

A large circular diagram with a white center and a teal outer ring. The ring contains various white line-art icons: a person with a headset, a cloud with circuit lines, a "net zero" icon with a leaf, a water drop with a checkmark, a target, a person at a computer, a hand holding a water drop, a person with an upward arrow, a leaf, a person, a water drop with a checkmark, and a glass of water. The central text is in a bold, dark blue font.

APPENDIX
SES001
LTDS
Development
Process

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SES001 - LTDS DEVELOPMENT PROCESS

A. Introduction

This appendix expands on our LTDS development process and sets out what the Copperleaf Value Framework is and how we have utilised this, alongside the Copperleaf Optimisation Tool, to inform the development of our LTDS.

Much of this material is summarised in Chapter 3 of our LTDS, with further detail provided in this appendix to assist with understanding the benefits of utilising the Copperleaf Value Framework and Optimisation Tool.

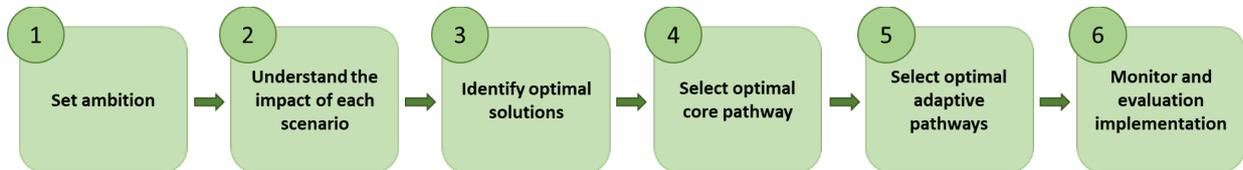
In order to explain our process in detail, and how it has been informed by the Copperleaf toolkit, the appendix will be structured as follows:

- Our LTDS development process
- The Copperleaf Value Framework
- The Copperleaf Optimisation Tool/Decision Analytics.

Our LTDS development process

1. The Figure below summarises the 6-step process we have used to develop our LTDS.

Figure 1: Our summarised LTDS development process



Source: SES Water analysis

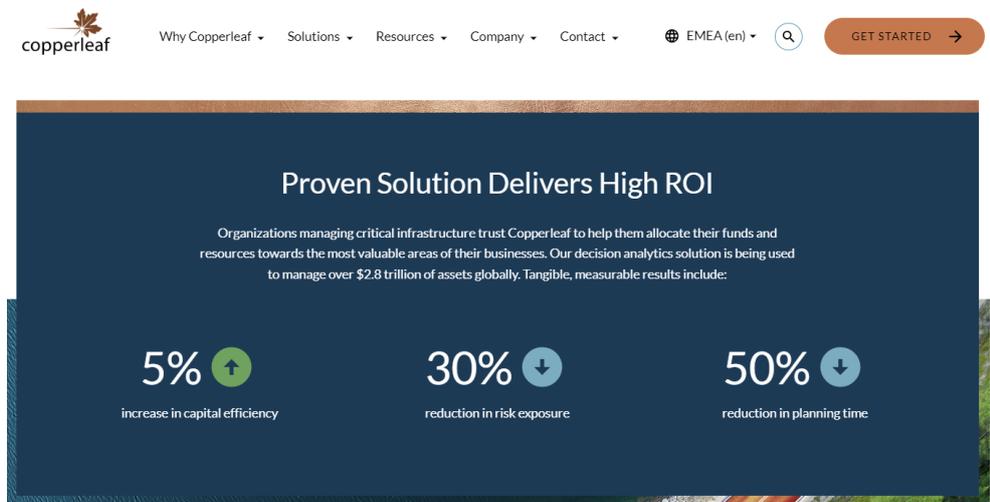
2. We expand on this process in Section B of this Appendix, outlining the different steps and sub-components of the process, and how it covers the Ofwat common reference scenarios, and bespoke scenarios.
3. Our development of the LTDS was aided by the use of relevant tools and software, most notably the Copperleaf toolkit. We set out immediately below some salient background information on the Copperleaf toolkit and provide further detail on the Copperleaf Value Framework and Optimisation Tool, and how they are utilised in the development of our process in Sections D and E of this Appendix.



B. The Copperleaf toolkit – salient background information

4. Copperleaf is a Canadian-based decision analytics business that provides a bespoke framework (the “Copperleaf Value Framework”) and optimisation software (the “Copperleaf Optimisation Tool/Decision Analytics”) for business to “*assess the tangible and intangible benefits of all investment options on equal footing—so that you can objectively compare dissimilar investments*”.¹
5. The result is an optimised solution that enables us to “*decide where and when to invest in [our] business to maximise capital efficiency, meet performance targets, manage risk, and achieve [our] ESG and financial goals*”.² Some of the measurable historical benefits of utilising the solution are shown in the figure below:

Figure 2: Copperleaf Solution – ‘Tangible, measurable results’



Source: <https://www.copperleaf.com/> (date accessed: 11/07/2023)

6. We have implemented the Copperleaf solution in determining our LTDS through utilisation of the Copperleaf Value Framework (specifically tailored to the UK water industry) and the Copperleaf Optimisation Tool/Decision Analytics, as described below.

The Copperleaf Value Framework

7. The Copperleaf Value Framework is highly relevant and applicable in determining our LTDS, as the tangible and intangible benefits of the projects and/or investments considered as part of our plans to achieve our ambition are not always comparable on a ‘like-for-like’ basis. The Copperleaf Value Framework ascribes a universal “Copperleaf Value Unit” (i.e., a comparable measure of the sum of the different tangible and intangible benefits) to the various projects assessed within the framework, such that projects are comparable on a common economic scale. We have worked hard to ensure these values are appropriately determined for each of our projects subject to assessment. The added functionality of being able to perform ‘what-if?’ analyses, in respect of the various Reference Scenarios (both Common and Bespoke) makes the Copperleaf solution even more relevant.
8. Copperleaf have provided us with a Value Framework specifically tailored to the water utilities market in the UK (the ‘Copperleaf H2O Solution’), that aligns with both ISO 55001

¹ <https://www.copperleaf.com/solutions/> (Date accessed: 31/05/2023). [Note: To check if there is a better quote on the water specific page: <https://www.copperleaf.com/solutions-for-industry/water-wastewater-infrastructure-asset-management/> t]

² Copperleaf Brochure Portfolio, Page 3



and Ofwat’s Outcome Delivery Incentives.³ Indeed, the Copperleaf H2O solution goes beyond these requirements ‘to bring greater effectiveness to the Framework’, as shown in the figure below:

Figure 3: Copperleaf Value Framework - benefits

6-Capital Aligned, Ready-to-go, Value Models

Enabling early benefits realization by implementing Copperleaf’s Common UK Water Value Framework

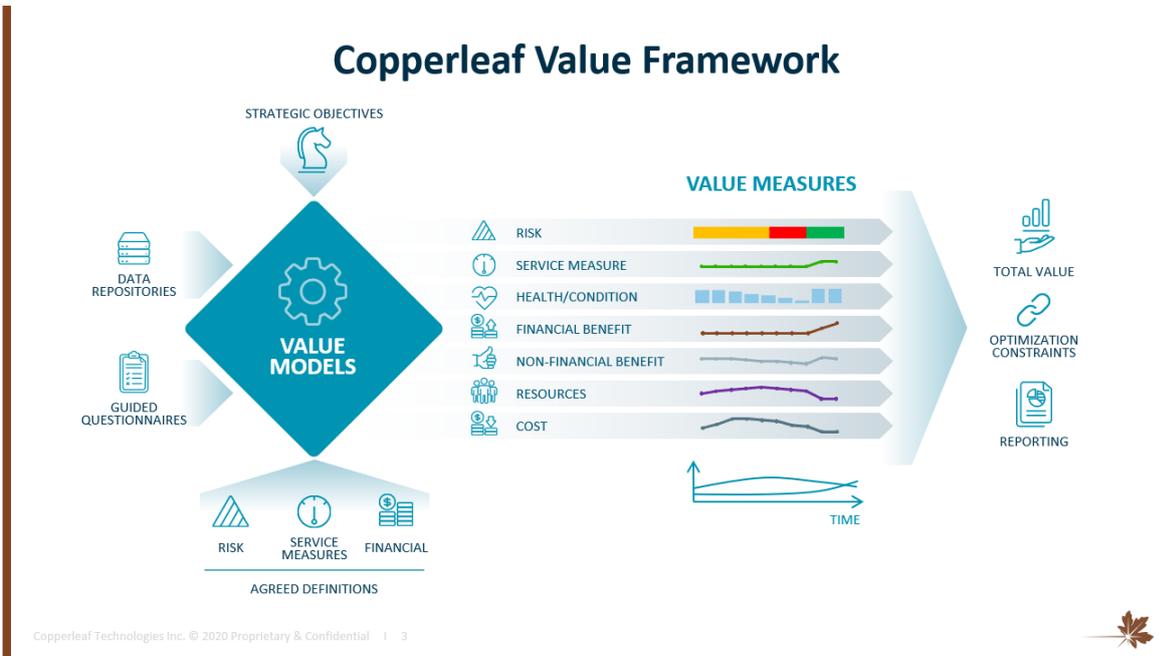
- The Common UK Water Value Framework (WVF) aligns OFWAT’s Common Performance Commitments with the 6 Capitals to create a Common UK Water Value Framework
- Investment measures not captured in OFWAT’s Common PCs were supplemented such as TOTEX to bring greater effectiveness to the Framework

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Source: ‘Copperleaf Overview of Common UK Water Value Framework (Revised September 2022)’, Slide 2

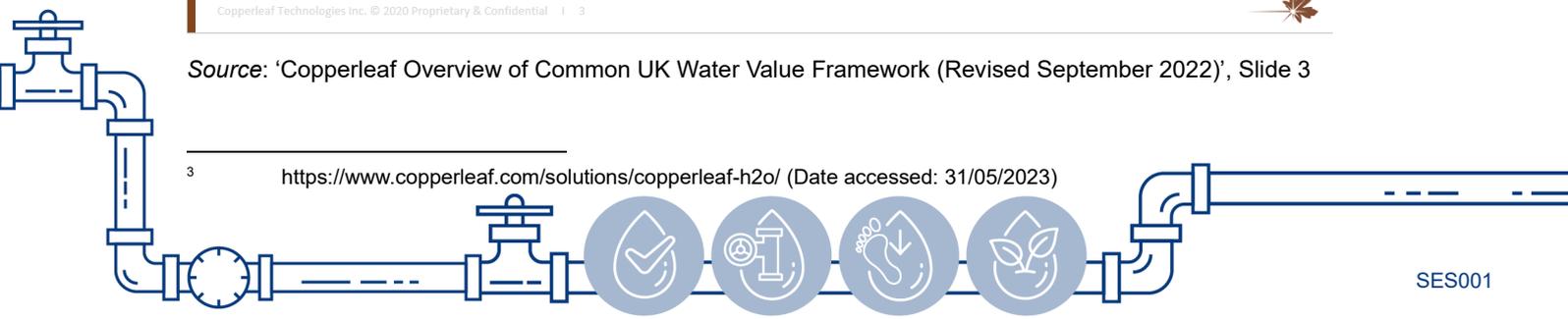
9. The above improvements to framework effectiveness are achieved by combining value models and measures with optimisation constraints (discussed in more detail in the next section) to help in the determination of our LTDS, as summarised in the figure below, which provides an overview of the ‘Copperleaf Value Framework’:

Figure 4: Copperleaf Value Framework - overview



Source: ‘Copperleaf Overview of Common UK Water Value Framework (Revised September 2022)’, Slide 3

³ <https://www.copperleaf.com/solutions/copperleaf-h2o/> (Date accessed: 31/05/2023)



10. The Copperleaf Value Framework, therefore, provides us with a basis on which to objectively compare various projects/investments under each of the determined/prescribed common reference/bespoke scenarios.
11. The standardised economic scale on which projects can now be assessed can then be utilised by the Copperleaf Optimisation Tool/Decision Analytics to determine the optimal combination of projects/investments in various scenarios.

The Copperleaf Optimisation Tool (also referred to as ‘Copperleaf Decision Analytics’)

12. Once projects/investments have been standardised (in respect of measuring their impact) using the Copperleaf Value Framework, the Copperleaf Optimisation Tool selects the best combination of projects/options to be implemented in each scenario (given the constraints provided) to maximise customer and stakeholder value, therefore helping to determine which projects should form part of our core or alternative pathways.

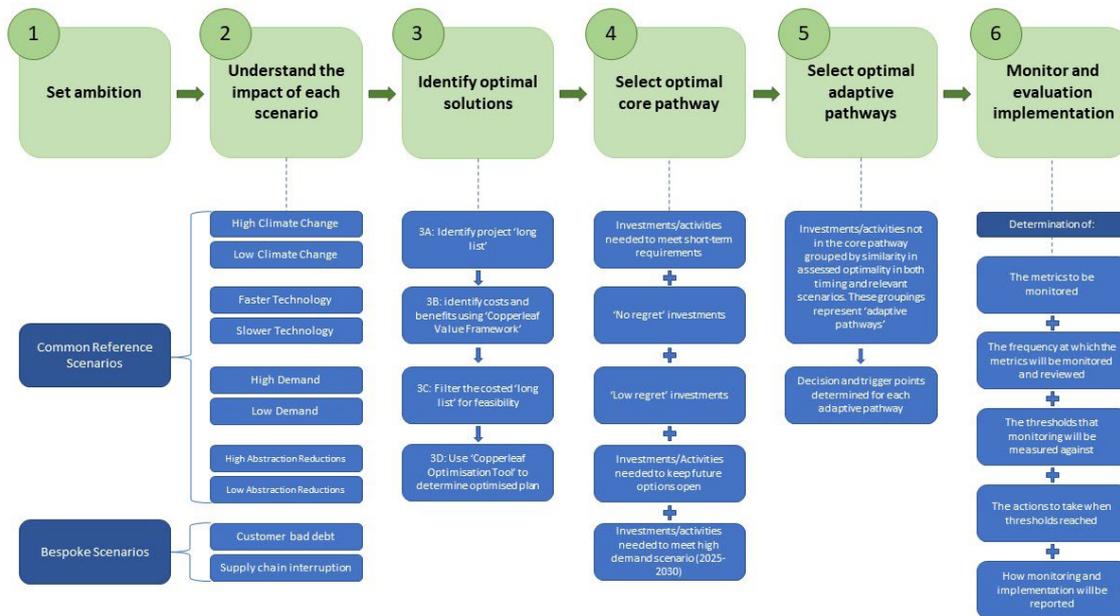


C. Our LTDS development process

Introduction

In this section we explain the process we have followed to develop our LTDS. We have developed a six-stage process that is summarised in the Figure below, followed by further explanation of each stage.

Figure 5: Our LTDS development process



Source: SES Water analysis

Stage 1: Setting our ambition

13. Our ambition is the level of performance we aim to achieve for each outcome by 2050. The level of ambition we have set has been determined by:

- (a) Statutory, regulatory and policy requirements and strategic priorities for the water industry including:
 - (i) The Government’s Strategic Policy Statement to Ofwat;
 - (ii) Strategic plans (WRMP and WINEP); and
 - (iii) Long-term targets set in the Government’s Environmental Improvement Plan to support the Environment Act and its integrated Plan for Water.
- (b) Our current performance and future performance projections:
 - (i) Analysis of current performance against performance commitments identified for PR24 by Ofwat and forecast performance at the end of the current business plan period in March 2025;
 - (ii) Comparative performance against performance commitments across the UK water sector as a whole; and



- (iii) Alternative glidepaths developed for different performance levels and pace of delivery including stretch and innovation options.
 - (c) Customer priorities and expectations of long-term performance:
 - (i) Synthesis of collaborative industry research and company-specific research to identify customer priorities;
 - (ii) Qualitative and quantitative research on investment choices, timings and trade-offs; and
 - (iii) Customer and stakeholder challenge on level of ambition and pace of delivery.
14. We have brought together these three areas and have proposed the long-term performance outcomes we aim to achieve by 2050 for each outcome. This has been discussed in detail with our Board and our customer and environmental scrutiny panels.

Stage 2: Understanding each of the scenarios and their impact on SES Water

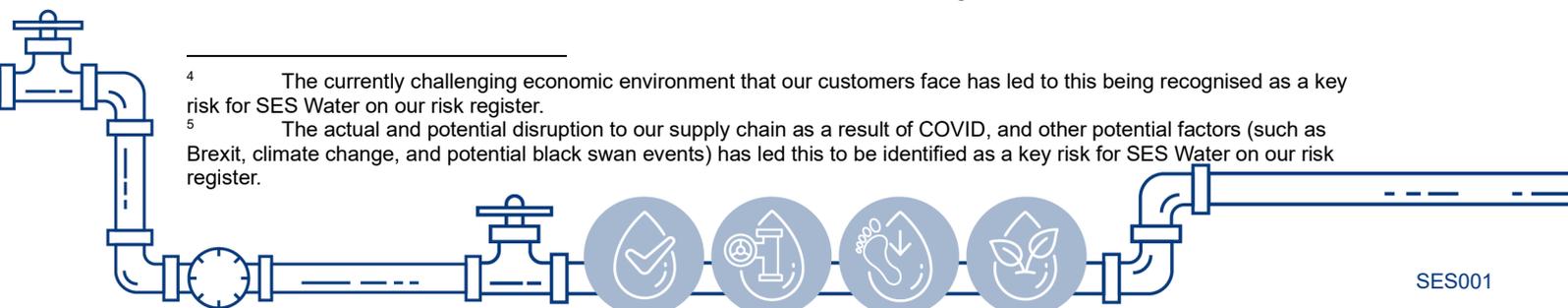
15. Ofwat has prescribed eight common reference scenarios, which we have analysed to understand the impact they could have on our business over the 25-year planning period. The eight common reference scenarios are:
- (a) High climate change scenario;
 - (b) Low climate change scenario;
 - (c) Faster technology scenario;
 - (d) Slower technology scenario;
 - (e) High demand scenario;
 - (f) Low demand scenario;
 - (g) High abstraction reductions scenario; and
 - (h) Low abstraction reductions scenario.
16. We have also identified two further scenarios which we consider to be material to the future strategic considerations the business will need to make. These 'bespoke scenarios' have been considered alongside the common reference scenarios prescribed by Ofwat. They take into account a range of local and company-specific factors. The two bespoke scenarios are:
- (a) Customer bad debt scenario;⁴ and
 - (b) Supply chain interruption scenario.⁵
17. A summary of the different scenarios can be found in Chapter 2 of our LTDS and further detail on the determination of the bespoke scenarios is provided in Appendix SES003 LTDS - Future Scenarios Detailed Report.

Stage 3: Identifying optimal solutions for each scenario

18. Stage 3 involves identifying investment plans that meet our long-term ambitions in each of the LTDS scenarios. We have optimised our plan using a valuation framework to

⁴ The currently challenging economic environment that our customers face has led to this being recognised as a key risk for SES Water on our risk register.

⁵ The actual and potential disruption to our supply chain as a result of COVID, and other potential factors (such as Brexit, climate change, and potential black swan events) has led this to be identified as a key risk for SES Water on our risk register.



enable us to identify the best value plan for our customers and the environment. Our high-level approach can be summarised as:

- **Stage 3A:** Identifying a ‘long list’ of potential projects and activities that may be needed to secure our ambitions in any (or all) of the scenarios, together with the relevant “optioneering” to identify the various possible ways in which each of those projects can be delivered and the various possible options for carrying out those activities.
- **Stage 3B:** Using the Copperleaf Value Framework to identify the various costs and benefits of each of the possible options.
- **Stage 3C:** Filtering this long list to determine the projects and activities that are relevant for each of the LTDS scenarios.
- **Stage 3D:** Using the Copperleaf Optimisation Tool to determine an optimised plan for each of the LTDS scenarios.

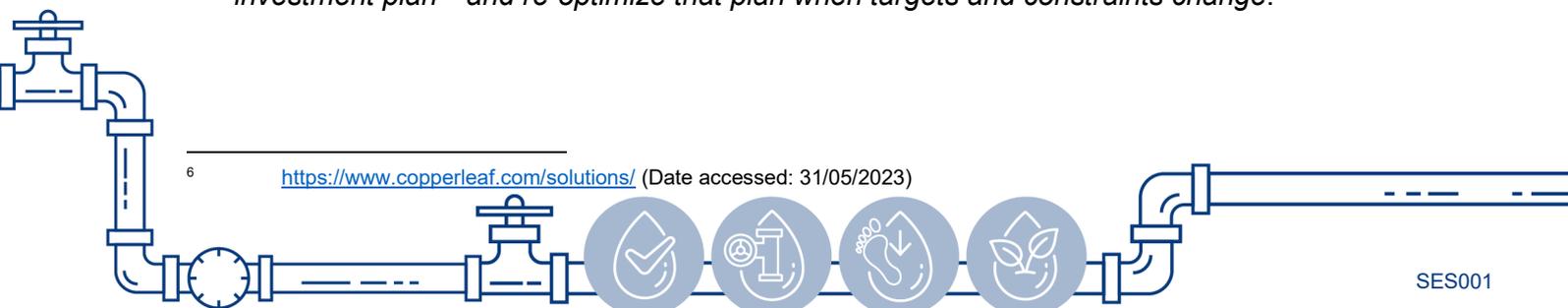
Stage 3A: Identifying a long list of potential projects and activities

19. What needs to be delivered in each scenario is defined by our ambition, our performance commitments and our delivery targets, all in the context of the external and environmental parameters set out in each scenario. To process these requirements using the Copperleaf Value Framework, we have collated the requirements for what needs to be delivered in each scenario as a collection of ‘needs’. In Copperleaf, each ‘need’ corresponds to a specific deliverable, for example a requirement to reduce leakage by a certain amount. Further detail of the Copperleaf Value Framework and the associated Copperleaf Optimisation Tool can be found in Sections D and E below.
20. Following the identification of business ‘needs’, a number of potential investment options were identified that could achieve the ‘need’ or contribute towards achieving the ‘need’. Copperleaf refers to these as ‘options’. In some cases, each ‘option’ may consist of a single project that can meet the need, in other cases an option might consist of a small suite of projects.
21. These options are identified at this stage as representing base expenditure, or enhancement expenditure.

Stage 3B: Using the Copperleaf Value Framework to identify costs and benefits

22. The Copperleaf Value Framework is highly relevant and applicable in determining our LTDS, as the tangible and intangible benefits of the projects and/or investments considered as part of our plans to achieve our ambition are not always comparable on a ‘like-for-like’ basis. The Copperleaf Value Framework ascribes a universal “Copperleaf Value Unit” (i.e., a comparable measure of the sum of the different tangible and intangible benefits) to the various projects assessed within the framework. We have worked hard to ensure these values are appropriately determined for each of our projects subject to assessment.
23. In determining our LTDS in the context of the various plausible scenarios given, the Copperleaf Value Framework allows us to assign comparable values to the various tangible or intangible benefits (or ‘**capitals**’) of each option (described below), and to “*create any number of what-if scenarios to compare the impact of different funding, timing, and resource constraints on risk and value to determine the best overall investment plan—and re-optimize that plan when targets and constraints change.*”⁶

⁶ <https://www.copperleaf.com/solutions/> (Date accessed: 31/05/2023)



24. The solution we have used is tailored specifically for water utilities in the UK and is aligned with both ISO 55001 and Ofwat's Outcome Delivery Incentives.⁷
25. As discussed in Section D of this Appendix, the Copperleaf Value Framework divides projects into six 'capitals', against which a Copperleaf Value Unit can be ascribed using 'industry-proven value models'.⁸ These six capitals are as follows:⁹
- **Natural Capital** (examples include: efficiency benefits, operational carbon, embedded carbon, water leakage, per capita consumption, low pressure);
 - **Social Capital** (examples include: C/D-Mex customer experience, safety risk, unplanned outage, water quality compliance (CRI), risk of severe restrictions in a drought, public perception benefit);
 - **Financial Capital** (examples include: financial, legal and reputational risk, investment cost (capex/opex/total Cost), water quality compliance (CRI), priority service for vulnerable customers);
 - **Manufactured Capital** (examples include: water supply interruptions, mains repair);
 - **Intellectual Capital** (examples include: improved plan execution); and
 - **Human Capital** (examples include: employee experience benefit)
26. The Copperleaf Value Framework provides a consistent basis on which options may be compared, as the results (or 'scores') assigned to each capital above are directly comparable. Further detail on how this process works in practice is provided in Sections D and E below.
27. Once the various options identified have all been processed within the Copperleaf Value Framework, Copperleaf's optimisation solution functionality supports the process of identifying the optimal combination of options that should be pursued in order to maximise customer and stakeholder value under each of the reference scenarios tested, given the constraints presented to the framework. This is described in Stage 3D.

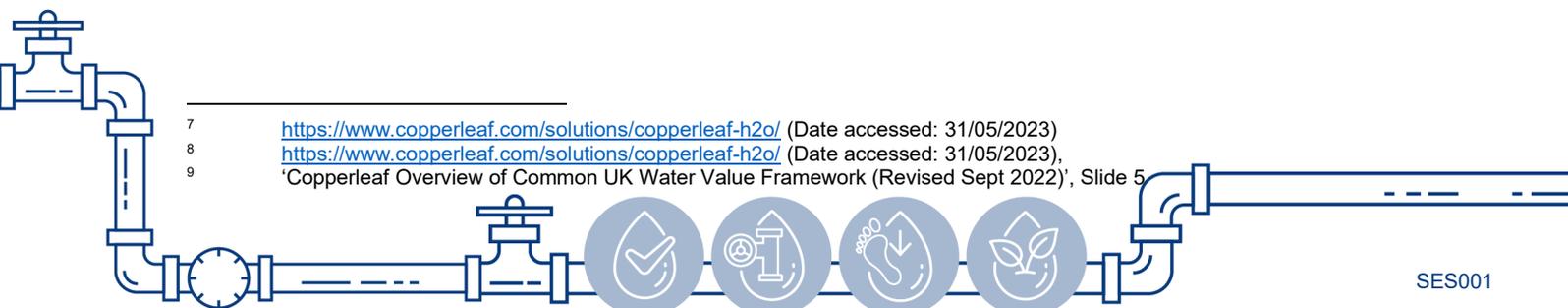
Stage 3C: Filtering this "long-list" to determine the projects and activities that are relevant for each of the LTDS scenarios

28. With the long list of projects and solutions generated (Stage 3A) and costed (Stage 3B), the list was filtered to determine the 'needs' for each of the LTDS scenarios. In other words, specifying what is needed to be delivered in order to meet our ambition in each scenario. For each of these needs, the various options to deliver them were filtered for each scenario to ensure that the solution was available for selection in that scenario. In essence, this was to ensure that each of the options to be fed into the Copperleaf Optimisation Tool was:
- (a) technically feasible in that scenario. For example, to ensure that in the high climate change scenario, there was no option to abstract more water at a given point and time than would be physically available in that scenario, and in the slower technology scenario, to ensure that a high-tech solution option was not included before the technology becomes available, and so forth; and
 - (b) legally compliant in that scenario. For example, to ensure that in the high abstraction reductions scenario, there was no option to abstract water where no abstraction licence would be available in that scenario.

⁷ <https://www.copperleaf.com/solutions/copperleaf-h2o/> (Date accessed: 31/05/2023)

⁸ <https://www.copperleaf.com/solutions/copperleaf-h2o/> (Date accessed: 31/05/2023),

⁹ 'Copperleaf Overview of Common UK Water Value Framework (Revised Sept 2022)', Slide 5



29. The output of this phase was a set of needs or requirements for each scenario, together with sets of possible options for meeting those needs that would be available in each scenario.
30. The projects determined to be available and required following this process are subsequently assessed within the Copperleaf Optimisation Tool. This process is described in detail below.

Stage 3D: Using the Copperleaf Optimisation Tool to determine an optimised plan for each of the LTDS scenarios

31. Given the relevant constraints for each scenario, the Copperleaf Optimisation Tool selects the best combination of options for that scenario. This includes the trading of costs and benefits in respect of each of the six Capitals and adjusting the timing and sequencing of projects (within the constraints) to give a plan that delivers the optimal balance between all the relevant stakeholders.¹⁰ The output of Copperleaf is, therefore, an optimised business plan for each of the LTDS scenarios.

Stage 4: Selecting the optimal core pathway

32. Having followed the Copperleaf framework in Stage 3, we were able to determine which projects represented ‘no regret’ (those projects/investments determined to be optimal projects in all reference scenarios), ‘low regret’ (those projects/investments determined to be optimal projects in the majority of reference scenarios), as well as projects that were only required in a small number of scenarios.
33. We defined our core pathway as comprising:
- Investments and activities that need to be undertaken to meet short-term requirements;¹¹
 - No Regret investments and activities (those selected to be optimal projects in all scenarios);¹²
 - Low Regret investments and activities (those selected to be optimal projects in a wide range of scenarios – in general we selected projects that were relevant in the majority of or more scenarios);¹³
 - Investments and activities required to keep future options open (such as enabling work or learning and monitoring), or required to minimise the cost of future options;¹⁴ and
 - Investments and activities needed to meet the high demand scenario in 2025-2030.¹⁵
34. The outputs of the Copperleaf process included the costs of each option, split between base costs and enhancement costs. This allowed us to generate the cost data for the core pathway.
35. Ofwat’s efficient cost allowances are made up of base and enhancement expenditure. Appendix 9 of the PR24 Final Methodology describes base expenditure as including *“routine, year-on-year costs, which companies incur in the normal running of their businesses; expenditure on maintaining the long-term capability of assets; expenditure to improve efficiency; and expenditure companies require to comply with current legal*

¹⁰ [Stakeholders references all parties impacted, with examples including Customers (customer satisfaction, prices), the business (ROI, available capital) and Government (Regulatory compliance, objectives, etc) among others]

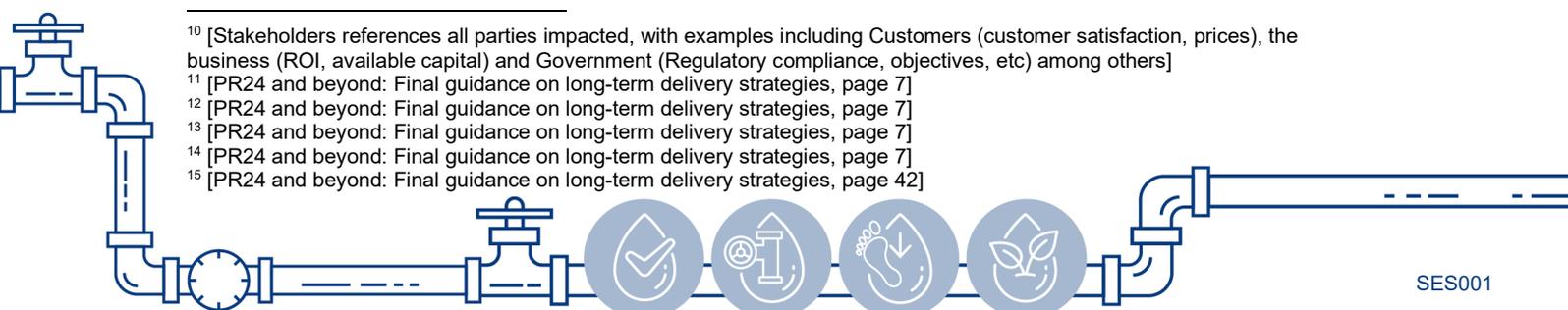
¹¹ [PR24 and beyond: Final guidance on long-term delivery strategies, page 7]

¹² [PR24 and beyond: Final guidance on long-term delivery strategies, page 7]

¹³ [PR24 and beyond: Final guidance on long-term delivery strategies, page 7]

¹⁴ [PR24 and beyond: Final guidance on long-term delivery strategies, page 7]

¹⁵ [PR24 and beyond: Final guidance on long-term delivery strategies, page 42]



obligations".¹⁶ Enhancement expenditure is described as "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 level".¹⁷ We have taken this guidance into account in preparing both our PR24 Business Plan and LTDS.

36. For the purposes of our PR24 Business Plan, we have benchmarked our ongoing base costs using Ofwat's industry datasets and have submitted a series of well-justified enhancement claims that include capex and incremental opex to support our forecast step change in performance levels in AMP8. Importantly, it is the combination of our forecast enhancement and efficient, benchmarked) base expenditure that is needed to enable the delivery of our proposed performance commitments and to support our ongoing operations to maintain this level of performance in AMP8.
37. Similarly, for the purposes of preparing our LTDS, which requires us to forecast and report only our enhancement expenditure including and beyond AMP8, we have adopted the following principles and approach:
- (a) We first assume that the investment we need to undertake beyond AMP8 to support the resilience of our business and future step changes in performance – that is, over and above the performance improvements we expect to achieve from our forecast ongoing base costs – is reported as enhancement expenditure. This includes the incremental opex that we expect to incur within the AMP to support the performance step change.
 - (b) We have then assumed that the ongoing expenditure that is required to maintain this new base level of performance – and the long-term capability of our invested asset base – in subsequent AMPs will become part of our base cost; that is, the reported enhancement expenditure in our LTDS tables excludes the incremental expenditure in subsequent AMPs to when the enhancement was made, as we have assumed this will be funded as base expenditure.
38. We note this forecast split of base and enhancement expenditure is, therefore, premised on Ofwat's base cost modelling adequately reflecting, over time, the ongoing costs SES Water and other companies incur as we invest in the capability of our assets and future step changes in performance levels. The process we have gone through to prepare our LTDS has highlighted the importance of Ofwat's future base cost assessments capturing the ongoing impacts of enhancements and our LTDS assumes that adequate ongoing base cost allowances will be provided at future AMPs to support our plans.

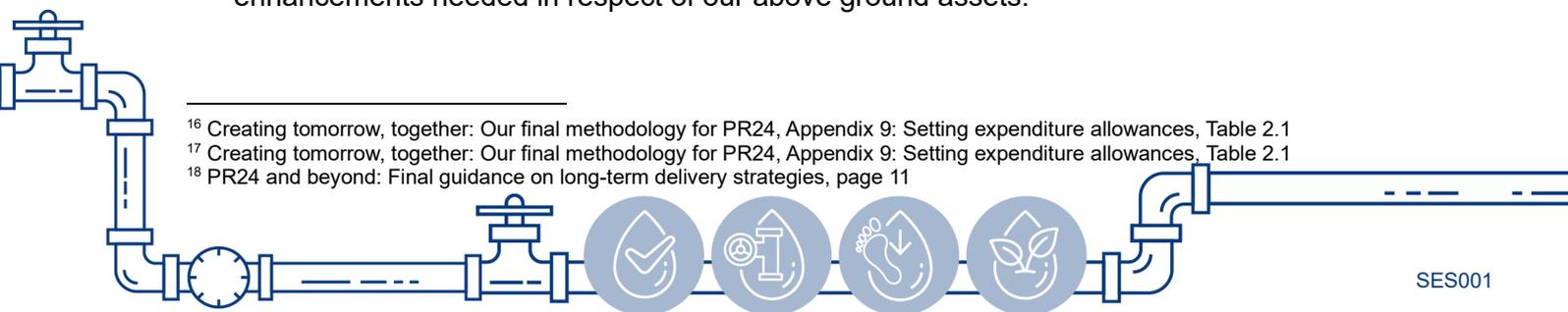
Stage 5: Identifying the relevant adaptive pathways

39. Once the core pathway was defined, we compared the projects required in each of the individual scenarios (that by definition, would only be undertaken in a limited range of circumstances)¹⁸ with the core pathway to derive the alternative adaptive pathways. We identified the relevant decision points, indicating when a decision needs to be taken to deliver the company's ambition, and trigger points (the point at which an alternative pathway needs to be followed). Decision points and trigger points were determined on a case-by-case basis for the various pathways.
40. To the extent that the same or broadly similar projects outside the core pathway were required at a broadly similar times in more than one of the LTDS scenarios, we brought those into the same alternative adaptive pathway. For example, in terms of enhancements needed in respect of our above ground assets:

¹⁶ Creating tomorrow, together: Our final methodology for PR24, Appendix 9: Setting expenditure allowances, Table 2.1

¹⁷ Creating tomorrow, together: Our final methodology for PR24, Appendix 9: Setting expenditure allowances, Table 2.1

¹⁸ PR24 and beyond: Final guidance on long-term delivery strategies, page 11



- (a) Our enhancement investment ‘resilient supply’ was not selected in the core pathway because it was only included by the Copperleaf Optimisation Tool in 4 of the 8 scenarios. However, because it was selected in the high demand and high abstraction reduction scenarios, we have included it in our high resilience alternative pathway.
- (b) Our enhancement investment ‘generator connection points’ was not picked by the Copperleaf Optimisation Tool in the core pathway (which, would only require what is effectively maintaining our current generator programme).¹⁹ However, in the high climate change, high demand and high abstraction reduction scenarios, an enhanced option targeting critical assets was selected to secure greater resilience, as shown in the table below.

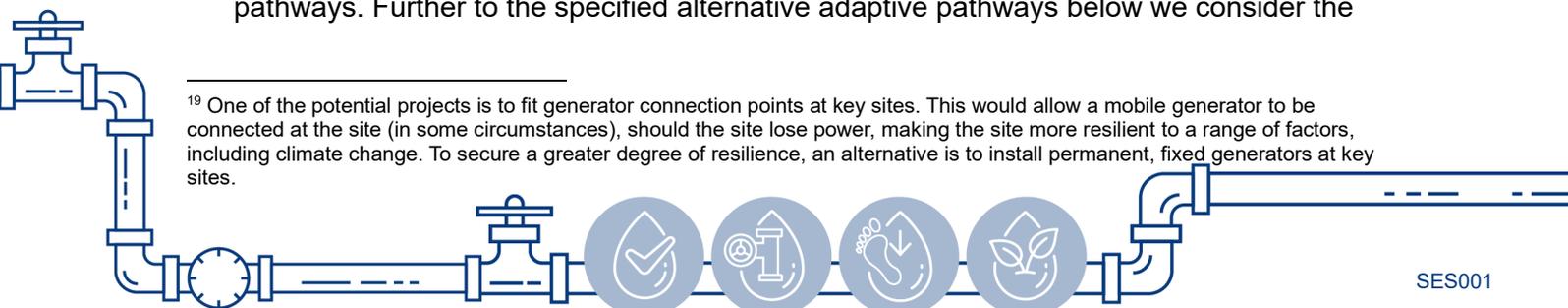
Table 1: Example optimal project selection by scenario – Generator connection points vs Fixed generators

Scenario	Generator connection points vs Fixed generators	Timeframe
High climate	Install fixed generators at critical sites	AMP9
Low climate	Fit generator connection points at all borehole and pumping sites	AMP8
Faster tech	Fit generator connection points at all borehole and pumping sites	AMP8
Slower tech	Fit generator connection points at all borehole and pumping sites	AMP8
High demand	Install fixed generators at critical sites	AMP9
Low demand	Fit generator connection points at all borehole and pumping sites	AMP8
High abstraction	Install fixed generators at critical sites	AMP9
Low abstraction	Fit generator connection points at all borehole and pumping sites	AMP8
Bad debt	Fit generator connection points at all borehole and pumping sites	AMP8
Supply chain resilience	Fit generator connection points at all borehole and pumping sites	AMP8

Source: SES Water – Copperleaf modelling outputs

- 41. It can be seen from the table that the action needed in the more adverse scenarios was similar, in that we will need to install permanent, fixed generators at critical sites in AMP9, so this aspect of all three of these adverse scenarios can be reflected in a single adaptive pathway. (In this case, our high resilience alternative pathway).
- 42. Completing this mapping exercise for all of the activities not in our core pathway resulted in two alternative groupings of projects, which represent our alternative adaptive pathways. Further to the specified alternative adaptive pathways below we consider the

¹⁹ One of the potential projects is to fit generator connection points at key sites. This would allow a mobile generator to be connected at the site (in some circumstances), should the site lose power, making the site more resilient to a range of factors, including climate change. To secure a greater degree of resilience, an alternative is to install permanent, fixed generators at key sites.



WRMP plan to define an alternative adaptive pathway for which we have set out a plan alongside our alternative adaptive pathways. These are referred to as follows:

- (a) WRMP alternative adaptive pathway; and
- (b) High resilience alternative adaptive pathway.

43. For each pathway, we have determined the decision and trigger points, as defined in Ofwat's LTDS guidance. Briefly, those are as follows:

Alternative adaptive Pathway 1: WRMP alternative pathway

- The trigger for this pathway would be that we need to meet the 'enhanced' abstraction reduction scenario. The decision point will be in 2034 when we have confirmation from the Environment Agency about licences changes and update our WRMP.
- Our current projections show that the investment required would be triggered in AMP11.

Alternative adaptive Pathway 2: High resilience alternative pathway

- The primary trigger for us to move to the alternative pathway would be an increase in the rate of climate change. We anticipate that if we experience climate change in South East England resulting in a 1.3°C increase in average temperatures above pre-industrial levels, we would need to consider making the additional investment set out in this alternative pathway.
- We anticipate that by 2034, ahead of the AMP10 price review, we would understand whether we expect to reach the trigger point in 2036, which would be our decision point to move to the alternative pathway which would then be triggered in 2035.

44. Further detail on the decision points and trigger points for the alternative adaptive pathways can be found in LTDS Chapter 5.

Likelihood of the alternative adaptive pathways

45. We note that the LTDS guidance requests that "*companies should provide an estimate of the relative likelihood of following each alternative pathway*".²⁰ Predicting the future, and/or the likelihood of different possible futures is never an exact science. We have, however, considered the relative likelihood, as requested.

46. Our approach to assessing the relative likelihood is to make a judgement based on considering historic trends, the forecast impact of relatively certain future events, and the likelihood of the adverse and benign common reference scenarios. In particular, we believe:

- (a) It is more likely that climate change will continue and that the rate of change will increase over the period of the LTDS than it is that climate change will slow down over the period of the LTDS.
- (b) It is more likely that SES Water will continue to be an industry leader in terms of innovation and the adoption of smart technology than it is that SES Water will fall back to somewhere around the average industry position.
- (c) It is more likely that demand will fall somewhere in between the high and low demand scenarios than that the demand will be at either extreme, however, within that range it is more likely that demand will be above the mid-point than below the mid-point.

47. On this basis we assess the relative likelihood of the adaptive pathways as follows:

²⁰ [LTDS guidance, section 3.3.3, page 23]

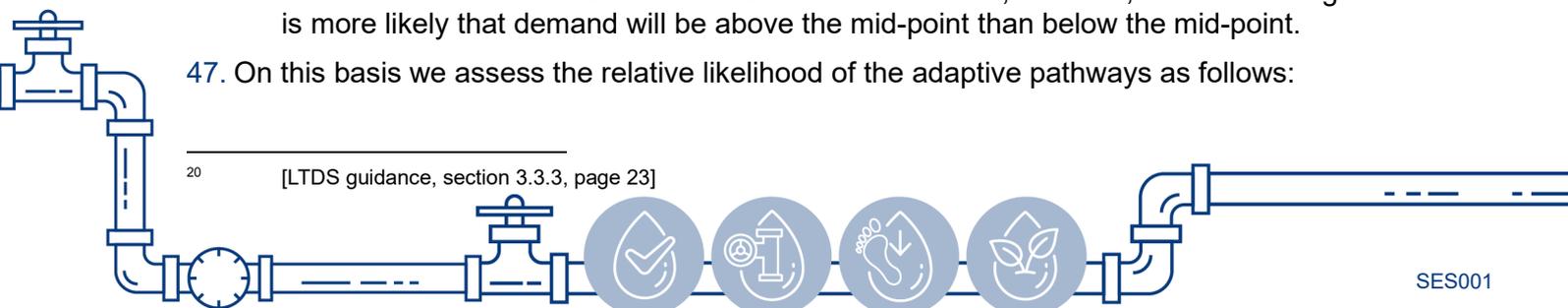
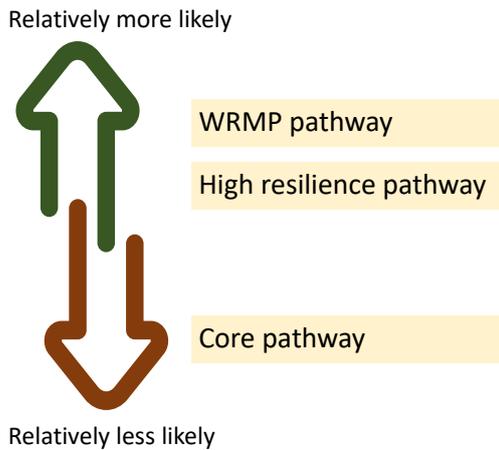


Figure 6: Relative likelihood of the alternative adaptive pathways



Source: SES Water

48. A more detailed discussion of the specific likelihood of the alternative adaptive pathways being triggered is included in LTDS Chapter 5.

Stage 6: Monitor and evaluate the implementation of the pathways

- 49. To determine our progress along the core pathway, and any requirement that may exist to switch to one of our adaptive pathways, we have put in place monitoring procedures, as described below.
- 50. Effective monitoring of adaptive pathways is a key principle of an adaptive approach. As part of our LTDS planning process, we have considered the following:
 - (a) how performance and delivery against the core pathway and alternative adaptive pathways can be monitored and measured objectively, to ensure that action can be taken to mitigate any potential issues that might slow progress towards achieving our ambition. (In essence, this would be to ensure we stay on course during delivery.); and
 - (b) how the wider environment can be monitored and measured objectively, to ensure that we can move to any of the adaptive pathways, should things evolve accordingly. (In essence, this would be to ensure we can change course, where it is appropriate to do so).



D. The Copperleaf Value Framework

Introduction

In determining our LTDS in the context of the various plausible scenarios given, the Copperleaf Value Framework allows us to assign comparable values to the various tangible or intangible benefits (or ‘**capitals**’) of each project, and to “*create any number of what-if scenarios to compare the impact of different funding, timing, and resource constraints on risk and value to determine the best overall investment plan—and re-optimize that plan when targets and constraints change.*”

Source: <https://www.copperleaf.com/solutions/> (Date accessed: 31/05/2023)

How the Copperleaf Value Framework works

51. The Copperleaf Value Framework described above divides projects in to six ‘capitals’, against which a Copperleaf Value Unit can be ascribed using ‘industry-proven value models’.²¹ These six capitals (and measures of each within the framework) are as follows:²²

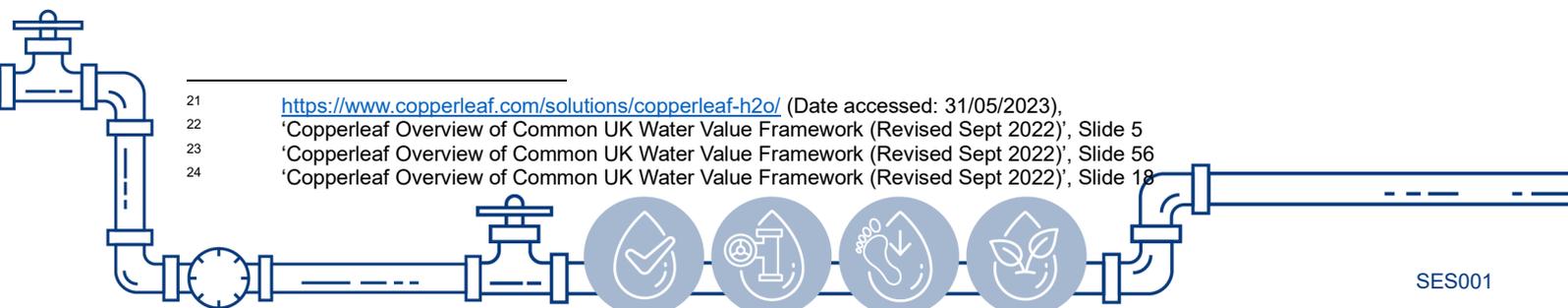
Natural capital: Defined as “*All renewable and non-renewable environmental stocks that provide goods and services that support the current and future prosperity of an organisation*”.²³ Measures included within the framework are:

- (a) Efficiency benefits;
- (b) Operational carbon;
- (c) Embodied carbon;
- (d) Water leakage;
- (e) Per capita consumption; and
- (f) Low pressure.

Social capital: Defined as “*The institutions and relationships established within and between each community, group of stakeholders and other networks... to enhance individual and collective well-being*”.²⁴ Measures included within the framework are:

- (a) C-MeX customer experience;
- (b) D-MeX developer services measure of experience;
- (c) Safety risk;
- (d) Unplanned outage;
- (e) Water quality compliance (CRI);
- (f) Risk of severe restrictions in a drought; and
- (g) Public perception benefit.

²¹ <https://www.copperleaf.com/solutions/copperleaf-h2o/> (Date accessed: 31/05/2023),
²² ‘Copperleaf Overview of Common UK Water Value Framework (Revised Sept 2022)’, Slide 5
²³ ‘Copperleaf Overview of Common UK Water Value Framework (Revised Sept 2022)’, Slide 56
²⁴ ‘Copperleaf Overview of Common UK Water Value Framework (Revised Sept 2022)’, Slide 18



Financial capital: Defined as “... *the pool of funds available to an organisation*”.²⁵ Measures included within the framework are:

- (a) Financial, legal and reputational risk;
- (b) Investment cost (capex/opex/total cost);
- (c) Water quality compliance (CRI); and
- (d) Priority service for vulnerable customers

Manufactured capital: Defined as “...*material goods and infrastructure owned, leased or controlled by an organisation that contribute to production or service provision, but do not become embodied in its output*”.²⁶ Measures included within the framework are:

- (a) Water supply interruptions; and
- (b) Mains repair.

Intellectual capital: Defined as “*Organisational, knowledge-based intangibles, including: ...Intellectual property..., systems procedures and protocols*”.²⁷ The measure included within the framework is:

- (a) Improved plan execution.

Human capital: “*Embodies competencies ... and capabilities ... and talent*”.²⁸ The measures included within the framework is:

- (a) Employee experience benefit.

52. Some of the measures given above for each capital are relatively straightforward to assign a Copperleaf Value Unit towards. For example, ‘investment cost (capex/opex/total cost)’ from the ‘financial capital’ category can be easily described with the GBP value of the estimated budgeted cost (which in turn may be supported by quotes/historical information on cost, for example).
53. Other measure, however, are less straightforward and require a scaling factor or value model to be applied to determine an equivalent value unit (in this case, to be defined as ‘GBP’²⁹). For example, within the ‘social capital’ category, one metric comprising the value is the measure of customer experience (C-MeX), which ‘measures the success of programmes designed to increase and provide excellent levels of service’,³⁰ the result of which is not stated in GBP terms, and thus is not comparable to the investment cost described above, unless it can be restated into an equivalent Value Unit.
54. The Copperleaf Value Framework applies value standardisation frameworks for which each input to the calculations may be determined, which when followed for all measures of capital for each project provides a consistent basis on which projects may be compared, as the results (or ‘scores’) are directly comparable. This means that, after conversion within the Copperleaf Value Framework, results can be compared on an ‘apples to apples’ basis, when the results were ‘apples to elephants’³¹ prior to the application of the value model.
55. Using the C-MeX example, the Copperleaf Value Framework methodology may be applied to ascribe an economic value unit in GBP terms, as shown in the figure below:

²⁵ ‘Copperleaf Overview of Common UK Water Value Framework (Revised Sept 2022)’, Slide 40
²⁶ ‘Copperleaf Overview of Common UK Water Value Framework (Revised Sept 2022)’, Slide 11
²⁷ ‘Copperleaf Overview of Common UK Water Value Framework (Revised Sept 2022)’, Slide 48
²⁸ ‘Copperleaf Overview of Common UK Water Value Framework (Revised Sept 2022)’, Slide 52
²⁹ Note: ‘GBP’ is the title used for the Copperleaf Value Unit in this framework, this can be thought of as Pound Sterling Currency. It is a unit of equivalence for all of the various factors that are considered as part of the assessment of the project.
³⁰ ‘Copperleaf Overview of Common UK Water Value Framework (Revised Sept 2022)’, Slide 12
³¹ Copperleaf CEO - <https://www.youtube.com/watch?v=Fe1v20TYlZQ&t=53s>, 0:59

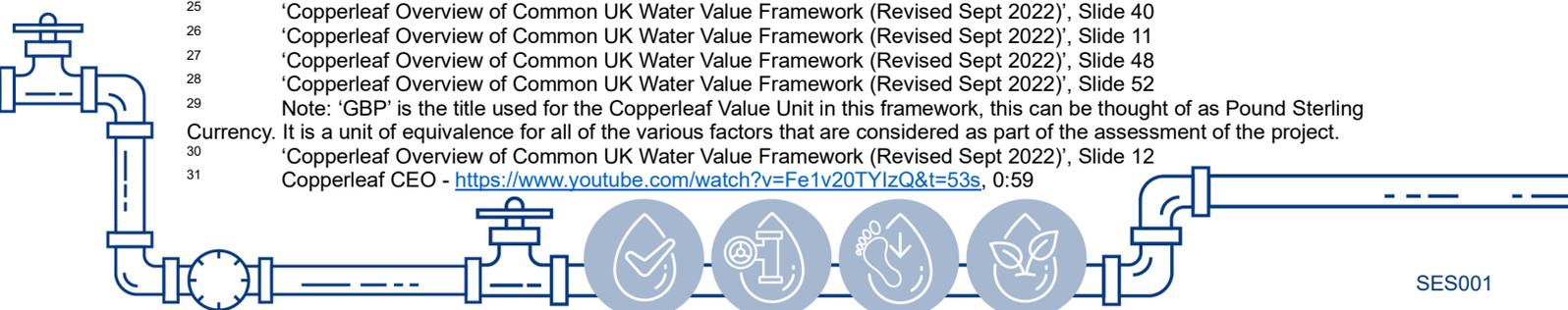
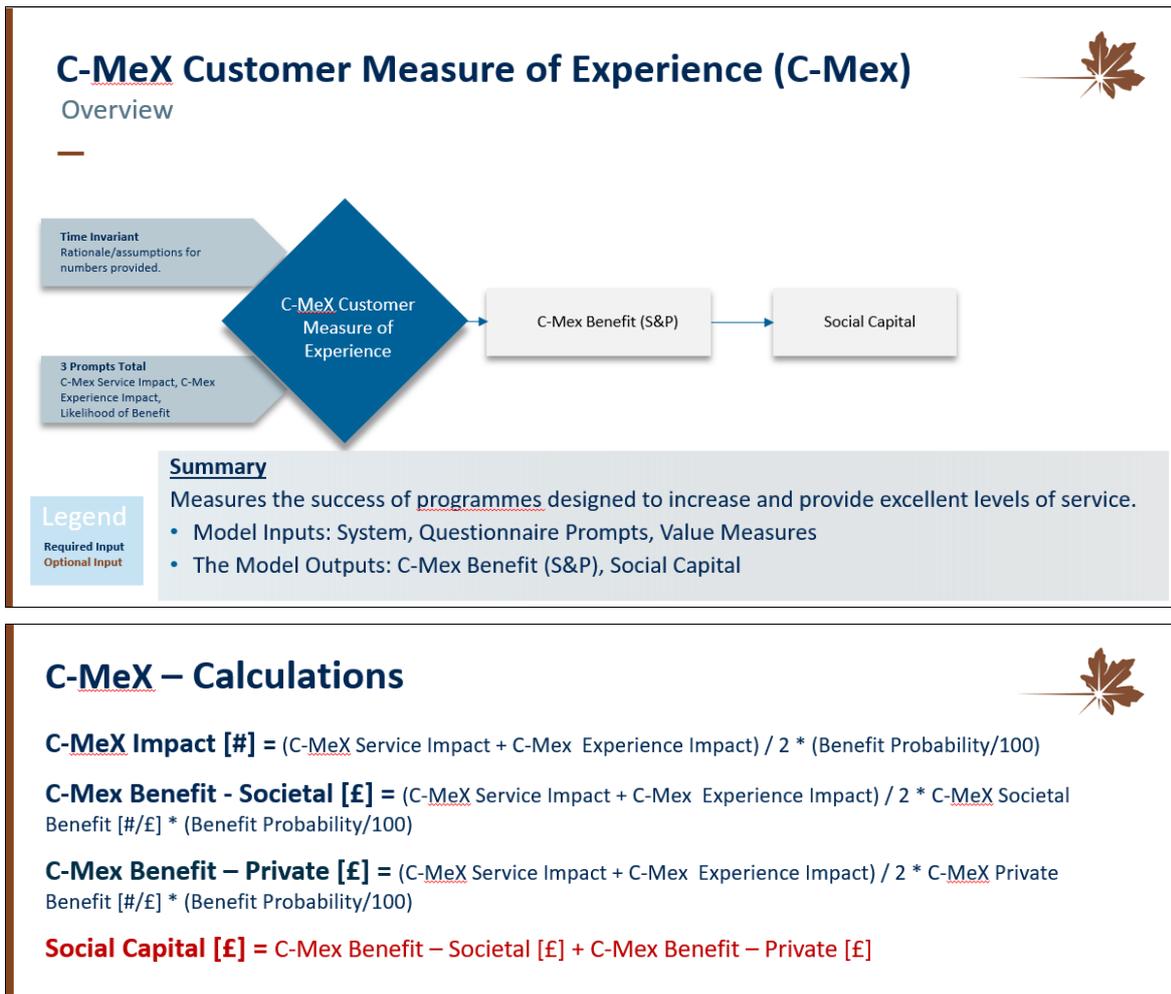


Figure 7: Copperleaf value model methodology, C-MeX example



Source: 'Copperleaf Overview of Common UK Water Value Framework (Revised September 2022)', Slides 19-20

56. It can be seen from the figure above that the Copperleaf Value Framework provides a means of converting the factor of 'C-MeX customer measure of experience' from its initial stated units ('measure of experience') into units described in GBP terms ('social capital (£)').
57. The same concept is applied to all measures such that once the framework is followed for all measures, the result of the project as a whole is stated as one number/economic unit. A small sample of the various inputs/values Copperleaf considers (including the 'C-MeX' inputs shown in Figure 4 above) as part of its standardisation of economic units is shown in the figure below:



Figure 8: Copperleaf value model methodology, valuation of inputs

System Definitions

Attribute	Name	Slide Ref.	Units/Description	Value Model Name
CarbonCostPrivate	Carbon Cost - Private	60	£/Tonne CO2e	Embodied Carbon
CarbonCostSocietal	Carbon Cost - Societal	60	£/Tonne CO2e	Embodied Carbon
CustomerMeasureOfExperiencePrivateBenefit	C-MeX Private Benefit	19	£/Point Value of a point percentage of C-MeX to the company in GBP	C-MeX Customer Measure of Experience
CustomerMeasureOfExperienceSocietalBenefit	C-MeX Societal Benefit	19	£/Point Value of a point percentage of C-MeX to the company's customers/stakeholders in GBP	C-MeX Customer Measure of Experience
DeveloperServicesMeasureOfExperiencePrivateBenefit	D-Mex Private Benefit	22	£/Point	D-Mex Developer Services Measure of Experience (D-MeX)
DeveloperServicesMeasureOfExperienceSocietalBenefit	D-Mex Societal Benefit	22	£/Point	D-Mex Developer Services Measure of Experience (D-MeX)
EmployeeCostPerYear	Employee Cost Per Year	53	£/Employee - Average/Mean salary of an employee in GBP	Employee Experience Benefit
EmployeeCostToReplace	Employee Cost To Replace	53	£/Employee - Average/Mean cost of hiring an employee per year in GBP	Employee Experience Benefit
EnergyCostSavingsPerMWh	Energy Cost Savings Per MWh	57	£/MWh	Efficiency Benefit
OrganizationPublicPerceptionValue	Organization Public Perception Value	37	Value in pounds of improving public perception across the customer base	Public Perception Benefit

Source: 'Copperleaf Overview of Common UK Water Value Framework (Revised September 2022)', Slide 6

- 58. Definitions such as those above are provided for each of the 'capitals' detailed above, and ultimately makes it possible to follow this framework systematically to achieve a standardised measure of economic value for each project.
- 59. Once the various projects identified have all been processed within the Copperleaf Value Framework, Copperleaf's Optimisation Tool supports the process of identifying the optimal combination of feasible projects that should be pursued in order to maximise customer and stakeholder value under each of the reference scenarios tested, given the constraints presented to the framework. This is discussed in the next section.



E. The Copperleaf Optimisation Tool/Decision Analytics

Introduction

The Copperleaf Optimisation Tool allows us to determine a plan that delivers the optimal balance between all the relevant stakeholders, with examples including customer considerations (customer satisfaction, prices), the business (ROI, available capital) and Government (Regulatory compliance, objectives, etc) among others.

In summary, *“Decision analytics software can help utilities strike the optimal balance between maintaining the reliability of their existing network while building a better future business”*.³²

60. Copperleaf enables us to tailor the optimisation tool to reflect the constraints that apply to, and assumptions made in respect of, each common reference scenario. This is in addition to the ability to include bespoke constraints that we face as a business (for example, capital constraints, assumptions in respect bad debts, etc.) We discuss the assumptions/constraints that we have made in determining our LTDS in LTDS Chapter 6 (the foundations of our long-term delivery strategy).
61. As a result of this, once projects/investments have been standardised within the Copperleaf Value Framework and we have updated the Copperleaf Optimisation Tool to reflect the assumptions and constraints that face the business in each scenario, the Copperleaf Optimisation Tool will select the best combination of options for each scenario. This includes:
 - (a) The trading of costs and benefits in respect of each of the six capitals; and
 - (b) Adjusting the timing and sequencing of projects (within the constraints).
62. The result is a plan that delivers an optimised balance between all the relevant stakeholders (as described in the introduction to this section) and is therefore an optimised business plan for each of the LTDS reference scenarios.

³²

Copperleaf Playbook, Page 2

