

Improvements to the regulatory framework for asset health and operational resilience

Annex 1: Further information on workstream 2 policy packages

5 July 2024

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1: Introduction

In January 2024, four water companies – Affinity Water, Anglian Water, Northumbrian Water and Wessex Water – started a programme of work to consider potential reforms to the regulatory framework for water companies, in relation to the treatment of capital maintenance and asset health. This is intended to support the development of the approach to the PR29 price review. The motivation for the project is a growing concern that the current regulatory approach to funding capital maintenance expenditure (e.g. asset replacement) – and the wider regulatory arrangements relating to asset health – are not fit for purpose.

The initial phase of the work programme has been built around two workstreams commissioned from the consultancies Reckon and Jacobs:

- **Workstream 1:** this workstream, carried out by Jacobs, has identified and assessed a range of metrics that would help to reveal current and future asset health risks and historical trends in asset health, including metrics that could support the potential changes to the regulatory approach identified in workstream 2.
- **Workstream 2:** this workstream, carried out by Reckon, has concerned potential problems with Ofwat’s current regulatory framework, in relation to the treatment of capital maintenance expenditure, asset health and risks to customer service and environmental outcomes in the future. It has explored potential reforms to the regulatory approach to tackle these problems.

This document is an annex to Reckon’s main report from workstream 2. It provides further information on the five packages of policy options (packages P1 to P5) identified in our main report.

These five policy packages can be seen as involving a set of components which represent changes to the overall regulatory approach in different areas (we do not cover in this document those aspects of the regulatory framework that would be the same as under the current approach under the five packages). In the table below, we list the six main sections of this document and indicate which of the five policy packages the section is most relevant to. Where applicable, these sections set out alternative options within the relevant topic area and map these to the five packages.

Table 1 Mapping between policy packages and sections of this document

Section and topic area	Packages that section is most relevant to				
	P1	P2	P3	P4	P5
Section 2: High-level approach to cost assessment	✓	✓	✓	✓	✓
Section 3: Analysis and tools to support cost assessment		✓	✓	✓	
Section 4: Measures to enhance information and incentives on long-term performance		✓	✓		
Section 5: Deliverables based on asset risk metrics or investment programmes	✓			✓	✓
Section 6: Adjustment mechanism for industry-wide outturn expenditure		✓			

It is not the intention of workstream 2 to produce a set of fully-documented policy options ready for implementation. The material in this document helps to flesh out and clarify the five policy packages that are outlined in our main report, but the packages, and the options/components within them, remain defined at quite a high level. Our aim at this stage is to provide the foundation for regulatory reforms at PR29 in relation to the regulatory approach to capital maintenance and asset health, with recognition that considerable further work will be needed to further develop and refine the key policy options ahead of implementation of a new approach.

In addition to the material elaborating on the five policy packages, the appendix to this annex provides further information on the structured long list of policy options that we considered as part of workstream 2. This long list was an input to the development of the five policy packages.

2: High-level approach to cost assessment

Introduction

In this section we provide information on the broad approach that would be used by Ofwat, as part of the price review process, to determine ex ante allowances for capital maintenance expenditure under packages P1 to P5.

We start with an overview of some key features of Ofwat’s current approach to cost assessment for base costs (based primarily on its PR19 approach). We then summarise four options (A to D) that seemed most promising as high-level alternatives. These were drawn from a longer list of options that we explored during workstream 2 (see the appendix). The table below shows how these four options for cost assessment relate to the broader packages of policy options.

Table 2 Mapping of packages to high-level cost assessment options

Package	Cost assessment option
P1	Cost assessment option A: Dedicated process for funding additional investment in asset health
P2	Cost assessment option B: Assessment to consider industry-wide forward-looking adjustments using a range of evidence
P3	Cost assessment option C: Ofwat-led assessment of capital maintenance using a range of its own models and tools
P4	Either of cost assessment option B or C above, making use of evidence on asset risk metrics as part of the cost assessment process
P5	Cost assessment option D: Ofwat review of each company's business plan for capital maintenance

The options that we set out in this section are intended to convey some high-level choices that seem particularly relevant at the stage of workstream 2, but do not cover all aspects of the approach to be taken to cost assessment. The table below illustrates some of the key differences between the four options in terms of the high-level approach, with a particular emphasis on the way that asset health is assessed.

Table 3 Examples of some key ways in which options A to D differ in terms of high-level approach

	Role of Ofwat within the process to tackle asset health funding concerns	
	Ofwat-led analysis with cross-industry perspective	Analysis led by companies with Ofwat review of companies’ proposals
Potential for adjustments to the estimates of expenditure requirements that are derived from base-plus benchmarking models estimated using historical data	Option B	Option A
Separate forward-looking assessment of capital maintenance expenditure requirements, without any key role for base-plus benchmarking models	Option C	Option D

We also summarise and contrast a slightly broader set of ways in which these options differ and overlap in the main report to workstream 2 (page 31).

Within these options there is a range of analytical tools and types of qualitative and quantitative analysis that might be used to provide evidence to inform the cost assessment process. In section 3, we provide further information on some of the sources of evidence that might be used, beyond those which are an established part of Ofwat's current approach.

The remainder of this section takes the following topics in turn:

- Scope of capital maintenance expenditure for purposes of cost analysis.
- Overview of key aspects of Ofwat's current approach.
- Option A: Dedicated process for funding additional investment in asset health.
- Option B: Assessment to consider industry-wide forward-looking adjustments using a range of evidence.
- Option C: Ofwat-led assessment of capital maintenance using a range of its own models and tools.
- Option D: Ofwat review of each company's business plan for capital maintenance.

Scope of capital maintenance expenditure for purposes of cost analysis

Before we proceed to the options, we provide some preliminary comments by what we mean by capital maintenance expenditure for the purposes of new approaches to cost assessment.

Under the current framework, Ofwat does not explicitly determine allowances for capital maintenance expenditure, but rather it determines allowances for what we refer to as "base-plus" expenditure.¹ This primarily comprises the bulk of operating expenditure, all capital maintenance expenditure (e.g. asset replacement) and some categories of enhancement expenditure (e.g. network reinforcement to accommodate growth in the number of customers served). In contrast, Ofwat's approach at PR09 and earlier reviews involved separate cost assessment processes for operative expenditure and capital maintenance expenditure, with quite different approaches used for each of these.

In this document, where options and tools for cost assessment would involve some form of separate assessment of capital maintenance expenditure (rather than covering the whole of base expenditure), we leave open at this stage whether the scope of such assessment is taken as the definition of capital maintenance expenditure under RAG 4.12, or whether it might be broader or narrower than this.

¹ Ofwat has used this terminology in the past but more recently refers to "base costs". But the term base costs can be unhelpful because this has also been defined to cover operating expenditure and capital maintenance expenditure but excluding all enhancement expenditure.

For instance:

- Some asset replacement expenditure or other investment in asset health that is classified as operating expenditure rather than capital expenditure for accounting purposes (e.g. infrastructure renewals expenditure that is expensed) might be incorporated within capital maintenance expenditure for cost assessment purposes.
- Some investment in asset health which might be defined as enhancement expenditure under some interpretations of RAG 4.12 (e.g. expenditure to improve the reliability of service provision or to reduce leakage compared to historical levels) might be incorporated within capital maintenance expenditure for cost assessment purposes.
- Some capital maintenance expenditure (e.g. some reactive repairs work) might be excluded from the scope of capital maintenance expenditure for cost assessment purposes, and assessed as part of the analysis for operating expenditure.

We use the term capital maintenance as something of a shortcut in this document; further consideration of these issues of scope is beyond the intended scope of workstream 2.

Overview of key aspects of Ofwat's current approach

In this document, where we refer to Ofwat's current approach to cost assessment, this is intended to capture the type of approach that Ofwat applied at PR19 and what we knew, when we carried out workstream 2, about Ofwat's planned approach to PR24 (e.g. based on its PR24 final methodology). This document was produced ahead of Ofwat's PR24 draft determinations so it may not be reflective of the approach Ofwat decides to take at that stage of the PR24 process.

Ofwat's cost assessment is split into a number of different categories for which different approaches to cost assessment apply. In broad terms, we define these as: (a) unmodelled costs; (b): modelled base-plus expenditure (which we shorten to base-plus expenditure); and (c) the residual categories of enhancement expenditure that are not within the scope of base-plus expenditure.

Our primary interest is in Ofwat's approach to base-plus expenditure, which includes the totality of capital maintenance expenditure (e.g. capitalised asset replacement expenditure), as well as any asset replacement expenditure that is reported as operating expenditure (e.g. infrastructure renewals expenditure that is expensed) and other operating expenditure.

For base-plus expenditure, some key features of Ofwat's current approach that are relevant for the purposes of this project are as follows:

- **Cross-company econometric benchmarking.** The cornerstone of the assessment for base-plus expenditure is a suite of econometric benchmarking models that draw on data across companies and over a historical time period stretching back to around 2011/12. The input data for the models concerns (a) expenditure of water companies at various levels of aggregation over the historical data period; and (b) data on a set of explanatory variables which are assumed by Ofwat to capture (or proxy for) key underlying cost drivers that lead to differences in expenditure between companies and over time.

- **Modelled costs at the model level.** Ofwat draws on the estimated results from the econometric models, combined with forecasts over the forthcoming price control period of the explanatory variables that feature in these models (e.g. number of connected properties), to produce what it refers to as “modelled costs” for that period. As an initial step modelled costs are calculated separately for each company, in each year and for each model.
- **Triangulation of modelled costs.** It triangulates the results from its suite of econometric models to produce a modelled cost for each company for each year of the forthcoming price control period for each of the four wholesale price controls (this involves an allocation of model results between water resources and water network plus controls). Ofwat also calculates triangulated modelled costs over the last five years of data for use in the step below.
- **Catch-up efficiency adjustment.** Ofwat calculates a backward-looking “efficiency score” for each company which is taken as the aggregate expenditure of each company over the last five years for which data are available and the aggregate of modelled costs for that company over this period. Ofwat then determines what level of efficiency score to treat as that of a notional efficient company (e.g. Ofwat might find that the upper quartile company has an efficiency score of 0.93) and uses that score to adjust the modelled costs for all companies.
- **Adjustment for real price effects (RPEs).** Ofwat makes an assessment of the extent to which the input prices faced by water companies (e.g. reflecting wage rates and energy costs) may rise at a faster or slower rate than CPIH, and determines an annual adjustment factor that is applied to modelled costs when projecting efficient costs over the forthcoming price control period.
- **Adjustment for ongoing productivity (frontier shift).** Ofwat makes an assessment of the rate of ongoing productivity / efficiency improvements that an efficient water company should be able to make over the forthcoming price control period (beyond improvements reflected in the catch-up assumption applied to modelled costs), and determines an annual adjustment factor that is applied to modelled costs when projecting efficient costs over the forthcoming price control period.
- **Review of cost adjustment claims.** There is a process for companies to make claims for adjustments to the modelled costs from Ofwat’s base-plus modelling, which Ofwat assesses against a structured set of criteria. The burden is on companies to provide evidence to justify their claims for an adjustment being appropriate. At PR19 the claims relating to base expenditure were primarily concerned with differences between companies – or unique company circumstances – which were argued to mean that a company has a higher level of efficient costs than indicated by Ofwat’s benchmarking models. For PR24, Ofwat has also said that companies can make claims for cases where future industry-wide costs are higher than historical costs.
- **Overall stretch.** At PR19, Ofwat carried out some analysis to consider whether the overall degree of stretch (e.g. efficiency improvements and performance improvements) required under its price control determinations would be achievable by efficient companies.

There are several points that are of particular relevance to the current project:

- Ofwat’s econometric models from PR19, and those it consulted on for PR24 in April 2023, did not include any time trend explanatory variables.
- Beyond the impact of forecast changes over time for the specific explanatory variables used in the econometric models and the consideration of the catch-up efficiency adjustment, RPEs and ongoing productivity, there is limited consideration of how costs may differ in the future compared to historically.
- Other than by comparison against the results from the benchmarking approach set out above, there is no direct review by Ofwat of the expenditure proposals for base-plus expenditure (or components of this such as capital maintenance) that water companies include in their business plan and the evidence base that companies include in their plans to support these proposals (which might include more detailed information on what the company considers to be the need for capital maintenance expenditure and what that would be spent on).

Option A: Dedicated process for funding additional investment in asset health

Our option A involves relatively limited changes to Ofwat’s current approach. The main change would be the creation of a new process for Ofwat to review proposals for water companies for additional funding to support investment in asset health beyond the funding provided for this (implicitly) via the allowances derived from the econometric benchmarking of historical expenditure data. This is in contrast to the current approach, where any proposals of this nature would be assessed as part of Ofwat’s broader cost adjustment claim process or potentially as enhancement claims.² Under option A there would be a dedicated and tailored process.

There are different ways in which this type of approach could be implemented. For the purpose of our option A we assume as follows:

- As under Ofwat’s current approach, the approach to cost assessment would retain a prominent role for econometric benchmarking of base-plus expenditure.
- There would be a dedicated process for companies to submit proposals for targeted increments to their expenditure allowances to fund additional investment in asset health, beyond that which is funded (implicitly) via the allowances derived from the econometric benchmarking models, and for Ofwat to review and assess those proposals.
- The process would relate to a broad concept of asset health investment which might cover expenditure categorised as capital maintenance, operating expenditure (e.g. expensed renewals) or expenditure to improve asset health that could be viewed as enhancement expenditure (e.g. where factors such as climate change or increased expectations for environmental performance mean that higher levels of asset reliability are required than has been necessary historically). Companies would need to explain which parts of their proposals relate to capital maintenance and which relate to enhancement expenditure.

² There may be some overlap between this option and Ofwat’s PR24 approach for “investment plans for enhancing resilience” (page 51 to 56 of its PR24 final methodology), though at the time of writing it is hard to understand the significance of this aspect of the PR24 approach in relation to asset health.

- Ofwat would update RAG 4 to provide greater clarity and coherence on the distinction between capital maintenance and enhancement expenditure, recognising that how expenditure is classified and reported does not need to determine how it is assessed (e.g. some enhancement expenditure is already assessed alongside base expenditure through the same econometric models).
- Ofwat would provide guidance to water companies as part of the PR29 final methodology on what is expected in submissions for this process. The tests or criteria used for Ofwat's assessment, and explained in the guidance, would be tailored to the key considerations for making and reviewing claims for additional asset health investment. This would include guidance on the potential role that data and other information on asset health and operational resilience could play in providing evidence to support a claim, Ofwat's expectations around this type of evidence as well as examples of best practice.
- Ofwat would work together with water companies and regulatory experts to produce a better understanding of how implicit allowances for asset health investment can be estimated, and it would provide guidance in the PR29 final methodology on this matter. This would look to address as far as possible some of the difficult issues that arise in practice and which do not seem to be resolved at present.³
- There would be an expectation that any funding provided under this process would be linked to corresponding delivery accountability arrangements (e.g. price control deliverables).
- Ofwat would assess each company's proposals on a case-by-case basis. However, it would consider whether it would be appropriate for additional allowances that have been sought by one or more companies to be provided to those companies only or on a similar basis to all companies. In considering this, it would take account of factors including: (a) potential differences in companies' circumstances, historical funding and their approaches to asset management and operational resilience; (b) the benefits of rewarding companies who have provided relatively strong evidence and insight on the case for additional investment in asset health; and (c) the potential complications that might arise in assessing performance and setting PCLs at future price reviews (over a potentially long timeframe) if companies have been provided different levels of explicit funding for asset health investment historically.
- Where Ofwat does not accept a company's claim, there would be no automatic financial (or reputational) downside to the company as part of Ofwat's business plan assessment of the "efficiency" of each company's plan (if such an assessment is to be retained): instead, any such downside would apply only if a company's submission were to be found by Ofwat to be poorly reasoned and evidenced (with a realistic threshold for what could have been done).
- Subject to further consideration, there may be an expectation for submissions under this process to include estimates of the future impacts of the proposed additional investment on the company's performance against common PCs, which would then be subject to Ofwat review and

³ For instance, while one can look at average rates of replacement of certain asset types over a historical period, it is not clear that these rates would be implicitly funded over a forthcoming price control period if an efficient company would need to increase spend in other areas to meet more demanding PCLs than applied historically or to accommodate increased asset maintenance arising from past enhancements.

factored into PCLs at subsequent price reviews. We leave this open in the specification of the option as the practicality of this is difficult to gauge at this stage.

- Finally, in developing the approach and guidance for this process and applying it in practice, Ofwat would consider whether the type of evidential threshold used for the existing cost adjustment claim process (e.g. requirement for “compelling evidence”) is appropriate. For instance, if the case for allowing such investment is to benefit customers (e.g. through mitigation of operational resilience risks), and there is adequate customer protection (e.g. via PCDs) then there may be concerns about too high an evidential threshold discouraging the use of the process or resulting in the approval of too few proposals.

The case for limiting financial downside from claims that are not accepted, and reconsideration of the evidential threshold, reflects the view that the appropriate level of asset health investment is an uncertain and subjective issue involving judgement, and that there may be significant risks to customers from rejecting or deterring proposals from companies for funding asset health investment beyond what is funded implicitly by the econometric models (which might be a declining trend in asset health).

Option B: Assessment to consider industry-wide forward-looking adjustments using a range of evidence

As under Ofwat’s current approach, under option B the approach to cost assessment would retain a prominent role for econometric benchmarking of base-plus expenditure. But Option B would involve a new explicit stage in the assessment process to consider whether to apply industry-wide adjustments when using the results from those models to set base-plus allowances for the forthcoming price control period (and, if so, what scale of adjustments to apply). This assessment would draw on a range of quantitative and qualitative evidence and analysis.

There may be alternative ways to apply adjustments across the industry, and the assessment might be carried out separately for each of the four wholesale price controls. In a simple case, Ofwat might decide that allowances for base-plus expenditure for each company should involve a 5% uplift on modelled costs, beyond any adjustments applied through existing processes (e.g. adjustments for RPEs, ongoing productivity, or cost adjustment claims). However, there may be other ways to apply an adjustment (e.g. reflecting specific cost or risk drivers that vary between companies) such that – while a common model or methodology is applied – the value of the adjustment may not be the same across companies in terms of the proportion of base-plus expenditure that it represents.

The potential industry-wide adjustment would not capture all company-specific considerations. So, this adjustment would be a complement to – rather than substitute for – the current cost adjustment process. There may still be a role for separate cost adjustment claims relating to asset health (e.g. if a specific company has very different needs to the rest of the industry due to factors outside of its control).

Ofwat briefly identified the possibility of a “sector wide adjustment to base cost allowances” in material presented to its cost assessment working group in September 2021.⁴

The conceptual basis for the new assessment stage to consider whether to make an industry-wide adjustment stems from the observations that: (a) there are a number of potentially significant industry-wide factors which could lead to companies’ efficient expenditure levels over the next price control period being different from the expenditure levels derived from the econometric models estimated using historical data; and (b) only a small subset of these factors seem to have been explicitly and seriously considered as part of Ofwat’s PR19 process for base cost assessment.

Furthermore, within a broader regulatory framework that makes use of cross-company benchmarking, there is considerable logic in making industry-wide adjustments for industry-wide issues. And there are potential benefits in adopting an industry-wide perspective in relation to the funding for asset health. To take a simple example, if any single company is taken in isolation, and its asset health is found to be poor, it may be difficult for the regulator to decide whether to provide additional funding for asset health investment in the next price control period, as there may be concerns that the company’s situation reflects inefficiency or relatively poor prioritisation of asset replacement expenditure in the past, and concerns that customers should not be faced with the full costs of the additional funding needed to enable the company to improve. In contrast, if the poor asset health is widespread across the industry, it seems less likely that this reflects inefficiency or relatively poor prioritisation of asset replacement expenditure, and more likely that it reflects industry-wide factors that require additional funding from customer to address.

The table below lists a number of industry-wide “dynamic” factors and shows that those considered explicitly at PR19 were quite limited.

Table 4 Examples of potential dynamic factors (not necessarily comprehensive)

Dynamic factor	Explicitly considered under PR19 approach?	Comments
Real price effects	✓	This concerns the potential for the input prices that water companies face (e.g. for labour/wages, energy and perhaps subcontractor fees) to change over time at a different rate to economy-wide inflation (as measured by CPIH). Set at PR19 as a positive adjustment of around 0.5% per year (but subject to uncertainty mechanism for labour RPEs).
Ongoing productivity	✓	This concerns the impact on base-plus expenditure of ongoing productivity / efficiency improvements that water companies are able to make (beyond improvements reflected in the catch-up assumption applied to modelled costs). This includes efficiency improvements from changes over time in asset management and operational practices. This is a negative adjustment (by definition), set by Ofwat or the CMA at around -1% per year at PR19.
Impacts of historical enhancements	✗	During each price control period water companies carry out substantial enhancement investment (e.g. to improve the forecast water supply-

⁴ Ofwat (2021) *PR24 Cost Assessment Working Group: Forward looking capital maintenance: draft for discussion*, page 15.

Dynamic factor	Explicitly considered under PR19 approach?	Comments
		<p>demand balance or to achieve improved environmental outcomes) that is funded by enhancement allowances determined by Ofwat.</p> <p>Any upfront enhancement allowances set by Ofwat cover initial investment costs only and are not intended to cover ongoing maintenance and asset replacement costs. An expanding asset base driven by enhancements will tend to put upward pressure on capital maintenance expenditure requirements over time.</p>
Impact of changes in performance over time	x	<p>Companies have generally been improving their performance over time across Ofwat's set of outcome-focused PCs. While some performance improvements may be achieved via efficiency gains, others may be achieved via additional operational resources or targeted investment. The ODI incentive framework provides companies with financial incentives to incur additional costs to improve their performance against PCs, and this may contribute to an upward trajectory on base costs.</p>
Impacts of changes in price control incentives (where not captured above)	x	<p>Changes over time in the incentives companies face under the price control framework can affect how future costs relate to historical costs.</p> <p>For instance, the move to a totex regime and efforts to address the perceived capex bias from PR14 might have been expected to lead (all else equal) to a reduction in base-plus expenditure in the near-term (as some capital expenditure is replaced with operating expenditure) followed by a gradual increase over time.</p> <p>Furthermore, regulatory changes that are intended to tackle perceived concerns about companies focusing too much on short-term performance and not enough on long-asset health investment could act to increase base-plus expenditure if successful.</p>
Changes in external conditions affecting efficient base-plus costs that are not fully funded via enhancement allowances	x	<p>Examples of factors that may mean that the efficient level of base-plus expenditure is different in the future to the past include the effects of Net Zero policies/requirements and climate change.</p>
Desirable levels of asset health investment being different to those reflected in the historical dataset	x	<p>There are reasonable concerns that the level of asset health investment that has been carried out over the relevant historical time period is below the level that is likely to be in customers' interests over the forthcoming price control period. For instance, this may result from the combined effect over the relevant historical period of the informational, behavioural and funding concerns that we identify in our main report to workstream 2.</p> <p>Analysis may suggest that historical levels of expenditure are associated with a trajectory of increasing risk to future outcomes (e.g. from asset deterioration) and that increased expenditure beyond historical levels may be needed to avoid further escalation of risk (or to reduce risk).</p>

Ideally, each of the factors above would be considered as part of the assessment, whether in combination or by taking specific factors in isolation. We provide further information on the types of evidence and analytical tools that might support this assessment in section 3.

One technical consideration concerns the identification of the relevant historical period that applies when considering whether the forthcoming price control period is likely to lead to different levels of efficient costs than those observed in that period. Our view is that under Ofwat's current approach

of applying a catch-up adjustment to modelled costs based on efficiency scores calculated over the last five years of data, that five-year period is the most relevant reference point for considering whether efficient expenditure in the forthcoming price control period will be different from expenditure observed historically. The effect of the catch-up adjustment is to mean that data for early years in the dataset used for econometric modelling has relatively limited influence on the level of expenditure (but does inform the estimated cost driver relationships and hence differences in costs between companies and over time that reflect the forecasts of explanatory variables).

As identified in the table above, concerns over the levels of asset health investment are only part of the broader set of dynamic factors that merit consideration. However, if overlooking other dynamic factors leads to base-plus allowances that are too low, this in itself could contribute to or exacerbate concerns about asset health investment. For instance, if there is upward pressure on capital maintenance costs as a result of a growing asset base from past enhancements, then a failure to take account of that growth risks insufficient funding for asset health investment and so consideration of this factor would be relevant to efforts to ensure that capital maintenance is adequately funded.

While there is potential for some of the factors above to be considered via the cost adjustment process under Ofwat's current approach, or under option A, the approach under option B would be quite different:

- Given that the factors above will tend to apply on an industry-wide basis, there are logical and practical benefits for considering them at the industry level, at least as a starting point, rather than assessing them separately for each company.
- Ofwat would have a more proactive role, taking responsibility for the assessment of whether the evidence suggests adjustments would be appropriate, rather than taking a reactive review role in the review of any proposed adjustments put forward by companies.
- Ofwat would explicitly recognise that the level of ex ante expenditure allowances that it sets *may have* a significant impact (benign or adverse) on companies' actual expenditure (including asset health investment) over the coming price control period and, in turn, the risks to outcomes for customers and the environment over the longer term. Related to this, Ofwat would recognise that it is not in the long-term interests of customers to treat the position of zero adjustment from the allowances based on historical expenditure levels as the *default option* in the absence of "compelling evidence" to the contrary. Instead, Ofwat would assess the case for adjustments, and set allowances for the forthcoming price control period, on the balance of probabilities.
- The use of industry-wide adjustments under option B would avoid the concerns that arise under option A relating to regulatory inconsistencies under an approach in which company-specific funding is provided for asset health investment in the context of a broader regulatory framework based on comparative competition (e.g. involving benchmarking companies' base-plus costs and performance against common PCs, and setting common PCLs).

Option C: Ofwat-led assessment of capital maintenance using a range of its own models and tools

Under option C, there would be a move away from the use of base-plus benchmarking models as the foundation for Ofwat's cost assessment. Ofwat would carry out an explicit assessment of the appropriate levels of capital maintenance expenditure, or asset health investment, for each company drawing on a range of modelling approaches and tools. It would assess operating expenditure separately.

Unlike a more conventional bottom-up regulatory cost assessment (e.g. see option D) this option would place greater weight on Ofwat's own detailed analysis and evidence rather than Ofwat reviewing detailed analysis and evidence provided in water company business plans. Ofwat would have more ownership, visibility and understanding of the tools used to build up a picture of capital maintenance requirements and would look to apply these consistently across companies drawing on detailed information provided by companies on their assets and systems.

Further consideration would be needed of the types of analysis to be used under this option, but at this stage the following examples seem relevant:

- Econometric benchmarking of capital maintenance expenditure in specific areas, using historical expenditure data and taking account of information on asset health and/or asset replacement rates over the historical data period.
- Evidence of capital maintenance expenditure requirements based on estimates derived from asset inventories, replacement cost estimates and estimated asset lives (e.g. drawing on the types of evidence used to inform the cost assessment carried out by WICS in relation to Scottish Water).
- Extrapolation of historical rates of asset replacement with consideration of the need for adjustments if applicable to tackle concerns that these are too low or too high (e.g. if historical rates of asset replacement are deemed too low to be sustainable without compromising service).
- Granular asset deterioration modelling that draws on data from all companies, for example to inform on how asset health and future risks to outcomes may evolve over time under specified scenarios for asset replacement rates and/or capital maintenance expenditure levels.
- Unit cost benchmarking for asset replacement activities (e.g. econometric benchmarking of unit costs based on granular historical and/or forecast data for granular asset replacement activities, or perhaps some version of the cost base approach used by Ofwat before PR14).
- Analysis of changes over time in operational capabilities (e.g. potentially derived from comparisons between analysis of asset failure or failure modelling and outturn performance) and consideration of the implications of this for future capital maintenance requirements.

We provide further information on some of these types of evidence and analytical tools in section 3.

For the purposes of specifying the option, we have identified Ofwat as leading the analysis (supported where appropriate by consultants), but there may be opportunities for other organisations to carry out some of the analysis on behalf of Ofwat.

Of the four cost assessment options outlined in this section, option C is the furthest away from Ofwat's current and historical regulatory approaches, and is likely to require the greatest amount of work before it can be more fully specified and implemented.

At this stage, we have left open how Ofwat would carry out cost assessment for operating expenditure under option C. The approach might be similar to that currently applied to base-plus expenditure, with an emphasis on econometric models covering operating expenditure. But there may be a case for more granular benchmarking and greater consideration of changes over time in operating expenditure requirements, and interactions with capital maintenance expenditure.

Part of the work required to flesh out option C further would involve finding ways to mitigate the risks that the overall cost assessment is compromised by carrying out separate assessments for operating expenditure and capital maintenance expenditure, in a context where the balance between the two will differ across companies and over time due to both accounting practices and company strategies (e.g. asset management practices or the extent of focus on nature-based solutions). There are risks to the accuracy of cost assessment, and of distortion to incentives, from carrying out separate assessments and it would be important to consider ways to mitigate these risks.

There may be some useful precedent from Ofgem and the Utility Regulator. For instance, there may be merit in defining a set of cost categories that are focused on areas such as repairs and maintenance (excluding asset replacement) and which cover both operating expenditure and capital expenditure in these categories, and then carrying out some benchmarking for these sub-categories. There is some further information on this in the separate supporting document we produced with outputs from our reviews of the approaches used by Ofgem and the Utility Regulator for NIE.

Furthermore, it would be important that any catch-up efficiency challenges applied as part of the cost assessment process avoid the pitfall of ignoring interactions. For instance, some companies may have relatively low operating expenditure because they have relatively high capital expenditure, and some companies may have relatively low capital expenditure because they have relatively high operating expenditure, and it may be infeasible for any single company to operate at levels of expenditure which reflect the operating expenditure of the former and the capital expenditure of the latter. At the very least, any assessment of companies' relative efficiency, or of upper quartile cost benchmarks, should be made after aggregating across operating and capital expenditure, rather than individually for each cost category.

Finally, in moving to option C from the current approach, there may be a case for considering some form of transitional adjustments, whether at the industry or company level. For example, if some companies have profited in the past from some under-spend against ex ante allowances for base-plus expenditure from previous price control periods, there is a risk that customers could be seen to be paying twice for some asset replacement activities if the explicit allowances for capital maintenance expenditure under option C are calculated in a way that reflects the current health or age of each company's assets. There may be a case for some modification to the allowances so that these are based on estimates of what these would be for a notional efficient company in the absence of any historical under-spend. The case for any company-specific adjustments is likely to

be lower if allowances under option C are derived from forms of cross-company benchmarking or modelling, rather than each company's allowance reflecting its current levels of asset health.

Option D: Ofwat review of each company's business plan for capital maintenance

Option D is intended to capture a broad approach to cost assessment which involves, for each regulated company, the regulator starting with the company's business plan proposals for capital maintenance and asset replacement expenditure over the forthcoming price control period, and reviewing and potentially amending the costs arising from this plan. As under option C, there would be a move away from the use of base-plus benchmarking models as the foundation for Ofwat's cost assessment.

This review might include the following:

- Reviewing the evidence provided for the company's proposed volumes, scope and timing of asset replacement, and potentially adjusting these if it finds that these are not well evidenced, or if the regulator has concerns around them (e.g. future impacts on outcomes).
- Comparison of the business plan forecasts for levels of expenditure and/or activity levels against those observed for the company in the past, and assessing the strength of evidence in the business plan for any proposed changes going forward.
- Using granular benchmarking of historical and/or forecast costs (e.g. unit costs) to challenge and potentially amend some of the assumed costs for specific activities / projects in the business plan.
- Drawing on engineering expertise to challenge and potentially amend some of the assumed costs for specific activities / projects in the business plan.
- Reviewing the company's asset management practices and processes, potentially targeting specific areas, with a view to informing its view on the quality of the company's plan and the extent to which adjustments from business plan costings are likely to be appropriate.

There is regulatory precedent for this type of approach to cost assessment from the ORR's regulation of Network Rail, the Utility Regulator's regulation of the Northern Ireland electricity distribution and transmission company NIE Networks, Ofgem's regulation of electricity and gas transmission companies in Great Britain, and aspects of Ofwat's approach for water company price reviews before PR14. The box overleaf outlines elements of Ofwat's approach at PR09.⁵

Under the approach to cost assessment envisaged above, there would be a question of how the assessment for operating expenditure would be done. There are several options for that and, in line with the subsection above on option C, we keep these open for the purposes of specifying option D. For example, one approach would be for operating expenditure to be included in the same review process as carried out for capital maintenance expenditure, which would allow for a more integrated

⁵ Further information on the evolution over time in Ofwat's cost assessment approach for capital maintenance is provided in Bush and Earwaker (2019) *Providing appropriate regulatory funding for capital maintenance activity: ensuring capital sustainability and service resilience*.

assessment across these expenditure categories. An alternative would be to use econometric benchmarking models for the operating expenditure component.

Figure 1 Ofwat's assessment of capital maintenance at PR09

Ofwat's assessment of capital maintenance at PR09 gave weight to a review of each company's business plan proposals for capital maintenance expenditure and each company's historical expenditure.

Ofwat said that it took companies' planned expenditure for the forthcoming AMP, and the expenditure in the review period coming to an end (i.e. 2005–2010), as a starting point to assess the planned increases or reductions in capital maintenance expenditure put forward by companies. For example, Ofwat considered the evidence and analysis put forward by a company to explain the need for increased levels of capital maintenance expenditure within specific areas.

Ofwat's assessment drew on consideration of the quality of the companies' asset management plans. The approach underlying this latter assessment, labelled as the Asset Management Assessment (AMA) sought to "provide an assessment of the quality of the business plan submitted, the business planning process used to develop the plan and the manner in which the plan had been presented in accordance with the Common Maintenance Planning Common Framework."⁶

Under the AMA process, companies were attributed, at a sub-service level, a score between 0 and 5; a score of 4 was given where Ofwat considered that expectations concerning capital maintenance plans were fully met. In turn, the AMA score was used to calculate an AMA challenge: an amount by which to reduce or increase the capital maintenance allowance relative to the amount sought in the company's business plan. The AMA challenge was calculated as $(\text{AMA score} - 4) * 25\% * (\text{Expenditure subject to challenge})$ where "Expenditure subject to challenge" was defined as twice the difference between the expenditure in the 2005 – 2010 period and the proposed expenditure for 2010 – 2015.⁷ This computation is such that the AMA challenge was £0 for a company whose capital maintenance plans were deemed to have fully met expectations (i.e. a score of 4). There was an intention by Ofwat, to help incentivise efficient plans, that a company could be provided with an allowance of more than it had sought (e.g. a score above 4 where the company had identified and justified scope to reduce expenditure below its historical levels).

Ofwat's assessment also drew on the "cost base" comparative tool to challenge companies' costs. This involved comparing, for a set of standardised projects, a company's costs against the median of the industry and, from that, producing a company-wide relative efficiency challenge for capital expenditure, which could be positive or negative.

The above elements fed into the derivation of Ofwat's projection of capital expenditure for 2010–2015. This, in turn, was an input to the Capital Incentive Scheme (CIS) which Ofwat had in place with a view to providing incentives to companies to put forward challenging and efficient plans and providing incentives on costs during the subsequent price control period.

⁶ Ofwat (2009) *PR09/23 Asset Management Assessment (AMA) and baseline setting*, page 2.

⁷ The company proposed expenditure for 2010–2015 was calculated after removing exceptional items and making adjustments, including to correct for cases where Ofwat considers that companies have misclassified relevant capital maintenance as other types of capital expenditure

3: Analysis and tools to support cost assessment

Introduction

This section elaborates on some of the types of analysis and analytical tools that could be used to provide evidence for use under options B and C for the high-level approach to cost assessment (see section 2 for an introduction to these options).

This is a relatively detailed and technical section within this document, and a reader looking for a more accessible explanation of the key elements of policy packages P1 to P5 might prefer to skip to section 4.

In this section we focus primarily on evidence to support cost assessment options B and C. This is for two main reasons. First, under these two options there would be a greater need for Ofwat to carry out alternative forms of analysis which are not a significant part of its current approach to cost assessment. Second, options B and C are the options that feature in the three policy packages (P2, P3 and P4) which we suggest, in our main report to workstream 2, are most promising and should be prioritised at this stage.

We discuss a number of types of analysis and analytical tools in this section that could inform the evidence base for options B and C. For the majority of these, they could be used for both options B and C, which reflects the idea that there is considerable overlap between these options in the types of evidence that are useful. But the role of the evidence is somewhat different under each of these two options as shown in the table below.

Table 5 Role of evidence sources under options B and C

High-level approach to cost assessment	Role of the evidence covered in this section
Option B (used for package P2 and potentially P4)	<p>Potential contribution to the evidence base for assessing potential industry-wide adjustments to the cost estimates produced from Ofwat's base-plus expenditure models, so as to take appropriate account of factors that may mean that efficient costs in the forthcoming price control period differ from the cost estimates produced from base-plus benchmarking models estimated using historical expenditure data.</p> <p>Evidence may be used to:</p> <ul style="list-style-type: none">• Assess whether adjustments are appropriate (and the direction of these)• Quantify the scale of the adjustment for each company
Option C (used for package P3 and potentially P4)	<p>Potential contribution to the evidence base for an Ofwat-led assessment to determine an explicit allowance for the efficient levels of capital maintenance for each company over the forthcoming price control period.</p>

In some sense, the use of multiple sources of evidence to determine cost allowances (e.g. estimates from the type of base-plus econometric models used at present and the types of evidence used in this section) might be seen as a form of triangulation across different approaches. However, we suspect that making best use of the evidence is likely to go beyond taking estimates from multiple types of analysis and taking a weighted or unweighted average of these. This is partly because some of the evidence that is relevant does not give a direct estimate for expenditure

requirements to use, but can inform judgements on the weight to be given to the estimates that are available. Furthermore, there may be a role for adjustments to the available estimates of expenditure requirements, in light of qualitative or indirect evidence. At this stage, we leave open the ways in which different sources of evidence might be combined.

In the table below we provide *examples* of different types of analysis that could support options B and C (further to the types of analysis established under Ofwat’s current approach).

Table 6 Examples of sources of evidence that might be used to support options B and C

Evidence source (e.g. type of analysis or analytical tool)	High-level approach to cost assessment	
	Option B	Option C
1. Analysis of changes over time in expenditure and consideration of the factors driving these changes	✓	✓
2. Analysis of historical data on asset health over the historical period covered by expenditure benchmarking	✓	✓
3. Estimates of expenditure requirements based on asset inventories and assumed asset life estimates	✓	✓
4. Projections for asset health and outcomes under defined investment scenarios drawing on asset deterioration modelling	✓	✓
5. Econometric benchmarking models of base-plus expenditure with time trend explanatory variables	✓	✗
6. Econometric benchmarking models of base-plus expenditure with explanatory variables relating to asset health	✓ / ?	✗
7. Econometric benchmarking models of capital maintenance expenditure	✓ / ?	✓
8. Econometric benchmarking models using company expenditure forecasts as input data	✓ / ?	✓ / ?
9. Analysis of costs per unit of monetised asset risk reduction	✓ / ?	✓ / ?

The table above identifies those types of evidence that may be able to make a valuable contribution to the evidence base for options B and C, and which seem especially worth considering further as part of further work on reforms to the approach to cost assessment. A tick is not intended to imply that a source is essential under the relevant option. Where we indicate both a tick and a question mark, we are more uncertain about the feasibility and/or value of these analytical tools than for cases where there is just a tick.

We take each type of evidence from the table in turn and outline it in this section. This is intended as a starting point, to help illustrate the types of analysis and modelling that might be used under options B and C and to capture ideas that arose over the course of workstream 2. Some of these were identified as potential alternatives to Ofwat’s current approach to cost assessment in the initial long list of potential remedies that we identified in the early stages of workstream 2 (see the

appendix to this document). Some of the other evidence sources from the table emerged as we considered the practicalities around options B and C.

It was not a priority for workstream 2 to develop or review these examples in any detail, and they are not intended to be comprehensive of all the forms of analysis that might be useful. Furthermore, we have not sought to consider what might be a minimum set of evidence types needed to provide an adequate evidence base under each option.

Evidence source 1: Analysis of changes over time in expenditure and consideration of the factors driving these changes

One limitation of Ofwat's current approach to cost assessment is the lack of explicit attention to:

- how expenditure across the industry has changed over time;
- what factors might have driven these changes; and
- what these changes and factors suggest about the funding requirements for efficient companies in the forthcoming price control period.

Under cost assessment option B there would be a clear need to explore these questions as a means to help reach an informed decision on whether to apply an adjustment for how efficient levels of expenditure in the forthcoming price control period may differ from those observed historically.

There may be some role within option B for econometric models of base-plus expenditure that include time trends (see evidence source 5 below), but the issues above call for a broader assessment that looks beyond the results from econometric models estimated using historical data.

Furthermore, analysis of changes over time in historical expenditure are likely to be relevant under cost assessment option C, where separate assessment of capital maintenance expenditure requirements are to be carried out, especially where some use of made of historical expenditure data (or measures of the historical scale of asset replacement acidity) to set allowances for the forthcoming price control period.

In carrying out this type of analysis it would be particularly relevant to look at changes observed at the industry level (e.g. on average across company) and affecting all companies, while also giving some consideration to differences between companies and what these might be due to.

Evidence source 2: Analysis of historical data on asset health over the historical period covered by expenditure benchmarking

Ofwat's current approach to cost assessment places emphasis on benchmarking of companies' historical base-plus expenditure. In addition, there may be a role, either to complement (under option B) or replace (under option C) that form of benchmarking, in looking at econometric models of companies' historical capital maintenance expenditure.

For either of these types of econometric benchmarking analysis, it could be important to understand how companies' performance and systems have evolved over the time period covered by that analysis (including consideration of what has been achieved or delivered with that expenditure).

Part of this concerns consideration of historical levels of companies' performance (e.g. for common PCs), and trends in that performance over time, to understand whether allowances based on benchmarks derived from historical expenditure data are likely to be consistent with the PCLs that Ofwat is planning to set for the forthcoming price control period (e.g. for common PCs). Ofwat did give some consideration to this at PR19, though there may be benefit in a fuller and more rigorous analysis.⁸

Another part concerns consideration of the prevailing and historical levels of companies' asset health and operational resilience, and trends in these over time. We focus in this subsection on this second strand of analysis.

For example, it could be relevant to carry out analysis of historical data on asset health and operational resilience to understand and consider:

- If asset health (e.g. as measured by asset failure events and/or modelled asset failure risk) across the industry has deteriorated, remained stable or improved over the period covered by the historical expenditure.
- If the level of asset health across the industry that is observed during the historical period is at a level which is considered acceptable for the next price control period, or whether there are concerns that it is too low (or too high).
- The relationship between the trends in asset health, trends in wider measures of operational resilience, and trends in more outcome-focused performance metrics (e.g. common PCs), and possible explanations for any differences in these trends.

On the third point above, a possible scenario identified by the analysis could be that outcome-focused performance metrics have improved over time while asset failure events have got worse, and that improvements in operational capabilities to respond to and mitigate asset failures have improved over time (perhaps prompted by the financial ODIs on outcome-focused performance metrics). This analysis might then raise the question of whether a similar rate of improvement in operational capabilities is achievable in the future; if not then expenditure allowances based on historical levels of expenditure (or extrapolation of historical trends in expenditure) might have the effect of funding a notional efficient company at a level that may lead to increased asset failures in the future and worsening performance in terms of customer and environmental outcomes.

For this type of analysis, we envisage that the data on asset health and operational resilience should use a set of metrics that are more reliable than those used at PR19 (e.g. more reliable as a source of information on asset failure risk) and provide greater coverage of the water and wastewater asset base than those used at PR19.⁹

⁸ For some further discussion of these issues, see section 2.4 of Reckon (2022) *The opportunities for a more coherent regulatory approach for Ofwat's funding of base expenditure and enhancements*.

⁹ For example, under Ofwat's PR19 approach it had a narrow set of asset health metrics and attached financial ODIs to these. There may be concerns that improvements in these areas covered by ODIs are not indicative of trends in the wider asset base. Furthermore, the specific metrics used by Ofwat may not provide a good guide to asset failure risk.

This analysis could be done for individual companies and for the industry as a whole (e.g. taking averages across companies of the estimated trends or recent positions). Looking at the industry as a whole may be more relevant if the wider approach to cost assessment is placing weight on cross-company benchmarking as a means to set ex ante expenditure allowances.

Evidence source 3: Estimates of expenditure requirements based on asset inventories and asset life estimates

Ofwat's current approach to cost assessment places emphasis on companies' historical levels of expenditure.

A focus on this type of historical evidence in isolation is problematic given the behavioural concern that we have identified in our main report to workstream 2, which may mean that historical levels of expenditure observed in the industry are not a reliable guide to the level of expenditure that an efficient company would incur over the forthcoming price control period if it were to manage effectively the risks of adverse outcomes for customers and the environment in the future.

There is a good argument that the historical expenditure data across the industry is likely to be polluted, to some degree, by the financial and reputational incentives arising from the regulatory framework that has applied to water companies over the historical data period.

In this context, there may be particular value, for cost assessment purposes, in looking at sources of evidence that are less likely to be polluted in this way.

One potential alternative type of evidence on capital maintenance expenditure requirements is to estimate these based on asset inventories and estimated asset lives. The type of evidence was used in the approach that WICS took for Scottish Water at SRC21, and there may be opportunities to apply a more sophisticated approach for PR29.

At this initial stage, we see two main ways in which estimates of asset replacement expenditure requirements might be built up from asset inventories and estimates of asset lives:

- **Method that ignores asset ages.** For each company, this would involve taking estimates of the unit (replacement) cost (or gross modern equivalent asset value, GMEAV) of each asset type and dividing this by a corresponding estimated asset life for the asset type, and then aggregating across all asset types to produce an estimate of average annual levels of asset replacement expenditure.
- **Method that takes account of asset age.** For each company, and each asset type, an estimate of replacement volumes in the forthcoming price control period would be calculated by counting the number of assets within that type that will reach (or exceed) estimated asset life for the asset type by the end of that price control period, taking account of the actual ages of the actual assets in each type (and excluding assets due to be replaced before the start of that period). These volumes would be multiplied by estimates of unit (replacement) cost (or gross modern equivalent asset value, GMEAV) of each asset type, before aggregating across all asset types to produce an estimated level of asset replacement expenditure.

The first of these is simpler, and closer to our understanding of the approach taken in the analysis used by WICS for the SR21 price review for Scottish Water. However, the second method may offer

a more reliable way to estimate expenditure requirements for a given regulatory period in circumstances where a company's actual assets have an uneven age profile due to the historical profiles of past enhancement and asset replacement expenditure (e.g. as a consequence of greater enhancement programmes since privatisation or a growing backlog of asset replacement needs).

Under either approach, there is a need for input data on asset lives and unit costs. There could be a role for cross-company benchmarking of the input data used, such as:

- Using benchmarking to estimate an efficient unit cost for specific types of asset replacement activity (e.g. benchmarking of unit costs based on granular historical data for granular asset replacement activities, or perhaps some version of the cost base approach used by Ofwat before PR14).
- Using benchmarking of historical and/or estimated economic asset lives for specific types of assets as a means to inform asset life assumptions. This could include account being taken of the impact that expenditure on refurbishment can have on expected economic asset life

The assumptions on asset lives would be a regulatory judgement in light of both historical experience, and engineering and operational insight. The same assumptions on asset lives might be applied to all water companies, unless there is good evidence for an alternative approach. Given uncertainty about asset lives, there may be value in repeating the analysis for multiple scenarios for the set of asset life assumptions.

There are further questions about how estimates of capital maintenance derived from the methods above could be used to inform the evidence base for cost assessment and the role of benchmarking analysis.

One approach would be to treat the estimate of expenditure requirements derived from each company's asset inventory (and asset age data where applicable) to inform price control expenditure allowance for that company.

However, we also see value in exploring an approach under which the estimates of companies' expenditure requirements based on assumed asset lives are used as input data to forms of cross-company benchmarking models (e.g. econometric models that reflect the type of explanatory variables used for base cost modelling) and the results from those models are used to inform the price control allowances for all companies. The benchmarking could be applied directly to the estimates of expenditure requirements based on assumed asset lives or to a measure of base expenditure that combines these with operating expenditure (this issue would need further consideration). This type of role for benchmarking could bring several benefits:

- This fits better with Ofwat's wider regulatory approach of using cross-company benchmarking, while still bringing into the cost assessment process evidence on expenditure requirements that is more forward-looking and offers a different perspective than historical expenditure data.
- It helps to address concerns that using this type of analysis to inform companies' expenditure allowances could increase risks of distortion to companies' financial incentives in favour of capital expenditure, acting against a key part of the PR14 reforms (e.g. such incentives could arise if companies anticipate that expansion of their own stock of assets could lead to increased

allowances in the future under this type of analysis, without any corresponding increase from adopting more opex-based alternatives to investment, including nature-based solutions).

- It could help mitigate concerns about the reliability and accuracy of the input data used for the estimation approach based on assumed asset lives. The nature of this data is quite different to data on expenditure that is subject to statutory and regulatory accounting requirements. Benchmarking might be used to query and improve the data and assumptions provided by some companies and/or to mitigate the impacts on customers of any data inaccuracies.

Further consideration could be given to whether these benefits are likely to outweigh potential downsides from benchmarking these types of estimates (e.g. extra complexity and effort, or concerns that estimates for a particular company derived from benchmarking would not take sufficient account of the circumstances of that company), and the opportunity to mitigate these if needed (e.g. through off-model adjustments to the estimates derived from the benchmarking).

Evidence source 4: Projections for asset health and outcomes under defined investment scenarios drawing on asset deterioration modelling

Another potential source of evidence that might be valuable is scenario modelling analysis that is intended to make projections of asset health and/or outcomes performance into the future, to inform on potential price control funding levels for base expenditure (under option B for the high-level approach to cost assessment) or for capital maintenance expenditure (under option C) over the next price control period.

This type of analysis would take expenditure (or associated activity levels) related to asset health (and perhaps wider aspects of operational resilience) as an input and project potential trajectories for asset health and/or outcomes using clear modelling assumptions and supporting evidence.

For example, modelling might provide projections for asset health (e.g. measures of asset failure risk) under scenarios such as:

- Capital maintenance expenditure levels (or activity levels) reflecting those observed historically.
- Capital maintenance expenditure levels (or activity levels) that might be viewed as consistent with the expenditure allowances arising from econometric models of base-plus expenditure or capital maintenance expenditure.
- Capital maintenance expenditure levels (or activity levels) that reflect the type of expenditure estimates from evidence source 3 above (i.e. based on asset inventories and asset life estimates).
- Capital maintenance expenditure levels (or activity levels) that are aligned with proposals from companies' business plans.

The scenario modelling might, for example, draw on deterioration modelling that uses evidence on historical asset failure events (or asset condition grades, or performance measures) to model the relationships between asset age and asset failure risk taking account of a range of other factors affecting asset failure risk. When projecting forwards, the types of scenarios above could be used to specify assumptions for asset replacement rates and hence the age profile of assets to model risk over a future period.

There may be a role for using composite asset risk metrics of the type discussed in section 5 for this analysis. Alternatively, the analysis could build up from a suite of more granular modelling. We leave these issues open at this stage.

The modelling might also draw links between projections for asset health and projections for future outcomes performance. If the modelling is focused on asset health and does not consider wider aspects of operational resilience that affect outcomes performance (e.g. operational mitigations of asset failure), then it may be appropriate to give separate consideration to potential changes over time in those wider aspects under the relevant scenarios. For example, operational improvements may act to offset the effects of deterioration in asset health, but the past rates of operational improvements are not necessarily a good guide to what is achievable in the future.

This type of analysis would not provide an explicit estimate of the capital maintenance expenditure requirements of a notional efficient company over the forthcoming price control period, but would provide a way to help test or sense check figures produced by other sources of evidence, and may help inform decisions on how much weight to give to figures from different sources for the purposes of setting allowances.

There is overlap between the type of modelling and analysis envisaged here and one of the information remedies discussed in section 4: see initiative 2 (“Long-term projections of PC/outcomes performance under well-defined scenarios”). There may be opportunity for some common models, tools or methodologies to be used across the two.

Evidence source 5: Econometric benchmarking models of base-plus expenditure with time trend explanatory variables

The use of time trend variables is a familiar feature of econometric modelling of time series panel data modelling within the wider econometric literature. However, Ofwat’s approach at PR19 and the early stages of PR24 seems unconventional in its use of model specifications for base-plus benchmarking that assume no changes in costs (beyond those attributable to changes in the cost driver explanatory variables) over a data period spanning 10 years.¹⁰

To support Ofwat’s analyses under cost assessment option B, there could be a role for Ofwat’s base-plus econometric models to include time trend explanatory variables. This approach could be applied to all of the econometric models used, subject to some review of the statistical results for the coefficients on the time trend variable in each model.¹¹

Since cost assessment under option B is concerned with whether the efficient levels of expenditure in the forthcoming price control period are likely to be different from the levels of expenditure

¹⁰ Ofwat did use using time trend explanatory variables at PR14. However, at PR14 Ofwat’s econometric models were compromised by a number of other issues (e.g. attempting to include too many explanatory variables). And there is now a longer time series of data available at PR14. This means that the experience of time trend models from PR14 is not a good guide to how they would perform at PR24 or PR29.

¹¹ While beyond the scope of this project, we do not consider it to be valid on statistical and economic grounds to limit the use of time trend variables to cases where a 5% or 10% statistical significance threshold is reached, especially where there are, as is the case here, good reasons for expecting trends in costs that are not captured in the explanatory variables or changes in CPIH. That said, the t-ratio of the time trend coefficient would be a relevant consideration.

observed historically, consideration of this type of modelling seems highly relevant, either as a complement to, or replacement for, econometric models that lack time trend variables.

This would allow for the impacts of historical changes over time in base-plus expenditure, beyond those captured by the estimated impacts of changes in explanatory variables, to be factored into the allowances for base-plus expenditure over the forthcoming price control period. This may be relevant for capturing effects such as the increase over time in the scale of capital maintenance expenditure that is driven by a growing asset base from past enhancements and increased costs to help achieve improved levels of performance against common PCs.

Nonetheless, this source of evidence has some limitations which mean that it is best seen as part of the evidence base under option B (e.g. alongside other types of evidence discussed in this section), and is unlikely to be sufficient on its own to address the limitations of Ofwat's existing analytical tools:

- When extrapolating time trends into future periods, it would be sensible to develop an understanding of what the likely factors are which have driven those time trends and to consider whether they are likely to apply over the forthcoming price control period. This might call for a wider set of qualitative and quantitative evidence beyond the econometric models with time trend variables, and a need for judgement in deciding whether to apply the time trend in full, in part, or not at all when setting allowances for the next price control period.
- The use of time trends in the models changes the way that historical expenditure data is used but essentially the base-plus allowances would still be driven by the expenditure (and profile of this expenditure) observed historically. This does not provide an opportunity to take full account of potential differences between the efficient levels of expenditure in the future and the levels of expenditure observed historically. For instance, the use of time trend variables does not address concerns that the levels of expenditure observed historically may be unduly low, due to the incentives created by the price control framework as discussed under the behavioural concern in our main report and highlighted above in relation to evidence source 3. Simply extrapolating historical trends in expenditure may lead to insufficient allowances over the forthcoming price control period.

The discussion in this subsection has been in the context of econometric models of base-plus expenditure, especially within the context of cost assessment option B within package P2. But it has broader relevance. For instance, if econometric benchmarking is carried out separately for capital maintenance (see evidence source 7 below), then it would be relevant to consider inclusion of time trends in these models and to consider what might have driven historical trends and the extent to which those trends are likely to apply over the forthcoming price control period.

Evidence source 6: Econometric benchmarking models of base-plus expenditure with explanatory variables relating to asset health

To support Ofwat's analyses under cost assessment option B (within package P2), there could be a role for versions of Ofwat's base-plus econometric models that include additional types of explanatory variables that are intended to take account of the relationship between companies' expenditure over the historical dataset and changes over time, and differences between companies, in factors relating to asset health.

Considerable further work would be needed to identify and test potential variables to include in the models, so at this stage we describe this type of modelling in quite broad terms. For example, additional explanatory variables might include the following:

- A composite metric of asset health which is calculated as a weighted average of more granular asset health data across different assets.
- A composite metric of asset risk, which is similar to the composite asset health metric above but takes account of information on other factors that affect the consequences of asset failure and risk to outcomes (e.g. similar to the network asset risk metrics used by Ofgem).
- Measures of the scale of capital maintenance or asset replacement activity each year (e.g. the proportion of water mains that are renewed each year, or perhaps a weighted average of replacement rates across a broader set of asset categories).
- Composite measures of asset age (e.g. a weighted average age across different categories of assets) or weighted averages of estimates of the remaining economic life of assets.

For each of these metrics consideration would be needed as to exactly how they should be incorporated (e.g. should expenditure in each year be regressed against the level of asset health in that year or the change in asset health in that year?). It will be an empirical matter whether specific metrics can be included in specific models while producing econometric results that are meaningful and usable.

If measures of asset health or activity levels are included as explanatory variables in the models estimated on the historical dataset, decisions would then need to be made about what should be assumed for these explanatory variables when calculating modelled costs over the forthcoming price control period. Asset health is not exogenous and it would not make sense, in the context of concerns about asset health, to simply extrapolate historical trends in asset health metrics into the future for the purpose of setting allowances. There are likely to be a range of options, such as:

- Make an industry-wide assumption on what levels of asset health are desirable by the end of the price control period and use this to determine values for the asset health metric for each company over the period.
- Make an industry-wide assumption on what rate of change (e.g. improvements) in the asset health metric are desirable by the end of the price control period and use this to determine values for the asset health metric for each company over the period (taking account of what levels on the metric they start at).
- Make a separate assumption for each company, potentially based on a review of each company's business plan proposals for the appropriate trajectory for the metric combined with comparison between companies and other relevant evidence.

Decisions in these areas would allow the modelling above to be forward-looking in the sense that a different trajectory for (or level of) asset health could be assumed – and funded – for the forthcoming price control period compared to the trajectory (or level) that has materialised over the historical period.

Evidence source 7: Econometric benchmarking models of capital maintenance expenditure

Under options B and C for the high-level approach to cost assessment, there is a potential role for econometric benchmarking models of capital maintenance expenditure, estimated using historical data.

Under option B, for this type of modelling to add value compared to the econometric models of base-plus expenditure, our starting point is that these would need to offer a more successful way to incorporate explanatory variables that do not feature within Ofwat's main set of base-plus models. For instance, carrying out separate benchmarking for capital maintenance expenditure, or more granular sub-categories within this,¹² may allow modelling to be focused on those areas of expenditure for which explanatory variables relating to asset health are more relevant which could increase the statistical accuracy of the estimated coefficients on such variables. However, there may also be drawbacks from econometric benchmarking at levels of aggregation below base expenditure and these would require consideration.

The additional explanatory variables used for capital maintenance benchmarking models might involve variables such as:

- A composite metric of asset health which is calculated as a weighted average of more granular asset health data.
- A composite metric of system risk, which is similar to the composite asset health metric above but takes account of information on other factors that affect the risk to outcomes (e.g. information on changes in operational capabilities or redundancy).
- Measures of the scale of capital maintenance or asset replacement activity each year (e.g. proportion of water mains that are renewed, or perhaps a weighted average of replacement rates across a broader set of asset categories).
- Composite measures of asset age (e.g. a weighted average age across different categories of assets) or weighted averages of estimates of the remaining economic life of assets.

Under option C, there is a more direct need for estimates of expenditure requirements for capital maintenance expenditure than under option B. Under option C econometric models of capital maintenance expenditure might include explanatory variables relating to asset health (e.g. as indicated in the examples above) but there could also be a role for capital maintenance models that do not include these types of variables and which focus on more exogenous variables. As under the current approach to cost assessment, there could also be a cost adjustment process to consider potential adjustments to the results from the econometric models for the purposes of setting allowances.

There is the potential for the capital maintenance models to be specified at a more disaggregated level (e.g. distinguishing between capital maintenance for different types of assets such as infrastructure versus non-infrastructure expenditure, and different parts of the water and wastewater

¹² Perhaps also covering some element of operating expenditure as discussed towards the start of section 2.

value chains). This might make sense if the aim is to take account of explanatory variables on asset health or capital maintenance volumes that only apply to specific sub-areas of expenditure, as it may increase the likelihood of the models identifying meaningful and statistically acceptable relationships between expenditure and those variables.

Given concerns about the potential for inaccuracy arising from interactions between companies' operating expenditure and capital maintenance expenditure, it would be important that any catch-up efficiency adjustments applied (e.g. for what is considered to be the upper quartile efficient level of costs) are calculated after aggregating across the results from operating expenditure and capital maintenance models. This would not resolve concerns about interactions between these categories of costs, but would lessen them.

As we discussed in the subsection above on evidence source 6, if explanatory variables relating to asset health or activity levels are used, this type of approach could enable a more forward-looking view about appropriate levels of capital maintenance for the forthcoming price control period. Decisions would need to be made about what should be assumed for these explanatory variables when calculating modelled costs over the forthcoming price control period. Asset health is not exogenous so this is not about trying to *forecast* what each company's asset health will be over that period and it would not make sense to simply extrapolate historical trends in asset health metrics in the future. See the discussion under evidence source 6 for examples of the types of approaches that might be considered.

Evidence source 8: Econometric benchmarking models using company expenditure forecasts as input data

To support the cost assessment under option B (within package P2), there may be a role for base-plus econometric models that draw on input data that covers both historical expenditure data and company's business plan forecasts for base-plus expenditure over the forthcoming price control period.

Furthermore, for the purposes of giving weight to the forecast data when setting allowances, one of the following modelling approaches would be applied (or a variation of these):

- A dummy variable would be used in the dataset which takes the value of one for years in the forecast period and zero in the historical period and, when calculating modelled costs over the forthcoming period, the dummy variable would be set to one. This approach has been used in the past by Ofgem.
- A time trend variable would be included in the historical dataset and projected forwards.
- A combination of both of the approaches above.

The time trend would be intended to capture and extrapolate from an approximate trend in costs over time while the dummy variable would allow for a step change between historical and future expenditure.

This type of approach would, by its nature, allow for a forward-looking assessment of base-plus costs, though primarily this would be an industry-wide adjustment relative to historical expenditure; this approach would not generally allow for variations across companies in the extent to which the

modelled costs for the company over the forthcoming price control period differ from its historical expenditure. The forward-looking assessment would be driven by water companies' business plan forecasts, without involving a regulatory assessment of the evidence underpinning those forecasts and without regard to other sources of evidence about how the future costs may differ from those in the past.

A variation on this option is one where the econometric modelling only uses historical data, but applies what Ofwat has referred to in the past as a "forward-looking efficiency challenge" (drawing on aspects of the approach it applied at PR19 for residential retail costs). Under this variant, the "efficiency score" used to calculate the catch-up adjustment would be based on a comparison of each company's forecast costs over the next price control period, relative to modelled costs for that period. It is possible that the catch-up adjustment would be negative – e.g. if the forecast costs of the upper quartile company (on a forecast basis) are more than its modelled costs. This is because the adjustment based on the efficiency score would not be simply (if at all) about efficiency and would reflect companies' views about how future costs may differ from historical costs, which may be driven by a range of factors. If this type of approach is used some alternative to the terminology of a "forward-looking efficiency challenge" would be needed to avoid confusion: perhaps "notional efficient company forward-looking adjustment". Care would also be needed to avoid double counting with other factors impacting costs over time, such as adjustments for RPEs and ongoing efficiency.

These approaches are heavily dependent on the quality and reliability of the figures for base-plus expenditure contained in companies' business plans. Beyond the difficulty of forecasting over a six- or seven-year period, there are concerns that each company's forecasts may be influenced by strategic considerations (whether intentionally or not), such as how the company will be assessed as part of Ofwat's business plan assessment process (which currently rewards low forecasts in various ways) or a desire to limit the risks of facing a totex allowance that leads to an over-spend.

Evidence source 9: Analysis of costs per unit of monetised asset risk reduction

Finally, we briefly highlight a further source of analysis which could be useful if the type of monetised composite asset risk metric discussed in section 5 were to be available.

For example, in a simple case if a monetised composite asset risk metric was available which covered the full wholesale water network plus asset base, then a form of unit cost metric could be calculated for each company by dividing historical (or forecast) expenditure on asset health in this area by the improvement in monetised asset risk expected to be achieved by that expenditure. Information on this unit cost metric could be used as part of the process to determine allowances going forward under specified scenarios for monetised asset risk (e.g. estimates of expenditure required to maintain asset health over time).

There may also be scope for cross-company benchmarking and/or broader analysis to help inform cost assessment for the forthcoming price control period, under which models of expenditure (e.g. base expenditure or capital maintenance expenditure) take account of explanatory variables for monetised asset risk as well as more exogenous factors (e.g. as used under the current base-plus benchmarking models). There are interactions here with the examples given above, in the subsections under evidence sources 6 and 7, of econometric benchmarking that uses asset health data as explanatory variables in the models.

However, as with the broader use of that type of metric (see section 5), complications are likely to arise. The relevant metric for the scale of improvement in monetised asset risk would be quite conceptual (e.g. improvement measured against a hypothetical counterfactual of no asset replacement) and may need to consider a long time-frame (e.g. a comparison of the NPV of monetised risk in all future years) to recognise that different types of capital maintenance expenditure / activities may lead to risk reduction of different durations.

This type of analysis could be particularly relevant under package 4. Under package 4, careful consideration would need to be given to the extent of consistency between the ex ante allowances for expenditure, relative to the target improvement in the monetised risk metric, and the scale of ex post adjustments to expenditure allowances that would be applied in the case that a company does not fully deliver on that target (i.e. that the implied unit cost adjustment for under-delivery of monetised risk reduction is consistent with the implied unit cost of monetised risk reduction funded ex ante).

Furthermore, subject to data availability and the feasibility of the analysis, there could also be a role for this type of analysis under packages 2 and 3, as a means to support the evidence base for more forward-looking expenditure allowances.

4: Measures to enhance information and incentives on long-term performance

Introduction

In our main report to workstream 2, we identified that changes to the approach to cost assessment are unlikely to be adequate on their own. As it stands, the wider framework may lead companies to prioritise short-term performance (and cost control) over the understanding of – and efficient management of – risks to outcomes in the future. The behavioural concerns we identified in the main report imply risks that any increases in cost allowances might not be used to improve asset health in a well-targeted way, which may limit the effectiveness of those increases or act as a deterrent to Ofwat setting higher ex ante allowances in the first place.

We identified two key strategies to help tackle the broader behavioural concerns:

1. Retain a focus on outcomes while enhancing the incentives on long-term performance.
2. Supplement outcomes with deliverables based on asset risk metrics or investment programmes.

In this section, we expand on a number of complementary regulatory measures or initiatives that we envisage under the first strategy, which is the strategy that would be adopted under packages P2 and P3. In section 5 we expand on the options that could be applied under the second strategy.

The initiatives highlighted in this section are intended to help to tackle both the behavioural and the informational concerns that arise under the current regulatory approach. These are closely linked: we see the informational concerns as one of the causes of the behavioural concerns, so tackling the behavioural concerns calls for action on the informational concerns. But the informational concerns also matter in their own right.

In our main report, we refer to packages P2 and P3 as including an “Enhanced set of incentive and informational remedies” and we describe this package of remedies in more detail in this section. These involve a series of informational initiatives, as well as targeted modifications to the way that the regulatory framework operates and is presented. This set of initiatives has been inspired, in part, by our analysis of the sources of the behavioural and informational concerns under the current framework, which is summarised in our main report to workstream 2.

We also identify in the table below which of those regulatory initiatives would be applied as part of packages P1, P4 and P5 (the packages that adopt the second strategy above). A narrower set of remedies in these areas might be viewed as a more proportionate and consistent if the preferred strategy is to supplement outcomes with deliverables based on asset risk metrics or investment programmes. On this basis, and for the purposes of specifying and assessing packages P1, P4 and P5 as part of workstream 2, we have assumed quite a narrow set of remedies. However, there may be net benefits from some further elements of the broader enhanced package even under these packages and we would not want to rule these out.

As a means to help present and structure the various different measures within the enhanced set of incentive and informational remedies (under packages P2 and P3) we have organised these into five areas:

- Increasing the prominence and credibility of information relating to future outcomes performance.
- Use of financial ODIs applied to information on operational resilience.
- Steps to help avoid misleading inferences being drawn on companies' current performance.
- Other targeted changes to reduce risks of undue incentives on short-term performance.
- Other targeted changes to support decision-making with a long-term perspective.

In the table below we show the set of measures that we have identified, at this stage, for the purposes of the enhanced set of incentive and informational remedies (under packages P2 and P3), and contrast these with what is applied under Ofwat's current approach (at the time of writing) and with the narrow set of informational remedies that we include under packages P1, P4 and P5.

Table 7 Mapping of informational and incentive remedies to the five packages

Regulatory measure or initiative	Current approach	Enhanced set of incentive & informational remedies P2 and P3	Narrow set of informational remedies P1, P4 and P5
Increasing the prominence and credibility of information relating to future outcomes performance			
Companies report against a broad set of metrics of asset health and operational resilience	x	✓	✓
Long-term projections of PC/outcomes performance under well-defined scenarios	x	✓	x
Company-owned policies on the management of asset health and risks to future outcomes	x	✓	x
Comparative evaluation of companies' outcome risk management	x	✓	x
Shadow RCV adjustments for scenarios of each company's future outcomes performance	x	✓ / x	x
Assessment of best practice / maturity in asset management and guidance for improvement	✓	✓ / x	✓ / x
Use of financial ODIs applied to information on operational resilience			
Financial ODIs applied directly to metrics of asset health and operational resilience	✓	x	x
Financial ODIs apply to outcome of comparative evaluation of companies' outcome risk management referred to above	x	✓	x
Steps to avoid misleading inferences being drawn on companies' current performance			
Ofwat to make clear to stakeholders why over-spend against ex ante allowances does not necessarily imply inefficiency and may reflect a good long-term approach	x	✓	x
Ofwat to make clear to stakeholders why base-plus cost benchmarking results are not on their own a reliable guide companies' relative efficiency or performance	x	✓	x

Regulatory measure or initiative	Current approach	Enhanced set of incentive & informational remedies P2 and P3	Narrow set of informational remedies P1, P4 and P5
Other targeted changes to reduce risks of undue incentives on short-term performance			
Ofwat's business plan assessment process avoids rewarding / penalising companies according to a narrow assessment of their near-term cost control	x	✓	x
Use an alternative to the catch-up (e.g. upper quartile) efficiency challenge that is less vulnerable to risk of treating near-term cost control as efficiency	x	✓	x
Other targeted changes to support decision-making with a long-term perspective			
Policy of cost-sharing incentive rates that are symmetric and stable over time in order to limit risk of distortions to the timing of investment or artificial incentives for deferral	x	✓	✓ / x
Use dynamic PCLs (e.g. more like C-MeX approach) rather than ex ante PCLs to provide a more visible/credible mechanism through which investment today that improves (relative) performance in the future would bring quantifiable financial benefits over time	x	✓ / x	✓ / x

In the subsections that follow, we provide further information on what is envisaged under each of the initiatives under the first category in the table above (measures to increase the prominence and credibility of information relating to future outcomes performance) and, related to this, on the potential new form of ODI that could draw on evidence from this category of initiatives. Compared to the initiatives in the other areas, these would generally require more work ahead of PR29 to further develop and implement these initiatives. While some further work on these other initiatives would be needed ahead of the PR29 final methodology, it was not a priority for workstream 2 to elaborate further on these.

Initiative 1: Reporting against a broad set of metrics of asset health and operational resilience

Water companies already report some information relating to asset health and operational resilience. For instance, under the approach from PR19 there is reporting against three metrics that Ofwat describes as asset health metrics, for which companies face financial ODIs. These cover: mains burst / repairs, sewer collapses, and unplanned outages at water treatment works. In addition, companies provide some further information (e.g. on the age and condition of water mains) although this has not played a prominent role in the ongoing regulatory framework.

Under initiative 1, there would more comprehensive and purposeful reporting by companies of information on the health and reliability of assets within water and wastewater systems as part of the regulatory framework. This includes information relating to the risks of assets failing to function or perform properly, as well as information on asset failures (and associated impacts on outcomes) experienced in practice.

Under initiative 1, and for all five policy packages, we envisage a set of metrics on asset health and operational resilience that is both considerably broader in scope (i.e. greater coverage of the asset base) and which involves metrics that are more reliable and informative than those used at present.

Under the “Enhanced set of incentive and informational remedies” envisaged under packages P2 and P3, the following types of metrics are likely to be particularly relevant:

- metrics on asset reliability, performance and resistance;
- risk metrics reflecting both asset failure risk and asset criticality; and
- adverse outcome events attributed to asset failure.

The first two of these relate more directly to asset health and the second and third capture operational resilience more widely. Metrics of operational resilience relate not so much to specific assets but to the resilience of the systems and processes that are used to provide services to customers and ensure good environmental outcomes.

Drawing on the key elements of operational resilience identified in Ofwat’s discussion paper from 2022, operational resilience can be seen as driven by the reliability and resistance of assets, as well as redundancy and the response to emergencies (events), which taken together impact on service performance.¹³ In turn, the redundancy and capability to respond to emergencies can be seen to affect the criticality of specific assets (or specific systems of assets) to the achievement of good outcomes for customers and the environment. On this basis, metrics of operational resilience would generally reflect both asset health and criticality.

Further consideration of the types of metrics that might be used is provided in the separate report to Workstream 1 produced by Jacobs.

Initiative 2: Long-term projections of PC/outcomes performance under well-defined scenarios

Initiative 2 would involve each water company providing long-term projections of its performance against common performance commitments, and potentially other areas of performance that are important to customers and the environment but not captured under common PCs.

Long-term projections for common PCs were included as part of PR24 business plans and option 1D would build on this through a number of substantial developments which are intended to help make the projections more reliable and more useful. In particular:

- Multiple sets of projections would be made for alternative scenarios about the future. Ofwat would specify a common set of scenarios for companies to include as a minimum (companies might wish to include additional scenarios).
- A key factor to be captured under different scenarios is the assumptions for the price control expenditure allowances set by Ofwat, and/or a company’s actual expenditure, in future price control periods (covering base and enhancements). For example, there might be scenarios where companies’ base expenditure levels in the future are specified at the levels or trends experienced in base expenditure over a defined historical period, as well as scenarios that involve greater levels of expenditure.

¹³ Ofwat (2022) *Operational resilience discussion paper*, page 13.

- In addition, there may be scenarios for defined external conditions under different projections for climate change (e.g. in terms of weather events) that may affect the risk to outcomes, which would be combined with the different scenarios for future expenditure levels. There may be a case for aligning some of the scenarios with the common reference scenarios used for companies' long-term delivery strategies.
- Companies would explain their projections by reference to the modelling analysis, assumptions and judgements underpinning it, which they would make available to Ofwat and other stakeholders. For instance, this might involve modelling of asset deterioration and/or asset failure under different assumptions for capital maintenance expenditure as well as analysis of changes over time in other elements of operational resilience that affect the consequences of such deterioration / failure on outcomes for customers and the environment (e.g. given redundancy and operational capabilities to respond to asset failure). And as part of the exercise, companies would relate their projections for outcomes with projections for key asset health metrics.

Under this initiative, Ofwat would provide guidance to companies on the scenarios to be used, on the evidence needed to support projections in the future, and on the arrangements for companies to update their forecasts over time. There may also be a role for review and feedback processes to help ensure that each company's long-term projections make sense in light of its supporting modelling and assumptions.

We envisage that the scenario analysis – or key aspects of it – would be updated annually, rather than simply being treated as an input to the business plan process every five years. For example, annual updates could report on how risk has been managed over the most recent reporting year, taking account of the level of capital maintenance investment incurred and how this compares to assumptions used previously, and updating for other changes over time or emerging information.

Initiative 3: Company-owned policies on the management of asset health and risks to future outcomes

Under this initiative, each water company would publish:

- key information about the policy and methodologies that it intends to use to manage asset health and control risks to outcomes in the future.
- Information about how they have applied their chosen policy and methodologies in practice.

Both elements would draw on and refer to the asset health metrics from initiative 1 and the projections for outcomes performance envisaged under initiative 2 above.

Further work would be needed to develop this initiative; at this stage we present our initial views on how it would work.

Each company would develop and keep updated a detailed policy document which covers the following:

- the company's assessment of the risks it faces in relation to successful outcome delivery; and
- how it intends to manage those risks over time.

A starting point for the policy document would be consideration of the types of risks to outcomes that may arise from poor asset health. This could include risks in the following broad areas: (a) risks of poor performance against common PCs; (b) risks of non-compliance with obligations; (c) risks of poor performance against areas that are not captured by PCs or legal requirements but matter to customers and the environment; and (d) the risk of incurring expenditure inefficiently over time (e.g. from needing to replace assets quickly in an unplanned way to address emerging performance deterioration).

In their policy, companies would be asked to give particular attention to risks arising from asset degradation and failure, but the policy would need to consider wider aspects of operational resilience.

In relation to how companies manage risk, one element that each company could be asked to elaborate on could be the different types of approach (or controls) that the company uses to manage the health of individual assets. For example, at a very high level, it might be informative for companies to distinguish between the following strategies:

- Replacement of the asset when it has reached a specified asset life (with information on how such asset lives are determined).
- Replacing assets subject to the outcome of periodic inspections of their condition (with information on how those conditions are determined).
- Replacement of an asset when a specified threshold for asset risk (or system / resilience risk) has been reached, based on a disclosed approach to modelling risk.
- Refurbishment regimes as an alternative to asset replacement, and the circumstances in which these are applied.
- Replacing assets only when they have failed.

The examples above concern asset replacement, and there may be other relevant areas of activity to cover too (e.g. maintenance and inspection regimes).

The company would then explain how the mix of approaches above varies across different water and wastewater assets, and the rationale for this (e.g. this may be affected by factors that concern the criticality of specific assets, and broader aspects of the approach to operational resilience).

The company would also explain whether, and if so how, internal budgets affect the mix of approaches above, and thresholds for asset replacement, that are used in practice and the way in which budgets are set so as to manage future risks effectively.

In addition, each company would report annually on:

- how its recent investment in asset health, and its latest plans for near-term investment, fit with its policy and the implications of any departures for future risks and/or required remedial measures;

- how the company has used information on performance issues that have arisen in practice (e.g. its own recent performance or incidents experienced by other companies) to help protect against risks of performance issues in the future;
- how its assessment of risks to outcomes has evolved over time, and how its asset management plans and activities have affected that evolution;
- how its approach to managing risks to outcomes has evolved over time, and what has driven that evolution; and
- how it has updated its policy in light of the learning and improvements above.

In setting this information out, a balance would need to be struck between providing something informative of a company's approach and keeping the exercise and level of detail manageable. This might be something that could be developed and iterated over time.

Initiative 4: Comparative evaluation of companies' outcome risk management

Under initiative 4, Ofwat (or a third party) would carry out a comparative evaluation of companies in terms of how well they are managing risks to customer and environmental outcomes in the future.

It would give emphasis to assessing which companies are performing relatively well in terms of management of risks to outcomes in the future and which are performing less well. It could also include the making of industry-wide or company-specific recommendations.

There are different ways in which this initiative could be developed and applied and we do not want to constrain it tightly at this stage. However, several points are worth highlighting:

- The evaluation would cover both: (a) evidence on the extent to which each company explores and understands future risks; and (b) evidence on the extent to which each company manages those risks effectively and efficiently.
- The evaluation would draw on a mix of quantitative and qualitative assessment rather than being based primarily on metrics.
- The evaluation would be annual, and might form a key part of Ofwat's broader work in monitoring companies' performance and operational resilience.
- Ofwat would produce, and further develop over time, a set of guidance on the evaluation process, covering the expectations for companies on what information to provide and how Ofwat will determine its assessment.

This evaluation would draw on evidence arising from other initiatives outlined above:

- Information on asset health and operational resilience from metrics reported under initiative 1.
- The projections of long-term outcomes performance for defined scenarios under initiative 2.
- The company-owned policies on outcome risk management, and annual reporting against these policies, under initiative 3.

Other relevant information might include: (a) companies' track record; (b) their understanding of the reasons for performance issues experienced historically and learning taken from these; and (c) any firm commitments that companies make in terms of the controls that they use to manage risk (e.g. covering capital maintenance, other aspects of operational resilience and available financing to maintain performance if it shows signs of deterioration).

There is a potential role for a qualified and trusted third party (rather than Ofwat) to make the assessments of companies' relative performance in this area based on a range of information and criteria. There are some links between this and the suggestion put forward by Northumbrian Water that: "*Ofwat and the sector should explore the opportunity for an independent party to assess asset health and asset management across the sector, comparable to the role undertaken by the independent rating agencies on financial resilience*".¹⁴

There are also some links between this initiative and the assessment of best practice / maturity in asset management that Ofwat has carried out in the past.¹⁵ However, the assessment above would be more outcome-focused, and would draw on a broader range of structured evidence required from companies. That said there may be a role for an assessment of best practice / maturity in asset management as one source of evidence to inform the overall evaluation.

Initiative 5: ODIs based on evaluative assessment of companies' management of risks to future outcomes

This initiative would build on initiative 4. There would be a new type of financial ODI based on the outcome of the comparative evaluation of companies in terms of how well they are managing risks to customer and environmental outcomes in the future. This would complement rather than replace the existing set of outcomes-focused PCs and ODIs which relate to observed performance within a specific year.

For instance, companies assessed as being significantly better than average in the industry could receive a financial reward and those significantly worse than average could receive a financial penalty. This would provide a financial incentive for companies to demonstrate that they are managing future risks relating to asset health well, including through the documents they provide under initiative 2 (long-term projections of PC/outcomes performance under well-defined scenarios) and initiative 3 (company-owned policies on the management of asset health and risks to future outcomes).

Under this type of ODI, companies could be seen to be rewarded/penalised according to an assessment of the *evidence of their credibility* – relative to other companies – to successfully manage risks to customer service and environmental outcomes over the shorter and longer term. One potential rationale for such an approach is that well-informed customers with a hypothetical choice of supplier for their current and future needs would look for evidence of how well alternative suppliers can demonstrate their ability to provide reliable and high-quality services in both the near-term and longer-term. All else equal, companies that can credibly demonstrate

¹⁴ Northumbrian Water *Regulating for the long-term: Resilient essential services require healthy assets*.

¹⁵ Ofwat has undertaken assessments into companies' asset management approaches, outside of the main price review processes, such as the asset management maturity assessment (AMMA) it published in 2021.

greater reliability would be expected to have more customers and higher profits than those companies who customers do not trust as much.

As part of the introduction of this new ODI, Ofwat would drop the existing financial ODIs relating to mains repairs, unplanned outage at water treatment works, and sewer collapses. These would be superseded by the more comprehensive and evaluative assessment of asset health as part of the assessment of companies' management of risks to outcomes above. While information metrics such as these might contribute relevant evidence, the comparative evaluation would draw on the broader set of metrics of asset health and operational resilience from initiative 2 above.

One potential benefit of an ODI-based approach is that it would allow for clear financial rewards to companies who demonstrate the best approach and strongest capabilities in this area, which could provide for a virtuous circle of improvements across the industry to tackle the informational concern we have identified. These improvements would be both in terms of: (a) the information that the companies make available (e.g. the evidence base for projections of future performance and the quality of published documentation on risk management); and (b) companies' actual behaviour and performance in managing those risks.

Nonetheless, we recognise that this type of ODI would be novel and more subjective than financial ODIs based on more familiar types of metrics. There may be merit in an implementation path along the following lines:

- Starting with one or more trial years in which the assessment is indicative without a financial reward or penalty.
- Starting off with a relatively small scale of potential upside or downside, perhaps intended to provide enough of a clear upside for companies who perform well in the assessment to cover the costs of developing high-quality data and documentation for the purposes of the evaluation.
- Over time, and in light of experience in practice, the scale of the ODI could be increased, and it could become a scale which is more in line with the financial ODIs relating to key areas of in-year performance.

While we see value in some level of financial ODI of this nature under the enhanced set of incentive and informational remedies included in packages P2 and P3, the appropriate scale of the financial ODI from the evaluation assessment might be lower if these packages also include the optional initiative 6 (discussed below) which provides an additional incentive.

Initiative 6: Shadow RCV adjustments for scenarios for each company's future outcomes performance

This potential initiative arose following discussions with a water company, during the course of workstream 2, about ways in which the ODI framework might be adapted to give companies a clearer financial stake in their long-term performance and, in turn, improved financial incentives to carry out levels of investment in asset health that are well aligned with the long-term interests of customers.

This initiative would require considerable further development, and at this stage we provide a brief outline as follows:

- Each year Ofwat would publish a set of shadow RCV adjustments for each company which are intended to communicate to stakeholders (including investors) the *potential* for the company's financial value to be increased or decreased in future years in light of its performance against financial ODIs (e.g. related to customer and environmental outcomes) and to take account of potential future compliance issues (e.g. fines from the EA).
- We refer to the adjustments as shadow RCV adjustments as they do not represent any formal decision on the company's RCV and are purely illustrative and informative.
- For each company, multiple figures for the shadow RCV adjustment would be published by Ofwat reflecting different scenarios for future performance (e.g. scenarios that give weight to a company's current / recent performance levels when projecting future performance, or scenarios that reflect some form of more forward-looking assessment by Ofwat or a third party drawing on a range of evidence).
- Information and analysis from initiatives 1, 2, 3 and 4 above could form part of the evidence base feeding into scenarios that involve some form of forward-looking assessment.
- The shadow RCV adjustments would be updated annually, including in light of the latest information on performance and asset health.

In the table at the start of this section, we marked this initiative as optional within packages P2 and P3. We recognise that the RCV plays an important role within the regulatory framework and particular care would be needed in seeking to further develop, and assess the case for, an approach involving shadow RCV adjustments.

Nonetheless, there may be substantial value in this kind of initiative as it has the potential to enhance the likely effectiveness of approaches to addressing informational and behavioural concerns within the context of a relatively outcomes-focused regulatory approach (as under packages P2 and P3).

5: Deliverables based on asset risk metrics or investment programmes

In section 4 above, we highlighted a need for changes to the approach to cost assessment (as considered in sections 2 and 3) to be complemented with changes to other parts of the regulatory framework, in order to tackle the behavioural and informational concerns we identified in our main report to workstream 2.

We identified two key strategies to help tackle the broader behavioural and informational concerns:

1. Retain a focus on outcomes while enhancing the incentives on long-term performance.
2. Supplement outcomes with deliverables based on asset risk metrics or investment programmes.

We discussed potential measures to implement under the first strategy in section 4 above. In this section, we turn to the second strategy which is adopted for packages P4 and P5, as well as P1 (on a more targeted basis). We summarise the strategy and broad approach to price control deliverables under each package in the table below.

Table 8 Mapping of broad approach to price control deliverables to policy packages

Package	Strategy for tackling behavioural concerns	Broad approach to price control deliverables
P1	Supplement outcomes with deliverables based on asset risk metrics or investment programmes	No specific deliverables for the bulk of base expenditure Deliverables based on targeted activities from investment programmes are narrowly applied in cases where additional funding is allowed through the dedicated process for funding additional asset health investment
P2	Retain a focus on outcomes while enhancing the incentives on long-term performance	No specific deliverables for base expenditure
P2		Accountability for performance based on financial ODIs on outcomes-focused PCs complemented by incentive and informational measures as set out in section 4 above
P4	Supplement outcomes with deliverables based on asset risk metrics or investment programmes	Deliverables based on composite asset risk metrics covering all / bulk of capital maintenance funding Possibility of some deliverables based on investment programmes
P5	Supplement outcomes with deliverables based on asset risk metrics or investment programmes	Price control deliverables based on granular investment programmes

In this section, we elaborate on the potential arrangements for deliverables or outputs linked to capital maintenance allowances under packages P1, P4 and P5. This section takes the following in turn:

- Deliverables option 1: granular deliverables based on investment programmes
- Deliverables option 2: deliverables based on composite asset risk metrics.

- The relationship between price control deliverables and price control funding.
- Potential alternative approach to the relationship between deliverables and price control funding informed by that introduced by the CMA for NIE Networks.

The first two subsections highlight two main options for the way that deliverables for capital maintenance might be specified. The two options are most directly relevant to the policy packages we have developed as part of workstream 2, but they are not intended to be comprehensive of all of the options that could be used in practice.¹⁶

Deliverables option 1: granular deliverables based on investment programmes

The first type of deliverable that we identify concerns the planned delivery of replacement or refurbished assets. For instance, deliverables could be defined for the following:

- specified asset replacement volumes for specified categories of asset replacement, with some flexibility as to which specific assets within the category are to be replaced;
- highly-detailed programmes of capital maintenance work, specifying not only the volumes of specific types of asset replacement but also the exact locations; and/or
- deliverables based on the details of more bespoke investment projects.

Within our packages, this type of deliverable is envisaged for package P5 and, on a narrow and targeted basis, package P1.

Under package P5, the bulk or all of the allowances for capital maintenance expenditure would have corresponding price control deliverables of this nature. The deliverables would reflect the specific investments in asset health put forward in the company's business plan, subject to variations for any differences between the company's plan and the investments that Ofwat provides funding for as part of the price control allowances (e.g. exclusion of specific investment projects proposed by the company that Ofwat has not included in the ex ante allowances).

For package P1, the deliverables would be narrowly applied to areas of investment for which Ofwat has made adjustments to companies' allowances through the dedicated process for additional asset health investment. The deliverables would be targeted so that any adjustments to fund additional asset health investment are complemented by arrangements to ensure that that funding is spent as intended. Under package P1 the bulk of funding for capital maintenance under package P1 would be derived from the econometric models of base expenditure, estimated on historical data, and there would be no specific deliverables linked to this.

¹⁶ For instance, there might be some form of intermediate option which uses a granular set of asset health metrics that are linked to individual assets for which investment in asset health is planned (e.g. achieving a specified asset condition grade for a set of assets), rather than composite asset risk metrics that are intended to capture a risk position across a broad set of assets (reflecting the relative criticality of individual assets). While the more granular type of asset health metric does not fit with what is envisaged for deliverables under package P4, there may be some role for it under packages P1 and P5, perhaps alongside the type covered under deliverables option 1 above.

Deliverables option 2: deliverables based on composite asset risk metrics

This option is intended to capture the type of approach adopted by Ofgem with its use of network asset risk metrics (NARMs) as deliverables/outputs for which price control funding for asset replacement is conditional upon. This type of approach is a core feature of package P4.

A more detailed explanation of the Ofgem NARM arrangements is provided in the separate supporting document covering our review of approaches in other UK regulated sectors (Annex 2). The reader is referred to that document for the purpose of understanding what is envisaged here.

While Ofgem's NARM approach was developed for electricity and gas network infrastructure companies, we do not see any reason in principle why it could not be applied to the fuller set of water company assets, covering network assets (e.g. water distribution assets) and other assets within companies' systems (e.g. raw water abstraction, treatment and storage assets). However, it may be more time-consuming and/or challenging to apply to water companies' asset bases. It would be helpful to avoid terminology such as NARM for water companies' assets to avoid implying that the metric only applies to network assets.

At a high level, the type of consolidated asset risk metrics to be used for water companies under package P4 would involve the following:

- Risk would be considered from the perspective of potential adverse impacts on outcomes for customers and/or the environment that may arise from asset failure (e.g. supply interruptions or pollution events).
- Risk would be monetised, drawing for example on estimates of the potential adverse impacts on outcomes for customers and/or the environment that may arise from the failure of specific assets.
- The consolidated asset risk metrics would be built up from detailed estimates of the failure risk of individual assets, but the metrics would be designed to capture risk across a network or system of assets, rather than resulting in a large number of metrics which capture the risk for individual assets or asset groups at a granular level.
- As part of the consolidation, estimates of failure risk would be combined with information on the criticality of those assets to the network or system, taking account of other aspects of operational resilience (e.g. the extent of asset redundancy and the operational responses to mitigate the impacts of asset failure which affect the consequences of specific assets failing).

As part of the development of package P4, there would be a question of the level of aggregation that would be most appropriate (e.g. a separate metric covering assets within each of the four wholesale price control areas, or different risk metrics under each control for broad types of assets such as below-ground infrastructure versus above-ground assets, or something less aggregated).

As with the approach used by Ofgem, it may be appropriate to exclude some areas of capital maintenance expenditure and asset health investment from the scope of the composite asset risk metric and instead cover these under the more conventional type of price control deliverable discussed in the subsection above. Under package P4, this could be done by exception, with the

majority, if not all, of asset replacement expenditure covered by the deliverables based on composite asset risk metrics.

The relationship between price control deliverables and price control funding

Aside from the specification of deliverables, there would be a need to develop a policy position on the relationship between the price control deliverables and the price control funding that companies receive (after any adjustments in light of outturn delivery) under packages P4 and P5 (and P1 where applicable).

We outline below some of the features of one potential approach below:

- All or some defined part of the ex ante expenditure allowance for base costs or capital maintenance expenditure determined at the price review for a given company would be treated as being conditional on the company delivering the specified deliverables by the specified delivery date (e.g. end of the price control period).
- If the company does not deliver those outputs or achieve those benefits (or only partly delivers them) then financial adjustments would be made at subsequent price reviews to return to customers the upfront funding that had been provided for these (or some corresponding part of that funding in the case of partial delivery).
- If the company delivers the outputs or benefits later than the specified delivery date then an adjustment would be made to avoid the company enjoying any financial benefit from delivery being later than assumed in previous price control calculations.
- There may also be financial penalties for under-delivery and for late delivery. This is an optional element, and our starting position (reflecting the approach to price control deliverables developed by Ofgem) is that any penalties for late delivery or under-delivery would be a separate policy matter, and the role of the price control deliverables arrangements would be focused on returning to customers the ex ante cost allowances (including financing costs) for deliverables that are delayed or not provided.
- As an option, there may be arrangements for the company to get additional funding for delivering more outputs/benefits than assumed when determining the price control, subject to some limits and/or rules.

Beyond these points, there are some regulatory design questions as to what counts as full delivery and the way that flexibility around this is treated:

- There may be some flexibility arrangements for the company to deliver something different to the specified deliverables but for this still be treated as fully delivered. For instance, drawing on the type of evaluative PCDs used by Ofgem, the approach could provide some ability to substitute the anticipated deliverables subject to rules/methodology set by Ofwat (e.g. conditional on there being evidence of equivalent long-term benefits to customers). There may be a stronger case for flexibility arrangements where the deliverables themselves are defined in quite a detailed way.

- There may be a role for additional requirements in addition to the delivery of the specified deliverables. For instance, a company might be required to follow an agreed methodology when deciding on the details of deliverables to provide (e.g. methodology for prioritising assets for replacement). There may be a stronger case for additional requirements if the deliverables are themselves specified in quite a flexible or broad way (e.g. total length of water mains replaced without reference to location, size or criticality of mains) and if there are concerns that the company may use that flexibility to provide fewer benefits than anticipated (e.g. by focusing on cheaper solutions within the broad category of specified deliverables).

The points above are intended as a broad outline, and a more detailed methodology would need to be developed as part of the application of price control deliverables for capital maintenance.

Potential alternative approach to the relationship between deliverables and price control funding informed by that introduced by the CMA for NIE Networks

In relation to packages P1, P4 and P5 we also identify a potential variation in terms of the relationship between the price control deliverables and the price control funding that companies receive. This would be a departure, for example, from the approach taken by Ofgem for price control deliverables under RIIIO-2 and which is reflected in the approach outlined in the subsection above.¹⁷

In short, rather than responding to non-delivery by clawing back funding that had been provided at the latest price review, the expenditure allowances for the next price control could be set on the assumption that there had been full delivery, with steps taken to avoid providing additional funding in the next period for costs that arise as a consequence of any under-delivery in the past.

An example of this type of approach is that is applied to asset replacement expenditure as part of the price controls for the Northern Ireland electricity transmission and distribution company NIE. This approach was formalised by the CMA as part of an appeal of the RP5 price control and subsequently retained by the Utility Regulator in its own price control determinations NIE.

The aims of this approach are to:

- protect customers from the risk of facing charges for investment work which has already been funded as part of past price reviews (i.e. risks of customers exposed to double counting of costs).
- Remove or reduce the financial incentives for the regulated company to unduly defer network investment to subsequent price control periods (while retaining incentives to defer investment where it is efficient to do so and/or to avoid investments that are no longer needed at all).

Under this approach, there needs to be clear specification of the planned investments that have been assumed for each company during the price control period (e.g. in terms of specific

¹⁷ Though it seems that Ofgem did have some intentions of using some version of this alternative approach in the early stage of RIIIO-1: see Ofgem (2011) *Strategy for the next transmission price control - RIIIO-T1 Outputs and incentives*, page 49-50.

deliverables, volumes of specified types of activity and specified projects). These could be called deliverables and based on the types of deliverables outlined earlier in this section.

In the context of package P4, this approach could amount to setting outputs/targets for the asset risk metrics in the forthcoming price control period under an assumption that the outputs/targets for the previous period had been met, and not providing any additional funding for companies to catch up from any difference between where they actually are (e.g. in terms of asset health and network risk) and the levels they were funded to achieve during the previous price control period.

In the context of package P5, the deliverables would be based on the granular investment programme that is funded by the capital maintenance allowances set by Ofwat. Each company would not be required to deliver the planned investments. However, if its delivery during the price control period falls short of the set of planned investments, then the shortfalls would be treated as pre-funded costs at the next price review. If the company's proposed investments for the next review include investments that were planned but not carried out during the last price control period (or which are needed because of deviations from the plan) then the costs of those investments would be excluded from the funding provided to the company for the next price control period.

This approach might be combined with arrangements to allow some flexibility to deliver something different from the set of planned investments where this is in customers' interests.

This type of approach is similar to that of PCDs, except that it is more focused on avoiding funding the same investment twice (via the level of allowances set for the forthcoming price control period) rather than clawing back the costs of investment that was not delivered (via reconciliation adjustments for the previous price control period).

For the purposes of workstream 2, we leave open whether the more familiar price control deliverables approach or this type of alternative is used as part of packages P1, P4 and P5. This issue could be explored further as part of the further development of these packages.

6: Adjustment mechanism for industry-wide outturn expenditure

Section 2 above concerns the high-level approach to setting ex ante cost allowances. This is only part of the picture when it comes to the totex allowances that are intended to cover a company's efficient expenditure during each five-year price control period. Under Ofwat's current approach, the totex allowance is subject to adjustments which mean that, for each company, the overall price control funding is, in effect, comprised of X% of the ex ante allowance and (1-X)% of what the company actually spends during that period (the percentages vary between companies and for over-and under-spends, but Ofwat planned to set X in the range 40% to 60% at PR24).

In this section we outline a potential industry-wide adjustment mechanism which can be seen as a new type of uncertainty mechanism and/or a more sophisticated way to update expenditure allowances in light of outturn expenditure data, with a view to offering greater protection to customers and companies against the risk that ex ante allowances do not reflect expenditure needs arising over the price control period. It would apply in addition to conventional cost-sharing incentives. We primarily see this mechanism as a means to help address the funding concern identified in the main report to workstream 2 (which is in turn one of the sources of the behavioural concern) and should be complemented by broader regulatory reforms (e.g. see section 4).

This industry-wide adjustment mechanism has been suggested in previous work by Reckon,¹⁸ but as far as we know has not been implemented in UK regulatory practice.

Under our specification of packages, we have included this mechanism under package P2 only. The mechanism seems to offer a logical complement to the industry-wide adjustment to *ex ante* allowances that applies under the approach to cost assessment envisaged under package P2. Nonetheless, there is flexibility in the role that the mechanism could play within the packages:

- It would be possible to apply a version of package P2 without the industry-wide adjustment mechanism.
- There could be a case for including the industry-wide adjustment mechanism in some of the other packages, in particular P1 and P3 (though under these packages there may be a need for some targeted modifications compared to what is set out below).

Before presenting an outline of the industry-wide adjustment mechanism, we provide some background on the role of adjustments for outturn expenditure under Ofwat's current approach.

Background: Conventional approach to cost-sharing

Ofwat's current approach might be described, in broad terms, as a conventional approach to cost sharing. The general idea is that Ofwat determines an ex ante allowance at the price review in respect of expenditure to be incurred by a given company over the price control period, but this allowance is subject to adjustments in light of what the company actually spends over that period.

¹⁸ Reckon (2022) *The opportunities for a more coherent regulatory approach for Ofwat's funding of base expenditure and enhancements Final report*.

This approach involves a form of risk sharing in the sense that both the company (and its investors) and customers share the financial benefits from situations where the company under-spends against the ex ante expenditure allowance determined by Ofwat at the price review, and both share the additional costs in cases where the company over-spends against the ex ante expenditure allowance.

A key parameter is what Ofwat calls the “cost sharing rate”. If the cost sharing rate is 40%, this means that the aim is that the company is exposed (pre-corporation tax) to 40% of any variations between ex ante allowance and outturn expenditure, with the remaining 60% of such variations being passed on to customers through financial adjustments applied at subsequent price reviews.

Under Ofwat’s current approach there is, for some companies, a different cost sharing rate on under-spends against the ex ante allowance compared to over-spends against that allowance. This reflects Ofwat’s current policy of using the level and structure of cost sharing rates to reward or penalise companies as part of its business plan assessment.

The overall effect of the conventional cost sharing approach is that each companies’ price control funding for base expenditure reflects a combination of ex ante allowance determined for it by Ofwat (which is based primarily on benchmarking analysis drawing on historical expenditure data across the industry) and what that company spends during the price control period.

Rationale for the industry-wide adjustment mechanism within package

We now turn to the industry-wide adjustment mechanism that we have included as part of our specification of package P2.

The rationale and purpose of this mechanism, in the context of package P2, would be as follows:

- Compared to the current approach, companies’ price control funding would be based more on the costs revealed over time across the industry rather than on subjective and contentious ex ante regulatory assumptions about the levels of efficient costs over the forthcoming price control period.
- It mitigates the uncertainty faced in trying to quantify the net impact of industry-wide factors that could mean that efficient levels of expenditure could be quite different to expenditure levels observed historically. With the mechanism in place, the ex ante assumptions/forecasts made by Ofwat at the price control review about the effects of these factors would still matter, there would be less riding on these assumptions/forecasts.
- It tackles what might otherwise be a key deterrent for Ofwat in setting ex ante expenditure allowances for the industry that are above historical levels or trends: the concern that there are industry-wide underspends against the increased allowances.
- If Ofwat provides increased allowances and companies (on average) do not spend it, customers are refunded; if companies (on average) spend more, then additional funding is released.

We primarily see this mechanism as a means to help address the funding concern identified in the main report to workstream 2 (which is in turn one of the sources of the behavioural concern).

We recognise that, against the benefits above, there are potential risks that the reduced predictability of price control allowances under this type of mechanism could, if it were to be applied in isolation, act to deter investment from some companies. However, within package P2 this mechanism would not be applied in isolation. It would be complemented by a strong package of initiatives designed to tackle the behavioural and informational concerns (see section 4) and to promote more appropriate levels of asset health investment. Furthermore, there are arguments that by making allowances less predictable, companies could focus more on what levels of capital maintenance expenditure they consider appropriate from a longer-term perspective, rather than targeting expenditure relative to the ex ante allowances for a five-year period.

Outline of the industry-wide adjustment mechanism

Under package P2, the ex ante expenditure allowance determined at the price review for a given company would be subject to two separate adjustments in light of outturn expenditure:

- A conventional cost sharing approach based on differences between a baseline allowance for that company and the outturn expenditure of that company (as described earlier in this section).
- An adjustment for some measure of the difference, across the industry, between the level of expenditure implied by the ex ante allowances and the outturn level of expenditure (this adjustment which would feed into the baseline allowance above).

We present the two adjustments in this order so that the more familiar one comes first. For the purposes of implementation, it may make more sense to apply the industry-wide adjustment first, so that an *adjusted expenditure baseline* is first calculated in light of industry-wide expenditure before the company's own expenditure is compared to this and any difference is subject to the cost sharing factor.

There are different ways that the adjustment for industry-wide expenditure might be implemented. We set out one possibility below, which draws on an outline specification from a previous report by Reckon,¹⁹ but variations and refinements on this may be possible.

Ofwat would first determine what scope of outturn expenditure should fall within the scope of the mechanism. Our starting point is that this would be all of base expenditure plus enhancement expenditure in those categories which are included in the data feeding into the base-plus models. We refer to this as "in-scope expenditure". This would exclude the enhancement expenditure that is subject to a separate cost assessment process, and it would exclude operating expenditure that Ofwat treats as unmodelled costs (e.g. local authority rates). Further consideration could be given to the most appropriate scope as part of the development and implementation of the mechanism.

The adjustment for industry-wide expenditure could be based on an approach which involves a form of unweighted average, across companies, of differences between their ex ante allowance and outturn expenditure. More specifically:

¹⁹ See section 5.6 of Reckon (2022) *The opportunities for a more coherent regulatory approach for Ofwat's funding of base expenditure and enhancements Final report*.

- An adjustment factor would be calculated by: (a) taking each company in turn, and dividing the in-scope expenditure that it actually incurs over the price control period by the final ex ante allowance set by Ofwat for its in-scope expenditure over that period (after adjustments for efficiency assumptions, RPEs, cost adjustment claims, etc); and then (b) taking an unweighted average of this value across all companies.
- This factor would be above 1 if, on average across companies, companies spent more than the relevant allowances and below 1 if they spent less.
- An adjustment would then be applied for each company by taking its ex ante allowance set by Ofwat for its in-scope expenditure and multiplying by: the adjustment factor minus 1.
- For instance, if a company's ex ante allowance was 100 million and the adjustment factor was 1.03 then the adjustment for industry-wide expenditure would be £3 million.
- This adjustment for industry-wide expenditure could be subject to an adjustment for financing costs for the delay between expenditure impacts and revenue adjustments (as for the revenue reconciliation for conventional cost sharing and uncertainty mechanisms or true-up arrangements). Some assumptions to profile the adjustment over the price control period might be needed for this (there may be a case for calculating the adjustment factor separately for each year but it is not clear whether this would be worth the additional effort). The adjustment could be apportioned into adjustments to revenue allowances in the subsequent AMP and adjustments to the RCV in line with the applicable PAYG rates (and/or consistently with the approach taken for conventional cost sharing).

The role of the adjustment would be so that, at an industry-average level, there would be no net over-spend or under-spend within a price control period, but there would still be expectations of under-spend and over-spend for individual companies.

There are some interactions with financial ODIs to consider. For example, if companies have on average over-spent their ex ante allowances, but also have on average earned net ODI financial rewards, then the net ODI reward across the industry might be seen as making a contribution to the costs of the over-spend, and therefore reducing the adjustment required. This issue would need further consideration if this option were to be taken forwards. For instance, there may be a case for deducting each company's net ODI position on common PCs from its outturn expenditure (e.g. so a positive ODI would act to reduce the adjustment overspend and a negative ODI position would act to increase an overspend) before calculating the adjustment factor. Alternatively, the mechanism for adjustments in light of industry-wide expenditure might be seen to fit well with a corresponding change to the approach to setting PCLs, so that these are based on some measure of outturn performance levels across companies rather than setting PCLs ex ante.

There may also be some transitional issues to consider in relation to past under-spends or over-spends against price control allowances determined from Ofwat's benchmarking models.²⁰ We do not see these issues as likely to be an impediment to the development and application of the

²⁰ For some further discussion of transitional issues see pages 110-112 of Reckon (2022) *The opportunities for a more coherent regulatory approach for Ofwat's funding of base expenditure and enhancements Final report*.

industry-wide adjustment mechanism, but they are likely to warrant some attention as part of work to implement the mechanism for the first time.

Appendix: Long list of potential remedies from workstream 2

Introduction

This appendix provides further information on the structured long list of potential remedies to help tackle the concerns with the treatment of capital maintenance expenditure and asset health under the current regulatory framework, which we compiled as part of workstream 2. This long list was an input to the development of the five policy packages described in the main sections of this document.

In developing the long list, we drew in particular on: (a) our analysis of the sources of concerns with the current framework in relation to capital maintenance and asset health and ideas on how these may be tackled; (b) suggestions for addressing these concerns put forward in previous studies; (c) suggestions in Ofwat consultations and regulatory submissions; and (d) our review of approaches adopted in other UK regulated sectors and jurisdictions.

We organised the long list into six broad areas, based primarily on the aspects of the regulatory framework that they concern. These are:

- Area 1: Informational remedies relating to asset health and risks to future outcomes.
- Area 2: Broad approach to cost assessment for capital maintenance expenditure.
- Area 3: Delivery accountability arrangements relating to capital maintenance.
- Area 4: Use of asset health and outcome risk information as part of the ODI framework.
- Area 5: Ex post adjustments to price control allowances in light of outturn expenditure.
- Area 6: Supporting measures.

We recognised that a good approach for PR24 is likely to involve a package of complementary measures across several of these six areas. We take these in turn below and outline very briefly the potential remedies that we identified as part of the initial long list. Sections 2 to 6 of this document provide further information on those options and initiatives that we considered to be priorities and which we included in one or more of the five policy packages.

The long list that we developed was refined following feedback from the project steering group and working group. It is not intended to be comprehensive of all possible options or approaches, and should not be seen as a key output of workstream 2. Instead, it acts as a record of the wide range of options that we identified and organised in the earlier phases of workstream 2, and which helped inform the development of the five policy packages.

Area 1: Informational remedies relating to asset health and risks to future outcomes

Water companies already report some information relating to asset health and operational resilience. And Ofwat has carried out some assessments into companies' asset management approaches, outside of the main price review processes.

For the purposes of our long list of potential remedies, we took a broad view of what additional information might be used. For instance, it could involve metrics of asset health or operational

resilience, as well as information, modelling and analysis relating to operational resilience or the risks to services / outcomes in the future. Workstream 1, carried out by Jacobs, has considered asset health metrics in more detail.

There are several ways in which enhanced information on asset health and risks to future outcomes might be used within the regulatory framework.

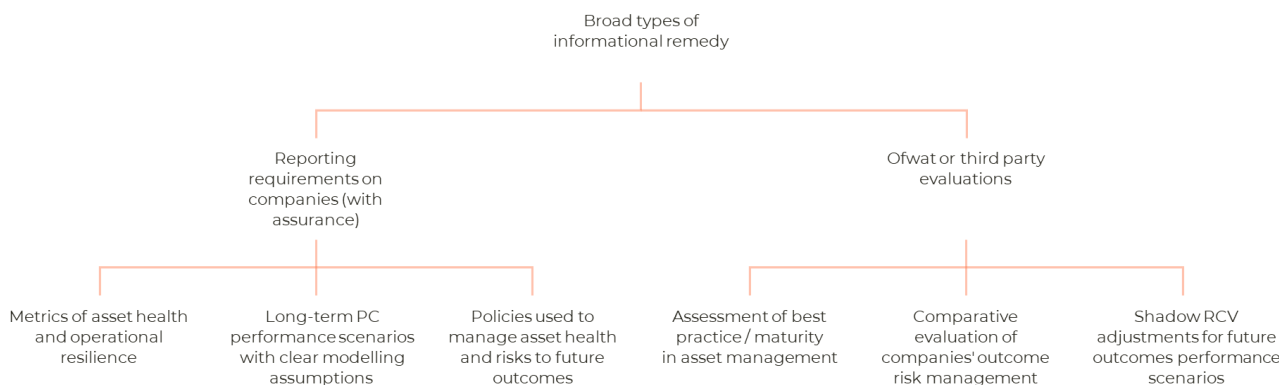
First, it could help the regulator understand the level of risk being carried in the industry, which may then feed into the design and application of its regulatory approach. For instance, information on trends in asset health and operational resilience might help inform on whether the prevailing regulatory arrangements are working as intended.

Second, greater information being published on companies' asset health and risks to future outcomes could itself affect company behaviour. For instance, this information might mean that a company that adopts an overly short-term approach to capital maintenance and allows its assets to degrade, and risks to build up, might be more exposed (e.g. to investors, Ofwat and other stakeholders) which could in turn act to deter such an approach. Furthermore, this information might enable a company that adopts behaviour that helps it better manage longer-term risks, albeit with higher expenditure today, to be perceived more favourably than at present.

Third, as covered in more detail under areas 2, 3 and 4, enhanced information on asset health and future risks to outcomes could be used directly within the regulatory approach to cost assessment, delivery accountability and the ODI framework.

The diagram below provides an overview of the range of potential informational remedies that we identified as part of our long list. The potential remedies presented in this diagram are not necessarily alternatives (e.g. multiple forms of reporting requirements might be used and these might be combined with some forms of Ofwat / third party evaluation) and they might be applied on their own or in combination with measures from areas 2 to 6.

Figure 2: Overview of potential informational remedies



Area 2: Broad approach to cost assessment for capital maintenance expenditure

Under area 2, we set out a range of options for the broad approach to be used by Ofwat, as part of the price review process, to determine ex ante allowances for capital maintenance expenditure. Allowances for capital maintenance expenditure may be determined explicitly or they may be implicit within the allowances for broader categories of costs, such as base-plus expenditure.

To help structure the options under area 2, we draw a primary distinction between approaches that would largely retain a key role for the type of cross-company econometric benchmarking of base-plus expenditure that Ofwat used at PR19 (summarised in figure 3) and approaches that would move away from this type of benchmarking approach (summarised in figure 4). This seems a major decision point for PR29, because it affects the extent of change from the approach that was introduced as part of a broader set of regulatory reforms at PR14, and which has evolved over the course of PR19 and PR24.

Figure 3 Sub-options with prominent role for base-plus benchmarking

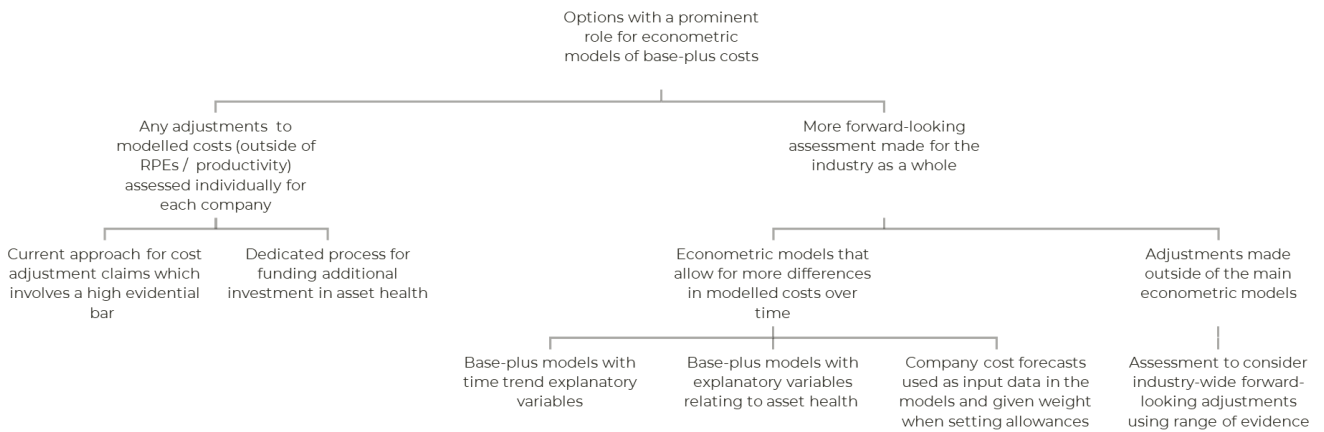
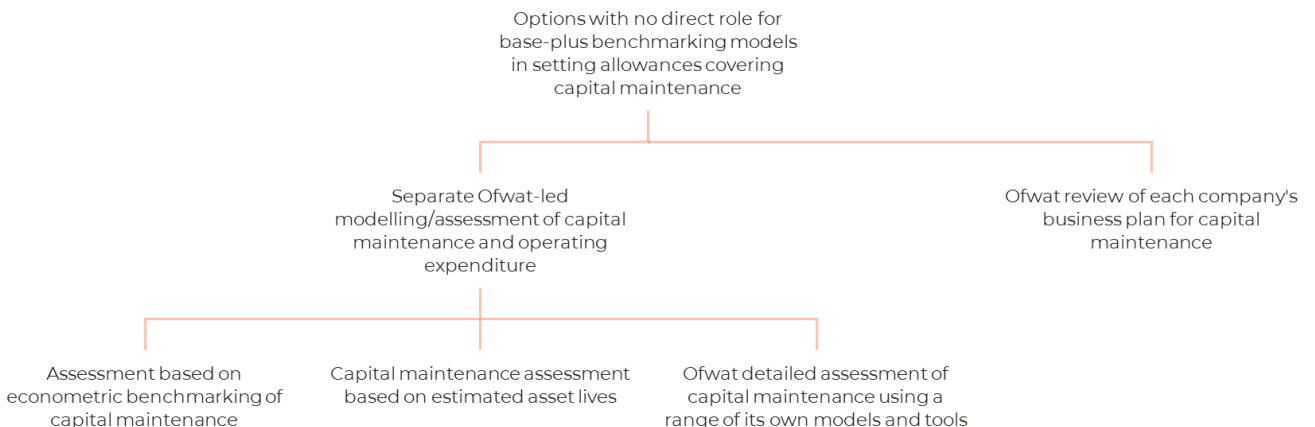


Figure 4 Sub-options that do not have a prominent role for base-plus benchmarking



Area 3: Delivery accountability arrangements relating to capital maintenance

We use the term "Delivery accountability arrangements" to refer to a broad range of regulatory arrangements that are intended to hold companies accountable for how they spend some/all of the ex ante allowances set for them at the price review.

We take as given the current broad approach to outcomes-focused ODIs: we assume that Ofwat will continue to set financial ODIs covering a range of aspects of customer service and environmental performance. Our interest is in what other arrangements relating to delivery accountability (if any) might apply to capital maintenance.

Under Ofwat's current approach, the allowances for base-plus expenditure (which covers capital maintenance) are not generally tied to any specific outputs or deliverables. This type of approach has well-recognised benefits in terms of allowing companies flexibility and scope to innovate in terms of the way that they consider best to meet their obligations and perform well against outcomes-focused ODIs.

However, there are several reasons to consider delivery accountability arrangements as part of the long list of policy options.

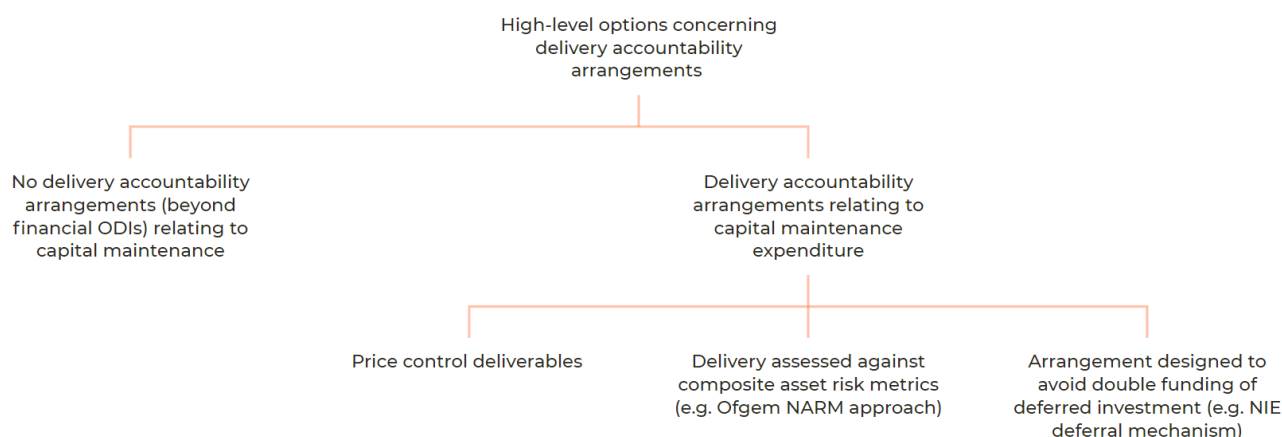
First, one of the factors contributing to what we have called the behavioural concern is the risk of a water company limiting its capital maintenance expenditure in order to benefit financially (e.g. via a higher under-spend of its totex allowance or a smaller over-spend) in a way that does not have any immediate impact on performance against ODIs, but which is neither efficient nor safe from an outcomes perspective over the longer term. One possible view is that delivery accountability arrangements might be used to limit the financial incentives for this type of behaviour.

Related to this, there may be concerns that where a company does limit its capital maintenance expenditure, customers may end up paying more over the long term if future price control allowances provide funding to cover deferred investment (this is sometimes seen as a concern about double counting).

Beyond these issues, some of the alternative or modified approaches to cost assessment that we identified under area 2 make more sense when applied in conjunction with delivery accountability arrangements.

The figure below outlines the main high-level options for delivery accountability that we identified in our structured long list of potential remedies.

Figure 5 High-level options for delivery accountability arrangements for capital maintenance



Area 4: Financial ODIs related to asset health and operational resilience

Area 4 concerns the use of financial ODIs applied to common performance commitments, with a particular focus on the extent to which these include ODIs on asset health metrics or ODIs relating to evidence on operational resilience or the management of risks to future outcomes.

Ofwat's use of performance commitments with financial ODIs at PR24 is primarily intended to be outcomes-focused. It includes PCs relating to the quality of service provided to customers (e.g. water supply interruptions or internal flooding incidents) and PCs relating to aspects of environmental performance (e.g. pollution events or discharge compliance).

For PR24, Ofwat also plans to set financial ODIs for what it describes as three “asset health” performance commitments, which relate to water mains bursts, unplanned outages at water treatment works and sewer collapses. So, there is already some role for metrics which relate to asset health or operational resilience being used within the current ODI framework

The use of ODIs is likely to affect companies' incentives and behaviour. Furthermore, depending on how they are calibrated, ODIs might provide a funding channel for costs that companies incur to improve asset health and operational resilience.

There are questions of whether asset health metrics are suitable for financial ODIs at all, especially if these only capture specific aspects of operational resilience. One possible approach is to only set outcomes-focused ODIs and use other regulatory tools (e.g. as discussed under areas 1, 2 and 3 above) to tackle concerns about asset health.

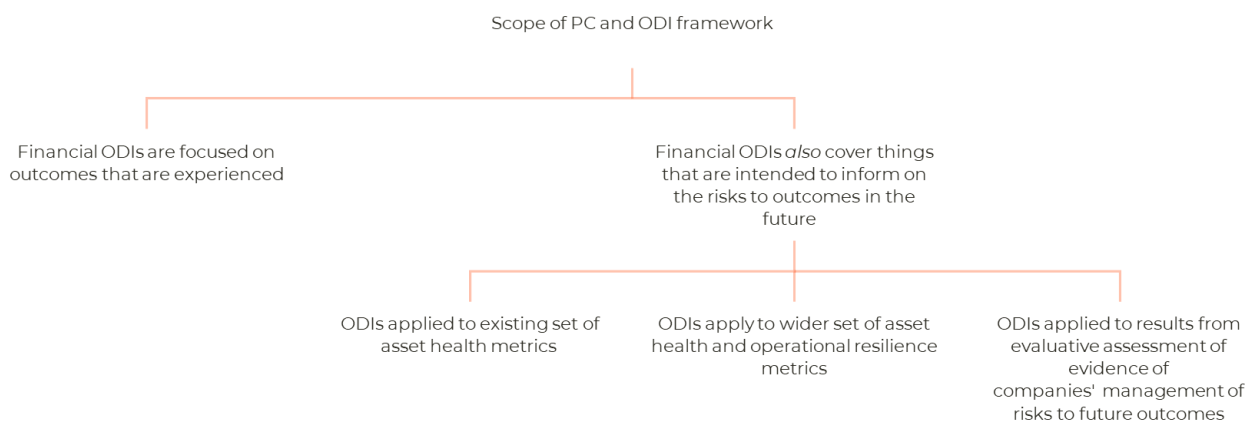
If financial ODIs are to extend beyond the more outcomes-focused metrics, there is a question of whether these should relate to a few narrow measures of asset health (as at present) or cover a broader range of metrics relating to asset health, and operational resilience of risk to future outcomes.

There is also a potential for a different type of financial ODI relating to operational resilience: rather than being based on a specific metric it could be awarded following an evaluation of a broader evidence base. For instance, companies might be rewarded/penalised according to evidence of their credibility – relative to other companies – in managing risks to customer service and

environmental outcomes over the medium and long term. This could draw on a range of qualitative and quantitative information, potentially including metrics of asset health and scenario modelling for future outcomes performance. It could also act as a means of encouraging companies to improve their own understanding of asset health and the relationship between asset health and risks to outcomes in the future.

We summarise the four broad options that we identified in this area in the figure below.

Figure 6 Options for use asset health and outcome risk information as part of the ODI framework



Area 5: adjustments to expenditure allowance in light of outturn expenditure

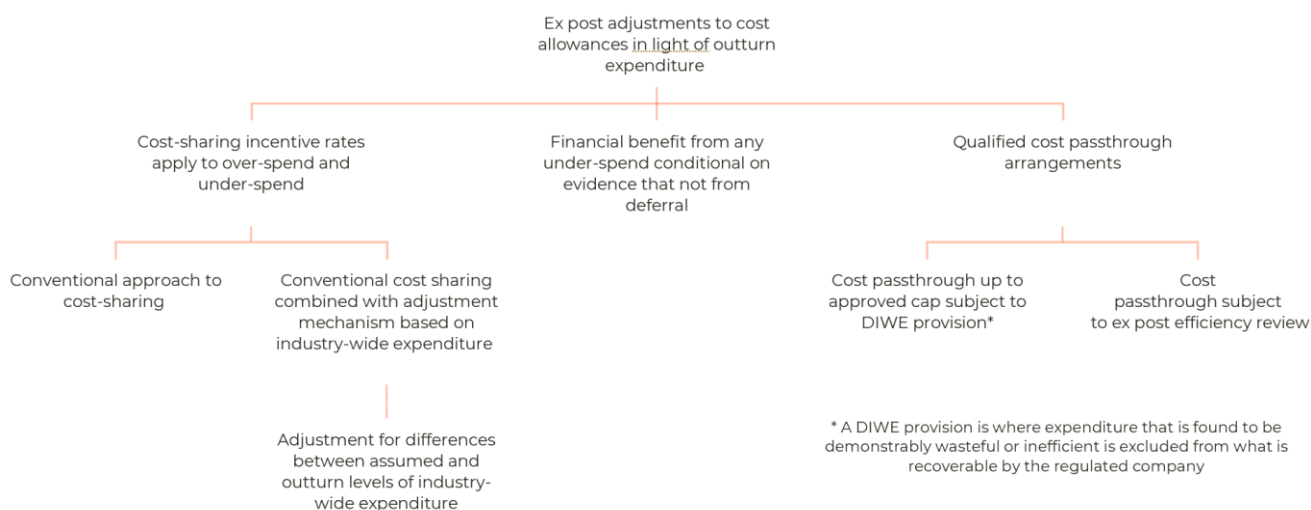
Under area 5, we identified different ways in which information on outturn expenditure could be used to adjust the overall allowances for base expenditure.

Some of these options refer to different ways in which a company's overall allowance for base expenditure could be adjusted in light of what that company spends. This includes the conventional cost sharing approach used at present, under which a specified share of any over- or under-spend against its ex ante allowances that a company experiences is passed through to its customers. It also includes approaches that involve a greater degree of passthrough of outturn costs to customers (with some safeguards as to what costs are fully recoverable from customers).

In addition, we highlight a further category of option which concerns the use of information on *industry-wide* expenditure levels to adjust the allowance for each individual company. This type of approach is of particular interest because it could enable base cost allowances to better track what water companies spend over time, with less weight placed on historical expenditure than under the current approach, in a way that does not undermine efficiency incentives.

We summarise the main options we identified under area 5 in the diagram below. Some of these approaches might be applied to a broader scope of expenditure (e.g. all totex) or a narrower one (e.g. capital maintenance only).

Figure 7 Options for ex post adjustments to cost allowances in light of outturn expenditure



There is some overlap between the options above and forms of uncertainty mechanisms that might be applied as part of the overall approach to cost assessment. However, for reasons of prioritisation, we did not cover in our long list the broader suite of uncertainty mechanisms that might be considered.

Area 6: Supporting measures

The final area that we covered in our structured long list of potential remedies was a collection of additional measures or changes that might be introduced as part of the regulatory framework at PR29. These measures would be intended to act as potential complements to options covered under areas 1 to 5 above.

The measures that we set out under area 6 are not alternatives. They could potentially be applied together as they tackle different issues. However, the relative need for each of the measures may depend on what options are chosen under areas 1 to 5.

Figure 8 Outline of options for supporting measures

