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PR24 and beyond: Long-term delivery strategies and common reference scenarios

About this document

This discussion paper sets out further detail on our approach to long-term delivery strategies at PR24, following our recent consultation, '[Creating tomorrow together](#)', and subsequent engagement with the sector. It sets out our expectations for what companies should include in their long-term delivery strategies as part of the business plan submission for PR24.

To help meaningfully integrate the strategies into the price review process, this paper proposes a series of common requirements for long-term delivery strategies. It then sets out a small number of common 'reference scenarios' to help develop and assess the strategies, and outlines our expectations for wider scenario planning to address future uncertainty.

Responding to this discussion paper

We would welcome any comments on this document. Please email them to PR24@ofwat.gov.uk.

The closing date for responding to this discussion paper is 6th January 2022. If you wish to discuss any aspect of this paper, please contact George Miller by email at george.miller@ofwat.gov.uk.

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1. Introduction

As we look ahead to PR24 and beyond, the water sector in England and Wales faces a series of long-term challenges. Together, we need to tackle demands from climate change and respond to customers' increasing expectations around service and treatment of the environment, while recognising pressures on customers' ability to pay their water bills. Since PR19, companies and governments have set a number of long-term targets and objectives on key issues, with further targets to be set under the Environment Act. In Wales, we are working with the sector to see whether long-term outcomes might be identified through a collaborative approach.

Across the sector, we all recognise the need for solutions that work now and into the future. In May 2021, we suggested, and companies overwhelmingly agreed, that an increased focus on the long term should be one of the key themes for PR24.¹ We consider that five-year price reviews should be staging posts in the overall trajectory towards long-term outcomes. This means companies need to think carefully about how they sequence their activities over the next 25 years and beyond, in line with wider strategic planning frameworks, to achieve those objectives in the best value way. It also demands that both us and companies approach the price review process with a stronger long-term focus and that the sector takes steps to embed an adaptive approach to planning for the future.

To help make the right decisions for the long term, we think companies should set out their five-year business plans in the context of a long-term delivery strategy. These strategies would outline the long-term outcomes the company aims to deliver, and the key investments and activities that form the best pathways to achieving them, given future uncertainties. On one hand, this will include identifying no- or low-regret activities where investment now is likely to pay off in future; on the other, it may be better to wait until the benefits of investment are more certain. Overall, the aim of the price review would be to establish the most appropriate five-year package of interventions to kick off the 25-year trajectory, taking into account future uncertainties, customer views and fairness between current and future customers. This includes delivering improvements for customers and the environment in the short as well as long term.

Long-term delivery strategies should help us all plan intelligently for 2050 and beyond, by explicitly taking account of plausible future changes in key factors. Companies should test their strategies against a wide range of scenarios to demonstrate they are resilient to different plausible futures. In addition, we are setting a small number of sector-wide common 'reference scenarios'. The reference scenarios are designed to cover the key drivers of uncertainty around the future costs and benefits of water company activities, and to help answer the question:

¹ Ofwat, '[PR24 and beyond: Creating tomorrow, together](#)', May 2021, p. 14.

Given future uncertainties, what activities need to be undertaken in the next price review period to meet long-term objectives, and what should be scheduled for future periods?

Further, long-term delivery strategies should not only anticipate change, but adapt to it. We expect companies to set out their strategies in terms of adaptive pathways up to 2050, allowing projects and programmes to respond to new information and experience over time.² This will include identifying future trigger points, beyond which a particular activity would no longer be adequate for meeting long-term objectives, and a different option or strategy would be required. Where appropriate, adaptive pathways can allow options to be kept open into the future so companies can respond to change at the right time. Having this framework in place will be crucial for identifying the most appropriate investment sequences over the long term, and funding any preparatory or investigatory activities needed to support this.

In response to our consultation, we were pleased that companies and wider stakeholders responded positively towards our proposed focus on the long term. We discuss the responses we received in more detail below. We have since engaged with the industry in workshops on how we can plan for the future intelligently, using adaptive planning techniques and long-term scenario planning. We would like to thank everyone who has helped to shape our policy thinking through these processes. We anticipate that PR24 marks a significant initial step towards integrating long-term considerations more fundamentally into the price review process, and expect that our approach will continue to evolve for PR29 and beyond.

1.1 Stakeholder responses to 'Creating tomorrow, together'

All companies and stakeholders supported the proposed ambition for an increased focus on the long term at PR24. The majority of companies expressed support for the introduction of long-term delivery strategies to set five-year business plans in a long-term context.

We received a variety of suggestions for what areas long-term delivery strategies should include. The most common areas suggested were service delivery strategies and profiles, investments to deliver those service profiles, customer evidence, and incorporation of strategic planning frameworks. Some companies proposed that strategies should consider uncertainties and key risks, with some suggesting that an assessment of future scenarios would help to identify and alleviate these uncertainties and risks. We have included all these elements in our guidance. Companies may wish to go further than the requirements set out in this guidance, for example to reflect their specific circumstances or to cover additional areas as they consider appropriate.

² In its [draft strategic policy statement](#), the UK Government states that it expects companies in England to 'shift towards long-term adaptive planning'.

A number of companies called for a balance to be struck between the prescription of common requirements and ensuring companies have the freedom to reflect local and company-specific factors in their long-term delivery strategies. A minority of companies suggested that common requirements were not necessary and setting them would mean strategies would become formulaic. We consider that the requirements set out in this discussion paper enable meaningful integration into the price review process and a proportionate level of comparability between strategies. The requirements allow for companies to own their strategies, for example to engage with their customers and stakeholders to develop their long-term ambitions and determine how they should aim to achieve them.

The majority of companies and stakeholders argued that future changes to the long-term delivery strategies would be inevitable and necessary as new information arises, such as changes in external factors or government policy. Most companies stated that the price review offered an appropriate review point for revising strategies, with a number of respondents suggesting that the use of adaptive planning could allow strategies to flex quickly and avoid the need for 'resetting' at each price review. We agree that long-term delivery strategies should be created on the basis that they will need to be revised in future, and that adaptive planning can help strategies to be robust to changes in circumstances, and our guidance reflects this.

1.2 Long-term delivery strategies

Building on our engagement with the sector, section 2 of this paper sets out further detail on our proposal for companies to position their five-year business plans in the context of long-term delivery strategies.

Companies' long-term delivery strategies should bring together all the strategic planning frameworks, including regional water resource planning, water resources management plans (WRMPs) and drainage and wastewater management plans (DWMPs), the activities set out within the statutory environment programmes, and all the remaining business plan activities outside of these frameworks. Key enhancement activities across these areas should be expressed as adaptive pathways, and the strategy as a whole should be tested against a range of scenarios, including the common reference scenarios.

We are conscious that many companies already produce public-facing long-term strategies, in collaboration with their customers, stakeholders and employees. Some companies have continued to update their strategic direction statements (SDSs) since we required them at PR09; others have used different approaches to communicate their long-term ambitions and future plans. The long-term delivery strategies are not intended to replace these processes, nor other key planning processes such as the strategic planning frameworks. Rather, they are designed to clearly connect company strategies with the business plan, and therefore focus the price review on meeting long-term outcomes.

The introduction of long-term delivery strategies represents a different approach to previous price reviews. For example, we consider there are two main ways in which long-term delivery strategies build on the SDSs:

- **Long-term delivery strategies will be part and parcel of the five-year business plan submission.** SDSs were developed separately to business plans, according to different timescales. We did not set any specific guidance for updating the statements or how they should influence the business plan. At PR09, we often struggled to see a clear line of sight from the SDSs to business plans. In contrast, we will expect business plans at PR24 to explicitly represent the first five-year 'chunk' of the accompanying long-term delivery strategies, and will take this into account when we assess enhancement proposals.
- **Long-term delivery strategies will be specifically designed to inform the price review process.** To be able to meaningfully assess proposed investments using the long-term strategies, we are proposing a series of common requirements for what all strategies should include. We consider these requirements to be proportionate, given the simultaneous need for 1) companies to take ownership of their strategies and 2) to secure a meaningful level of consistency and comparability between them. This includes some additional data requirements.

Enhancement investments at PR24 and beyond

We want to support the investment that is needed to meet long-term goals. At PR24 and beyond, we will expect companies to demonstrate the need for enhancement investments with explicit reference to the long-term delivery strategy. This includes providing evidence that the proposed strategy is sufficiently adaptive to different plausible futures, such as through testing against scenarios. To encourage an enduring shift towards long-term adaptive planning in the sector, we are keen that the quality of long-term delivery strategies has a material bearing on the outcomes of the price review process.

We recognise that **some water and wastewater enhancement investment may be necessary where preparatory work is required in advance of an adaptive pathway being triggered.** This would be the case where it is unclear whether a trigger is likely to be met in a following price review period, but work is required this period to ensure that the potential need can be subsequently met. This investment, such as pre-planning application activities and investigations or part-delivery of the scheme, would be over and above normal option investigation, development and appraisal activity, which is covered through base expenditure allowances.³ This would be expenditure that is normally incurred after the award of enhancement funding for a scheme.

³ Pre-planning application activities would be akin to the activities listed under Gate 3 for the strategic resource schemes as set out in Ofwat, '[PR19 final determinations: Strategic regional water resource solutions](#)', December 2019, pp. 14-15. We would normally expect expenditure in Gate 1 and 2 to be covered by base expenditure allowances.

We expect requests for enhancement funding for preparatory work to align with the following key principles:

- The scheme should be connected to an alternative adaptive pathway set out in a company long term delivery strategy to meet a defined externally driven uncertainty.
- The scheme requires a material enhancement allowance and has a long lead-in time to develop and deliver which covers more than one price control period.
- The preparatory investment in the scheme in this price control period is better value for money than delaying the investment until there is certainty of need in a subsequent price control period.
- The scheme is the best option to meet the need and the proposed funding allowance is efficient and appropriate for the preparatory work.
- There is appropriate customer protection in place to ensure that the preparatory work is progressed.

We expect **long-term delivery strategies to focus on the requirements for enhancement expenditure**.⁴ The purpose of long-term delivery strategies is to meet the long-term performance ambitions. While base expenditure will contribute towards these ambitions, it is the requirements for enhancement expenditure that that will have greatest impact and benefit most from the scenario testing and consideration of sequencing that long-term delivery strategies will bring.⁵ We therefore expect long-term delivery strategies to set out future enhancement expenditure but not base expenditure requirements.

Future long-term delivery strategies

We are setting out our requirements for long-term delivery strategies on the prior assumption that the strategies will need to be modified to some extent in future, taking into account new information and circumstances. For example, changes in customer views, scientific evidence, new government policies, or new innovations may mean changes to the long-term delivery strategy are in the interests of customers, communities and the environment. We consider the price review represents a sensible review point for the strategies, and that adaptive pathways can help to mitigate significant changes in key factors that occur between price reviews.

We therefore expect that, at future price reviews, companies would submit refreshed long-term delivery strategies. However, it will be important that there is a clear line of sight between the previous and refreshed strategy. Companies will need to demonstrate what new information or circumstances have led to an evolution in the strategy. This should separately identify changes that were taken into account in the adaptive pathways, and those that could not have been considered in the previous strategy. Adaptive pathways should ensure a level

⁴ Enhancement expenditure is generally where there is a permanent increase or step change in the current level of service to a new 'base' level and/or the provision to new customers of the current service.

⁵ Base costs are routine, year-on-year costs, which companies incur in the normal running of their businesses to provide a base level of service to customers and include expenditure on maintaining the long-term capability of assets, as well as expenditure to improve efficiency.

of continuity between strategies over time, by providing advance visibility of how the strategy is likely to change given different futures.

1.3 Scenario testing

In section 3 of this paper, we set out eight common reference scenarios, following engagement with the sector and beyond. These scenarios are designed to help focus the price review on establishing the best possible trajectory towards meeting long-term outcomes, given what we know now. Companies will use the common reference scenarios to develop their long-term delivery strategies, and to demonstrate that their proposed strategy is likely to be appropriate in this uncertain long-term context. This can enable us to meaningfully assess how far the proposed timings of the investment are appropriate, given future uncertainties.

The common reference scenarios focus on four material drivers of uncertainty around long-term enhancement spending: **climate change**, **technology**, **demand**, and **environmental ambition**. They are split into 'high' and 'low' assumptions about the future. For example, the 'low' climate change reference scenario is based on a set of widely-used IPCC and UKCP18 projections for a scenario that aims to keep global warming likely below 2°C, while the 'high' assumes very high emissions without additional efforts to constrain them.⁶ We will expect companies to show, through the use of adaptive planning, that their long-term delivery strategies are flexible enough to efficiently deliver long-term ambitions under each scenario.

As such, these scenarios are not intended to be exhaustive or comprehensive, but represent approximations of how certain factors may develop. There are a number of key uncertainties that it would not be appropriate for the common reference scenarios to cover. This includes company-specific and regional factors. We have also avoided including factors that are largely within the control of individual companies, such as resilience to weather events, as uncertainty around these factors can be alleviated by company actions.

Therefore, beyond the common reference scenarios, we expect companies to use wider scenario planning and other techniques to alleviate uncertainty. Companies should stress-test their long-term delivery strategies against a wide range of assumptions about the next 25 years and beyond, as far as the company deems necessary to ensure long-term resilience to plausible future risks and eventualities. Where the company considers it appropriate, this can include wider stress-testing against different assumptions to what is set out in the common reference scenarios. We expect companies to take ownership of their long-term delivery strategies, including to provide assurance according to the requirements we will set out in the PR24 methodology and outlined at a high level in section 2.5.

Further, it is for companies to analyse the implications of the common reference scenarios for their business, their region, and their long-term delivery strategies. The common

⁶ IPCC, '[Climate Change 2014: Synthesis Report](#)', November 2014, Box 2.2.

reference scenarios set out plausible ways in which key factors may develop in the long term; they do not prescribe how these factors will affect companies and their strategies. We will therefore expect companies to explore the likely regional, local or otherwise company-specific impacts of the different common reference scenarios, before developing a long-term delivery strategy that can adapt sufficiently to these impacts.

At future price reviews, we anticipate that the common reference scenarios will be revisited, in consultation with the sector. This will be necessary to ensure they use up-to-date information, as well as to use learnings from PR24 to consider which factors are appropriate for testing on a common basis, and which should be covered entirely by wider company-specific stress-testing.

1.4 Next steps

We welcome comments on this discussion paper from companies, customers and wider stakeholders. Taking this feedback into account, we will set out a further iteration of our common requirements for long-term delivery strategies in our draft methodology for PR24, which will be published in summer 2022. At that stage, we will also confirm the common reference scenarios.

During engagement with the sector, several companies made clear that they would like to start making progress with their business planning and long-term delivery strategies for PR24. We agree with the need to make progress, as draft DWMPs and draft regional water resource plans, which we expect to be key elements of long-term delivery strategies, are scheduled to be published in summer 2022. We therefore encourage companies to start to use the common reference scenarios set out in this document to help to inform the development of their draft business plans and long-term delivery strategies, alongside wider scenario planning as appropriate. Given we have based the common reference scenarios and the adaptive planning approach on published documentation and engagement with the sector, we consider that this is a good basis for companies to commence working.

2. Common requirements for long-term delivery strategies

This section sets out our guidance for long-term delivery strategies. As set out in section 1, long-term delivery strategies will be a key element of PR24 and beyond. We expect company business plans for PR24 to represent the first five years of the long-term delivery strategy, and we will consider long-term delivery strategies when we assess business plans for PR24. As company long-term delivery strategies cover the next 25 years, we expect them to influence decisions taken at PR29 and beyond.

Long-term delivery strategies should be made up of five parts:

- **Ambition:** setting out what the company aims to achieve over the next 25 years;
- **Strategy:** how the company will aim to meet this ambition over the next 25 years;
- **Rationale:** why the long-term delivery strategy represents the best way of meeting short- and long-term ambitions;
- **Foundations:** the key assumptions and uncertainties underpinning the long-term delivery strategy; and
- **Board assurance:** how the company Board has challenged management to deliver a high-quality long-term delivery strategy.

Our expectations in each of these areas are set out below. We expect companies to provide supporting data to accompany their long-term delivery strategy and provide details of data table requirements alongside this document.

This guidance is intended to set out the minimum requirements for long-term delivery strategies. By setting out common guidance and expectations across companies, we expect to be able to make comparisons across companies, helping to ensure that companies are undertaking the right investments for customers and the environment.

We expect that the development of long-term delivery strategies will also be an important exercise for companies, as it will allow companies to ensure that they are providing a better service to customers, communities and the environment, in both the short and long term. It will also allow companies to bring together the outputs from existing strategic planning frameworks, such as WRMPs and DWMPs, into a consistent and holistic long-term strategy. We therefore anticipate that companies may wish to go further than the requirements set out in this guidance, for example to reflect their specific circumstances or to cover additional areas as they consider appropriate.

Customer engagement for long-term delivery strategies

We have set out that companies will be responsible for engagement with their customers on evidence to support development of long-term delivery strategies at PR24.⁷ We expect companies to use evidence of customer preferences and priorities to inform their long-term delivery strategies, but, recognising the inherent limitations of that research, to balance that evidence against other relevant considerations, such as efficiency and fairness between current and future customers.⁸

We expect companies to present evidence that their long-term delivery strategies are informed by customer preferences in two key areas:

- **Ambitions.** We will expect any long-term objectives, over and above any statutory requirements, to be informed by customer views. We will expect companies to consider the coherency between their proposed performance commitment levels for PR24, their forecast performance commitment levels up to 2050, and the customer evidence used to inform the company's long-term ambitions as set out in the long-term delivery strategy, and, where appropriate, to explain how and why these differ.
- **Strategy and rationale:** We will expect that companies use evidence of customer priorities and preferences to inform the selection and sequencing of enhancement investments for the core pathway up to 2050.

2.1 Ambition: where will the company be in 25 years?

Stakeholders expect more from water companies. Over the next 25 years, water companies need to deliver important improvements in outcomes, significantly increasing drought resilience, reducing abstraction of water, reducing leakage, reducing per capita consumption, improving environmental water quality, and meeting net zero emissions.

The long-term delivery strategy should start with the company's **vision** statement. This should articulate what the company would like to achieve over the next 25 years, how it wants to position itself and how it wants to be seen. It should provide a focus for the company and be clear and concise. As set out in section 2.5, the company Board should explicitly sign up to both the vision and the ambition for the company.

The strategy should then set out what this vision would **mean for customers and the environment over the next 25 years**. To ensure consistency and comparability across companies, the strategy should set out what the company will deliver in terms of key performance outcomes during this period. This should include all PR24 common performance commitments, except those based on compliance (such as compliance risk index) or relative performance (such as C-Mex). It should also cover key output metrics from strategic planning

⁷ Ofwat, '[PR24 and beyond position paper: Collaborative customer research for PR24](#)', October 2021, p. 6.

⁸ We are conscious of the issues around conducting meaningful customer research on long-term preferences. For example, research by CCW and Blue Marble has found that one of the least appropriate areas for consumer research relates to inputs relating to 'very long-term planning and future scenarios'. CCW, Blue Marble, '[Engaging water customers for better consumer and business outcomes](#)', April 2020, p. 5.

frameworks, such as additional water capacity delivered and wastewater storage capacity delivered. We will be refining the list of common performance commitments during the development of the PR24 methodology and will be shortly issuing a consultation on PR24 performance commitments.

Company ambitions for the level of performance outcomes and metrics should be informed by a range of factors, including:

- **For English water companies, the UK Government's statement setting out strategic priorities and objectives for Ofwat**, referred to in this document as the UK Government's strategic policy statement,⁹ and relevant legislation, including the Environment Act 2021 and targets to be set under it¹⁰ and related targets set by the Environment Agency;
- **For Welsh water companies, the Welsh Government's statement setting out strategic priorities and objectives for Ofwat** (when published), the Water Strategy for Wales,¹¹ and relevant legislation, including the Environment Act 2016;
- outputs from **strategic planning frameworks** including regional water resource planning, WRMPs, DWMPs, the Water Industry National Environment Programme (WINEP) in England, the National Environment Programme (NEP) in Wales, River Basin Management Plans (RBMPs) and Flood Risk Management plans (FRMPs);
- **customer and stakeholder preferences**; and
- **company ongoing service improvements** that it expects to make over time as technology and processes improve.

Company ambitions should also reflect the particular challenges the company faces. The long-term delivery strategy should therefore explain the current **issues facing the company and the sector**, how these are likely to impact the company over the short and long term, and how these issues are expected to change over the next 25 years. The company should highlight the areas of **strength** that it expects to build on, as well as areas where the company is **working to improve performance**.

Box 1: A collaborative approach to the long term in Wales

In May 2021, we said that a collaborative approach could be used to develop Welsh companies' business plans for PR24. We suggested this could involve bringing together Welsh companies and their stakeholders to identify high-level outcomes and long-term objectives for the future.¹²

⁹ Defra has recently consulted on a [new strategic policy statement](#) and is expected to publish a finalised statement in early 2022.

¹⁰ The Environment Act 2021 will deliver at least one long-term target relating to water. There will be a consultation on the targets in early 2022, and they will be brought forward by 31 October 2022.

¹¹ Welsh Government, '[Water Strategy for Wales](#)', May 2015.

¹² Ofwat, '[PR24 and beyond: Creating tomorrow, together](#)', May 2021, p. 36.

In response to our consultation, Welsh companies and stakeholders generally expressed support for a collaborative process at PR24. Since then, we have been working with Welsh companies and stakeholders to understand how best to ensure the priorities of the Welsh government and the needs of Welsh customers are closely reflected in companies' long-term strategies and plans, while also ensuring plans remain subject to our scrutiny regarding financing costs, cost efficiency and service level stretch.

We will set out further details on the collaborative approach to PR24 in Wales in a paper early next year. This will explain how we expect the outputs of the collaborative process will influence Welsh companies' long-term strategies.

2.2 Strategy: how will the company get there?

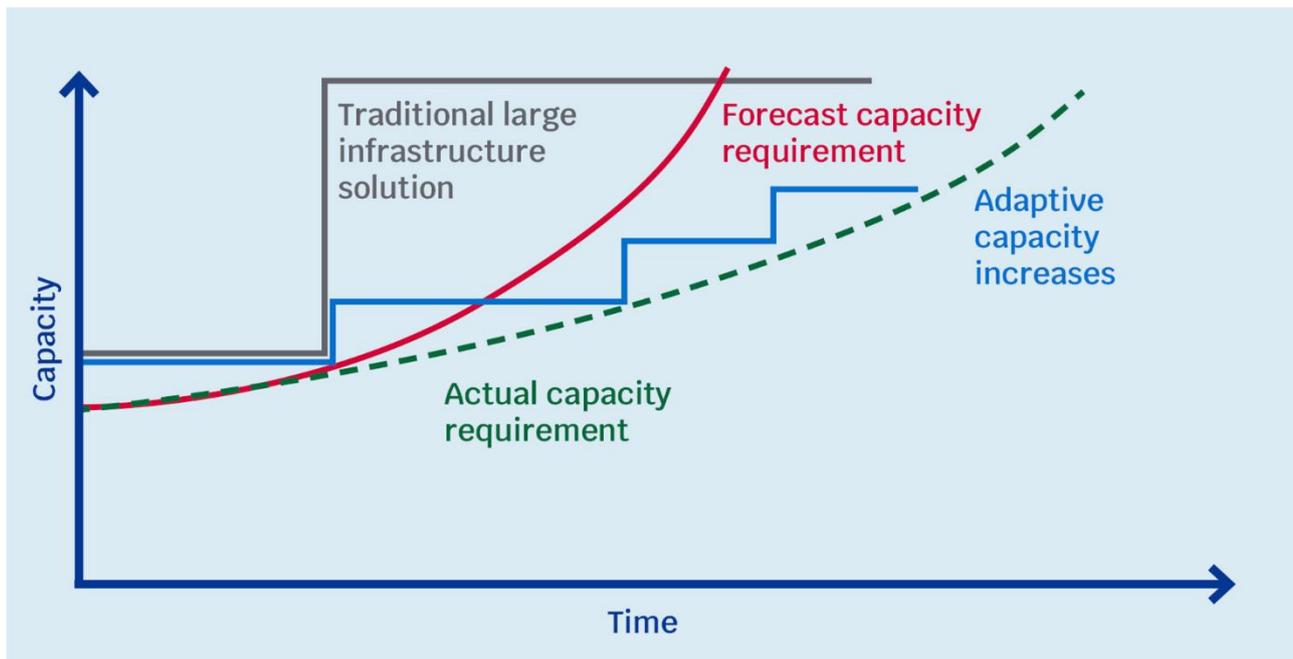
The strategy should set out how the vision and ambition will be delivered and explain the governance procedures that have been established to oversee delivery.

Adaptive planning should be at the heart of the long-term delivery strategy. The future is inherently uncertain, and it is important that the strategy is flexible enough to cope with changes in circumstances so it is robust over time.

The adaptive planning approach enables strategies to be developed in the context of different future scenarios. It aims to optimise the profile of key interventions across time, ensuring that decisions are not avoided when they are needed – for example, to ensure resilience against high-impact scenarios – while minimising the risk of stranded assets should low impact scenarios come to pass.

Adaptive planning can therefore establish what investments are needed now, and where decision points can be scheduled later in the timeline, when there is likely to be greater certainty about what is needed. It can also consider where to bring forward investment and where to invest to create flexibility.

As shown in Figure 2.1, adaptive planning can facilitate the delivery of solutions that more closely reflect what later turns out to be required, compared to building traditional large infrastructure solutions on the basis of uncertain assumptions about the future, which risks unnecessary investment. At the same time, adaptive planning ensures, through regular monitoring, that solutions continually deliver the service level required to meet outcomes in the short and long term.

Figure 2.1 Adaptive planning versus conventional planning

A major focus of adaptive planning is on the timing of large new enhancement investments. But companies should also consider wider interventions, such as:

- behaviour change, for example to reduce water use;
- partnership working, for example around catchment management, and collaboration with other water companies where appropriate, for example to develop new innovations and solutions;
- learning, for example from the Ofwat innovation fund projects and from overseas and other sectors;
- testing through local and production scale pilots; and
- interventions at systems level as well as at the individual infrastructure level.

Box 2: Adaptive planning and pathways

Adaptive planning techniques are particularly useful where there is future uncertainty, and provides a framework to allow companies to consider multiple preferred options. It is an iterative process, with monitoring and review points to ensure the strategy remains up to date.

The UK Government's draft strategic policy statement states that companies should 'shift towards long-term adaptive planning'.¹³ While we are currently anticipating the publication

¹³ Defra, '[The government's strategic priorities for Ofwat: Draft for consultation](#)', July 2021, p. 11. Examples of how this shift has already started include the guidance for the production of the latest round of WRMPs and the first DWMPs, both of which promote the use of adaptive planning approaches, and the latest [National Flood and Coastal Erosion Risk Management Strategy for England](#), which commits that, by 2025, 'water companies and other risk

of the Welsh Government's strategic policy statement, we note the Water Strategy for Wales highlights the importance of taking adaptive and incremental measures in the short and medium term, given uncertainties around the rate and impact of climate change.¹⁴

Under the adaptive planning approach, '**adaptive pathways**' set out how decisions will be made in future. These pathways contain clear **decision points**, indicating when a decision needs to be taken about the right option to efficiently deliver long-term outcomes. At these points, pathways deviate from each other as different sets of options are chosen.

These choices should be informed by pre-defined **trigger points**, which set out the conditions that would cause one pathway to be adopted over another, using clear and observable metrics with an associated monitoring plan.

Well-designed adaptation measures should, in most circumstances:

- not foreclose future options or unnecessarily constrain future choice;
- be efficient, effective and equitable under the widest set of all plausible futures;
- enable appropriate modification of policies, plans and projects as the reality of the future becomes known; and
- account for the potential impacts of adaptation across different groups and ensure that the reduction in social damage from adaptation justifies the costs of implementing the measure.¹⁵

Decisions relating to adaptation should take account of the magnitude of risk, but also the urgency of the risks. This means different adaptation actions may be appropriate depending on the context of the decision.

Adaptive pathways

The long-term delivery strategy should be based on an adaptive pathways approach (see Box 2). This should be undertaken in four stages:

1. for the ambition the company wants to achieve, identify the challenges and potential solutions that are likely to be needed under a range of scenarios to meet this level of ambition;
2. evaluate the alternative options, and develop alternative pathways and triggers to help meet the future ambition in a range of plausible futures;
3. select the core pathway, include short-term actions into the PR24 business plan, and set metrics to be monitored for future evaluation of the pathways; and

management authorities will ensure that long-term adaptive planning for flooding and coastal change is better coordinated with the next and subsequent cycles of planning for water and wastewater investments'.

¹⁴ Welsh Government, '[Water Strategy for Wales](#)', May 2015, p. 15.

¹⁵ As set out in Defra, '[Accounting for the Effects of Climate Change: Supplementary Green Book Guidance](#)', November 2020, pp. 18-19.

4. during the price review period, monitor and evaluate the implementation of the pathways, and reassess future long-term options as future uncertainties change, for input into PR29 and beyond.

The company's long-term delivery strategy should set out a core adaptive pathway and alternative pathways which could be triggered depending on how future uncertainties develop. Within this, pathways should be presented separately for water and wastewater, as appropriate.

While the long-term delivery strategy should set out the interventions required to 2050, the strategy should also have regard to major issues and pressures beyond this period which could justify interventions up to 2050.

To assist with the development of adaptive pathways, we have developed a set of common reference scenarios, following engagement with the sector. These scenarios cover key uncertainties that could impact water company activities in the future and should be used alongside wider scenario testing. They include climate change, developments in technology, changes in demand for water and wastewater services, and levels of potential abstraction recovery required to meet the company's environmental destination. The common reference scenarios are set out in section 3.

Core adaptive pathway

The core pathway should describe the company's current preferred approach to achieve the ambition and vision. This should set out the following, for the period up to 2050:

- a clear **narrative** on how the company expects to achieve the ambition and vision. For each of the targeted areas of improvement this should set out how the ambition will be achieved, the measures that need to be put in place and the key uncertainties involved;
- the **improvements in performance that are expected from base expenditure**, considering improved technology and processes. These improvements will be particularly important for water supply interruptions, pollution incidents, sewer flooding and leakage (see section 2.4);
- the additional **enhancement expenditure** that would be required to meet the long-term ambition. This should take account of outputs from strategic planning frameworks and be a comprehensive view of potential enhancement expenditure over the long term; and
- the **key strategic investments** that are likely to be needed, their cost and timing, including lead and delivery times.

The core pathway is not a central pathway between the alternative scenarios. It should fully reflect adaptive planning techniques and should include:

- investment that needs to be undertaken now to meet short-term requirements;

- investment that is necessary to meet future low scenarios;¹⁶
- investment required to keep future options open (such as enabling work), where possible, or is required to ensure that future options do not become significantly more expensive;
- 'no and/or low regrets' investments, for example investments that are required in both low or high scenarios, or across a wide range of plausible scenarios; and
- investment in learning and monitoring to ensure that the company is prepared for alternative pathways.

The core pathway should explain what needs to be done within the 2025–30 period and what should be scheduled later.

As set out in section 2.4, we expect companies to develop their core pathway on the basis of a clear and consistent set of baseline assumptions about key internal and external factors. It is for companies to define an appropriate baseline, but they may consider aligning assumptions across strategic planning frameworks, and we will expect that assumptions are consistent across the business plan and the long-term delivery strategy.

Alternative adaptive pathways

After describing the investments and activities within the core pathway, the strategy should then explain how the proposed enhancement investments may need to change in the future in response to changes in circumstances. This should consider the range of uncertainty described in the common reference scenarios, as well as relevant local and regional factors. For example, a change in enhancement expenditure may be required in response to climate change or technological developments. The plan should identify a relatively small number of alternative pathways, focused on the key areas of risk and uncertainty.

Based on the range of future uncertainty, the strategy should identify **triggers** where **alternative adaptive pathways** would need to be followed. These triggers should set out:

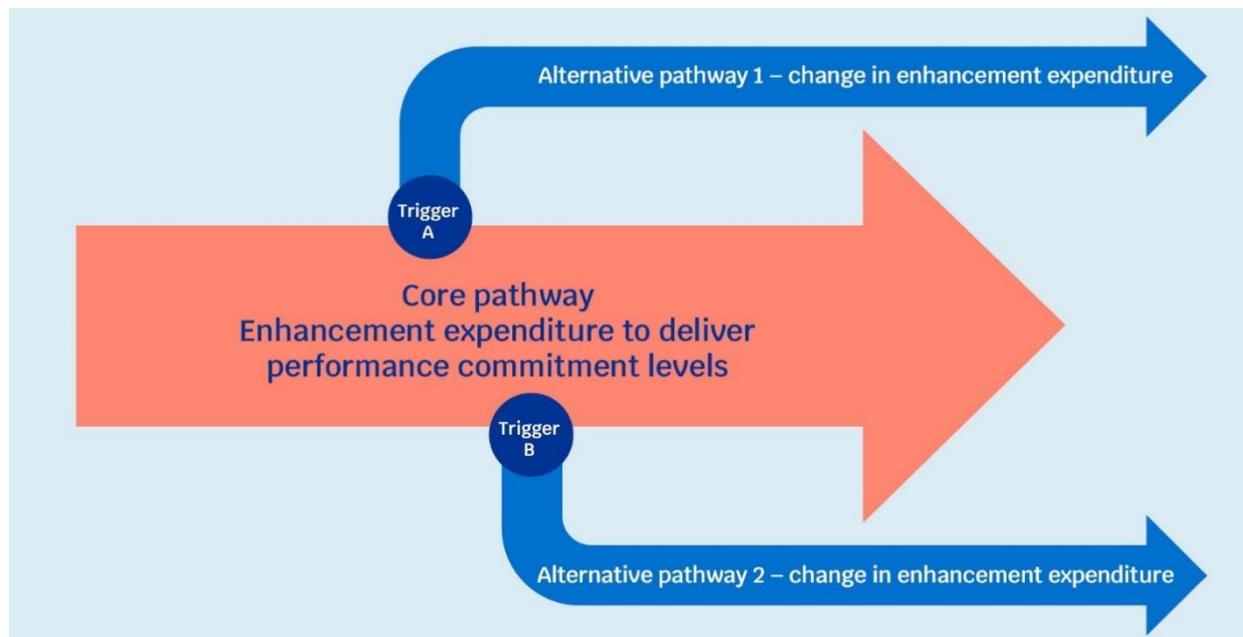
- the point at which the alternative pathway will deviate from the core pathway;
- the circumstances in which the alternative pathway would need to be followed, and how these will be assessed and monitored; and
- when the decision would need to be taken about whether the alternative pathway is taken forward.

As with the core pathway, each adaptive pathway should comprise a narrative description to explain the reasons why the pathway is appropriate in these circumstances and the enhancement investments that would be involved. The strategy should explain the uncertainties around this and how that uncertainty will be managed. Given the greater degree of uncertainty around whether they will be required, we would expect a lower level of detail in the alternative pathways than in the core pathway. To help stakeholders understand

¹⁶ These scenarios should include but not be limited to the common reference scenarios. We expect companies to use wider scenario planning as deemed necessary.

the likelihood of the core and alternative pathways, companies should provide an indication of the relative likelihood of each alternative pathway.

Figure 2.1 Core and alternative pathways



Monitoring the long-term delivery strategy

Effective monitoring of adaptive pathways is a key principle of an adaptive approach and critical for success. The long-term delivery strategy should therefore explain how, during its implementation, the metrics and triggers and other key elements of the strategy will be monitored and reviewed. This should encompass monitoring of the development of each of the common reference scenarios on climate change, technology, demand, and environmental destination, together with any regional or local factors that have been reflected in triggers. At a minimum, we would expect companies to report on the progress towards the ambition and towards meeting the triggers for alternative pathways as part of their submissions for PR29.

The monitoring plan in the strategy should therefore identify:

- the metrics that will be monitored, how these will be calculated and the source of the data;
- the frequency in which the metrics will be monitored and reviewed;
- the threshold that the metrics will be monitored against and what action will be taken when the threshold is reached; and
- how the monitoring of the metrics and the progress against the long-term strategy will be reported (including to Ofwat and other regulators) and published.

Impact of the long-term delivery strategy on bills

The long-term delivery strategy will set out how it will meet the long-term ambitions for the company and the sector. Customers will pay for the activities required to meet these ambitions. Companies should therefore set out the estimated bill impact of the long-term delivery strategy. Bill impacts should be identified separately for the core adaptive pathway and the alternative pathways. Bill impacts for 2025–30 should be based on the PR24 business plan, with longer-term bill changes based on the forecast impact of enhancement expenditure using PR24 assumptions on allowed returns as appropriate. Further detail is set out in Annex 1.

2.3 Rationale: why is the strategy the best way of getting there?

This section should explain why the adaptive pathways chosen for the strategy represent the best approach to deliver the company's vision and ambitions, both in the long and short term, given future uncertainties, customer preferences and affordability considerations.

Identification of core and alternative pathways

The strategy should set out how the core and alternative pathways have been developed. This should include an explanation of:

- how the options included in each of the pathways have been identified and selected;
- why the options and the mix of approaches included in the long-term strategy – between capital and operating solutions and between traditional and nature-based solutions – represents best value; and
- why the investments are sequenced to deliver optimally in the short, medium and long term.

When considering whether options selected are best value, we mean taking into account environmental and social impacts over a suitable timeframe, in line with Ofwat's expectations for strategic planning frameworks for PR24,¹⁷ Ofwat's public value principles,¹⁸ and the WINEP options and appraisal guidance.¹⁹

The strategy should set out what options were considered in identifying the core pathway, and why the core pathway was chosen over other options, including how customer (see section 2) and stakeholder views have been taken into account in its development. The strategy should also explain why the specific alternative pathways and trigger points have been chosen.

¹⁷ Ofwat, '[Ofwat's expectations for strategic planning frameworks at PR24](#)', November 2021.

¹⁸ Ofwat, '[Public value in the water sector: A supporting set of principles](#)', July 2021.

¹⁹ The WINEP methodology will be published in late 2021. Additional guidance will be available from the Environment Agency, setting out further details of the approach.

The strategy should also explain how the core and alternative pathways reflect the key principles of adaptive planning, including how they allow no or low-regret options to proceed where appropriate, do not foreclose future options or unnecessarily constrain future choice and are efficient, effective and equitable given the range of future uncertainty.

Taking account of future uncertainty and scenario testing

To assist the development and stress-testing of the adaptive pathways, we have developed a small number of common reference scenarios, following engagement with the sector and beyond. These cover climate change, technology, demand, and environmental destination. We set out high and low scenarios to reflect a range of plausible future uncertainties. We provide further details of the common reference scenarios, as well as how we expect companies to apply them to their strategy, in section 3.

The long-term delivery strategy should be tested against each of the eight common reference scenarios to demonstrate that, under different plausible versions of the future, the strategy is likely to efficiently deliver the company's ambitions. We expect companies to clearly set out how the strategy would continue to deliver its ambitions in each of these futures. This includes the activities that are likely to be required to achieve those outcomes and their associated costs and benefits, where these are different to the core pathway.

Companies should clearly set out how the long-term delivery strategy would continue to deliver its ambitions under each of these common scenarios. This evidence should include:

- **the sensitivity of the core pathway to the scenario**, i.e. how the scenario would affect the delivery of outcomes in the absence of alternative adaptive pathways;
- **how the long-term delivery strategy would adapt to the scenario**, i.e. the alternative adaptive pathways that would be followed if this scenario came to pass;
- **the long-term outcomes that would be delivered in this scenario**, as a result of following these adaptive pathways, if different to those achieved under the core pathway; and
- **how the scenario would affect the expenditure requirement over time**, compared to the core pathway;
- **how, under the scenario, the strategy delivers fairness between current and future customers.**

Beyond the common reference scenarios, we expect companies to use wider scenario planning, as far as the company deems necessary, to ensure the strategy is resilient to a wide range of plausible eventualities. The company should demonstrate that risks have been considered in the development of the long-term delivery strategy, and that it has used scenario testing to validate the strategy by testing alternative options, pathways and sequences. We set out further details around wider scenario planning in section 3.3.

Linkages to strategic planning frameworks and RAPID

We expect the long-term delivery strategy to draw on outputs from strategic planning frameworks. The strategic planning frameworks will identify long-term programmes for regional water resources, water resources management (WRMP), drainage and wastewater management (DWMP), flood risk management (FRMP), improvement of the water environment at a river basin district level (RBMP), and over the next five to ten years for company environmental requirements as set out in WINEP and NEP.

The WRMP and DWMP processes require companies to consider adaptive pathways if there is significant uncertainty. Given the range of future uncertainty, we consider that adaptive planning is critical for effective long-term planning, to ensure that the right investments are being done in the next five-to-ten-year period as well as over the longer term. We therefore consider that adaptive planning should be used for WRMPs and DWMPs.

WINEP and NEP are programmes of work that water companies in England and Wales are required to deliver to meet their obligations arising from environmental legislation and government policy. As these are requirements that need to be met, they should be assumed to be completed as required as part of the long-term delivery strategy.

The Regulators' Alliance for Progressing Infrastructure Development (RAPID) is facilitating and assessing 19 different strategic water resource options through an accelerated gated process.²⁰ The options under consideration are likely to reduce over the next three years as they are refined and optimised through the strategic planning frameworks. These large-scale schemes are being considered within the regional water resource planning framework and therefore should be reflected in company WRMPs. Any residual uncertainty in the need for and delivery of large-scale water resource options should be reflected in long-term delivery strategies.

Comparing to previous company long-term strategies

It is important for long-term delivery strategies to take account of and learn from previous long-term forecasting and planning exercises. This will help increase the robustness of the long-term delivery strategies and help reinforce the importance of good long-term planning.

At PR09, companies produced [strategic direction statements](#). These provided a 25-year context for the companies' five-year business plans. The strategic direction statements set out company long-term plans and objectives, their approach to climate change and sustainability, customer priorities, and major risks and how these would be managed. Some companies have continued to update these statements.

²⁰ RAPID was formed in 2019 by Ofwat, the Environment Agency and the Drinking Water Inspectorate to support strategically important new water resource infrastructure supply solutions and meet future water needs. [RAPID is overseeing a gated process](#), which assesses the quality of companies' plans at specific points to ensure that sufficient progress is being made, and that strategic resource options are developed further. In June 2021, RAPID [set out its initial thinking for consultation](#) on a more effective regulatory and commercial framework for strategic water resource solutions.

Where available and comparable, companies should identify the key differences between their long-term delivery strategy and their strategic direction statement, the reasons for these differences and any lessons that could be learnt for making long-term delivery strategies more robust.

At PR19, companies provided long-term forecasts of common performance commitments to 2035, and in some circumstances, 2045. Companies should also identify the key differences to the forecasts included in the long-term delivery strategy and set out the main reasons for those differences.

Impact on affordability and fairness between current and future customers

The long-term delivery strategy should aim to secure:

- **long-term affordability:** the company should consider how its strategy protects customers' ability to pay their water bill over the long term.
- **fairness between current and future customers:** the company should consider how its strategy ensures fairness between what existing customers will pay for and what is paid for by future customers.

The company should present evidence that these issues have been explored with customers, including how the interests of future customers have been taken into account, and that these views have informed its long-term delivery strategy. We expect to see evidence that customers consider the forecast bill impacts of the long-term delivery strategy to be acceptable.

As set out in section 2.3, we expect the company to identify bill impacts separately for its core adaptive pathway and alternative pathways. The long-term delivery strategy should aim to deliver intergenerational fairness and affordability in a range of plausible futures, beyond the baseline assumptions that inform the core pathway. The company's engagement with its customers should therefore reflect affordability impacts in different futures and take account of the impact of alternative pathways and their impact.

Companies should also consider using scenario testing to demonstrate the strategy is likely to be fair and affordable for both current and future customers. We expect strategies to consider a range of scenarios to test different future levels of affordability in their region, for example using different assumptions around the level and distribution of future economic growth. These assumptions should be cross-referenced against key drivers of uncertainty around future company activities, such as the common reference scenarios, to show that long-term affordability is likely to be maintained under a range of plausible futures.

2.4 Foundations: what is underpinning the strategy?

This section should set out the key assumptions and uncertainties behind the long-term delivery strategy. This is important to help us and stakeholders understand how the strategy has been built up. It also helps to ensure that the long-term delivery strategy is a 'living' document that can adapt to new information and circumstances over time, and that there will be a clear line of sight between the previous and refreshed strategy.

As set out in section 2.2, we expect companies to develop their core pathway on the basis of a clear and consistent set of baseline assumptions about key internal and external factors.

At future price reviews, we expect companies to refer to assumptions made and uncertainties cited in the previous long-term delivery strategy when explaining why changes in the strategy are necessary.

Assumptions

The company's core pathway will be based on a number of assumptions about how certain factors are most likely to change over time. Some of these factors will be external, and therefore largely not under company control, such as:

- **climate change** and its impacts on the company region, including the natural environment;
- **demand** for water and wastewater services, resulting from demographic changes;
- **socioeconomic factors**, such as economic growth and changes in household incomes; and
- **government and regulatory policy**; and
- the activities of **other water companies and sectors**, such as their contribution towards long-term targets.

Other factors are partly under company control, but also depend on the activities of other sectors and entities, such as:

- the condition of the **natural environment**;
- **consumer behaviour and attitudes**;
- customer **affordability and vulnerability**;
- the costs of **inputs**;
- the availability of **skills**; and
- **technological developments**, developed inside and outside the sector, including through the Ofwat innovation fund.

The company will also need to make assumptions about its own operations, that are largely under company control, such as:

- levels of **asset health** and **resilience**;
- **innovation** within the company;
- **cost efficiencies**; and
- progress towards key **long-term outcomes**.

We will expect the company to set out details of the key assumptions that underpin its core pathway up to 2050 and to explain on what basis the assumptions are being made. The above list is not exhaustive and the company should refer to the assumptions it considers are material to the long-term delivery strategy. These assumptions should align with the company's PR24 business plan and be consistent across the entire long-term delivery strategy.

Performance improvements from base expenditure

Even without enhancement expenditure, companies will deliver performance improvements over time through their base cost allowances and ongoing technological improvements. In 'Creating tomorrow, together', we stated that we are considering whether we can publish the improvements we expect from base funding early.²¹ It is unlikely that any such early publication will be in time for draft strategic planning documents in summer 2022, given it depends on the approach to assessing base costs at PR24.

It will therefore be important for companies to develop their own forecasts of improvements expected from base expenditure to inform draft plans, and if we decide against early publication, final plans. We expect companies to set out clearly the improvements in performance expected towards each of the performance outcomes and metrics set out in the company's ambition. These performance improvements should be based on historical trends and expected future improvements and should consider expected changes in technology.

Uncertainties

The long-term delivery strategy should be developed on the basis that the future is uncertain and likely to change. The company should clearly describe the areas of greatest uncertainty in its long-term delivery strategy and explain how uncertainty has been appropriately accounted for in each area. It should set out the underpinning factors the company considers are most uncertain, those which could have the biggest influence on the long-term delivery strategy, and how changes in those factors may affect the strategy in future. The factors identified by the company may be similar to those included in its assumptions.

As set out in sections 2.3 and 3.3 of this document, we expect companies to account for key uncertainties using scenario planning and other techniques, such as sensitivity testing, as appropriate. Uncertainties can also be accounted for through the development of alternative adaptive pathways.

²¹ Ofwat, '[PR24 and beyond: Creating tomorrow, together](#)', May 2021, p. 34.

2.5 Board assurance

We expect the introduction of long-term delivery strategies to provide an important and enduring framework for the sector to embed a stronger long-term focus. A fundamental shift towards a long-term mindset will require culture change at all levels of the business. We therefore expect the company's full Board to own and be accountable for their long-term delivery strategies, including to ensure that the strategy is high quality.

As part of the long-term delivery strategy, the company's full Board should provide an assurance statement that explains how it has challenged and satisfied itself that the long-term delivery strategy:

- reflects a long-term vision and ambition that is shared by the Board and company management;
- is high quality, efficient, and will deliver its stated long-term objectives,
- is based on adaptive planning principles and takes into account future uncertainties;
- has been informed by customer engagement; and
- secures long-term affordability and fairness between current and future customers; and
- will enable the company to meet its statutory and licence obligations, now and in the future.

The Board should provide evidence of where it has challenged company management and an explanation of the process it has used to arrive at the view that its long-term delivery strategy is the best it can be. It is for companies and their Boards to determine how best to provide this assurance, including the role of external assurance.

We will confirm our requirements for Board assurance of the long-term delivery strategy and the business plan in our methodology in 2022.

3. Common reference scenarios

As many of the challenges faced by the water sector require long-term solutions, decisions around the right investments to make to meet them are complicated by uncertainty about what will happen in the future. For example, the impact of climate change on the sector in the next 25 years is likely to be material, but its long-term effects remain uncertain, and the severity of those effects depends on mitigating actions that are taken globally.

This has consequences for deciding what interventions should be made over the next 25 years. The inherent uncertainty creates risks around either underinvestment – which would see the sector falling short of long-term objectives and allocating disproportionate costs to future customers – or overinvestment, which would involve unnecessarily high costs for current customers and the prospect of stranded assets in future.

To help alleviate these risks, we expect companies to use scenario planning techniques to inform their long-term strategies, by testing their strategies against plausible variations in key assumptions.

To be able to assess how far proposed activities are appropriate given future uncertainties, we set out in section 3.2 eight common reference scenarios, informed by engagement with the sector and beyond. These scenarios offer both 'high' and 'low' assumptions around the future impacts of climate change, demand, technological development and environmental destination on water company activities.

The common reference scenarios provide a tool to help assess whether the proposed activities are likely to be the right ones and are being delivered at the right time. Companies should also use them to clearly demonstrate that the long-term delivery strategy is likely to deliver its ambitions under plausible assumptions about the future.

Beyond the common reference scenarios, we expect companies to test their planned activities against the scenarios that they deem appropriate to form their adaptive pathways. Companies will be expected to own their long-term delivery strategies, including to provide appropriate Board assurance (see section 2.5).

3.1 Using the common reference scenarios

We expect all companies to use the common reference scenarios to inform their long-term delivery strategy. We consider that the common reference scenarios serve two main functions:

1. Developing the long-term delivery strategy

Companies should use the common reference scenarios, alongside wider scenario planning as appropriate, to help **develop** their long-term delivery strategy, by testing the sensitivity of their core pathway to different futures. Uncertainties can then be alleviated through refining the core pathway or developing alternative pathways as appropriate.

In developing their strategy, we expect companies to consider a wide range of possible impacts of the high and low common reference scenarios. Companies should consider wider impacts when analysing how these scenarios may affect the viability of their strategies. For example, companies may consider that climate change will not only affect the water sector and the company's own region, but also that climate impacts on other sectors and regions may ripple out and impact others. These impacts could include changes to the natural environment, impacts on global supply chains, and increased risk to infrastructure.²²

2. Demonstrating that the long-term delivery strategy is high-quality

Companies will also be required to **demonstrate** that the long-term delivery strategy is likely to efficiently meet long-term outcomes, not only in terms of the company's baseline assumptions, but also given the range of uncertainty described in the common reference scenarios. We set out the evidence companies should provide in section 2.3.

When presenting the results of testing the long-term delivery strategy, companies should set out the impact of each individual common reference scenario, rather than combining common scenarios. This is to ensure that investments are tested against plausible, rather than low probability, assumptions about the future. Where companies deem appropriate, they can additionally present the results of combining two or more common reference scenarios, if they consider it helps to demonstrate that the strategy is appropriate given future uncertainties.

Where interdependencies between the common reference scenarios are identified, the impacts should be presented under the relevant scenarios. For example, temperature rises caused by climate change may be associated with higher demand for water. In this case, we would expect companies to adopt the following approach:

- when testing against the climate change common reference scenario, consider any changes in demand that are due to climate change; and
- separately, when testing against the demand common reference scenario, consider the demand parameters specified in section 3.2.3.

We do not prescribe how the individual common reference scenarios impact on the company's long-term delivery strategy. This is because the nature and magnitude of

²² As set out in Defra, '[Accounting for the Effects of Climate Change: Supplementary Green Book Guidance](#)', November 2020, pp. 4-5.

these impacts will often depend on localised and/or company-specific factors. Companies should explain clearly how these factors have been taken into account in their analysis.

We set out our expectations for wider scenario planning to inform long-term delivery strategies in section 3.3.

3.2 Parameters for common reference scenarios

The common reference scenarios for PR24 have been developed following engagement with the sector and wider stakeholders and taking into account established best practice in scenario planning.²³

In response to our consultation, 'Creating tomorrow, together', several companies and stakeholders emphasised the need to strike the right balance between:

1. enabling companies to own their long-term delivery strategies; and
2. prescribing some common aspects to help meaningfully integrate the strategies into the price review process.

We have been conscious of this balance when setting the common reference scenarios, by identifying in what areas common scenarios are most likely to add value, and then allowing companies to use wider scenario planning where appropriate. We consider that common reference scenarios are most useful where they are:

- **Simple.** To meaningfully inform a time-pressed price review process, we consider that common reference scenarios need to be simple and workable.
- **Material.** The main aim of the common reference scenarios is to help assess how far planned activities are appropriate given future uncertainties. Therefore, we consider common scenarios should focus, as far as possible, on the greatest drivers of uncertainty in future water company costs and activities.
- **Exogenous.** We consider that uncertainties which are within the control of individual companies are better accounted for by individual companies, rather than being prescribed on a common basis.
- **National.** For similar reasons, we consider that setting out assumptions about regional or company-specific factors would not be appropriate. Companies may build on the common reference scenarios to include regional variations in their wider scenario planning.

²³ For example, see Defra, '[Accounting for the Effects of Climate Change: Supplementary Green Book Guidance](#)', November 2020; Government Office for Science, '[A brief guide to futures thinking and foresight](#)', February 2021.

- **Plausible.** Best practice in scenario planning suggests that scenarios should outline plausible representations of how factors may unfold, based on past observations and future projections, rather than hypothetical factors.²⁴

As such, the common reference scenarios are not intended to be exhaustive or comprehensive. Instead, they represent simple, plausible approximations of the future, and cover the most material areas of uncertainty around future water company activities and costs.

In some key areas of water company activities, such as the journey to net zero emissions, uncertainties around what companies need to achieve are partially alleviated through the setting of government targets. We consider that common reference scenarios do not need to be set in those areas, as it would not be appropriate or useful to speculate on any future changes to those targets.

We set out below the high and low parameters for four areas in which we are setting common reference scenarios: climate change, technology, demand, and environmental ambition. We have attempted to present them in a simple and workable way, where possible using parameters commonly used in strategic planning frameworks.

3.2.1 Climate change

The future impacts of climate change on water company activities are uncertain. This is partly because how climate change will affect the sector and the environment in which it operates is not clear; further, the future pace of climate change depends on action taken at global level to reduce emissions. Consequently, the uncertainties around climate change have been recognised in scenarios that are already widely used in the water sector and beyond, and are therefore appropriate for setting on a common basis.

We are setting common reference scenarios for climate change on the basis of the **Representative Concentration Pathways (RCPs)**, as adopted by the Intergovernmental Panel on Climate Change (IPCC) in its 5th assessment report.²⁵ The RCPs are also used by the latest UK Climate Projections (UKCP18), which provide the most up-to-date assessment of how the climate in the UK may change in the future.²⁶

The RCPs specify different future concentrations of greenhouse gases to create a wide range of plausible future emissions scenarios.²⁷ They range from RCP2.6 to RCP8.5, which represent low and high scenarios for the amount of 'radiative forcing' caused by greenhouse gases,

²⁴ Defra, '[Accounting for the Effects of Climate Change: Supplementary Green Book Guidance](#)', November 2020, p. 9.

²⁵ IPCC, '[Climate Change 2014: Synthesis Report](#)', November 2014.

²⁶ Met Office, '[UK Climate Projections: Headline Findings](#)', July 2021.

²⁷ Met Office, '[UKCP18 Guidance: Representative Concentration Pathways](#)', November 2018.

which in turn creates changes in factors such as temperature, rainfall, and sea levels. We are setting RCP2.6 and RCP8.5 as common reference scenarios for PR24.

RCP2.6 is a 'stringent' mitigation scenario, representing a future in which the world aims for and is able to implement sizeable reductions in emissions of greenhouse gases. For example, carbon emissions begin to decline from 2020 and reach zero by 2100, leading to a global average temperature rise of between 0.3°C and 1.7°C by 2081–2100, compared to the reference period of 1986–2005.²⁸ RCP8.5 represents a future without additional efforts to constrain emissions, where greenhouse gas emissions continue to grow, leading to a global average temperature rise of between 2.6°C and 4.8°C by 2081–2100.

We expect companies to use **UKCP18 projections for RCP2.5 and RCP8.5** to explore how these different climate futures affect their strategies – including their potential impacts on water resources, wastewater loads, flooding, and biodiversity – and to ensure the strategy is appropriate given these alternative climate assumptions. We consider that using the 50th percentile probability level for each projection offers plausible high and low assumptions for setting common reference scenarios, but companies may consider testing against a wider range of climate scenarios.

For land projections, covering maximum temperature and total precipitation, companies should use the UKCP18 probabilistic projections. The probabilistic projections are designed to provide the primary tool for assessments of the ranges of uncertainties in UKCP18, and provide information on known uncertainties in future climate changes.²⁹ They use a maximum spatial resolution of 25km to provide scenarios around local changes across the UK for precipitation and maximum temperature. We therefore expect companies to apply the projections to their geographical region as appropriate.³⁰

To cover sea level rise, companies should use the UKCP18 marine projections. The 'time mean sea level' dataset should be used.³¹ This dataset projects the average height of the sea over a year, with shorter-term variations of tides and storm surges averaged out. They use a 12km grid to provide scenarios around the UK coastline. As with the land projections, we expect companies to apply the marine projections to their geographical region as appropriate.³²

High climate change scenario

Land: UKCP18 probabilistic projections, RCP8.5, 50th percentile probability level

Sea level: UKCP18 marine projections, RCP8.5, Time mean sea level, 50th percentile

²⁸ IPCC, '[Climate Change 2014: Synthesis Report](#)', November 2014, Table 2.1.

²⁹ Met Office, '[UKCP18 Guidance: How to use the UKCP18 land projections](#)', November 2018.

³⁰ For example, the [Met Office UKCP User Interface](#) allows for the generation of probabilistic projections of temperature and rainfall under RCP 2.6 and RCP8.5 at 25km grid-square level, according to a range of probabilities.

³¹ Met Office, '[UKCP18 Factsheet: Sea level rise and storm surge](#)', November 2018.

³² The marine projections can also be accessed using the [Met Office UKCP User Interface](#).

Low climate change scenario

Land: UKCP18 probabilistic projections, RCP2.6, 50th percentile probability level

Sea level: UKCP18 marine projections, RCP2.6 Time mean sea level, 50th percentile

3.2.2 Technology

While technology is both an exogenous and endogenous factor, we consider that long-term technological development is only partially in the control of a single company, and so is appropriate for setting on a common basis. We have based the common reference scenarios for technology on an extrapolation of key current technological developments inside and outside the sector, following engagement with companies, regulators and stakeholders.

As such, the common technology scenarios do not attempt to provide an exhaustive list of potential developments, some of which will be specific to companies and/or certain regions. Nor do we attempt to capture technologies that are currently in the early stages of their development and have not already started to be adopted or considered by some water companies, as we consider their inclusion would be too speculative to be useful.

In at least a high scenario, technologies that are currently unknown or unproven are likely to materially impact the sector over the long term. Beyond those set out in the common reference scenarios, we expect companies to consider a wide range of technological developments in their long-term delivery strategies. This should include, where appropriate, those set out below:

- **Internet of things:**
 - Smart metering and network telemetry;³³
 - AI/data interrogation;³⁴
 - common data sharing protocols;³⁵ and

³³ Smart meters and network telemetry are widely used in the water sector today to monitor data such as water consumption, flow, pressure and quality.

³⁴ Artificial intelligence solutions have a range of applications and are increasingly being adopted and developed across the sector and beyond. For example, see International Water Association, '[Digital Water: Artificial Intelligence Solutions for the Water Sector](#)', August 2020, and Global Infrastructure Hub, '[Self-learning autonomous control of water networks](#)', December 2020. Further, as part of our inaugural [Water Breakthrough Challenge](#), a coalition of companies and partners are piloting the use of artificial intelligence that monitors a waste catchment area in real time, to minimise the risk of flooding and sewage pollution. The [Water UK Vision for 2050 Discussion Paper](#) highlights the importance of using big data and machine learning to identify high-risk assets in future.

³⁵ The [2050 UK Water Innovation Strategy](#) refers to the need to use 'open data and compatible digital infrastructure across water companies, supply chains, other innovators and customers' in order to deliver its

- remote inspection/repair, including through the use of drones, robotics, and self-driving fleets.³⁶
- **Wastewater network improvements:**
 - high resolution grid square advanced warning and forecasting of surface water events, and related pollution and wastewater stresses;³⁷ and
 - enhanced monitoring and sampling capability and capacity, including remote monitoring of water bodies.³⁸
- **Fifth industrial revolution:**
 - self-healing networks;³⁹ and
 - developments in bioscience, for example to reduce carbon emissions and treat wastewater more efficiently.⁴⁰
- **Nature-based solutions:**
 - state of the art nature-based solutions toolkit, enabled by monitoring and/or blockchain platforms.⁴¹
- **Emissions-reducing technologies:**
 - increasing availability, higher quality and lower cost of low-carbon construction materials;⁴² and
 - carbon-free baseload electricity and low-emission HGVs and fleet.⁴³
- **Societal attitudes:**
 - varying speed of economy-wide openness to behaviour change.⁴⁴
- **Resilience:**

ambitions. Our discussion paper, '[H2Open – Open data in the water industry: a case for change](#)', sets out our expectations that companies make measurable progress in delivering open data over the next 12 months, to keep pace with the wider digital economy.

³⁶ A contemporary example is the use of real-time virtual or [augmented reality](#) by some companies to view existing or planned assets. The [2050 UK Water Innovation Strategy](#) sets out the industry's aim to develop options for the use of robotics to monitor asset health and performance.

³⁷ For example, the Flood Forecasting Centre (FFC), a collaboration between the Environment Agency and Met Office, delivers flood risk and other weather hazard forecasts up to 5 days ahead of the event. It uses high-resolution numerical weather prediction to generate these forecasts. See the [Flood Forecasting Centre website](#), or Price et al., '[Operational use of a grid-based model for flood forecasting](#)', February 2012.

³⁸ For example, Water UK has called for a 'next-generation national monitoring system...that sees all rivers subject to timely, accurate, multi-source data on ecology, chemistry, public health and aesthetics'. Water UK, '[21st Century Rivers: Ten Actions for Change](#)', September 2021, p. 20.

³⁹ Water companies [such as Yorkshire Water](#) have started to explore the potential for self-repairing materials.

⁴⁰ The UK Government's bioeconomy strategy sets out the importance of developing bioscience to meet key challenges relevant to the water sector. BEIS, '[Growing the bioeconomy: a national bioeconomy strategy to 2030](#)', December 2018.

⁴¹ The industry is continuing to develop innovations in building, monitoring and operating nature-based solutions. For example, the [Financing UK Nature Recovery initiative](#) is working with the UK government to develop a roadmap for scaling up environmental markets, including to develop approaches to monitoring and data.

⁴² For example, green concrete products such as [geopolymer concrete](#), [ECOPact concrete](#) and [graphene-reinforced concrete](#) have been developed and/or brought to market in recent years. The [Net-Zero Steel Initiative](#) aims to bring zero-carbon primary steel production technologies to market by 2030 as part of a path to reach net zero emissions in the global steel sector by 2050. The [SteelZero](#) initiative sees organisations commit to procuring, specifying or stocking 100% net zero steel by 2050.

⁴³ The electricity system in Britain has decarbonised by 66% between 2013 and 2020 and National Grid aims to deliver a carbon free system by 2025 (as cited in the [GOScience Trend Deck](#)). The UK Government's [Net Zero Strategy](#) commits to full decarbonisation of the power system by 2035, so we use this date in both the high and low common reference scenario. Sales of new petrol and diesel cars [are due to end in the UK by 2030](#).

⁴⁴ For example, the Climate Change Committee has identified, in a publication alongside its Sixth Carbon Budget Advice, several sources of 'friction' that can slow societal adaptation to new ways of living and working. Climate Change Committee, '[Net Zero after Covid: Behavioural Principles for Building Back Better](#)', December 2020.

- possible need for low-tech fall backs as reliance on digital solutions increases: ensuring resilience to electricity/digital outages.⁴⁵
- **Demand impacts:**
 - possible increases in demand from new technologies, such as carbon capture and storage, and blue/green hydrogen production.⁴⁶

The common technology scenarios, set out below, represent plausible high and low assumptions around how technological development may impact the sector over the next 30 years; they are not intended to be targets for the sector. They have been developed with reference to government publications and observable trends in technological development in the industry, including those identified by companies and stakeholders through our engagement with the sector and beyond. Some examples of these developments are set out in footnotes to the above list of technologies.

Each scenario assumes that technologies are fully operationalised across the company by the date indicated. We expect companies to demonstrate that long-term strategies are appropriate in a future where these key technologies advance more quickly than expected, as well as one where developments are slower than expected, given current trends.

High technology scenario

- 1) Smart water supply network by **2035**:
 - automatic detection of potential leaks; and
 - robust real-time asset condition information – including telemetry, robotic and drone inspection – enabling a risk-based maintenance approach across the business.
- 2) 100% smart meter penetration by **2050**.
- 3) New wastewater approach by **2040**:
 - satellite monitoring and advance forecasting of localised surface water rainfall and related pollution/wastewater stresses, enabling rapid response and/or prior action; and
 - automatic monitoring and enhanced sampling of environmental water quality.
- 4) Low-emission HGVs and fleet by **2030** and carbon-free baseload electricity by **2035**.
- 5) Full open access to datasets across water companies and other utilities, through common data sharing protocols by **2035**.
- 6) The whole-life financial cost of low-carbon construction materials equals that of conventional building materials by **2040**.
- 7) Increasing reliance on technology produces progressively higher risks of failure and threats from cybercrime, creating growing need for non-digital backups **throughout the period to 2050**.

⁴⁵ The [National Risk Register](#) cites the increasing risk and potential consequences of cyber attacks on infrastructure, including possible disruption to essential services such as energy and telecommunications, stating that the country's vulnerabilities to cyber attacks 'become greater as we increasingly rely on cyberspace'.

⁴⁶ [The UK Hydrogen Strategy](#) sets out an ambition to deliver 1GW of production capacity by 2025 and 5GW by 2030. The government has also stated that 20-35% of the UK's energy consumption by 2050 could be hydrogen-based.

Low technology scenario

- 1) Smart water supply network by **2040**:
 - automatic detection of potential leaks; and
 - robust real-time asset condition information – including telemetry, robotic and drone inspection – enabling a risk-based maintenance approach across the business.
- 2) New wastewater approach by **2045**:
 - satellite monitoring and advance forecasting of localised surface water rainfall and related pollution/wastewater stresses, enabling rapid response and/or prior action; and
 - automatic monitoring and enhanced sampling of environmental water quality.
- 3) Low-emission HGVs and fleet by **2040** and carbon-free baseload electricity by **2035**.
- 4) Progress on open data across the sector is limited **throughout the period to 2050**, with only a handful of water companies opening up large numbers of their datasets, beyond those required for regulatory purposes.
- 5) The whole-life financial cost of low-carbon construction materials continues to fall, but conventional building materials remain cheaper **throughout the period to 2050**.
- 6) Cyber and digital protection stays ahead of cybercrime and digital networks remain resilient **throughout the period to 2050**.

3.2.3 Demand

In the common reference scenarios for demand, we include the main drivers of uncertainty around demand that we consider are beyond company control. Therefore, for example, we do not include future changes in consumer behaviour, as companies have the ability to influence reductions in household demand and improved consumer flushing practices.

We include high and low scenarios for **growth** that are aligned to assumptions already used by companies in the latest round of WRMPs.

In the low scenario, we also include the potential for future changes to **building regulations and product standards** to reduce household demand for water. The possible impact of these changes across England and Wales has been explored in a 2019 study by Artesia and Water UK, which found that a mandatory government-led scheme to label water-using products, linked to tightening building regulations and water supply fittings regulations, was 'the single most cost-effective intervention to save water'.⁴⁷ While the study did not consider

⁴⁷ Artesia and Water UK, '[Pathways to long-term PCC reduction](#)', August 2019.

impacts at a company-specific level, we expect companies to refer to the study when estimating the impact of the scenario.

We acknowledge the possibility of future legislative changes that may serve to materially reduce demand in the wastewater network. However, to date there has not been an industry-wide study into this scenario or its impacts, so we do not consider it is appropriate to set common scenarios in this area. Companies may consider using wider scenario planning to account for this possibility.

As with the other common reference scenarios, we expect these scenarios to be tested across the entirety of the long-term delivery strategy, including water and wastewater activities.

High demand scenario

Growth: in England, use population, property and occupancy forecasts derived from **local plans published by the local council or unitary authority**, as used in the latest round of WRMPs, in line with the water resources planning guideline.⁴⁸

In Wales, use population, property and occupancy forecasts derived from the latest **local authority population and property projections published by the Welsh Government**, as used in the latest round of WRMPs, in line with the water resources planning guideline.

Building regulations and product standards: assume no change over the period to 2050.⁴⁹

Low demand scenario

Growth: in England, use population, property and occupancy forecasts derived from **ONS population and household projections**, as used in the latest round of WRMPs, in line with the water resources planning guideline.

In Wales, use population, property and occupancy forecasts derived from the **national population projection for Wales produced by ONS**, as used in the latest round of WRMPs, in line with the water resources planning guideline.

Building regulations and product standards: assume the introduction in 2025 of a mandatory government-led scheme to label water-using products, linked to tightening

⁴⁸ Environment Agency, Natural Resources Wales, Ofwat, '[Water resources planning guideline](#)', July 2021.

⁴⁹ In [England](#), current regulations require that per capita consumption for newly constructed homes must not exceed 125 l/h/d, except where planning permission specifies a requirement of 110 l/h/d. In [Wales](#), regulations require that per capita consumption must not exceed 110 l/h/d, except where homes are formed by conversion of an existing building, in which case the requirement is 125 l/h/d.

building regulations and water supply fittings regulations. Companies should refer to the 'Water labelling only (with minimum standards)' scenario used in the Water UK study, 'Pathways to long-term PCC reduction', in presenting the estimated impact on their long-term delivery strategy.⁵⁰

3.2.4 Environmental ambition

For the latest round of WRMPs, companies are developing a long-term environmental destination. This describes how sustainable abstraction will be achieved to 2050 and beyond, taking into account climate change impacts and future demand. In England, the environmental destination is being developed through regional water resource planning.

The rate at which companies will need to reduce abstraction in future in order to protect the environment is uncertain. It is dependent on how climate change and demand affect the environment, as well as the policy changes that regulators enforce to protect water bodies, designated sites and downstream abstractors. How these factors develop is likely to materially affect water company costs and activities in the future. As part of their WRMPs, all companies are required to consider scenarios to show the impact of different levels of long-term environmental ambition, including tighter levels of protection for the environment to achieve and maintain sustainable abstraction.⁵¹

In England, the Environment Agency has set out a range of scenarios according to different levels of potential abstraction recovery required in the future.⁵² These include a 'business as usual' scenario, which assumes that the current policy and regulatory approach remains the same up to 2050, and the same percentages of natural flows are protected as today. An 'enhanced' scenario assumes that current policies become insufficient to protect ecologically sensitive sites. Therefore, greater environmental protection is provided by applying the most sensitive flow constraints to offset the impact of climate change. We consider these scenarios are appropriate for setting as 'high' and 'low' common reference scenarios in England.

⁵⁰ Water UK, '[Pathways to long-term PCC reduction](#)', August 2019, pp. 3, 15, 54–55. The intervention is described as follows: 'water labelling of relevant products is legislated as mandatory and managed by government. The scheme would be operated in association with Building Regulations and minimum standards (i.e. based on changes to The Water Supply (Water Fittings) Regulations 1999). This would mean that only products performing at a baseline level will be allowed on the market and referenced in the Building Regulations. This would require not only the development of the labelling policy but also the development and agreement on the baseline standard and the amendment of the relevant Building Regulations. It is assumed that there would be 3 minimum standard intervention years over an 11-year period with the first minimum standard coming into force in year 5, then year 8 and finally year 11'.

⁵¹ Environment Agency, Natural Resources Wales, Ofwat, '[Water resources planning guideline](#)', July 2021.

⁵² Environment Agency, '[Water resources national framework, Appendix 4: Longer term environmental water needs](#)', March 2020, pp. 4–5.

The scenarios are set as a starting point for discussions with stakeholders and regulators. Regional groups and companies are expected to refine this information, including engaging on local priorities and undertaking further local and regional analysis.⁵³

In Wales, there are currently no published scenarios around environmental destination. However, Welsh companies are expected to consider scenarios in their WRMPs to show the impact of tighter levels of protection for the environment to achieve and maintain sustainable abstraction. We expect Welsh companies to develop plausible common environmental destination scenarios to help test their long-term delivery strategies.

These scenarios should include a low scenario, which assumes no changes to the current policy and regulatory approach to 2050, and a high scenario, which assumes a greater level of environmental protection in future.

High environmental ambition scenario

In England, use the Environment Agency's 'enhanced' scenario. This assumes greater environmental protection in future for Protected Areas and Sites of Special Scientific Interest (SSSI) rivers and wetlands, principal salmon and chalk rivers.⁵⁴

In Wales, we expect companies and regulators to work together to develop a common high scenario, which assumes Natural Resources Wales tightens measures in the future to reduce abstraction to support the environment.

Low environmental ambition scenario

In England, use the Environment Agency's 'business as usual' scenario. This assumes the Environment Agency's policy and regulatory approach towards abstraction reduction remains the same to 2050, and the same percentage of natural flows for the environment are protected.

In Wales, assume that Natural Resources Wales' policy and regulatory approach towards abstraction reduction remains the same to 2050.

⁵³ As set out in Environment Agency, ['Long-term water resources environmental destination: Guidance for regional groups and water companies'](#): 'the outputs from the National Framework should be used as a guide to inform your discussions on the long-term destination – consider if you will need additional information or local evidence to better interpret these. This is in the context that they must take account of current statutory and regulatory requirements for abstraction and should plan to deliver environmental improvements to meet future needs'.

⁵⁴ The Environment Agency sets out that the 'enhanced' scenario should be used to 'identify where it may be necessary to provide enhanced protection to buffer from predicted climate change impacts and use additional local information and evidence to refine which sites (water bodies and groundwater dependent terrestrial ecosystems) and catchments where these enhanced targets should apply to'.

3.3 Wider uncertainty testing

The common reference scenarios are intended to help assess how far the proposed activities are appropriate and being delivered at the right times, given future uncertainties, to efficiently meet long-term outcomes. **Outside of testing against the common reference scenarios, we expect companies to use wider scenario planning, as deemed necessary, to:**

- test against any relevant factors not specified in the common reference scenarios, such as company-specific or localised factors;
- demonstrate that long-term delivery strategy is resilient to a range of risks;
- demonstrate that risks have been considered in the development of the long-term delivery strategy; and
- help to validate the long-term delivery strategy, and/or to test whether alternative options and programmes would be more appropriate, including the different adaptive pathways set out in the long-term delivery strategy.

Companies may also consider undertaking sensitivity analysis to test alternative input assumptions and to determine the relative impact of each variable tested.

We expect companies to take ownership of their long-term delivery strategies. Therefore, companies should judge for themselves how far wider uncertainty testing is required to ensure an appropriate level of long-term resilience, as well as the specific methods that need to be used to achieve this.

We note the findings from the third Climate Change Risk Assessment (CCRA) report, which identifies seven key risks facing the water sector as a result of climate change.⁵⁵ Companies may consider these risks as part of their wider uncertainty testing.

⁵⁵ UK Climate Risk Independent Assessment, '[Water briefing](#)', June 2021.

A1 Calculation of long-term bill impacts

We expect companies to follow a simple and transparent approach to forecasting future bill impacts from long-term delivery strategies. Bill impacts should be based on the change in bills from enhancement expenditure. Bill calculations should be submitted with long-term delivery strategies.

- Enhancement expenditure should be split into capital and operating expenditure;
- Capital enhancement expenditure should be added to a new enhancement RCV;
- The return on the new enhancement RCV should be based on the PR19 allowed return on capital or any subsequent updates provided by Ofwat for PR24;
- The new enhancement RCV should be run-off based on the asset life of the enhancement expenditure;
- Where a company expects to pay notional corporation tax an allowance should be included for corporation tax funding. This can be approximated as follows:

$$\text{Corporation tax funding} = \text{Return on new enhancement RCV} \times \left(\frac{\% \text{ return on equity} \times (1 - \text{notional gearing})}{\% \text{ allowed return}} \right) \times \left(\frac{1}{(1 - \text{statutory tax rate})} - 1 \right)$$

- Total wholesale long-term revenue requirement should be based on operating enhancement expenditure plus return on new enhancement RCV plus new enhancement RCV run-off, plus corporation tax funding;
- Total long-term revenue requirement should be wholesale long term revenue requirement multiplied by 1.01 to account for retail margin;
- Total long-term revenue requirement should be split into revenue recovered from household and non-household customers; and
- The bill impact per year should be total long-term revenue requirement recovered from household customers divided by the number of household customers.

A2 Long-term delivery strategy tables

We expect companies to submit the following data tables alongside their long-term delivery strategy. These will be fully incorporated within business plan tables, but are provided here to provide an early indication of our expectations. We will be refining the list of common performance commitments and enhancement lines as we develop the PR24 methodology. We will be shortly issuing a document consulting on our approach to performance commitments for PR24. We will refine PR24 water and wastewater enhancement lines as we develop our approach to PR24, and expect to consult further with companies on these during the development of the PR24 methodology, but would appreciate any early views on potential amendments as part of the response to this discussion paper.

Table A2.1 Proposed long-term delivery strategy tables

Table number	Table description
LS1	Forecasts of performance outcomes and outputs – core pathway
LS2	Forecasts of performance outcomes and outputs from base expenditure – core pathway
LS3	Core pathway wholesale water enhancement expenditure requirements
LS3a	Alternative pathway 1 wholesale water enhancement expenditure requirements
LS3b	Alternative pathway 2 wholesale water enhancement expenditure requirements
LS3c	Alternative pathway 3 wholesale water enhancement expenditure requirements
LS3d	Alternative pathway 4 wholesale water enhancement expenditure requirements
LS3e	Alternative pathway 5 wholesale water enhancement expenditure requirements
LS3f	Alternative pathway 6 wholesale water enhancement expenditure requirements
LS3g	Alternative pathway 7 wholesale water enhancement expenditure requirements
LS3h	Alternative pathway 8 wholesale water enhancement expenditure requirements
LS3i	Alternative pathway 9 wholesale water enhancement expenditure requirements
LS4	Core pathway wholesale wastewater enhancement expenditure requirements
LS4a	Alternative pathway 1 wholesale wastewater enhancement expenditure requirements
LS4b	Alternative pathway 2 wholesale wastewater enhancement expenditure requirements
LS4c	Alternative pathway 3 wholesale wastewater enhancement expenditure requirements
LS4d	Alternative pathway 4 wholesale wastewater enhancement expenditure requirements
LS4e	Alternative pathway 5 wholesale wastewater enhancement expenditure requirements
LS4f	Alternative pathway 6 wholesale wastewater enhancement expenditure requirements
LS4g	Alternative pathway 7 wholesale wastewater enhancement expenditure requirements
LS4h	Alternative pathway 8 wholesale wastewater enhancement expenditure requirements
LS4i	Alternative pathway 9 wholesale wastewater enhancement expenditure requirements
LS5	Wholesale water enhancement expenditure under common reference scenarios
LS6	Wholesale wastewater enhancement expenditure under common reference scenarios
LS7	Long-term delivery strategy bill impact

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is a non-ministerial government department.
We regulate the water sector in England and Wales.**

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