provide their underlying calculations (including a file showing how they had mapped their internal asset hierarchy to the WICS asset hierarchy).

relevant data leads to establish whether they reflected: (i) genuine company-specific or regional factors that should be retained in the data (e.g., if Thames faces much higher water mains replacement costs than other companies due to operating in London); or (ii) inconsistencies in data collection, which required correction. Following discussion with companies, the following revisions were made to the original data provided:

- **Civil-MEICA split for Northumbrian.** Northumbrian's initial data submission reported the total replacement cost (of civil and MEICA assets combined) for several asset categories, rather than reporting them separately. For consistency with other companies, Northumbrian revised the data to separate these for most asset categories<sup>25</sup> using an estimated civil-MEICA split based on historical data.<sup>26</sup> In the revised data, we noticed that Northumbrian's unit cost for WTWs MEICA assets was materially lower than that of other companies and queried whether this could be caused by Northumbrian's approach to estimating the civil-MEICA split. On review, Northumbrian adjusted its method for estimating the WTWs civil-MEICA split, which brought the values more in line with other companies.<sup>27</sup>
- **Asset stock of groundwater civil assets for Northumbrian.** Northumbrian's initial data submission reported the asset stock for this sub asset category as the number of ground water sites, rather than the number of civil assets. Northumbrian corrected this in the revised data submission for consistency with other companies.
- **Classification of valves for South East.** South East's initial data submission categorised valves as civil assets, whereas other companies categorised them as MEICA assets. This led to South East reporting a materially higher asset stock and lower average unit cost for civil assets than other companies. Following discussion, South East revised its data submission to classify valves as MEICA assets for consistency with other companies.
- **Classification of water meters for Southern.** Southern's initial data submission classified customer meters (i.e., domestic and business meters for billing purposes) under 'Water meters' within the functional activity 'Water distribution'. Other companies classified customer meters under business services instead, using the 'Water distribution category' for internal monitoring meters. Following discussion, Southern revised its data submission to classify customer meters under business services for consistency with other companies.<sup>28</sup>
- **Replacement costs for Southern.** Southern's initial data submission was materially out of line from other companies for a number of sub asset categories.<sup>29</sup> Following discussions

<sup>25</sup> These were: 'Sewage pumping stations (Combined)'; 'Ground water sources'; 'Raw water pumping'; 'Sludge treatment centres (combined)'; 'Treated storage'; 'Treated water pumping'; and 'Combined sewer overflow'.

<sup>26</sup> We also noticed that, for some asset categories, the civil-MEICA split that Northumbrian mentioned in the cover email was different to that reported in the data submission. We discussed this with Northumbrian to ensure we used the correct split in our model for each category.

<sup>27</sup> We understand that Northumbrian initially estimated the replacement cost of its WTWs civil and MEICA assets by inflating replacement cost data from 2010, which included specific information on the replacement cost of MEICA assets. Northumbrian then revised its method to use more up-to-date data on the total replacement cost of its WTWs, and applied a civil-MEICA split (based on information from 2003) to this updated replacement cost data.

<sup>28</sup> While companies recorded customer meters under business services for the purpose of providing the data, for our results we categorise customer meters as water assets (rather than as business services assets). This is for comparability with Ofwat's water allowance, which includes the cost of customer meters.

<sup>29</sup> These were: 'Water trunk mains >300mm'; 'Water distribution mains <300mm'; 'Water treatment works MEICA'; 'Water treatment works civils'; 'Sewage pumping stations'; 'Wastewater treatment works MEICA'; 'Wastewater treatment works civils';

regarding whether this could reflect a different estimation approach or genuine company-specific factors, Southern revised its data submission with firmer estimates.

- **Replacement costs for Wessex.** Wessex's initial data submission reported materially different unit replacement costs to other companies for a number of asset categories. Following discussion, we understand that Wessex reviewed its replacement cost data against the figures generated separately by its finance team. We understand that it found material differences resulting from: (a) its approach to estimating missing data, which underestimated the size of some civil assets; and (b) its models excluding certain assets like site pipework and some structures such as boreholes. Wessex revised its replacement cost data accordingly.
- **Asset lives for Wessex.** Likewise, Wessex's reported asset lives varied significantly from those reported by the five other participating companies (and those used by Scottish Water). Following discussions, Wessex considered that Scottish Water's asset lives reflected the standard expectation of asset lives for the industry, and therefore we have used these for Wessex across the report.

## We took a proportionate approach to addressing gaps in the data

Most companies were able to provide the necessary data for nearly all sub asset categories, with gaps generally limited to only certain variables within a small number of categories. However, where there were gaps in companies' internal data for a certain asset category, we took a proportionate approach by using the information available from the other participating companies.

Specifically, we took the following approach:

- In most cases where there were gaps in companies' data for certain asset categories, we used the median asset life or median unit replacement cost across all other companies as a reasonable estimate of the missing information.
- In cases where South East had limited data on replacement costs, we used the unit replacement costs from Wessex – the smallest company in our sample by water RCV – to be conservative. As we explain in more detail in Annex 2, smaller companies are more likely to have smaller assets and, therefore, lower unit costs for a given category.

2D

## We compared our bottom-up estimates to Ofwat's allowances using available data

To contextualise the magnitude of our estimates, we compare them to Ofwat's PR24 FD allowances. In practice, it has not been possible to do a like-for-like comparison, since Ofwat does not identify how much of its allowances are intended to cover replacement activities. The closest comparison to our bottom-up estimates of the long-term sustainable level of asset replacement expenditure possible with available data is Ofwat's implicit base capex allowances (estimated in line with Ofwat's approach in its financial models).<sup>30</sup>

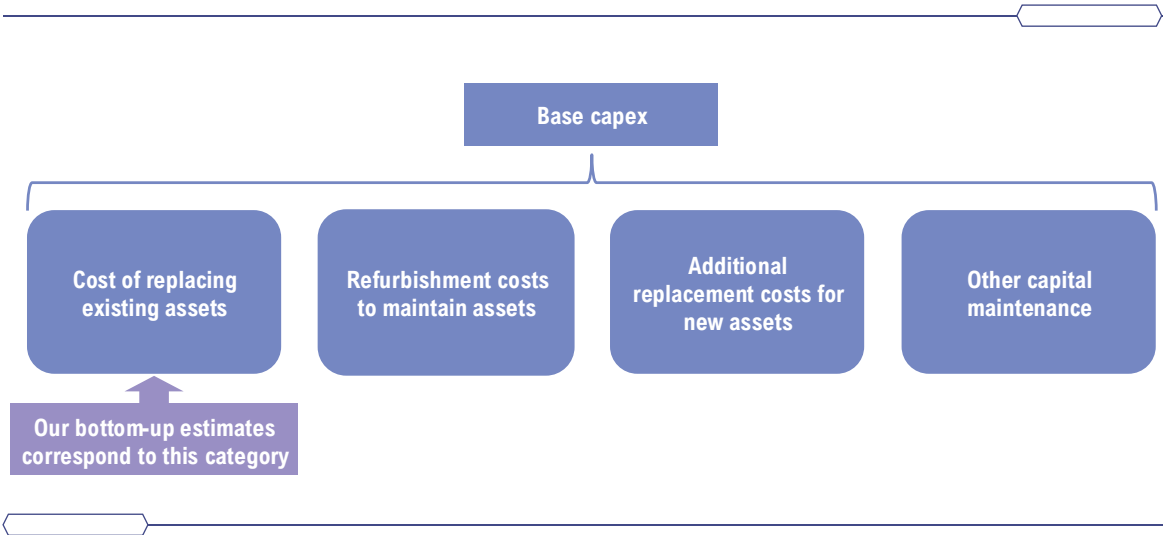
However, it is important to note that, in addition to the cost of replacing existing assets, this implicit allowance is also intended to include the following activities:

<sup>30</sup> We explain our approach to estimating the implicit allowances in more detail in Annex 1.

- **Refurbishment** to maintain assets for their reasonable asset lives in a manner that continues to provide resilient water services.
- **Additional replacement** of new assets (where the original capex was covered by enhancement cost allowances, but companies have been expected to cover subsequent replacement costs within base cost allowances).
- **Other capital maintenance** which includes planned capital maintenance to facilitate inspections, comply with changing regulations, or other remedial work that is not directly related to extending asset life or improving functionality. It may also include expenditure associated with the planned decommissioning of assets where no replacement is planned.<sup>31</sup>

This relationship is summarised in the figure below.

**Figure 3:** Relationship between base capex and our bottom-up estimates



Source: Economic Insight illustration.

It follows that these implicit allowances should be sufficiently high to fund not only the replacement of existing assets but also the additional (non-replacement) activities.

Based on historical data provided to us by Northumbrian and Anglian<sup>32</sup>, we understand these additional elements are significant:

- **Northumbrian's data suggests that, historically, its expenditure on refurbishment represents around 32% of its total expenditure on base capex.**<sup>33</sup> This means that, to modify our bottom-up estimates to account for refurbishment expenditure, we would need to apply an uplift of 47%. A larger uplift would be required to also account for the other elements of base capex.<sup>34</sup>

<sup>31</sup> This category aligns with the 'Other' category of capital maintenance referred to in Ofwat's asset health roadmap work. Source: 'Roadmap for enhancing asset health understanding in the water sector: Workshop 5'. Ofwat (August 2025); slide 13.

<sup>32</sup> We understand that most companies do not have this data readily available as there has been no consistent expectation for them to collect it historically.

<sup>33</sup> Where this is equal to the sum of the four elements in Figure 3.

<sup>34</sup> Northumbrian provided us with data on its historical spending from 2011/12-2024/25 on: (a) repair/refurbishment; and (b) replacing existing assets / additional replacement of new assets (Northumbrian was unable to split out these two categories). Based on this data, we calculate that Northumbrian spent on average £171m each year on replacement and £81m on

- **Anglian’s data suggests that, historically, its expenditure on replacement has accounted for between 29% and 78% of its total expenditure on base capex.** This means that, to modify our bottom-up estimates to account for the other (non-replacement) activities, we would need to apply an uplift of between 28% and 243%. The wide range reflects uncertainty in project categorisation because, although companies are often provided separate allowances for different base and enhancement spending, capex upgrade projects often do not fit neatly into specific categorisations of replacement of existing assets or new assets (for example, within a single project there may be some activities that correspond to replacement and some activities that correspond to refurbishment). The lower bound of the range for the uplift assumes all uncertain projects were replacement, while the upper bound assumes none of the uncertain projects were replacement.<sup>35</sup>

For better comparability with Ofwat’s base capex allowances, we present our bottom-up estimates in the following section both before and after applying an adjustment to account for the other (non-replacement) activities covered within these base capex allowances. We use the lowest estimate available (28%) to provide a conservative view. We understand from companies that this is likely to understate the true adjustment that would be required.

## 2E Our bottom-up estimates of the long-term sustainable level of asset replacement expenditure are materially greater than current allowances

In this section, we present our bottom-up estimates of the long-term sustainable level of asset replacement expenditure for participating companies for water, wastewater, and business service assets in turn.

### Water

Figure 4 presents our bottom-up estimates of the long-term sustainable level of asset replacement expenditure for water for all participating companies (on an annual basis as a % of RCV<sup>36</sup>).

The darker green bars show the long-term sustainable level of asset replacement expenditure (i.e., the estimates which are directly calculated using the WICS approach) and, for better comparability with Ofwat’s allowances, the lighter green bars show the uplift required to capture the other (non-replacement) activities.

We observe the following:

- **Our bottom-up estimates of the long-term sustainable level of asset replacement expenditure alone are between 40% and 250% greater than Ofwat’s implicit allowances** (these are the estimates shown in the darker green bars). This indicates that current allowances are below the level required to fund a sustainable level of asset replacement expenditure in the long term (even before considering the other non-replacement activities

*refurbishment. This represents a replacement / refurbishment split of 68% / 32%. Therefore, to modify our bottom-up estimates to account for the missing refurbishment / repair expenditure, we would need to uplift them by 47% (=68%/32%). This will understate the required uplift since the data on replacement also includes the additional replacement of new assets (and not just the replacement of existing assets).*

<sup>35</sup> This is based on data provided to us by Anglian on its historical spending from 2020/21-2024/25.

<sup>36</sup> The RCV is the average over the 2025-30 period as reported in Ofwat’s ODI rates model. See: [PR24-FD-OC03-OD-rates-v2](#), Ofwat (December 2024); tab RCV.

expected to be covered within base capex). The range across individual companies is influenced by a number of factors including: (a) how they plan to allocate their allowances at PR24 (which influences the implicit base capex allowance); and (b) the scope and scale of their assets (which influences the long-term sustainable level of asset replacement expenditure); and (c) the extent to which allowances reflect their replacement costs (which additionally influences the gap). Nonetheless, for all companies, the estimated requirements are materially greater than current allowances.

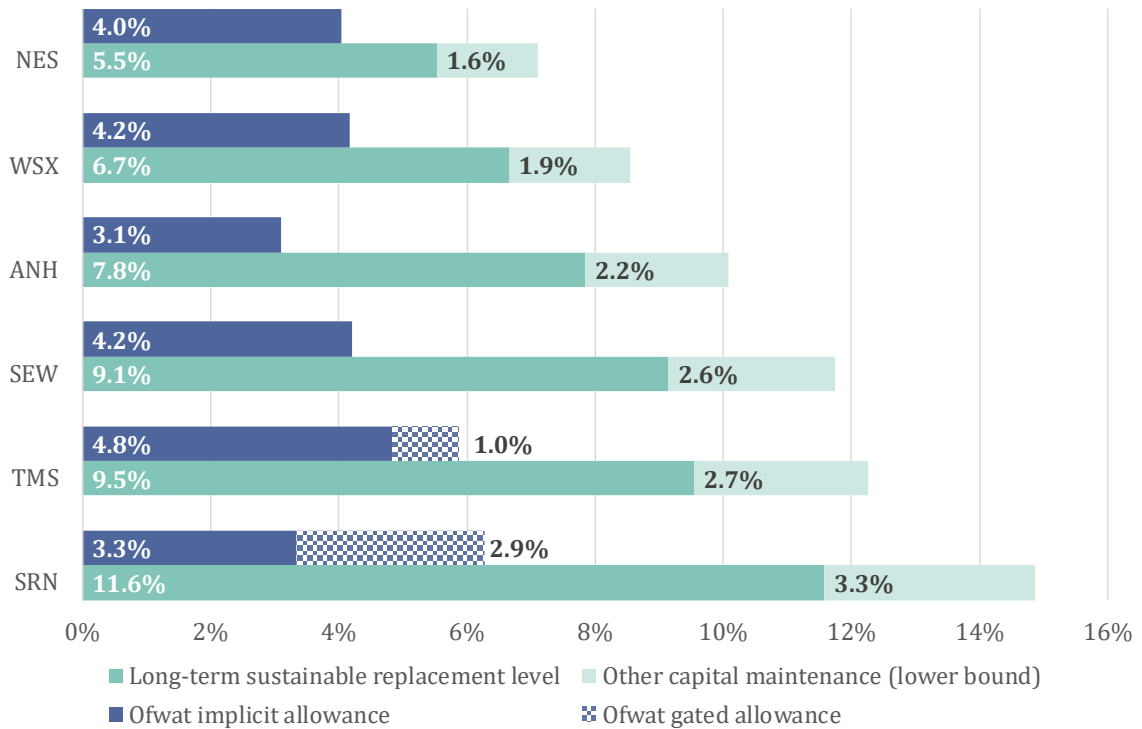
- **Our bottom-up estimates would be between 80% and 350% greater than Ofwat’s allowances if we uplifted them to capture the costs of the non-replacement activities for better comparability with Ofwat’s base capex allowances** (as shown in the lighter green bars). This further highlights the need for a material increase in investment to allow companies to maintain their assets on a sustainable basis.
- **The gap between Ofwat’s allowances and our bottom-up estimates is broadly consistent with the findings of WICS when it carried out a similar exercise for Scottish Water.**
  - Ahead of the Strategic Review of Charges (SRC) 2021-27, WICS estimated a long-term target range for the annual replacement cost of Scottish Water’s assets of between £743m and £922m<sup>37</sup> using the bottom-up approach. This represented an increase of 106% to 156% compared to the £361m<sup>38</sup> annual capital maintenance allowance provided in the previous price control (SRC 2015-2021).
  - Furthermore, the magnitude of our estimates (relative to RCV) is broadly consistent with WICS’ findings for Scottish Water. Our bottom-up results for the long-term sustainable asset replacement expenditure level range from 6% to 12% of RCV. While Scottish Water does not have an RCV under the currently regulatory regime, it does report the total value of its assets. Although this is not directly comparable to RCV, it provides a broad indication. WICS’ long-term target range for annual replacement expenditure represents between 9% and 12% of Scottish Water’s total asset value,<sup>39</sup> broadly in line with our bottom-up estimates for the participating companies.

<sup>37</sup> We have inflated the £620m-£770m reported by WICS from 2017-18 CPI prices to 2022-23 CPI prices. Source for WICS’ estimated long-term target range: ‘[Strategic review of charges 2021-27: draft determination](#)’, WICS (October 2020); page 68.

<sup>38</sup> We have inflated the £280m reported by WICS from 2012-13 CPI prices to 2022-23 CPI prices. Source for Scottish Water’s SRC 2015-21 capital maintenance allowance: ‘[Strategic review of charges 2015-21: final determination](#)’, WICS (May 2013); page 7.

<sup>39</sup> We use the average asset value from 2020-21 to 2024-25 as reported in Scottish Water’s annual reports. See: ‘[Annual reports](#)’, Scottish Water.

**Figure 4: Water assets** – the long-term sustainable level of asset replacement expenditure (% of RCV)



Source: Economic Insight analysis of data provided by companies, DDR data tables and Ofwat PR24 FD.

## Wastewater

Figure 5 presents our bottom-up estimates of the long-term sustainable level of asset replacement expenditure for wastewater for all participating companies, in the same format as the water results above (on an annual basis as a % of RCV).

We observe broadly consistent findings with the water results:

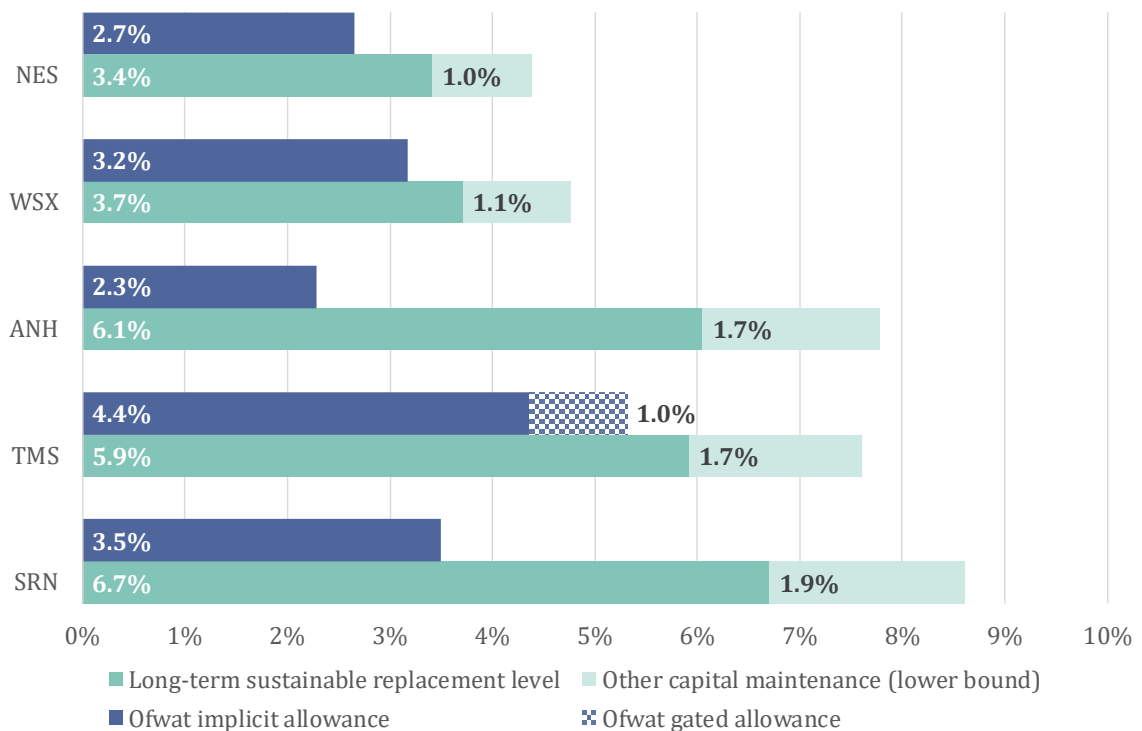
- Our bottom-up estimates of the long-term sustainable level of asset replacement expenditure alone are between 20% and 170%<sup>40</sup> greater than Ofwat’s implicit allowances** (these are the estimates shown in the darker green bars).<sup>41</sup> This indicates that current allowances are below the level required to fund a sustainable level of asset replacement expenditure in the long term (even before considering the other non-replacement activities expected to be covered within base capex).

<sup>40</sup> This may be an underestimate (particularly relative to the water results) because WICS classifies sewers as infinite-life assets (rather than replaceable assets like water mains). We understand from companies that, in practice, some sewers are being replaced and that the replacement costs exceed the historical refurbishment expenditure. We discuss this further in Chapter 3.

<sup>41</sup> As for the water results, the range across individual companies is influenced by a number of factors including: (a) how they plan to allocate their allowances at PR24 (which influences the implicit base capex allowance); and (b) the scope and scale of their assets (which influences the long-term sustainable level of asset replacement expenditure); and (c) the extent to which allowances reflect their replacement costs (which additionally influences the gap). Nonetheless, for all companies, the estimated requirements are materially greater than current allowances.

- **Our bottom-up estimates would be between 50% and 240% greater than Ofwat’s implicit allowances if we uplifted them to capture the costs of the non-replacement activities for better comparability with Ofwat’s base capex allowances** (as shown in the lighter green bars). While this increase is less substantial than the corresponding increase for water assets, it continues to highlight the need for a material increase in investment.
- **The gap between Ofwat’s allowances and our bottom-up estimates remains broadly consistent with the findings of WICS when it carried out a similar exercise for Scottish Water (106% to 156%).** Furthermore, the magnitude of our estimates of the long-term sustainable level of asset replacement expenditure (relative to RCV) is lower but still comparable to the WICS results (particularly given that Scottish Water does not have an RCV so we are using its total asset value as a proxy – meaning it is not a direct comparison). Our estimates of the long-term sustainable level of asset replacement expenditure range from 3% to 7% of RCV, compared to WICS’ long-term target range for annual replacement expenditure which represents between 9% and 12% of Scottish Water’s total asset value.

**Figure 5: Wastewater assets** – the long-term sustainable level of asset replacement expenditure (% of RCV)



Source: Economic Insight analysis of data provided by companies, DDR data tables and Ofwat PR24 FD.

## Business services

In addition to water and wastewater assets, companies must invest in maintaining business services assets such as fleet, facilities and estate, and digital assets. Therefore, to provide a more complete

view of the total long-term sustainable level of asset replacement expenditure, we have also calculated estimates for these assets.<sup>42</sup>

Table 3 presents our bottom-up estimates of the long-term sustainable level of asset replacement expenditure for the business service assets. There is significant variation in the magnitude of results across companies, which is primarily driven by differences in data availability as some companies were not able to provide data for all assets within the timeframe, since it was captured in different systems and/or held by different people. In other words, our estimates for some companies are much greater than others simply because the data captures a much greater proportion of their business service assets.

What is evident, however, is that for the companies with the most complete data, the long-term sustainable level of replacement expenditure required for business service assets is material (e.g., £91m per year for Anglian, and £95m per year for Thames). Since Ofwat does not set a separate allowance for the maintenance of business service assets, these costs must be funded within the base water and wastewater allowances (i.e., those we present in Figure 4 and Figure 5 above). This provides further indication that the current allowances are below the level required to support a sustainable level of asset replacement expenditure in the long term.

**Table 3:** Long-term sustainable level of asset replacement expenditure for business service assets

	TMS	ANH	SRN	SEW	NES	WSX
Long-term sustainable level of asset replacement expenditure	£95m	£91m	No data	£12m	£7m	£15m

**Source:** Economic Insight analysis of data provided by companies.

*Note: Values are in 2022-23 CPIH prices.*

## 2F Summary and key implications

In summary, our bottom-up estimates indicate that Ofwat's base cost allowances are materially lower than the level required to support a sustainable level of asset replacement expenditure in the long term (even before considering the other non-replacement activities expected to be covered within base capex).

The estimates rely on the quality of the underlying data provided by companies. We understand that the completeness and quality of this data vary between companies and across asset classes. As an example, companies typically have more confidence in asset lives for above-ground assets (such as civil assets) than below-ground assets (such as main pipes). Likewise, replacement costs are more likely to be accurate where the asset has an established history of replacement (and, therefore, sufficient historical data on replacement costs is available).

However, our overall conclusion that current allowances are materially lower than requirements and the magnitude of the difference is broadly in line with WICS' findings when it performed the same exercise for Scottish Water (as are the magnitude of our bottom-up estimates relative to RCV).

<sup>42</sup> Specifically, we have included the following asset categories (consistent with the categories from Scottish Water's annual return): (i) vehicles (fleet); (ii) digital assets; (iii) facilities and estate; (iv) renewable energy; (v) scientific services; and (vi) transformation.

Furthermore, as we explain in Annex 2, we find that our main findings (i.e., the extent of gap between Ofwat's allowances and our estimates) are robust to a range of sensitivity analyses where we standardise asset lives and/or unit replacement costs across companies (including using the asset lives that WICS reported for Scottish Water).

In the next chapter, we explain that bottom-up results are likely an underestimate of the true requirements, and that this is consistent with the view WICS reached when it conducted the same exercise for Scottish Water.

# 3

## FUTURE IMPROVEMENTS

The WICS approach provides a pragmatic starting point for considering sustainable asset replacement expenditure needs – but is not without limitations. For example, we consider that our bottom-up results are likely an underestimate of companies’ true requirements (e.g., due to the exclusion of refurbishment expenditure). This conclusion is consistent with the view WICS reached when it conducted the same exercise for Scottish Water.

## 3A

## Chapter structure

In this report, we follow the bottom-up approach developed by WICS to estimate the long-term sustainable level of asset replacement expenditure for participating companies. This approach has the benefit of being developed with care by another regulator facing similar considerations and results in estimates that are reflective of each company's current asset base. This provides a pragmatic starting point for considering sustainable asset replacement expenditure needs, and it demonstrates that substantially more asset replacement expenditure is needed for long-term sustainability.

However, the WICS approach is only designed to capture asset replacement expenditure, and a more comprehensive bottom-up assessment would capture additional elements. As we explain below, this among other factors, leads us to consider the estimates we present in this report likely understate companies' true requirements (particularly when they are compared to Ofwat's base capex allowances, which cover more activities than just replacement). This conclusion is consistent with the view WICS reached when it conducted this exercise for Scottish Water: "[t]he Commission also notes that Scottish Water's assessment of its total asset replacement liability is more likely to understate than overstate the likely requirement."<sup>43</sup>

This chapter discusses how the WICS approach compares to other bottom-up approaches, before considering how it could be refined for future analysis. It is structured as follows:

- In Section 3B, we discuss the benefits and drawbacks of the WICS approach relative to other bottom-up approaches (in particular, NARM).
- In Section 3C, we discuss how the scope of the WICS approach could be expanded to provide a more comprehensive assessment.
- In Section 3D, we consider other ways in the WICS approach could be further refined for future analysis.

## 3B

## Key benefits and drawbacks of the WICS approach relative to other bottom-up approaches

A key drawback of bottom-up approaches, relative to top-down approaches, such as econometric benchmarking, is that they are inherently more data intensive. For example, the WICS methodology requires detailed information on each companies' asset stocks, asset lives and replacement costs. This information is currently not consistently available across all asset classes and companies. Data quality across the industry varies across different asset classes, which makes the implementation of bottom-up approaches more challenging in practice (particularly for certain asset classes). For example, we understand companies generally have lower confidence in installation dates and condition for below-ground assets. There are also greater gaps in available data for certain asset classes such as business services.

Furthermore, to the extent that the regulator required all companies to provide all data on asset stocks, asset lives and replacement costs for a consistent set of asset categories, achieving this level of

<sup>43</sup> '2019 Decision Paper: Asset replacement.' WICS (July 2019); page 41.

consistency adds further complexity. However, we note that ongoing industry work towards a common asset classification system should facilitate this in the future.

Even within bottom-up approaches the data requirements – and other benefits and drawbacks – can vary significantly. Risk-based approaches like NARM are considerably more data intensive than the WICS approach as, for example, they also require detailed data on asset condition. We understand that such data is less consistently available across companies and is expensive and time-consuming to collect (as the ICS report explains<sup>44</sup>). In contrast, the analysis in this report demonstrates that the WICS approach can be implemented using asset data that is currently available across companies, making it a pragmatic and proportionate method for conducting a bottom-up assessment.

The WICS approach is also relatively simple and transparent compared to other bottom-up approaches, avoiding the complexity associated with monetised risk metrics such as NARM. This can make it easier for stakeholders to understand and therefore may be more readily accepted.

A further benefit of the WICS approach is that it facilitates the replacement of assets broadly in line with their reasonable asset lives. We consider that, whatever approach (or combination of approaches) is ultimately used to assess asset maintenance requirements, it should ensure that assets are replaced at a rate broadly in line with their expected lives – for example, if a water main with an expected life of around 100 years was only being replaced every 500 years, then this would raise concerns about the long-term sustainability of the asset base. Focusing on asset life expectancy in this way also has the benefit of minimising the need for more subjective assessments, such as asset condition data, which would be required under risk-based approaches like NARM.

However, the WICS approach also has limitations relative to risk-based bottom-up approaches like NARM. In particular, the above also means that a key drawback of the WICS approach is that, by design, it does not reflect important factors (such as the asset condition and usage metrics) that affect asset replacement and investment needs. Therefore, there may be value in considering these approaches alongside each other, to reach better conclusions on asset investment needs.

Furthermore, as we explain in more detail below, the WICS approach does not capture some elements of asset maintenance expenditure (such as refurbishment expenditure) that would be captured by a more comprehensive bottom-up assessment. This is, in part, by design as the WICS approach only aims to capture asset replacement expenditure. As a result, the estimates in this report are likely to understate companies' true requirements. We discuss how the WICS approach could be expanded to provide a more comprehensive assessment in the next section.

### 3C How the WICS approach could be expanded to provide a more comprehensive bottom-up assessment

To provide a more comprehensive assessment, the WICS approach could be expanded to cover the following factors:

- **Refurbishment/maintenance/repair expenditure required to operate assets over their reasonable asset lives.** As we describe in Section 2D, the WICS approach does not consider refurbishment expenditure for *replaceable* assets (i.e., those not considered infinite-life by WICS). We illustrate in Section 2E that these costs are material by showing the effect of adjusting our bottom-up estimates to account for them. Future analysis could expand the

<sup>44</sup> *Network Asset Risk Metrics (NARM) Pilot Exploration*, ICS (October 2025); page 7.

bottom-up assessment to capture these costs on an asset-by-asset basis, similar to how replacement costs are currently estimated.

- **Growth of asset base** (i.e., replacement costs for assets that will be added in the future). Enhancement expenditure will increase the size of the asset base and, consequently, the long-term sustainable level of asset replacement expenditure (as there are more assets to replace). Future analysis could expand the bottom-up assessment to include estimates for these additional assets.
- **Historical refurbishment expenditure for the infinite-life assets (e.g., dams and impounding reservoirs) may have been suboptimal historically.** As we explain in Section 2B, for these assets, we assume historical expenditure reflects future requirements. However, if historical expenditure has been suboptimal (e.g., as a result of insufficient historical allowances), then this will understate the long-term sustainable level. Future analysis could compare historical expenditure on such assets with benchmarks from other countries or UK sectors (e.g., utilities), applying an uplift where necessary.
- **Some assets classified as infinite-life assets by the WICS methodology may require replacement in practice.** We understand from some companies that, in practice, some assets that WICS classifies as infinite-life are currently being replaced or will need replacing in the near future (such as gravity sewers). The replacement costs for these assets exceeds the historical refurbishment expenditure. Future analysis could identify these assets and include their costs in the replacement expenditure estimates, similar to the treatment of non-infinite-life assets.
- **The full scope of assets.** We adopted a proportionate approach to data collection, prioritising the most material asset categories (which, we understand all companies were able to provide). However, we understand that not all companies were able to provide data for some of the less material asset categories. This particularly affects the business services category, as we explain in Section 2E. The absence of these categories means the results are likely to understate the true level of need. We also understand that companies made reasonable assumptions where necessary to provide data that was otherwise unavailable. Where gaps remain, as we explain in Section 2C, we took a proportionate approach by using the information available from the other participating companies. Future analysis could expand the data collection to cover the full scope of assets (including the less material categories).
- **Future replacement costs may be higher than historical replacement costs.** For example, WICS note that:<sup>45</sup>
  - Regulations could be introduced in the future (e.g., relating to the environment, safety and noise or carbon emissions) that may increase future replacement costs for companies. For example, we understand that companies are now required by the Environmental Agency to meet higher standards when replacing the UV disinfection plant in coastal water recycling centres.
  - Increased urbanisation may increase future replacement costs. For example, if areas that are currently more rural become more urbanised in the future, the cost of replacing assets in those areas may increase.

<sup>45</sup> These limitations were recognised by WICS when it conducted the same exercise for Scottish Water. See: '[2019 Decision Paper: Asset replacement](#)', WICS (July 2019); page 29.

## 3D

## Other refinements to the WICS methodology

In addition to expanding the WICS approach to cover the factors we describe above, there are other refinements that could be made to the methodology:

- **Altering replacement costs to factor in the development of new technology.** Future replacement costs may be higher if older assets are replaced by more expensive, high-tech assets (e.g., electric vehicles replacing diesel vehicles). Conversely, the use of new technology may reduce the cost of building assets, which would reduce future replacement costs.
- **Assuring company estimates of replacement costs.** For the purposes of this analysis, we have relied on replacement costs provided by the companies. If regulatory authorities in England and Wales were planning to use this approach to set companies' allowances in the same way that WICS does in Scotland, they could be improved with third-party assurance. However, we understand that companies based their estimates on varying levels of detailed engineering and costing information, gathered using historical experience and market testing, which are used internally to plan capex needs. Furthermore, as we explain in Annex 2, we find that our main findings (i.e., the extent of gap between Ofwat's allowances and our estimates) are robust to a range of sensitivity analyses where we standardise asset lives and unit replacement costs across companies (including using the asset lives that WICS reported for Scottish Water).
- **Standardising at a more granular level.** As we explain in Annex 2 when conducting our sensitivity analyses, standardising across companies is inherently challenging because each of the companies are intrinsically different and face unique circumstances. For example, larger companies may have larger more expensive assets within a given asset category. Other companies may face different costs or have different asset lives due to the region they operate in (e.g., we understand that Thames may have to replace its pipes more frequently than other companies due to the higher corrosive sulphur content of London clay soil). This means that companies face genuine differences in asset lives and replacement costs which are not captured by our data. Future analysis could collect more granular data on asset characteristics to enable a more comprehensive standardisation between companies where it is sensible to do so. As mentioned above, we understand that ongoing industry work towards a common asset classification system should facilitate this in the future.
- **Consistency of mapping to asset categories.** As we describe in Chapter 2, we took steps to promote consistent asset mapping across companies, including: (i) issuing guidance, including a regularly updated FAQ document to address any questions raised during the data collection process; (ii) holding weekly meetings with company data leads to reach common decisions on any areas of ambiguity; and (iii) reviewing high-level statistics (e.g., asset stock counts, replacement costs, unit costs) for the most material asset categories to check for any inconsistency. However, future analysis could benefit from a more comprehensive review of each company's mapping (e.g., reviewing the mapping on an asset-by-asset basis).

# 4

## ANNEX 1: IMPLICIT ALLOWANCE

This annex explains that we estimate the level of capex implicitly included within Ofwat's FD base cost allowances, by applying the capex share of requested base costs (from companies' Draft Determination representations – DDRs) to Ofwat's FD base cost allowances. This is consistent with the approach Ofwat uses in its financial models.

## 4A Chapter structure

This annex describes how we have estimated the level of capex implicitly included within Ofwat's FD base costs allowances. It is structured as a single section (Section 4B).

## 4B We estimated the level of capex implicitly included within Ofwat's allowances

As we explain in Section 2D, to contextualise the magnitude of our estimates, we compare them to Ofwat's allowances. However, in practice, it has not been possible to do a like-for-like comparison, since Ofwat does not identify how much of its allowances are intended to cover replacement activities. The closest comparison to our bottom-up estimates of the long-term sustainable level of asset replacement expenditure possible with available data is Ofwat's implicit base capex allowances. As we explain below, we estimate this in line with Ofwat's approach in its financial models.

Ofwat does not explicitly provide an allowance for asset replacement in its price control process as it follows a totex regime, providing a single totex allowance that companies can choose how to distribute across their operations. Therefore, we have estimated the *implicit* level of capex funded by Ofwat's FD base cost allowances. We estimate this by applying the capex share of *requested* base costs (from companies' Draft Determination representations – DDRs) to Ofwat's FD base cost allowances:

- We took each company's requested base capex and opex from their DDRs.<sup>46</sup> These requests were inclusive of CACs.
- We used this data to estimate the share of requested base costs (inclusive of CACs) that is attributable to capex.
- We then applied this capex share to Ofwat's FD base cost allowances (inclusive of CACs)<sup>47</sup> to estimate the implicit level of base capex funded by Ofwat's FD allowances (i.e., 'Ofwat's implicit base capex allowance').

This approach is similar to that which Ofwat follows in its 'Opex capex split model'.<sup>48</sup> A key difference is that we use the allowances before real price effects (RPEs) and frontier shift (ongoing efficiency) are applied. This is so that the implicit allowances are more comparable to our bottom-up estimates – which do not embed any RPEs or ongoing efficiency improvements because they are based solely on historical data.

For Thames, we present the implicit allowances with and without the '*Thames Water Asset Improvement Gated Allowance*'. At FDs, Ofwat recognised the need for Thames to address its 'asset deficit' in the short-term, and has provided a gated allowance for this purpose – stating it would allow "*an additional £1 billion of customer funding for Thames Water to improve performance of its water and wastewater assets beyond historical levels to address its 'asset deficit'*".<sup>49</sup>

<sup>46</sup> The requests were sourced from company DDR data tables. We used the 'CW2' and 'CWW2' tables for water and wastewater respectively.

<sup>47</sup> We sourced Ofwat's FD allowances (before frontier shift and RPEs) from its FD model: 'Expenditure allowances summary tables'. See: '[Expenditure allowances summary tables](#)', Ofwat (December 2024).

<sup>48</sup> See: '[Opex capex split model](#)', Ofwat (December 2024).

<sup>49</sup> '[Expenditure allowances – Thames Water asset improvement gated allowance appendix](#)', Ofwat (December 2024); page 1.

For Southern, we present the implicit allowances both with and without its '*Resilience enhancement investment*' allowance for upgrading five water treatments works (WTWs). Although Ofwat categorises this as enhancement expenditure, rather than base, it relates to replacing WTWs and, therefore, we consider that it is comparable to our bottom-up estimates of asset replacement expenditure.

For consistency with other companies, and because gated allowances are targeted to fill short-term gaps (and, even so, carry more risk of whether or not they will ultimately be allowed), we have compared our bottom-up estimates for Thames and Southern to Ofwat's implicit base capex allowances (i.e., not including the gated allowances).

# 5

## ANNEX 2: SENSITIVITY ANALYSES

To test the robustness of our bottom-up estimates, we have conducted a range of sensitivity analyses where we standardise the asset lives and/or unit replacement costs across companies. We find that our overall conclusions (i.e., the extent of gap between Ofwat's allowances and our estimates) are robust to this standardisation process.



## Chapter structure

The estimates we present in the Chapter 2 are currently based on internal company data, using each company's own estimates of their asset stock; asset lives and asset replacement costs (or, in the case of assets defined as infinite-life by WICS, historical refurbishment expenditure). Therefore, if regulatory authorities in England and Wales were planning to use this approach to set companies' allowances in the same way that WICS does in Scotland, they could be improved with third-party assurance. Nevertheless, as we explain in this annex, we find that our main findings (i.e., the extent of gap between Ofwat's allowances and our estimates) are robust to sensitivity checks.

Specifically, with the benefit of having similar information across the six participating companies, we have tested the robustness of our results by conducting a range of sensitivity analyses where we standardise asset lives and/or unit replacement costs across companies (i.e., if reasonable asset lives and/or unit replacement costs for similar assets were common across companies).

In practice, we found that there are inherent challenges in standardising across companies – namely, that each of the companies are intrinsically different and face unique circumstances (e.g., varying scale and scope of assets; operating circumstances; and understanding of their assets) which this data does not capture. For example, we understand that Thames may have to replace its pipes more frequently than other companies due to the higher corrosive sulphur content of London clay soil (and faces additional costs associated with working in a dense urban area).

Estimating results on a standardised basis is made even more challenging because we only have data for six companies. One way to address the variation in company-specific circumstances when standardising could be to group companies with broadly comparable characteristics. However, with only six participants, identifying appropriate comparators is often difficult. For example, Thames has a water RCV of nearly twice the size of the next largest company, making it difficult to find a comparator of a similar scale.

The problem is further exaggerated because the WICS' sub asset categories necessarily use averages and, therefore, could reflect different asset types between companies (e.g., the sub asset category 'Water treatment works MEICA' contains a range of assets such as filters, batteries, generators etc).

Nonetheless, recognising the limits of comparability and given the inherent challenges in standardising across companies, we have carried out a range of sensitivity analyses to test the robustness of our results. This annex describes the method and results for our sensitivity analyses. It is structured as follows:

- First, reflecting that reasonable asset lives of similar assets could be similar across the industry, we standardise the asset lives across companies. We follow two different approaches:
  - **Sensitivity 1: we use the median asset lives** across all participating companies for each sub asset category, and the company-specific estimates of replacement costs. We present these results in Section 5B.
  - **Sensitivity 2: we use the asset lives reported by Scottish Water<sup>50</sup>** in its annual return<sup>51</sup> for each sub asset category, and the company-specific estimates of replacement costs. We present these results in Section 5C.

<sup>50</sup> Where these are unavailable for a particular sub asset category, we use the median asset life across all companies instead.

<sup>51</sup> '2023-24 Annual Return: G tables'. Scottish Water (December 2024); tab 'G2 – Replacement'.

- Then, for **sensitivity 3**, reflecting that unit replacement costs for similar assets could also be similar across the industry, **we additionally standardise the unit replacement costs**<sup>52</sup> across companies using the median across all participating companies. We present these results in Section 5D.
- Finally, for **sensitivity 4**, since there is a wide variation of the kinds of companies in our data (and, therefore, the nature of their assets), **we standardise the asset lives and unit replacement costs across companies with comparable RCVs**. The rationale for this approach is that companies with similar RCVs are of a similar scale and, therefore, can be expected to have assets of a similar scale. We recognise that this is necessarily an approximation and does not capture other company-specific or regional factors (such as operating circumstances). We present these results in Section 5E.

While we do not advise relying on the precise estimates from these analyses (due to the inherent challenges with the standardisation process described above), we find that our overall findings (i.e., the extent of gap between Ofwat's allowances and our estimates) are robust to this standardisation process, across all above specifications.

## 5B Sensitivity 1: Using the median asset lives

In this section, we present the results of our first sensitivity, which uses the median asset life (across all companies) for each sub asset category, and the company-specific estimates of replacement costs. There are two exceptions to this standardisation approach (for this sensitivity and those that follow):

- **Categories containing miscellaneous assets are not comparable across companies, so we use the company-specific estimates for these categories.**
  - Even for our standardised results, we have used company-specific unit costs and asset lives for categories which capture miscellaneous assets<sup>53</sup> (i.e., those not classified elsewhere). This is because there is a substantial variation in the types of assets companies were able to record under these categories. This means that the unit costs and asset lives are not likely to be comparable across companies, which limits the extent to which any standardised results would be reliable. For the same reasoning, we have not attempted to estimate any missing values for these assets.
  - Similarly, in a few specific cases<sup>54</sup> we observed that certain companies had materially lower unit replacement costs for certain asset categories than others. Therefore, to be conservative and recognising the necessary limits of comparability, we use the company-specific replacement costs for these assets.
- **We use a company-specific adjustment to estimate standardised water mains replacement costs for Thames.**

<sup>52</sup> We also standardise unit refurbishment costs for infinite-life assets in the same way as replacement costs for this sensitivity and the subsequent sensitivity.

<sup>53</sup> Out of the sub asset categories presented in Annex 3 the categories which capture miscellaneous assets are: (i) ancillaries; (ii) other (under business services); and (iii) water network ancillaries.

<sup>54</sup> 'Water distribution mains <300mm' and 'Water treatment works MEICA' for Northumbrian; and 'Wastewater treatment works civils' and 'Sewers' for Anglian.

- As we describe above, we understand from Thames that it faces genuinely higher replacement costs for water mains than other companies. We understand this is primarily due to the additional challenges and costs associated with operating in a dense urban region.
- Therefore, to ensure that Thames' standardised water mains replacement costs accurately reflect the long-term sustainable level, we have taken a company-specific approach – this is particularly important given that water mains represent one of the most material asset categories for the water service. However, to remain conservative, rather than using Thames' estimates of the unit costs we adjust for an efficiency challenge (reflecting the average efficiency challenge imposed on other companies). More specifically:
  - (i) We calculate the percentage change between the standardised unit costs and company-specific unit costs for the relevant water mains categories<sup>55</sup> for all companies (excluding Thames).
  - (ii) We calculate the median percentage change for each water mains category.
  - (iii) We reduce Thames' unit costs by this median percentage change.

Below, we report the bottom-up estimates under sensitivity 1 for water and wastewater assets in turn.

## Water

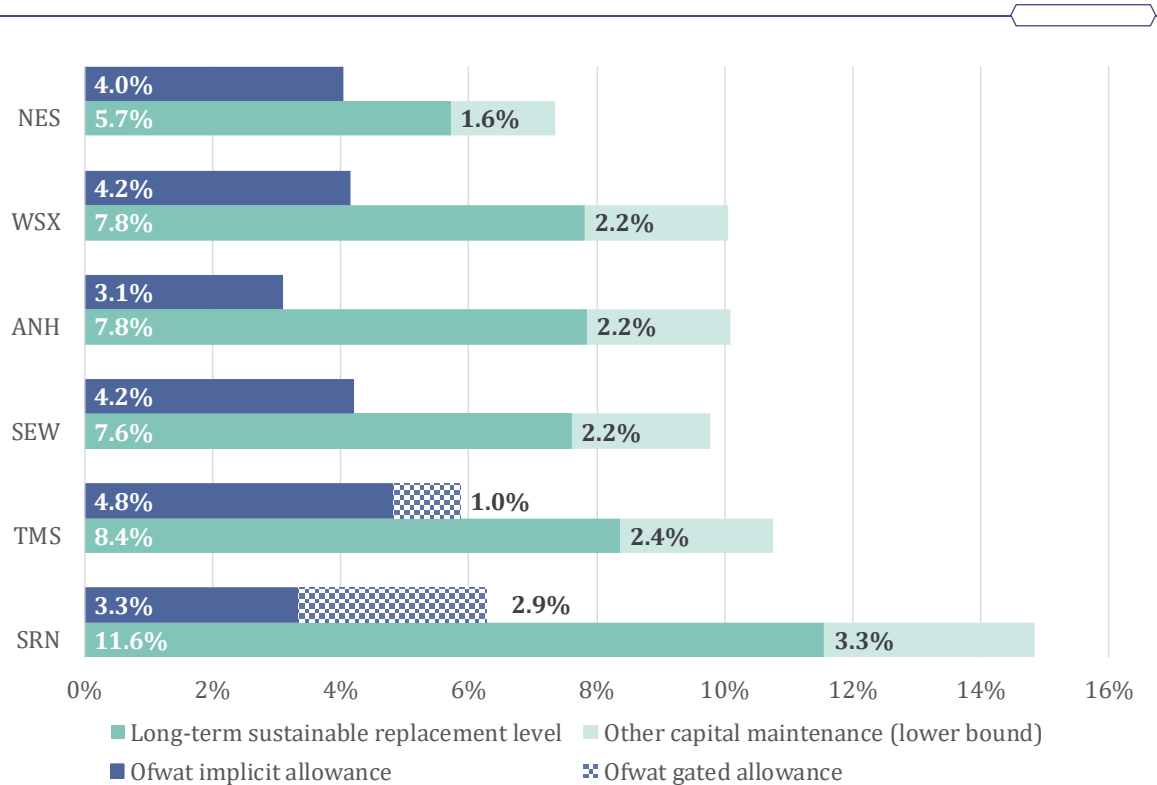
Figure 6 presents the estimates of the long-term sustainable level of asset replacement expenditure for each company's water assets under the sensitivity 1 (in the same format as the results from Chapter 2). Consistent with the results from Chapter 2, we observe that:

- **Our bottom-up estimates of the long-term sustainable level of asset replacement expenditure alone are between 40% and 250% greater than Ofwat's implicit allowances** (these are the estimates shown in the darker green bars). This indicates that current allowances are below the level required to fund a sustainable level of asset replacement expenditure in the long term (even before considering the other non-replacement activities expected to be covered within base capex).
- **Our bottom-up estimates would be between 80% and 340% greater than Ofwat's allowances if we uplifted them to capture the costs of the non-replacement activities for better comparability with Ofwat's base capex allowances** (as shown in the lighter green bars). This further highlights the need for a material increase in investment to allow companies to maintain their assets on a sustainable basis.
- **The gap between Ofwat's allowances and our bottom-up estimates remains broadly consistent with the findings of WICS when it carried out a similar exercise for Scottish Water (106% to 156%).** Furthermore, the magnitude of our estimates (relative to RCV) is comparable to the WICS results. Our estimates of the long-term sustainable level of asset replacement expenditure range from 6% to 12% of RCV. In comparison, WICS' long-term target range for annual replacement expenditure represents between 9% to 12% of Scottish Water's

<sup>55</sup> We made the adjustments only to: (i) Water trunk mains > 300mm; and (ii) Water distribution mains < 300mm. This is because these were the two sub asset categories where we understand Thames faces materially high unit replacement costs than the other companies. For the other water mains categories, we follow the same standardisation approach we use for other companies and asset categories (i.e., using the median unit replacement cost across firms of a similar RCV to Thames as set out in Section 5E).

total asset value (noting that Scottish Water does not have an RCV so we are using its total asset value as a proxy – while this is not directly comparable to RCV, it provides a reasonable indication).

**Figure 6: Water assets** – the long-term sustainable level of asset replacement expenditure under sensitivity 1 (% of RCV)



Source: Economic Insight analysis of data provided by companies, DDR data tables and Ofwat PR24 FD.

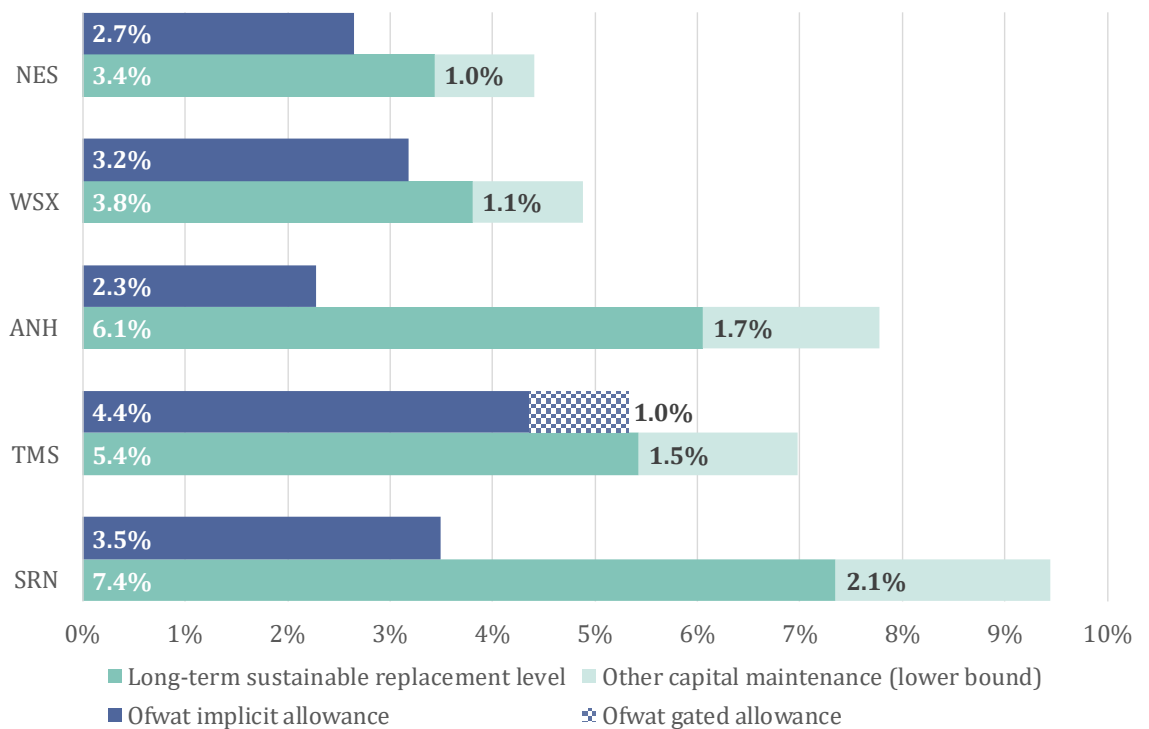
## Wastewater

Figure 7 presents the estimates of the long-term sustainable level of asset replacement expenditure for each company’s wastewater assets under the sensitivity 1 (in the same format as the results above). Consistent with the results from Chapter 2, we observe that:

- **Our bottom-up estimates of the long-term sustainable level of asset replacement expenditure alone are between 20% and 170% greater than Ofwat’s implicit allowances** (these are the estimates shown in the darker green bars). This indicates that current allowances are below the level required to fund a sustainable level of asset replacement expenditure in the long term (even before considering the other non-replacement activities expected to be covered within base capex).
- **Our bottom-up estimates would be between 60% and 240% greater than Ofwat’s implicit allowances if we uplifted them to capture the costs of the non-replacement activities for better comparability with Ofwat’s base capex allowances** (as shown in the lighter green bars). This further highlights the need for a material increase in investment to allow companies to maintain their assets on a sustainable basis.

- The gap between Ofwat’s allowances and our bottom-up estimates remains broadly consistent with the findings of WICS when it carried out a similar exercise for Scottish Water (106% to 156%).** Furthermore, the magnitude of our estimates of the long-term sustainable level of asset replacement expenditure (relative to RCV) is lower but still comparable to the WICS results (particularly given that Scottish Water does not have an RCV so we are using its total asset value as a proxy – meaning it is not a direct comparison). Our estimates of the long-term sustainable level of asset replacement expenditure range from 3% to 7% of RCV, compared to WICS’ long-term target range for annual replacement expenditure which represents between 9% and 12% of Scottish Water’s total asset value.

**Figure 7: Wastewater assets** – the long-term sustainable level of asset replacement expenditure under sensitivity 1 (% of RCV)



**Source:** Economic Insight analysis of data provided by companies, DDR data tables and Ofwat PR24 FD.

## 5C

## Sensitivity 2: Using Scottish Water's asset lives

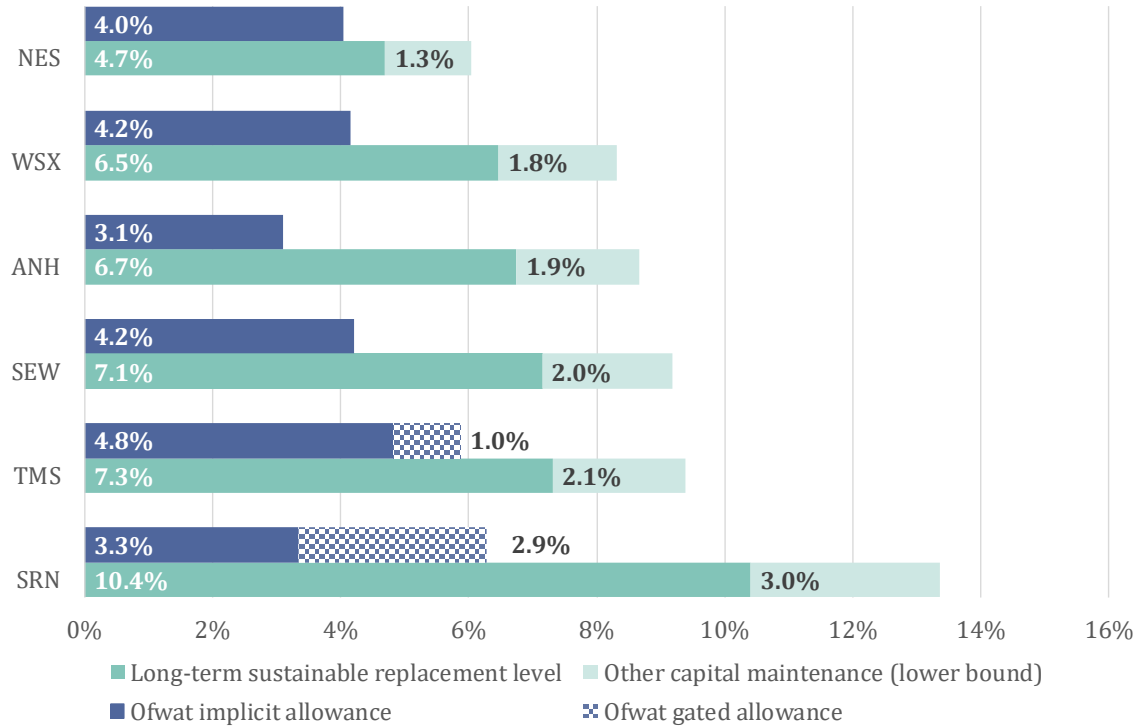
In this section, we present the results of our second sensitivity, which uses Scottish Water's asset lives for each sub asset category, and the company-specific estimates of replacement costs. We report the estimates for water assets and wastewater assets in turn.

### Water

Figure 8 presents the estimates of the long-term sustainable level of asset replacement expenditure for each company's water assets under the sensitivity 2 (in the same format as the results above). Consistent with the results from Chapter 2, we observe that:

- **Our bottom-up estimates of the long-term sustainable level of asset replacement expenditure alone are between 20% and 210% greater than Ofwat's implicit allowances** (these are the estimates shown in the darker green bars). This indicates that current allowances are below the level required to fund a sustainable level of asset replacement expenditure in the long term (even before considering the other non-replacement activities expected to be covered within base capex).
- **Our bottom-up estimates would be between 50% and 300% greater than Ofwat's allowances if we uplifted them to capture the costs of the non-replacement activities for better comparability with Ofwat's base capex allowances** (as shown in the lighter green bars). This further highlights the need for a material increase in investment to allow companies to maintain their assets on a sustainable basis.
- **The gap between Ofwat's allowances and our bottom-up estimates remains broadly consistent with the findings of WICS when it carried out a similar exercise for Scottish Water (106% to 156%).** Furthermore, the magnitude of our estimates (relative to RCV) is comparable to the WICS results. Our estimates of the long-term sustainable level of asset replacement expenditure range from 5% to 10% of RCV. In comparison, WICS' long-term target range for annual replacement expenditure represents between 9% to 12% of Scottish Water's total asset value (noting that Scottish Water does not have an RCV so we are using its total asset value as a proxy – while this is not directly comparable to RCV, it provides a reasonable indication).

**Figure 8: Water assets** – the long-term sustainable level of asset replacement expenditure under sensitivity 2 (% of RCV)



Source: Economic Insight analysis of data provided by companies, DDR data tables and Ofwat PR24 FD.

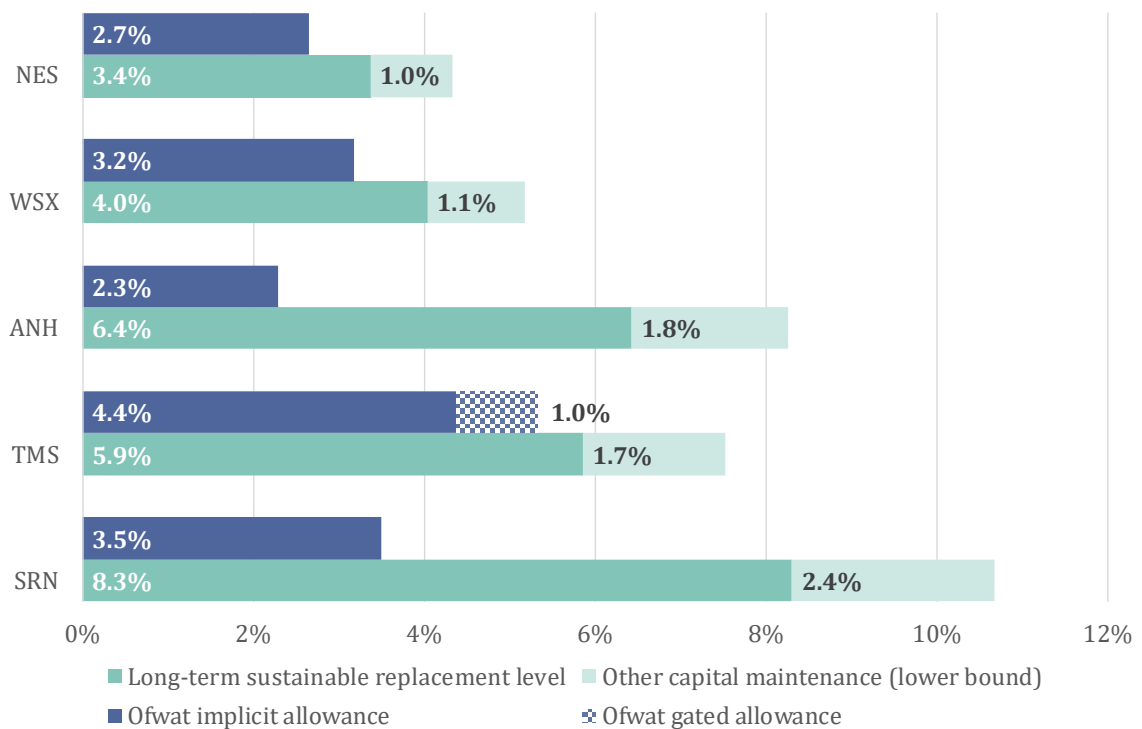
## Wastewater

Figure 9 presents the estimates of the long-term sustainable level of asset replacement expenditure for each company's wastewater assets under the sensitivity 2 (in the same format as the results above). Consistent with the results from Chapter 2, we observe that:

- **Our bottom-up estimates of the long-term sustainable level of asset replacement expenditure alone are between 30% and 180% greater than Ofwat's implicit allowances** (these are the estimates shown in the darker green bars). This indicates that current allowances are below the level required to fund a sustainable level of asset replacement expenditure in the long term (even before considering the other non-replacement activities expected to be covered within base capex).
- **Our bottom-up estimates would be between 60% and 260% greater than Ofwat's implicit allowances if we uplifted them to capture the costs of the non-replacement activities for better comparability with Ofwat's base capex allowances** (as shown in the lighter green bars). This further highlights the need for a material increase in investment to allow companies to maintain their assets on a sustainable basis.
- **The gap between Ofwat's allowances and our bottom-up estimates remains broadly consistent with the findings of WICS when it carried out a similar exercise for Scottish Water (106% to 156%).** Furthermore, the magnitude of our estimates of the long-term sustainable level of asset replacement expenditure (relative to RCV) is lower but still

comparable to the WICS results (particularly given that Scottish Water does not have an RCV so we are using its total asset value as a proxy – meaning it is not a direct comparison). Our estimates of the long-term sustainable level of asset replacement expenditure range from 3% to 8% of RCV, compared to WICS’ long-term target range for annual replacement expenditure which represents between 9% and 12% of Scottish Water’s total asset value.

**Figure 9: Wastewater assets** – the long-term sustainable level of asset replacement expenditure under sensitivity 2 (% of RCV)



Source: Economic Insight analysis of data provided by companies, DDR data tables and Ofwat PR24 FD.

## 5D Sensitivity 3: Using median asset lives and median replacement costs

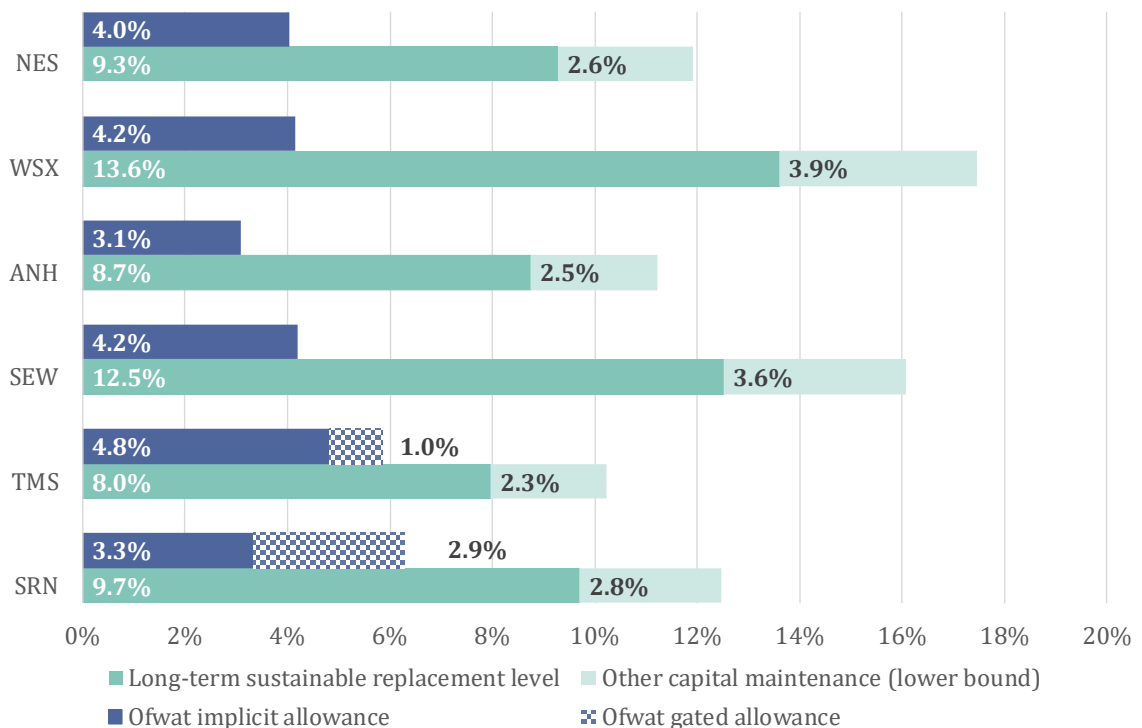
In this section, we present the results of our third sensitivity, which, as well as standardising asset lives across companies (like the first two sensitivities), also standardises unit replacement costs. Specifically, for this sensitivity, we standardise by using the median asset life (across all companies), and the median replacement costs (across all companies) for each sub asset category. We report the estimates for water assets and wastewater assets in turn.

### Water

Figure 10 presents the estimates of the long-term sustainable level of asset replacement expenditure for each company’s water assets under sensitivity 3 (in the same format as the results above). Consistent with the results from Chapter 2, we observe that:

- **Our bottom-up estimates of the long-term sustainable level of asset replacement expenditure alone are between 60% and 230% greater than Ofwat’s implicit allowances** (these are the estimates shown in the darker green bars). This indicates that current allowances are below the level required to fund a sustainable level of asset replacement expenditure in the long term (even before considering the other non-replacement activities expected to be covered within base capex).
- **Our bottom-up estimates would be between 100% and 320% greater than Ofwat’s allowances if we uplifted them to capture the costs of the non-replacement activities for better comparability with Ofwat’s base capex allowances** (as shown in the lighter green bars). This further highlights the need for a material increase in investment to allow companies to maintain their assets on a sustainable basis.
- **The gap between Ofwat’s allowances and our bottom-up estimates remains broadly consistent with the findings of WICS when it carried out a similar exercise for Scottish Water (106% to 156%).** Furthermore, the magnitude of our estimates (relative to RCV) is comparable to the WICS results. Our estimates of the long-term sustainable level of asset replacement expenditure range from 8% to 14% of RCV. In comparison, WICS’ long-term target range for annual replacement expenditure represents between 9% to 12% of Scottish Water’s total asset value (noting that Scottish Water does not have an RCV so we are using its total asset value as a proxy – while this is not directly comparable to RCV, it provides a reasonable indication).

**Figure 10: Water assets** – the long-term sustainable level of asset replacement expenditure under sensitivity 3 (% of RCV)



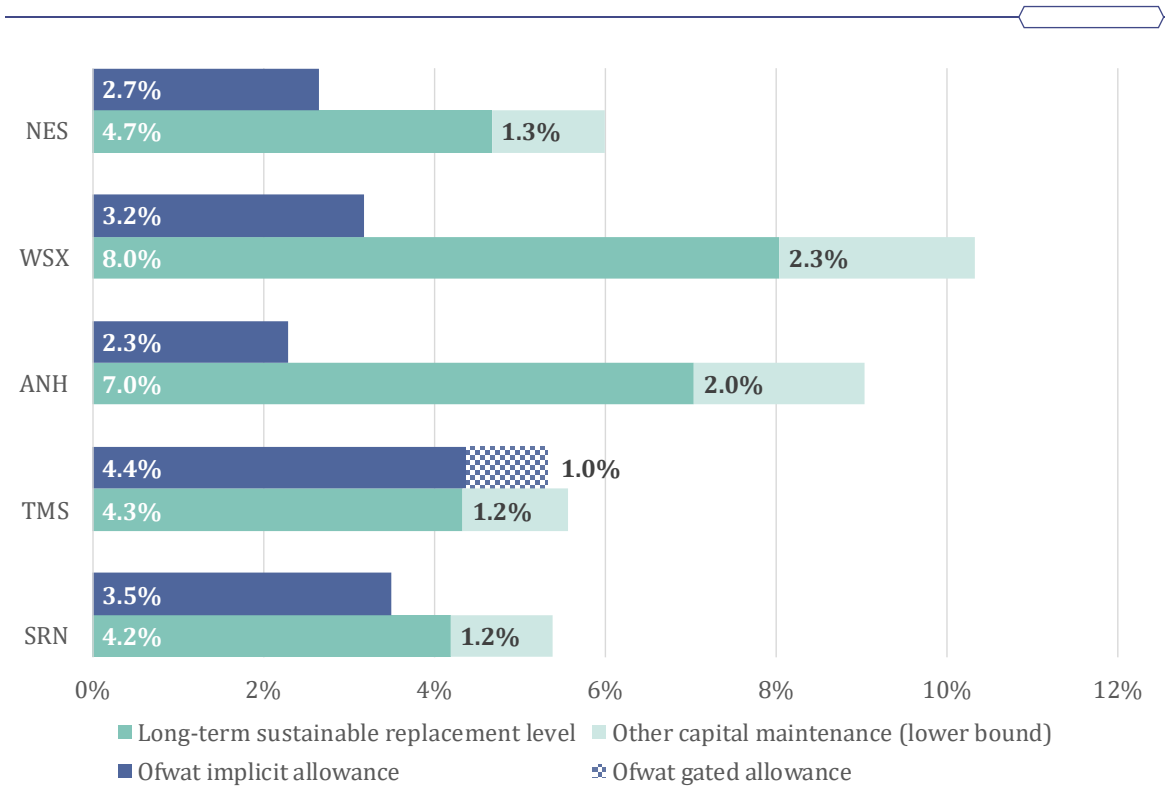
Source: Economic Insight analysis of data provided by companies, DDR data tables and Ofwat PR24 FD.

## Wastewater

Figure 11 presents the estimates of the long-term sustainable level of asset replacement expenditure for each company's wastewater assets under the sensitivity 3 (in the same format as the results above). Broadly consistent with the results from Chapter 2, we observe that:

- **Our bottom-up estimates of the long-term sustainable level of asset replacement expenditure alone range from broadly in line with Ofwat's implicit allowances to around 200% higher** (these are the estimates shown in the darker green bars). This indicates that current allowances are below the level required to fund a sustainable level of asset replacement expenditure in the long term (even before considering the other non-replacement activities expected to be covered within base capex).
- **Our bottom-up estimates would be between 30% and 300% greater than Ofwat's implicit allowances if we uplifted them to capture the costs of the non-replacement activities for better comparability with Ofwat's base capex allowances** (as shown in the lighter green bars). This further highlights the need for a material increase in investment to allow companies to maintain their assets on a sustainable basis.
- **The gap between Ofwat's allowances and our bottom-up estimates remains broadly consistent with the findings of WICS when it carried out a similar exercise for Scottish Water (106% to 156%).** Furthermore, the magnitude of our estimates of the long-term sustainable level of asset replacement expenditure (relative to RCV) is lower but still comparable to the WICS results (particularly given that Scottish Water does not have an RCV so we are using its total asset value as a proxy – meaning it is not a direct comparison). Our estimates of the long-term sustainable level of asset replacement expenditure range from 4% to 8% of RCV, compared to WICS' long-term target range for annual replacement expenditure which represents between 9% and 12% of Scottish Water's total asset value.

**Figure 11: Wastewater assets** – the long-term sustainable level of asset replacement expenditure under sensitivity 3 (% of RCV)



Source: Economic Insight analysis of data provided by companies, DDR data tables and Ofwat PR24 FD.

## 5E

### Sensitivity 4: Using median asset lives and replacement costs across companies with comparable RCVs

Finally, for our fourth sensitivity, since there is a wide variation of the kinds of companies in our data (and, therefore, the nature of their assets), we standardise the asset lives and unit replacement costs across companies with comparable RCVs. The rationale for this approach is that companies with similar RCVs are of a similar scale and, therefore, can be expected to have assets of a similar scale. We recognise that this is necessarily an approximation and does not capture other company-specific factors (such as operating circumstances or other regional factors).

To group companies by RCV, we took the following approach:

- **On the wastewater side, there is at least one other company with a similar RCV for each of the participating companies** (with the exception of Thames). Therefore, we have grouped each company (except Thames) with other company(ies) of similar wastewater RCV. Given Thames' unique scale, there are no ideal comparators. For current purposes, we have selected the next largest companies by wastewater RCV for standardisation purposes (Anglian and Southern).
- **Selecting the groups for water is more challenging because the differences in RCV between companies are often substantial.** Thames has nearly twice the RCV of the next largest company, making it unsuitable for inclusion in any standardisation group. Furthermore,

South East was unable to provide replacement cost data for some asset categories, limiting its value as a comparator. Therefore, to select comparators for water, we took the following approach (for all companies other than Thames):

- For each company, we use the nearest larger and smaller company by water RCV to estimate its benchmark, on the basis the standardised values for the company should reasonably fall between the two.
- For the largest and smallest companies by water RCV, we instead use the two companies with the closest RCV to estimate the benchmark (as there is no larger or smaller company available respectively).
- Where South East was selected to estimate the benchmark, we add the next closest company by RCV to the group as well in order to improve the robustness of the data.

As for wastewater, given Thames' unique scale, we select the next largest companies by water RCV for standardisation purposes (Anglian and Northumbrian). Table 4 presents the selected water and wastewater groups for standardisation.

To calculate the standardised results themselves, we follow the calculations set out in Chapter 2 using: (i) each company's own estimates of their asset stock; and (ii) the median asset lives and unit replacement costs for the corresponding standardisation group. We use the median since this recognises the inherent limits to our standardisation approach as well as concerns around the historical stretch on base capex being too high.

**Table 4:** RCV groups to calculate benchmark unit costs and asset lives

Company	Average water RCV (in 2022-23 CPIH prices)	Companies used to calculate water benchmark	Average wastewater RCV (in 2022-23 CPIH prices)	Companies used to calculate wastewater benchmark
WSX	£1,359m	WSX, SEW, SRN, NES	£3,498	NES, WSX
SEW	£1,926m	WSX, SEW, SRN, NES	N/A	N/A
SRN	£2,435m	WSX, SEW, SRN, NES	£6,247m	SRN, ANH
NES	£3,115m	SRN, NES, ANH	£3,470m	NES, WSX
ANH	£5,352m	SRN, NES, ANH	£7,113m	SRN, ANH
TMS	£10,567m	NES, ANH, TMS	£10,412m	SRN, ANH, TMS

**Source:** Economic Insight analysis of RCV data reported by Ofwat in its PR24 FD ODI rates model.

*Note: The RCV is the average over the 2025-30 period as reported in Ofwat's ODI rates model.*

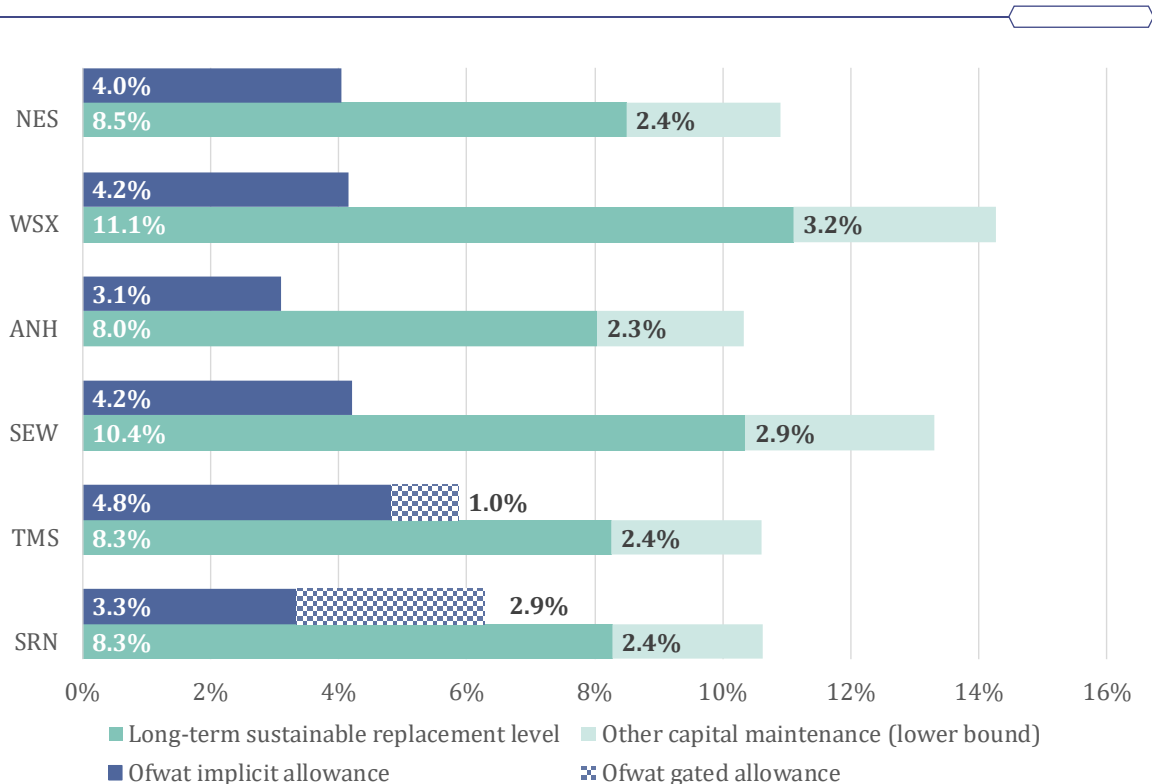
Below, we report the bottom-up estimates under sensitivity 4 for water and wastewater assets in turn.

## Water

Figure 12 presents the estimates of the long-term sustainable level of asset replacement expenditure for each company's water assets under the sensitivity 4 (in the same format as the results above). Consistent with the results from Chapter 2, we observe that:

- **Our bottom-up estimates of the long-term sustainable level of asset replacement expenditure alone are between 70% and 170% greater than Ofwat’s implicit allowances** (these are the estimates shown in the darker green bars). This indicates that current allowances are below the level required to fund a sustainable level of asset replacement expenditure in the long term (even before considering the other non-replacement activities expected to be covered within base capex).
- **Our bottom-up estimates would be between 120% and 240% greater than Ofwat’s allowances if we uplifted them to capture the costs of the non-replacement activities for better comparability with Ofwat’s base capex allowances** (as shown in the lighter green bars). This further highlights the need for a material increase in investment to allow companies to maintain their assets on a sustainable basis.
- **The gap between Ofwat’s allowances and our bottom-up estimates remains broadly consistent with the findings of WICS when it carried out a similar exercise for Scottish Water (106% to 156%).** Furthermore, the magnitude of our estimates (relative to RCV) is comparable to the WICS results. Our estimates of the long-term sustainable level of asset replacement expenditure range from 9% to 11% of RCV. In comparison, WICS’ long-term target range for annual replacement expenditure represents between 9% to 12% of Scottish Water’s total asset value (noting that Scottish Water does not have an RCV so we are using its total asset value as a proxy – while this is not directly comparable to RCV, it provides a reasonable indication).

**Figure 12: Water assets** – the long-term sustainable level of asset replacement expenditure under sensitivity 4 (% of RCV)



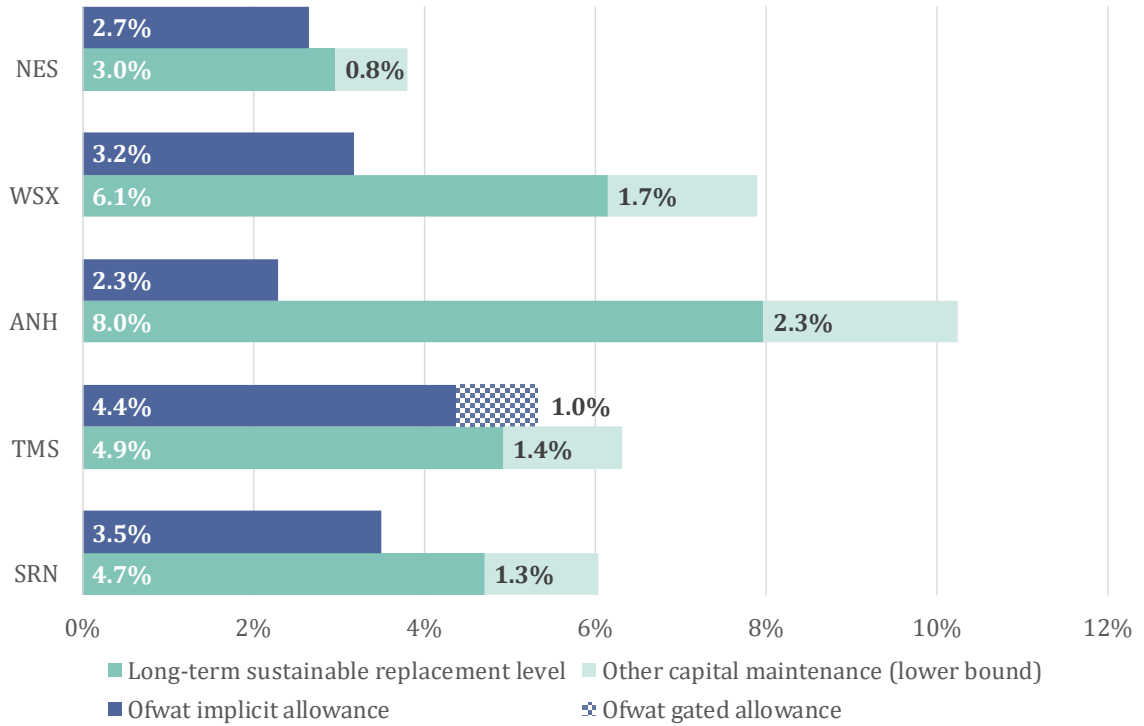
Source: Economic Insight analysis of data provided by companies, DDR data tables and Ofwat PR24 FD.

## Wastewater

Figure 13 presents the estimates of the long-term sustainable level of asset replacement expenditure for each company's wastewater assets under the sensitivity 4 (in the same format as the results above). Consistent with the results from Chapter 2, we observe that:

- **Our bottom-up estimates of the long-term sustainable level of asset replacement expenditure alone are between 12% and 250% greater than Ofwat's implicit allowances** (these are the estimates shown in the darker green bars). This indicates that current allowances are below the level required to fund a sustainable level of asset replacement expenditure in the long term (even before considering the other non-replacement activities expected to be covered within base capex).
- **Our bottom-up estimates would be between 40% and 350% greater than Ofwat's implicit allowances if we uplifted them to capture the costs of the non-replacement activities for better comparability with Ofwat's base capex allowances** (as shown in the lighter green bars). This further highlights the need for a material increase in investment to allow companies to maintain their assets on a sustainable basis.
- **The gap between Ofwat's allowances and our bottom-up estimates remains broadly consistent with the findings of WICS when it carried out a similar exercise for Scottish Water (106% to 156%).** Furthermore, the magnitude of our estimates of the long-term sustainable level of asset replacement expenditure (relative to RCV) is lower but still comparable to the WICS results (particularly given that Scottish Water does not have an RCV so we are using its total asset value as a proxy – meaning it is not a direct comparison). Our estimates of the long-term sustainable level of asset replacement expenditure range from 3% to 8% of RCV, compared to WICS' long-term target range for annual replacement expenditure which represents between 9% and 12% of Scottish Water's total asset value.

**Figure 13: Wastewater assets** – the long-term sustainable level of asset replacement expenditure under sensitivity 4 (% of RCV)



**Source:** Economic Insight analysis of data provided by companies, DDR data tables and Ofwat PR24 FD.

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## **In summary, the conclusions from our sensitivity analyses are broadly consistent with the results we present in Chapter 2**

In summary, the conclusions that we draw from our sensitivity analyses are broadly consistent with our results from Chapter 2, which indicates that the findings are robust. Specifically, our sensitivity also shows that:

- (i) Ofwat's FD allowances are lower than the level required to support a sustainable level of asset replacement expenditure in the long term (even before considering the other non-replacement activities expected to be covered within base capex); and
- (ii) the uplift to Ofwat's allowances required to reach the long-term sustainable level is broadly in line with that WICS' estimates for Scottish Water.

Due to the inherent challenges in standardising across that we describe above (e.g., the fact that companies have assets of materially different sizes, and face genuinely different operating circumstances that are not captured in our data), we do not advise relying on the precise estimates from these sensitivity analyses and, instead, recommend they are simply interpreted as a robustness check.

# 6

## **ANNEX 3: WICS ASSET HIERARCHY**

This annex presents a table showing how Scottish Water's assets are categorised.

## **6A** Chapter structure

This annex contains a table showing how Scottish Water's assets are categorised. It is structured as a single section (Section 6B).

## **6B** WICS asset hierarchy

The table below contains the WICS asset hierarchy, which Scottish Water uses to categorise its assets for annual reporting purposes. We highlight the so-called infinite-life assets in blue.

**Table 5:** Scottish Water asset hierarchy (blue highlighting indicates so-called 'Infinite-life' assets)

Service	Functional activity	Asset category	Sub asset category
Water	Source	Raw Water Pumping	Civils
		Raw Water Pumping	MEICA
		Raw Water Pumping	Ancillaries
		Raw Water Mains	Raw water mains
		Raw Water Mains	Ancillaries
		Infinite-Life Assets	Dams and impounding reservoirs
		Infinite-Life Assets	Ancillaries
		Infinite-Life Assets	Raw water storage (Civils)
		Infinite-Life Assets	Aqueduct
		Infinite-Life Assets	Raw water intakes (Gravity)
		Infinite-Life Assets	Catchment
		Ground Water Sources (Pumped)	Civils
		Ground Water Sources (Pumped)	MEICA
		Ground Water Sources (Pumped)	Ancillaries
	Water Treatment Works	Water Treatment Works (Civils)	Civils
		Water Treatment Works (Civils)	Ancillaries

		Water Treatment Works (MEICA)	MEICA
		Water Treatment Works (MEICA)	Ancillaries
		Water Treatment Works (MEICA)	Filtration
		Water Treatment Works (MEICA)	Security
	Distribution	Treated Water Pumping	Civils
		Treated Water Pumping	MEICA
		Treated Water Pumping	Ancillaries
		Treated Water Storage	Civils
		Treated Water Storage	MEICA
		Treated Water Storage	Ancillaries
		Water Mains	Water trunk mains <300mm
		Water Mains	Water trunk mains >300mm
		Water Mains	Water trunk mains asbestos cement
		Water Mains	Water distribution mains <300mm
		Water Mains	Water distribution mains >300mm
		Water Mains	Water distribution mains asbestos cement
		Water Mains	Ironworks
		Water Mains	Communication pipes

		Water Mains	Sub sea pipes
		Water Mains	Pipe bridges
		Water Mains	Water network ancillaries
		Water Mains	Leakage and consumption reduction measures
		Water Meters	Water meters
		Water Meters	Ancillaries
Foul sewage & surface water shared assets	Collection	Pumped Combined Rising Mains	Pumped combined rising mains
		Pumped Combined Rising Mains	Ancillaries
		Combined Sewer Overflow	Civils
		Combined Sewer Overflow	MEICA
		Sewage Pumping Stations (Combined)	Civils
		Sewage Pumping Stations (Combined)	MEICA
		Other Sewage Structures (Combined)	Sewer structures
		Other Sewage Structures (Combined)	Pipe bridges
		Other Sewage Structures (Combined)	Ancillaries
		Infinite-Life Assets (Combined)	Sewers (combined)
		Infinite-Life Assets (Combined)	Ancillaries
			Wastewater Treatment Works (Combined) (Civils)

	Wastewater Treatment Works	Wastewater Treatment Works (Combined) (Civils)	Ancillaries
		Wastewater Treatment Works (Combined) (MEICA)	MEICA
		Wastewater Treatment Works (Combined) (MEICA)	Ancillaries
		Cess and Septic Tanks (Combined) (Civils)	Civils
		Cess and Septic Tanks (Combined) (Civils)	Ancillaries
		Cess and Septic Tanks (Combined) (MEICA)	MEICA
		Cess and Septic Tanks (Combined) (MEICA)	Ancillaries
		Sludge Treatment Centres (Combined)	Civils
		Sludge Treatment Centres (Combined)	MEICA
		Discharge	Outfalls from Treatment (Combined)
Outfalls from Treatment (Combined)	Ancillaries		
Foul sewage only	Collection	Sewage and Sludge Pumping Mains (Foul Only)	Pumped foul only rising mains
		Sewage and Sludge Pumping Mains (Foul Only)	Ancillaries
		Emergency Outfalls (Foul Only)	Civils
		Emergency Outfalls (Foul Only)	MEICA
		Sewage Pumping Stations (Foul Only)	Civils
		Sewage Pumping Stations (Foul Only)	MEICA
		Other Sewage Structures (Foul Only)	Sewer structures

		Other Sewage Structures (Foul Only)	Pipe bridges	
		Other Sewage Structures (Foul Only)	Ancillaries	
		Infinite-Life Assets (Foul Only)	Sewers (foul only)	
		Infinite-Life Assets (Foul Only)	Ancillaries	
	Wastewater Treatment Works		Wastewater Treatment Works (Foul Only) (Civils)	Civils
			Wastewater Treatment Works (Foul Only) (Civils)	Ancillaries
			Wastewater Treatment Works (Foul Only) (MEICA)	MEICA
			Wastewater Treatment Works (Foul Only) (MEICA)	Ancillaries
			Cess and Septic Tanks (Foul Only) (Civils)	Civils
			Cess and Septic Tanks (Foul Only) (Civils)	Ancillaries
			Cess and Septic Tanks (Foul Only) (MEICA)	MEICA
			Cess and Septic Tanks (Foul Only) (MEICA)	Ancillaries
			Sludge Treatment Centres (Foul Only)	Civils
			Sludge Treatment Centres (Foul Only)	MEICA
	Discharge		Outfalls from Treatment (Foul Only)	Long and short sea outfalls (foul only)
			Outfalls from Treatment (Foul Only)	Ancillaries
	Surface water only	Collection	Sewage and Sludge Pumping Mains (Surface Water Only)	Pumped surface water only rising mains
			Sewage and Sludge Pumping Mains (Surface Water Only)	Ancillaries

		Emergency Outfalls (Surface Water Only)	Civils
		Emergency Outfalls (Surface Water Only)	MEICA
		Surface Water Pumping Stations	Civils
		Surface Water Pumping Stations	MEICA
		Other Surface Water Structures	Surface water structures
		Other Surface Water Structures	Pipe bridges
		Other Surface Water Structures	Ancillaries
		Infinite-Life Assets (Surface Water Only)	Surface water pipes
		Infinite-Life Assets (Surface Water Only)	Ancillaries
	Wastewater Treatment Works	Surface Water Storage and Treatment (Nature-Based)	SUDS
		Surface Water Storage and Treatment (Nature-Based)	Wetlands
		Surface Water Storage and Treatment (Nature-Based)	Reed beds
		Surface Water Storage and Treatment (Nature-Based)	Swales
		Surface Water Storage and Treatment (Nature-Based)	Rain gardens
		Surface Water Storage and Treatment (MEICA)	MEICA
		Sludge Treatment Centres (Surface Water Only)	Civils
	Sludge Treatment Centres (Surface Water Only)	MEICA	
	Discharge	Outfalls from Treatment (Surface Water Only)	Long and short sea outfalls (surface water only)

		Outfalls from Treatment (Surface Water Only)	Ancillaries
Shared	Business Services	Support Services	Vehicles
		Support Services	Digital
		Support Services	Facilities and estates
		Support Services	Renewable energy
		Support Services	Scientific services
		Support Services	Customer meters
		Support Services	Transformation
		Support Services	Other

**Source:** Scottish Water 2023/24 annual return G tables.

*Note: For the purposes of our analysis, we categorise customer meters as water assets (rather than as shared assets / business services). This is for comparability with Ofwat's water allowance, which includes the cost of customer meters. We also aggregate 'Foul sewage & surface water shared assets'; 'Foul sewage only'; and 'Surface water only' into a single category for wastewater assets. Again, this is for comparability with how Ofwat presents its allowances.*

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