# COST MODELLING UNDER THE SUPERVISORY APPROACH – THE END OF TOTEX?

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## Background and objective

Cost modelling, and econometric benchmarking in particular, is a critical tool in incentive-based economic regulation. When it works well, it can help regulators overcome information asymmetry on costs, enabling the regulator to set efficient but realistic cost allowances. However Ofwat's benchmarking models have come under heavy scrutiny in recent years, and are being reviewed by the CMA as part of the ongoing PR24 redeterminations.

The Cunliffe review has identified cost modelling as an area where change is needed. While the Commission acknowledged that *"it is necessary to have objective, industry-wide benchmarking to protect customers from misuse of monopoly power"*, it criticised Ofwat's approach as being overly backwards-looking and a "one-size-fits-all" approach that does not take sufficient account of company-specific circumstances. The review recommended that econometric benchmarking be combined with a 'supervisory approach', and we discuss how this may work in practice in a separate paper.

The Cunliffe review gave a specific recommendation to set cost allowances for capital maintenance separately from operating expenditure (opex). However, the review did not discuss the types of cost benchmarking models that the future regulator should use. This paper considers how cost modelling needs to evolve so it is compatible with the supervisory approach and takes better account of company-specific circumstances. We look in turn at opex, capital maintenance costs, and enhancement costs.

## How the modelling needs to evolve: Opex

At PR14, Ofwat moved from setting separate operating expenditure (opex) and capital expenditure (capex) allowances, to modelling and funding base costs at a total expenditure (totex) level. The intention was to remove a perceived bias towards capex-based solutions and to ensure that companies choose optimal solutions, whether those are capex or opex based. It is debatable whether there was in fact a capex bias before the totex approach was introduced, and there is also limited evidence on the extent to which the totex approach has influenced company behaviour over the past two price controls.

The Cunliffe review gave a very clear recommendation to return to setting separate allowances for base opex and capex: "*The regulator should ensure funding directed appropriately to*

*maintain assets by clearly defining and ring-fencing base capital expenditure (capital maintenance), base operational expenditure and enhancement capital expenditure allowances*." The recommended categorisation of allowances is shown in the table below.

## Figure 1 Categorisation of allowances

| Expenditure type | To Price Review 2014 | Price Reviews 2014 to 2024 | Price Review 2029 onwards (recommendation) |
|---|---|---|---|
| **capex for enhancement** | 'Capex' | 'Enhancement' | 'Enhancement capex' |
| **capex for base** | | 'Base' | 'Base capex' |
| **opex for base** | 'Opex' | | 'Base opex' |
| **opex for enhancement** | | 'Enhancement opex' | n/a[578] |

*Source: Independent Water Commission Final Report, Box 27*

If base opex allowances are set independently and ring-fenced, the first question is at what level of aggregation to set these opex allowances, as this partly drives the type of modelling required. Our view is that opex allowances should be set at the highest level (i.e. total opex), to ensure that companies optimise their spending across the widest possible pool of costs, and to recognise that companies face different challenges at different points in time, which will influence their distribution of costs across different opex categories.

The second question is what type of cost modelling should be used to inform these allowances. The current approach to base-cost modelling has a number of technical issues that Ofwat has tried to address over the years. Companies have also not found Ofwat's modelling to provide valuable insight on their own efficiency. The econometric models can be a 'black box' and while Ofwat and companies can debate the technical design of these models, they do not enable constructive dialogue around what real-world factors are driving the results.

In contrast, at PR09 when Ofwat ran a simple set of activity-based opex models, management teams were able to use these models to consider how to run their businesses in a more efficient way. One key ambition for renewed cost modelling should be to deliver valuable insights both for the regulator and for companies. This would also support the supervisory approach as insightful models should ideally become the basis for constructive conversations around distinguishing efficiency from company-specific challenges that require additional funding.

Opex modelling can be carried out at different levels of aggregation, which we discuss below. While high-level modelling of overall opex is well established, more detailed modelling of individual activity areas or cost categories could be particularly useful under a supervisory approach, to help supervisory teams and companies understand what is driving overall

efficiency, and provide a basis for meaningful engagement and focused deep-dives. We discuss the different approaches and their pros and cons below.

## Total opex (for water and wastewater separately)

Modelling total opex provides an overall view of opex efficiency, and avoids distortions caused by companies making different trade-offs, and inconsistent cost allocation between different categories of opex (e.g. companies allocating fleet costs or overheads to different activities). However, at a total opex level it is difficult to identify meaningful insights for business improvement and gain a good understanding of company-specific costs (e.g. hilly terrain drives higher power costs). More disaggregated models, which we discuss below, can better capture the specific drivers of individual cost categories (in the example of power costs, the impact of hilly terrain can be controlled for using average pumping head).

We have carried out opex-only modelling by adapting Ofwat's PR24 models, to understand how companies' efficiency might look under this approach. The resulting 'efficiency scores' (which reflect how actual costs compare to the regulator's modelled costs) are shown below – with company names anonymised – first for Ofwat's current base totex models, and then for opex only. These results are highly indicative, but they do show that for some companies, opex performance is very different from base totex performance. In cases where opex performance is worse than totex performance, this could be driven by a number of factors, including companies deciding to prioritise opex solutions over capex solutions, genuine differences in efficiency across categories, or even accounting differences. More granular modelling would help tease out what is actually driving these differences. In any case, separate opex modelling is likely to create a stronger incentive to reduce opex, particularly if capital maintenance is assessed separately and on a forward-looking basis.

## Figure 2 Efficiency scores for total base costs and opex only

*Wholesale Water*

| Company | Total base costs | Opex only |
|---|---|---|
| A | 0.97 | 1.18 |
| B | 1.03 | 1.42 |
| C | 1.11 | 1.15 |
| D | 1.01 | 1.01 |
| E | 1.56 | 1.16 |
| F | 1.04 | 1.09 |
| G | 1.09 | 1.16 |
| H | 0.99 | 0.76 |
| I | 1.10 | 1.09 |
| J | 1.30 | 1.38 |
| K | 1.12 | 1.45 |
| L | 0.97 | 1.17 |
| M | 1.10 | 1.09 |
| N | 0.81 | 0.88 |
| O | 1.33 | 1.36 |
| P | 1.04 | 1.24 |
| Q | 0.76 | 0.77 |

*Wholesale Wastewater*

| Company | Total base costs | Opex only |
|---|---|---|
| 1 | 1.04 | 1.21 |
| 2 | 1.05 | 1.41 |
| 3 | 1.01 | 1.03 |
| 4 | 1.21 | 1.17 |
| 5 | 1.00 | 1.20 |
| 6 | 1.21 | 1.37 |
| 7 | 1.02 | 0.99 |
| 8 | 0.95 | 1.11 |
| 9 | 0.94 | 1.01 |
| 10 | 0.99 | 1.08 |

*Source: Ofwat PR24 base cost models, Frontier Economics analysis*
*Note: The tables show efficiency scores for triangulated costs, and over the period 2019/20 – 2023/24.*

## Activity-based opex models

This level of modelling would separately assess costs for different activity areas, e.g. water distribution, water treatment, water resources, sewerage network, sewerage treatment, sludge treatment and disposal. At this level, models would cover more comparable activities across companies, and the regulator could identify and test more targeted cost drivers. The results would provide insight into which activities companies are relatively more or less efficient on, and should enable more meaningful engagement between supervisory and management teams on what is driving cost differences and whether the models are appropriately controlling for company-specific factors. However, this level of modelling may still be too high-level to pinpoint specific challenges or areas of inefficiency.

## Disaggregated models

This approach would assess more granular cost categories individually. Ofgem uses this approach when setting allowances for electricity distribution companies – it uses around 40 different benchmarking models, each covering a separate cost category such as primary reinforcement, secondary reinforcement, tree cutting, and civil works. Ofgem places 50% weight on its disaggregated modelling, with the other 50% placed on totex models, when setting allowances.

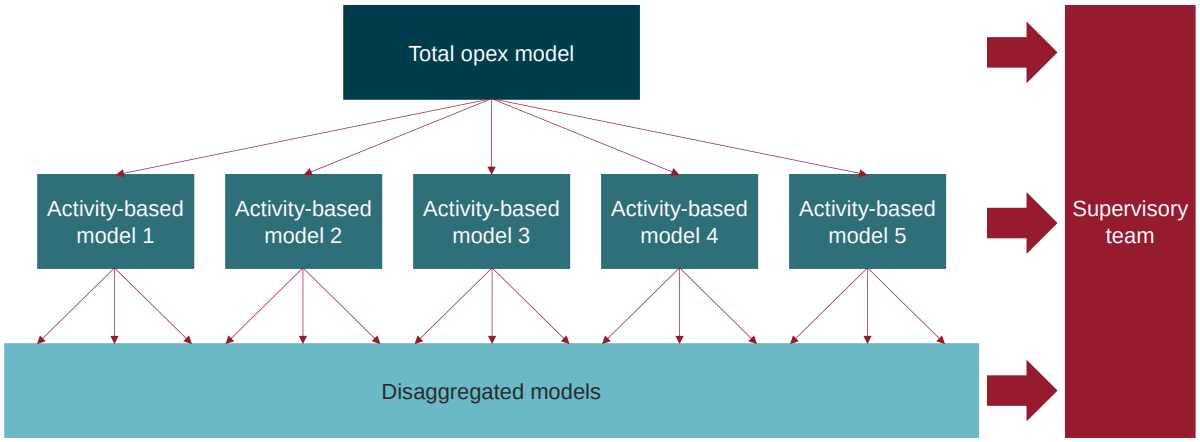
One downside of disaggregated modelling is that the results can be influenced by cost allocation decisions. The regulatory burden is also high as consistent, granular data needs to be collected, and both companies and the regulator need to engage with a large number of detailed models. It is also important that the regulator does not place too much weight on disaggregated modelling when setting allowances, because by 'cherry-picking' the most efficient level of costs for each cost category, this can lead to an unrealistic overall efficiency challenge.

However, the upside of disaggregated modelling is that it provides detailed insights into areas where companies are more or less efficient. Companies can use this information to improve cost efficiency to the benefit of consumers – for example targeting areas where they are relatively inefficient, and learning from companies that perform better. Results can also be useful to supervisory teams, who can use the findings to target their investigations and engagement with companies to the cost areas that appear most inefficient. Using objective benchmarking results as a basis for engagement between companies and supervisory teams will enable concrete discussions about what is driving cost differences between companies.

While 40 models may be too many for the water sector, we think it is worth developing a set of disaggregated models to test how insightful they are. This is likely to require more granular and consistent data reporting than is currently available, so it is important to start this exercise as soon as possible to identify data gaps and develop a reliable dataset.

Overall, we think that models at all three levels of granularity are needed in order to give supervisory teams a clear view of overall opex efficiency, as well as vital insight into what is driving that overall efficiency picture (see Figure 3 below). Granular modelling would also enable targeted discussions between management and supervisory teams about what is driving costs in specific areas, moving away from 'one-size-fits-all' modelling, and can inform supervisory teams on where to focus their time, for instance carrying out deep-dives in areas where costs look unusually high – keeping the supervisory approach proportionate. As modelling and data collection can increasingly be automated, the regulatory burden associated with more detailed modelling can be reduced over time.

## Figure 3 Models at different levels of aggregation could help arrive at an informed view of company efficiency




*Source: Frontier*

The final question is then how to use these different models to set opex allowances, particularly in combination with the supervisory approach. In our previous paper we discussed three different approaches for how benchmarking could be used alongside the supervisory approach. Under any of those approaches, we recommend that total opex modelling forms a starting point for the benchmarking-based allowance. Activity-based and disaggregated modelling results could then be used to inform the supervisory team's engagement and deep-dive activities, as well as providing insight into where efficiency can be improved quickly versus where it needs more time, or where cost reductions simply cannot be achieved because of company-specific factors. This would ultimately drive company-specific adjustments to the opex benchmarking results. As the activity-level and disaggregated models become more developed over time, they could potentially be given some weight alongside the opex modelling results (similar to Ofgem's approach). Ultimately, relying on different sources of information will help the regulator set opex allowances that are ambitious yet realistic.

# How the modelling needs to evolve: Capital maintenance

As discussed above, the Cunliffe review has recommended that companies have a specific, ring-fenced cost allowance for base capex so that capital maintenance is funded and monitored appropriately. We therefore need a sensible method for assessing and setting capital maintenance allowances. We first discuss the policy question of what objectives we are trying to achieve, and then turn to the technical question of how to set allowances.

## Setting allowances for capital maintenance – the policy question

There are various policy objectives that can be considered when deciding how to set allowances for capital maintenance:

- **Minimise long run costs** – at the highest level, we want to replace and repair assets in a way that minimises costs over the long run. This should take account of not just the costs of replacing and repairing assets, but also the potential costs resulting from asset failure. However, this could lead to very different levels of maintenance that are optimal at different points in time. For example, it may be optimal to spend 50 for the next five years to bring asset condition to a sustainable level, then to reduce spending to a long-run maintenance level of ten.
- **Clarity on the risk appetite** – assets generally deteriorate gradually, but there is considerable uncertainty around how and when they may fail. Climate change can mean that models based on past data are not accurate predictions for the future, but equally this may be offset by innovations that help prolong asset lives. While minimising long-run costs is clearly an important objective, this can be done with varying risk appetites. It is important that any capital maintenance allowance is based on a clear understanding of the associated level of risk.
- **Optimised across other activities (and potentially other sectors)** – while the narrow question of which assets to replace when is important, any allowance also has to reflect the operational realities around replacing assets. For example, if five metres of water mains need replacing, should the adjacent mains also be replaced as there are economies of scale in the site management? Should lead supply pipes be replaced at the same time? How should activities such as mains replacement be integrated with other sectors such as gas and electricity maintenance and roadworks? The costs and benefits of integrated approaches should ideally be reflected in decision-making. This could be similar to United Utilities' approach to integrated water management in Manchester, where it works closely with the EA and local authorities.

Intergenerational fairness could also be considered – while this is driven largely by how we recover capital maintenance allowances from consumers, decisions on allowances do have implications for how expenditure is recovered.

Finally, clarity on what we are trying to achieve needs to be coupled with a clear articulation of the quality and type of evidence that is needed to achieve the policy objectives.

## Setting allowances for capital maintenance – the technical question

Once policymakers have defined what the allowances are meant to achieve, the question is then how to set allowances in practice to achieve the policy goals. It is clear that cost benchmarking of historical capital maintenance spend is not a good starting point as historical spending is not a good representation of what is optimal (although it might provide a helpful cross-check).

There are two paths to determining the optimal level of capital maintenance: bottom-up modelling and top-down incentives.

Starting with **bottom-up modelling**, this would involve determining the volume of work that is optimal in each year, using asset deterioration and impact modelling. The modelling needs to reflect:

- What condition are assets currently in?
- How is asset condition related to the probability of failure?
- What is the impact of failure?
- What external factors influence asset condition in the future? For example, how is climate change likely to impact asset deterioration?
- What are the costs of repair and replacement?

Companies already have asset deterioration models that help inform and optimise asset management decisions. However, the quality and consistency of outputs depends on the quality of the input data. The Cunliffe review and Ofwat's asset roadmap both suggest that we do not have sufficient data and information to make informed decisions.

In the past, the incentive for companies to invest in better data and systems was driven by the likelihood of obtaining additional funding (generally low) and the risk of service performance failure (increasing). Going forward, there is an opportunity to achieve a step-change in asset condition and performance data. However, this will involve time and cost investment, and should therefore either be incentivised with the prospect of additional funding, or funded by the regulator directly. In our view direct funding for companies to improve data on asset health is likely to be highly cost beneficial for customers as it has the potential to improve decision-making on a substantial proportion of total expenditure.

Once better data and systems are in place, the new regulator with engineering and asset management skills can compare the results of broadly consistent asset deterioration models across companies. In the future this could even evolve into a centralised asset health model, fed with near real-time data from companies using machine learning algorithms to provide up-to-date optimised programmes of repair and replacement. The pros and cons of a centralised versus a company-specific approach would need to be weighed up once consistent data is available.

Investment in bottom-up modelling will clearly take time and is unlikely to have an impact on decisions in the short run. The other complementary approach is to **consider top-down incentives** to reveal optimal asset strategies. One option is to have a short period – say three years with a two year lead time – of cost pass-through for capital maintenance. This would enable companies to develop unconstrained asset maintenance plans, explore what is deliverable within supply chain constraints, and would give the regulator useful information on what types of maintenance were prioritised. To protect customers, the pass-through could be subject to spot checks and monitoring metrics to ensure that companies do not replace assets that do not need replacing. While this would be a radical approach, it could deliver a step-change in asset condition, as well as reveal valuable information on the optimal approach.

The supervisory team could then combine the insights from a short-run cost pass-through approach and better data and modelling to set sensible allowances going forward.

## How the modelling needs to evolve: Enhancement

Expenditure is categorised as 'enhancement' if it is incurred on activities which lead to permanent increases in the level of service or capacity, for example environmental improvements to meet new statutory obligations, improving service quality, or new solutions to improve water supply resilience. Developing sensible cost modelling for enhancement is an increasingly challenging task as the enhancement programme covers a wide range of diverse activities that are sometimes not directly comparable between companies.

To deliver the same outcome (e.g. reduce leakage) companies can use various different solutions, so the **first fundamental question** is whether the cost modelling should assess the optimal mix of solutions and cost efficiency simultaneously or separately. The answer may not be the same for all areas but needs to be considered carefully. If two companies could use the same mix of solutions to achieve the same improvement in performance and one chooses a more expensive mix, this is an inefficient decision and should be reflected in the assessment of cost efficiency. However, if a company has to use a more expensive mix of solutions – e.g. because it has exhausted solutions with lower costs – or if the more expensive solution delivered a better outcome, then this should be reflected in the cost assessment.

One way forward is for the supervisory team to assess whether companies are proposing an optimal mix of solutions (e.g. the balance between mains replacement, active leakage control, and smart networks to reduce leakage), so the benchmarking approach can be purely focused on cost comparisons of the same activity.

Cost comparisons of the same activity could then be undertaken on the basis of forecast costs, historical costs or "typical costs". The latter would be similar to the cost base approach in PR09 where companies were asked to cost specific activities (e.g. replacing X km of mains). This enabled detailed cost comparisons that helped Ofwat understand what drives cost differences, to complement more high-level benchmarking. This is similar to the discussion on opex above.

The second fundamental question is to what extent the method for cost estimation needs to be standardised for scheme-level costs. At one extreme the regulator could develop prescriptive rules for cost estimation. This would lead to highly comparable costs but would reduce flexibility and diversity in how companies approach their enhancement costs (and potentially the supply chain). While a fully standardised approach may be going too far, more detailed costing data would be helpful for supervisory teams to understand where cost differences are driven by different approaches to costing, for example in terms of:

- **Scope** – for example, some companies may include a narrower scope for enhancement projects (e.g. the storm tank only) while others may include wider works needed to make the enhancement project operational. This would also include an assessment of the assumptions made by each company.

- **Risk appetite** – companies may have different views on contingency and risk allowances to include in costing. While lower costs may appear more efficient upfront, they may also make overruns more likely. When commissioning building works, the lowest quote will not necessarily lead to the lowest outturn costs. The appropriate level of risk could be assessed as part of the supervisory approach or included in the benchmarking in a more explicit way.

One way to implement this while being mindful of the regulatory burden could be supervisory deep dives where costs appear particularly high or low. A deep dive would reveal to what extent cost differences are driven by efficiency, exogenous company-specific factors, or different costing approaches.

## Next steps

The Cunliffe review has provided a clear steer that while objective benchmarking is still an important part of the future regulation of the water sector, the current models are not working well. In our view the immediate next steps to make the necessary changes in the three key cost areas are:

- **Opex:** companies and the regulator should work together to explore what activity-based or disaggregated opex models could look like. Where more data is needed to enable this modelling, these data needs should be identified as soon as possible.
- **Capital maintenance:** policymakers need to set out the policy objectives for capital maintenance. The sector could then use a combination of investment in better data and modelling with a short-term cost-pass through for maintenance to develop a sensible way forward.
- **Enhancement:** clarity is needed on how cost efficiency and the optimal mix of solutions will be assessed, and whether these two elements should be assessed separately or simultaneously. There is an option for the supervisory team to focus on assessing the mix of solutions, while deep dives into cost estimation methodologies for specific schemes can help reveal more about differences in cost efficiency and risk appetite.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