Treatment of growth expenditure

Note prepared for Southern Water

4 May 2018

1 Introduction

Forecasts for house building in Southern Water's areas are expected to require significant enhancement and reinforcement expenditure, particularly on the sewerage network. Southern Water has asked Oxera to examine whether Ofwat's cost assessment models properly account for growth from new housing developments.

This note examines:

- **the background to the issue**—the growth rates in different water company areas, and public information on the incremental costs of new infrastructure development;
- **the cost assessment framework**—Ofwat's approach to cost efficiency and cost allowances for growth expenditure in PR14;
- **cost recovery**—the recovery of growth expenditure through regulated allowed revenues and developer charges.

Prior to examining each of the above, we provide a summary of the overall findings below.

2 Overall findings

2.1 Cost assessment

Ofwat's cost assessment framework potentially accounts for growth from new housing developments via a number of possible routes, as described below.[1]

[1] Ofwat is currently consulting on its cost modelling approach for PR19 (Ofwat (2018), 'Cost assessment for PR19: a consultation on econometric cost modelling', March). As part of this consultation, 382 models have been published. Of these 382 models, the vast majority of the models, including Ofwat's models, examine

- **Cost drivers in some of the cost models**. In PR14, the cost assessment models used a historical panel data set and the estimated relationships were applied to forecast cost drivers to predict future efficient cost levels. So whether the models account, to some extent, for growth depends on the cost drivers included in the model. For example:
  - **the main scale drivers in the water TOTEX models**, which may capture future growth from new housing developments, to the extent that historical unit TOTEX levels are appropriate for future requirements. The scale driver used in the PR14 TOTEX models was the length of mains rather than connected properties (forecasts of the latter may better reflect future growth);
  - **growth-related drivers in the water TOTEX models**—new mains, new meters were included in one of Ofwat's PR14 TOTEX models (in PR14 there were no wastewater TOTEX models).
  - **Growth enhancement expenditure models**:
    - **water**—the number of new connections, enhancements to the supply and demand balance were included in Ofwat's PR14 water enhancement expenditure models;
    - **wastewater**—properties connected under Section 101A, additional sludge produced, additional sewage treatment capacity were included in Ofwat's PR14 wastewater enhancement expenditure models.
- **Special cost adjustments/'deep dives'**.
- **Recovery through infrastructure charges** (see cost recovery, below).

However, the degree to which growth was adequately captured in PR14 may have been dampened as:

- the degree to which growth is captured through the scale driver in the aggregate models depends on the appropriateness of the scale driver used. Typically, length of mains was used in Ofwat's PR14 TOTEX and BOTEX water models, and length of the sewer network and load treated in the wastewater models. However, connected properties might better capture the impact of future growth from new housing developments;
- the impact of growth factors in the water TOTEX models was halved through Ofwat's triangulation approach with TOTEX models that did not include any growth factors;
- the cost forecasts relied on Jacobs' cost driver forecasts, which may not have aligned with the outturn;
- deep dives require passing a series of Ofwat criteria.[2] While criteria are warranted it is perhaps a less direct and certain means of appropriately allowing for future growth;

base expenditure (BOTEX). As such, there is still a lot of uncertainty around the exact specification of the cost models that will be used for PR19 and around how they will be applied. As such, in this note we focus on the PR14 cost assessment approach.

[2] Ofwat (2017), 'Delivering Water 2020: Our final methodology for the 2019 price review Appendix 11: Securing cost efficiency', December, pp. 14–15.

- the unit costs allowed through the enhancement expenditure models may not appropriately capture the company-specific situation.

Some of these issues require further examination to ascertain the significance of their impact. For PR19, some initial[3] suggestions for how the cost assessment approach to growth could be improved include:

- careful consideration needs to be given to the main cost drivers in the cost models. For example, connected properties may better capture future growth than drivers such as length of mains;
- careful consideration needs to be given to the forecasts of growth cost drivers in the cost models, the degree of uncertainty in these forecasts and, depending on this, whether uncertainty or sharing mechanisms are warranted;
- any TOTEX models, or BOTEX plus models (where they include growth expenditure), should include drivers of growth expenditure;
- the implicit growth allowance in aggregate models could be compared with that predicted by more disaggregated growth-related enhancement cost models and analysis undertaken to understand which better captures the required level of growth expenditure.

In addition to the above, companies will also need to consider whether their growth-related expenditure is more atypical than the industry and thus requires a separate cost adjustment/deep dive assessment (e.g. a greater requirement for the building of new strategic assets than is perhaps captured in the historical industry-wide unit costs).

2.2 Cost recovery

The form of control determines the exposure of water companies to volume risk when volumes depart from those assumed in price limits. A revenue cap (or control) approach means that prices would be lowered in the event that volumes were greater than anticipated. This is in contrast to a price cap approach.

This exposes the company to more risk if costs increase with volumes supplied. This is likely to be more pronounced in the South East of England over the medium- to longer-term.

For PR19 Ofwat will implement separate controls for water resources, bioresources (sludge), water network-plus and wastewater network-plus. All will be subject to total revenue controls—with the notable exception of bioresources, which will be subject to an average revenue control.

Oxera's understanding is that Southern Water is not seeking to amend the underlying form of the four wholesale controls proposed by Ofwat for PR19. Rather, it is important to note that the forms of control proposed expose companies in the South East to more risk than companies in the rest of England. This highlights the importance of adapting the econometric cost models discussed above.

[3] Given that we have not undertaken detailed analysis to examine the significance of the issues highlighted above.

Another issue concerns the cost of and income from new connections. Water companies receive capital contributions and infrastructure charges from developers connecting to the water network.

Actual capital contributions and infrastructure charges may differ from that forecast when price limits are set. In so far as they were added into the total revenue control at that stage, deviations in these from forecasts will necessitate adjustments to outturn prices to maintain the assumed revenue profile.

It is unclear whether this exposes companies in the South East of England to the same degree of profit risk identified in the case of the overall form of wholesale controls discussed above. This is because the charges are associated with the costs of connection—fewer charges means lower connection costs; a higher number of charges means higher connection costs.

Nonetheless, it will be important to take into account the relationship between connection income, connection costs and overall costs.

3 Scene setting

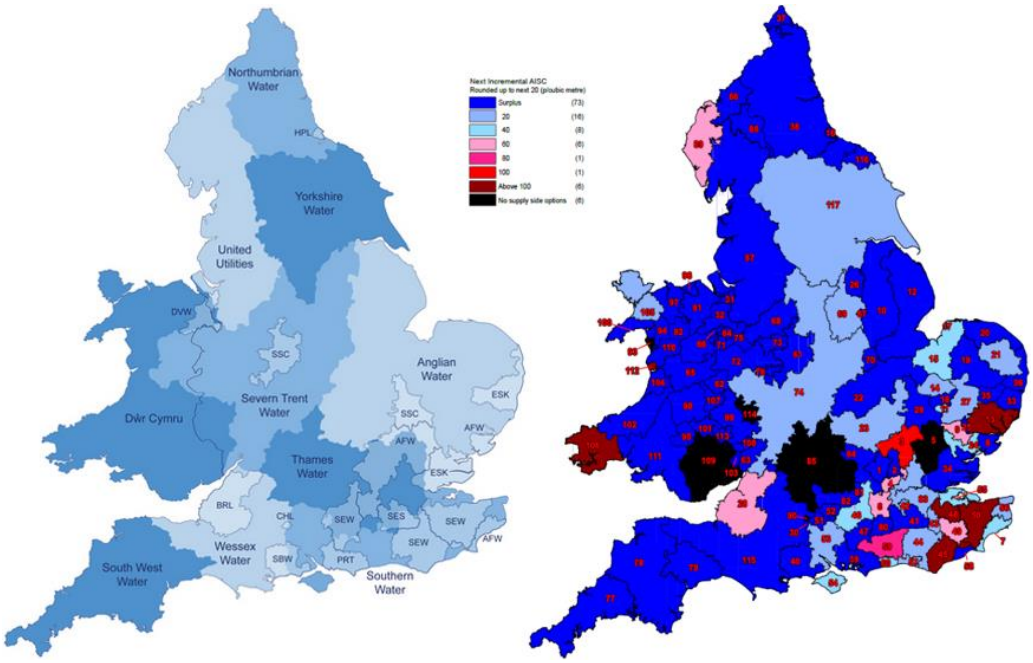
3.1 A varied picture

The South East of England is characterised by a patchwork of water companies: four WOCs (Sutton & East Surrey, South East, Affinity and Portsmouth) and two WASCs (Thames Water and Southern Water). The majority (around 80%) of abstractions in the region are from groundwater sources, with the remainder from reservoirs and rivers.

The South East region faces challenges including: a dry climate compared with the rest of the country (adequate rainfall over sufficient periods is crucial to replenishing aquifers and restoring river flow); population and housing growth; and limits to abstraction imposed by the Environment Agency (sustainability reductions). Climate change will also result in greater variability in rainfall and dry periods going forward.

As such, many companies in the South East (or at least some water resource zones, WRZs, within these companies) have forecast a supply–demand deficit by at least 2039–40 (under dry year conditions). As shown in Figure 3.1, the longer-run incremental costs of new infrastructure development, to deal with growth and water scarcity, are significantly higher in the South East than in many other parts of England and Wales.

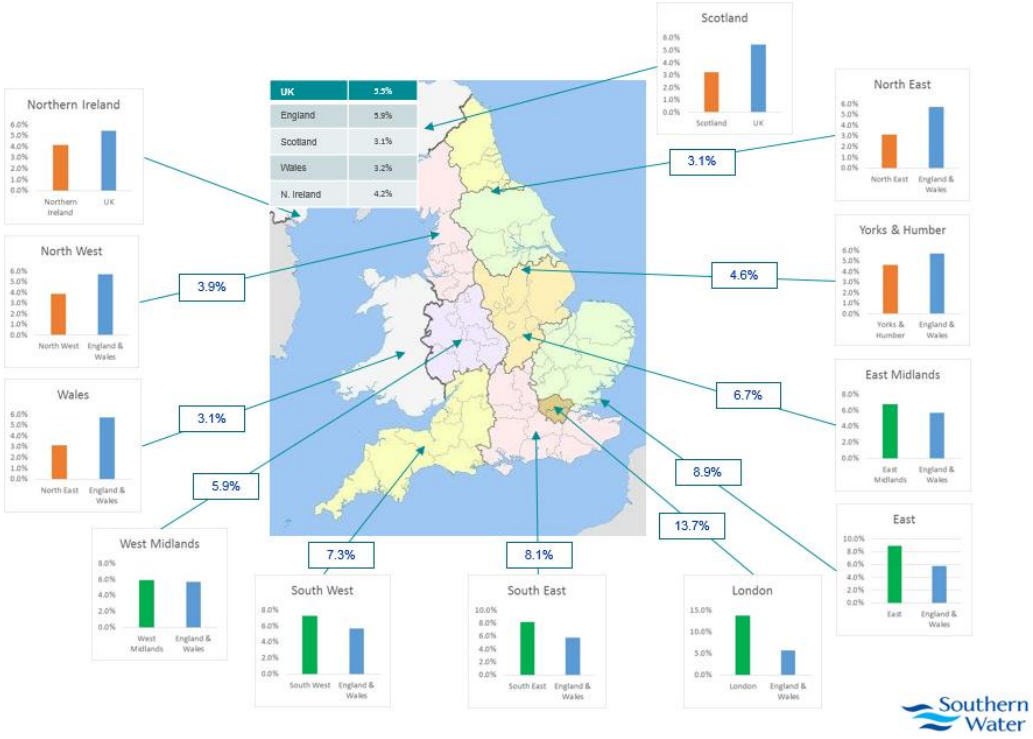
Figure 3.1 Water development costs across England and Wales (AISC)



Source: Ofwat website (https://www.ofwat.gov.uk/households/your-water-company/map/); and Figure 8 in Ofwat (2016), 'Water 2020: our regulatory approach for water and wastewater services in England and Wales: Appendix 3 Tackling water scarcity - further evidence and analysis', May. These figures are based on companies PR14 water resource management plans (WRMPs). These will change in the finalised PR19 WRMPs.

Population growth poses particular challenges going forward. As shown in Figure 3.2 below, the official UK forecaster, the Office for National Statistics, predicts much higher rates of population growth over the coming years in the South East than in most other parts of the country.

Figure 3.2 Population growth by region 2016–26



Source: Southern Water analysis of Office for National Statistics (ONS) figures.

Against this background, companies in the South East are considering their supply–demand position going forward and the solutions to plugging any deficits. The latter will include measures such as reducing water put into the system (demand reduction, leakage control), water trading between companies through bulk supply agreements (no net reduction), and augmentation schemes (reservoirs, internal transfers).

Draft water resource management plans (WRMPs) have been submitted for scrutiny by the Secretary of State. Government policy towards new infrastructure development will be an important part of this process, as will be the scenario modelling undertaken by the Water Resources South East (WRSE) Group, and new upstream markets and incentives introduced as part of PR19. Southern Water is an active member of the WRSE Group and has been exploring regional solutions through this for a number of years.

The National Infrastructure Commission (NIC) very recently set out its advice on how to address England's water supply challenges. Here it concluded:[4]

> The Commission's central finding is that government should ensure increased drought resilience in England by enhancing the capacity of the water supply system. This will require a twin-track approach combining demand management (including leakage reduction) with long-term investment in supply infrastructure.

The NIC therefore recognises that there are significant challenges going forward, although the specific recommendations of the NIC will require further scrutiny.

[4] National Infrastructure Commission (2018), 'Preparing for a drier future - England's water infrastructure needs', April.

3.2 Implications for the treatment of growth expenditure

While Southern Water can do its part to encourage customers to save water in order to mitigate the effects of population growth, population growth itself is largely beyond companies' control—it is an 'exogenous' or given variable that the industry has to deal with.

Growth rates are forecast to vary considerably by company (as shown in Figure 3.2) and are uncertain, while the incremental cost of new infrastructure development is higher in the South East than in many other regions (as shown in Figure 3.1).

The implication of the two is that the regulatory framework needs to treat companies fairly by taking into account these asymmetries. In particular:

- **cost assessment**—before prices are set, the way in which companies' costs are compared and assessed needs to account for divergences in population growth and the impacts of this growth on costs;
- **cost recovery**—once prices are set, the regulatory regime needs to enable companies to adequately recover costs associated with population growth while, given the uncertainties, achieving a fair balance of risk sharing between companies and customers for differences between outturn and predicted growth.

Failing to take into account these issues will result in systematic under- or over-recovery of revenues, which will affect not only Southern Water but also the rest of the industry. This note focuses on whether the current PR14 regime and proposed PR19 regime adequately deal with the two issues described above.

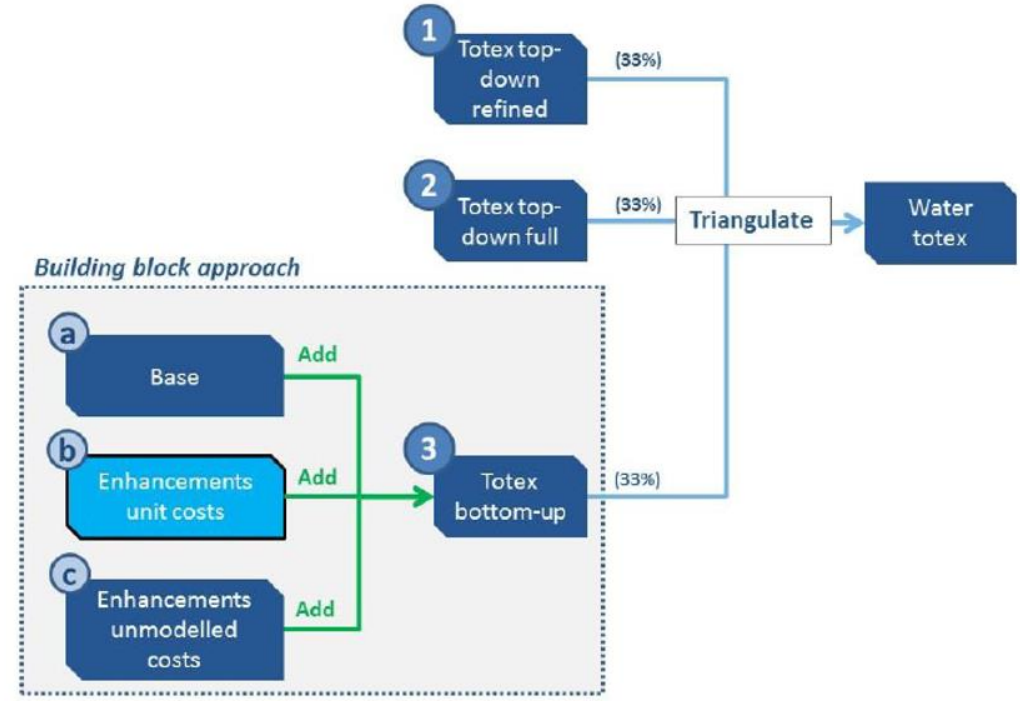
4 Ofwat's approach to efficiency and allowances

In this section we examine the cost assessment framework in PR14 and consider how it accounted for growth.

4.1 Water service

Ofwat's PR14 approach to derive the cost allowances for the water services was based on results from top-down total expenditure (TOTEX) models combined with the results from separate base (BOTEX) and enhancement models (see Figure 4.1). These models used a historical panel data set and the estimated relationships were applied to forecast cost drivers to predict future efficient cost levels.

Figure 4.1 Bottom-up modelling approach in water in PR14



Source: Ofwat (2014), 'Basic cost threshold model: appendix C enhancement modelling', p. 3.

4.1.1 TOTEX models

Within Ofwat's PR14 TOTEX models, only some of the models included a growth component. In particular:

- WM3 includes new meters and new mains as drivers for growth enhancement;
- WM5/6 only included BOTEX-related costs drivers.

Given the equal weighting used in Ofwat's triangulation to bring the results together from the different models to form one cost prediction, the impact of growth factors in the TOTEX models was halved.

Also, with the exception of the enhanced companies, Ofwat did not rely on companies' own forecasts of the cost drivers and instead used those derived by Jacobs.

In addition, the scale driver used in the PR14 models was the length of mains rather than connected properties (forecasts of the latter may better reflect future growth). The choice of scale driver may have a significant impact on the degree to which future growth is captured within Ofwat's modelling framework.

4.1.2 Enhancement models

The AMP6 allowance for growth expenditure was derived from the enhancement unit cost models. Two of these models (see Appendix A2.1) have a growth component, as follows.

- **Supply demand balance expenditure (model W1)**—costs to ensure that there is enough water to meet customers' demand for water into the future

- **New development expenditure (net) (model W3)**—expenditure to connect new customers to the water network

As well as whether Ofwat's framework appropriately captures future volume of work driven by growth, there is an additional question as to whether the framework adequately accounts for the unit costs of this work, and how these might differ across companies.

In addition, there may be non-linear costs to carrying out this work, for example the expenditure required to connect a 1,000 property development to a network may impose steeper costs compared with a 100 property development than unit cost analysis would imply.

Table 4.1 provides the effective unit rates from each of these models for Southern Water.

Table 4.1 Effective unit rates from the growth models—Southern Water

AMP totals	Supply demand expenditure (W1)	New development expenditure, net (W3)
Triangulated allowance pre-adjustments (£m)	220.7	6.4
Volumes	81.4 (total enhancements Ml/d)	34.4 ('000 properties)
Effective unit rate based on the above (£m)	2.7 per Ml/d	0.2 per '000 properties

Note: The triangulated allowance was calculated from applying an equal weighting to four models (weighted average, unweighted average, linear regression and logged regression). The triangulated allowance is expressed before adjustments for unmodelled enhancement costs (8.40%) and efficiency (6.5%). Volume driver for supply demand expenditure (W1)—enhancements to the supply demand balance (Ml/d); volume driver for new development expenditure, net (W3)—connected properties.

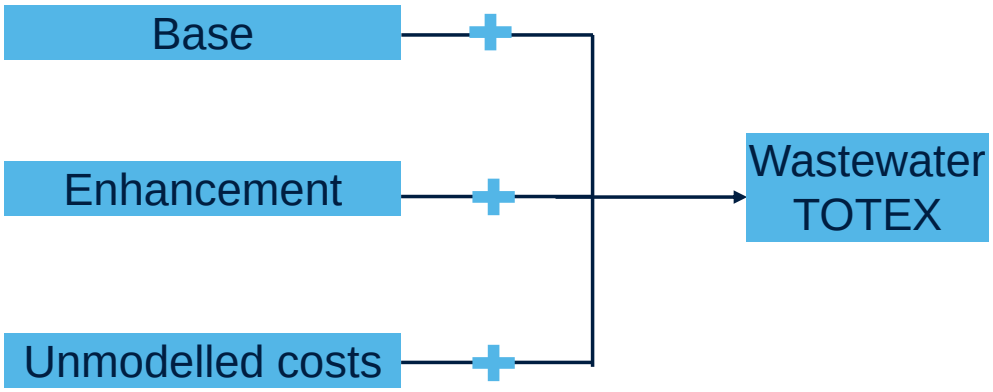
Source: Oxera analysis based on Ofwat (2014), 'pap_tec1408feederbasiccostwsrndd', December.

The unit rates differ between Southern Water and other companies as some of the models account for economies of scale and companies differ in size across the industry. However, for companies with the same volume level, the models predict the same cost level regardless of the pattern of regional growth. Thus, these unit rates will not account for the higher expected level of incremental costs in the South East of England.

4.2 Wastewater service

Ofwat adopted a different approach to derive the cost allowances for the wastewater service, with the results from separate base and enhancement models added together to derive the TOTEX allowance (see Figure 4.2). This is equivalent to giving the 'building block approach' a 100% weighting within the water triangulation.

Figure 4.2 PR14 approach to derive cost allowances—wastewater



Source: Oxera based on Ofwat (2014), 'Basic cost threshold model: appendix C enhancement modelling', p. 3.

4.2.1 BOTEX models

The scale driver used in the PR14 BOTEX models was the length of sewers (for Network) or load (for Treatment and wholesale wastewater) rather than connected properties (forecasts of which may better reflect future growth). The choice of scale driver may have a significant impact on the degree to which future growth is captured within Ofwat's modelling framework.

4.2.2 Enhancement models

The AMP6 allowance for growth expenditure was derived from the enhancement unit cost models (see Figure 4.2). Three of these models (see Appendix A2.1) have a growth component, as follows.

- **First time sewerage (model S1)**—cost to connect properties for the first time, where existing arrangements cause environmental or amenity problems. Properties connected under Section 101A was the volume driver for this model.[5]
- **Sludge enhancements (model S2)**—cost to treat and dispose of additional sludge generated because of an increase in population or a tougher consent. Additional sludge produced was the volume driver for this model.
- **Sewage treatment growth (model S10)**—cost to provide additional sewage treatment capacity required to serve a growing population. The four year increase in population from 2008–2012 was the volume driver for this model.

As well as whether Ofwat's framework appropriately captures future volume of work driven by growth, there is an additional question as to whether the framework adequately accounts for the unit costs of this work.

Table 4.2 below provides the effective unit rates from each of these models for Southern Water.

[5] Section 101A is a provision in the Water Industry Act 1991 (WIA91), https://www.legislation.gov.uk/ukpga/1991/56/section/101A

Table 4.2 Effective unit rates from the growth models—Southern Water

AMP totals	First time sewerage (S1)	Sludge enhancements (S2)	Sewage treatment growth (S10)
Triangulated allowance pre-adjustments (£m)	7.3	7.9	39.3
Volumes	253.5 (properties)	3.1 (sludge produced)	151.84 (increase in population, '000s)
Effective unit rate based on the above (£m)	0.029 per property	2.506 per unit of sludge produced	0.259 per '000 people

Note: The triangulated allowance was calculated from applying an equal weighting to four models (weighted average, unweighted average, linear regression and logged regression). The triangulated allowance is expressed before adjustments for unmodelled enhancement costs (3.95%) and efficiency (10.4%). Volume driver for first time sewerage (S1)—properties connected under Section 101A; volume driver for sludge enhancements (S2)—additional sludge produced; volume driver for sewage treatment growth (S10)—four year increase in population from 2008–2012.

Source: Oxera analysis based on Ofwat (2014), 'pap_tec1408feederbasiccostssrndd', December.

The triangulated allowances were then added to base expenditure and un-modelled costs and subjected to an upper quartile efficiency challenge (10.4%).

The unit rates differ between Southern Water and other companies as some of the models account for economies of scale and companies differ in size across the industry. However, for companies with the same volume level, the models predict the same cost level regardless of the pattern of regional growth. Thus, these unit rates will not account for the higher expected level of incremental costs in the South East of England.

A key question is, given the impact of growth on the type of work required, whether these unit rates are appropriate for Southern Water.

4.3 Addendum: the CMA inquiry[6]

Bristol Water referred its PR14 Final Determination to the CMA. With regard to the cost modelling framework, the CMA focused on developing alternative water BOTEX models, so growth drivers were not directly relevant, although, the CMA did use connected properties as the scale driver in its BOTEX models.

With regard to enhancement expenditure, the CMA considered this from a more bottom-up perspective. [7]

> We estimated enhancement expenditure from a review of the enhancements proposed in Bristol Water's business plan. We did not consider that Ofwat's benchmarking models provided a suitable basis for determining allowances for Bristol Water's enhancement expenditure that we could use for our cost assessment.
>
> For the individual schemes that we reviewed, we adopted a framework for assessing the evidence on the basis of need; whether the most suitable option had been chosen (optioneering); and the robustness of the cost estimation.

[6] CMA (2015), 'Bristol Water plc A reference under section 12(3)(a) of the Water Industry Act 1991'.
[7] CMA (2015), 'Bristol Water plc A reference under section 12(3)(a) of the Water Industry Act 1991', p 6 and 9.

4.4 Deep dives

In addition to the cost models, Ofwat's cost assessment framework also provides companies with an opportunity to submit claims for cost increases not captured directly in the cost modelling. While this presents less of an 'automatic' account for factors such as growth, it does provide a means for obtaining additional allowances over and above that predicted from the modelling.

In PR14, there were several deep dive claims related to growth issues, including:

- allowances for a population growth adjustment from Southern Water;
- allowance for growth expenditure from Bristol Water;
- allowances for investment to allow for wastewater growth from Anglian Water.

Of these, one was accepted in principle. Reasons for the rejections and/or reductions in allowance were:

- population growth adjustment (0% allowed): no adequate demonstration that Ofwat's existing modelling approach created systemic bias;
- growth expenditure (0%) allowed: rejected as Ofwat did not consider that the proposed investment was sufficiently different from routine investment for growth;
- wastewater growth investment (20% of original claim allowed): much of claim was considered to be covered by the implicit allowance, and received only a partial pass on whether the investment met Ofwat's cost–benefit analysis and robust costs hurdle.

5 Recovery of growth expenditure

Given the high forecast population growth in the South East compared with the rest of England, it is important that Southern Water is remunerated effectively within the regulatory framework in a way that takes this into account.

As noted above, one element is the treatment of costs including potential adjustments to the efficiency models. Another important element—given the relationship between population growth and costs—is the form of control once prices are set. This will determine the extent to which Southern Water is exposed to revenue risk associated with volumes that are higher or lower than forecast (and included) in price limits.

One part of this lies within the treatment of revenues in the total revenue control; the other part lies within the treatment of developer contributions.

In what follows we cover:

- what is included in allowed TOTEX and allowed revenues;
- what a total revenue control means if population outturns differ from forecast;
- what developer contributions cover and what this means if population outturns differ from forecast.

5.1 Wholesale form of control

The core form of control adopted in the England and Wales water sector has been modified over time.

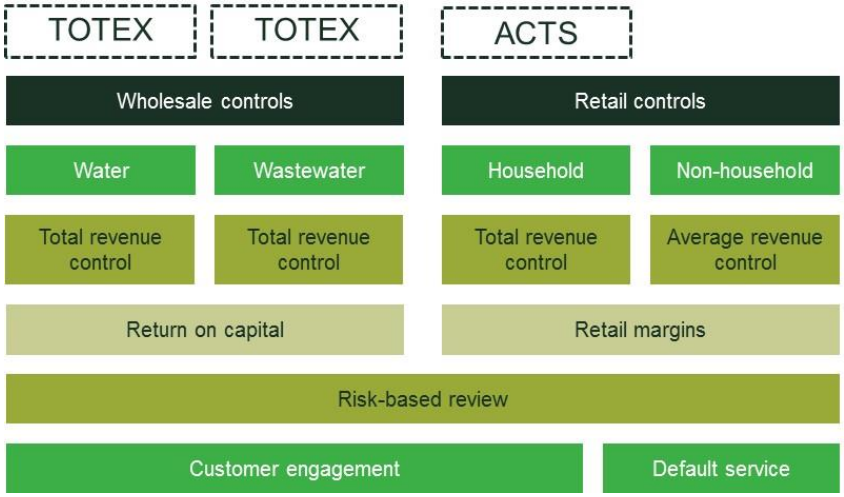
Over successive price controls, Ofwat has moved from a price cap approach to a total revenue control.

In PR04 Ofwat adopted a price cap approach, meaning that companies bore the risk within the five-year regulatory period if volume outturns deviated from forecast.

Due to concerns regarding the potential for gaming around growth forecasts and to incentivise water conservation, in PR09 Ofwat adopted a price cap approach coupled with a true-up revenue correction mechanism. In effect, this had the price stability properties of a price cap but with some of the incentives of a revenue cap.

In PR14 Ofwat switched to a revenue cap approach—for both water and wastewater wholesale services. This was in addition to the other measures introduced as part of the last price review (see Figure 5.1).

Figure 5.1 PR14 form of control



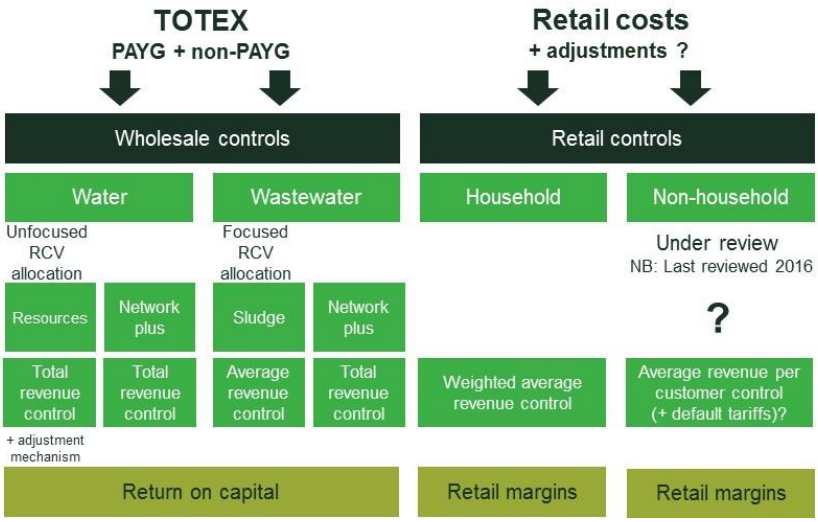
Note: ACTS, average cost to serve.

Source: Ofwat (2013), 'Setting price controls for 2015–20: final methodology and expectations for companies' business plans', July.

For PR19 Ofwat will implement separate controls for water resources, bioresources (sludge), water network-plus and wastewater network-plus. All will be subject to total revenue controls—with the notable exception of bioresources, which will be subject to an average revenue control.

These changes are in addition to the other measures introduced as part of the current price review (see Figure 5.2 below).

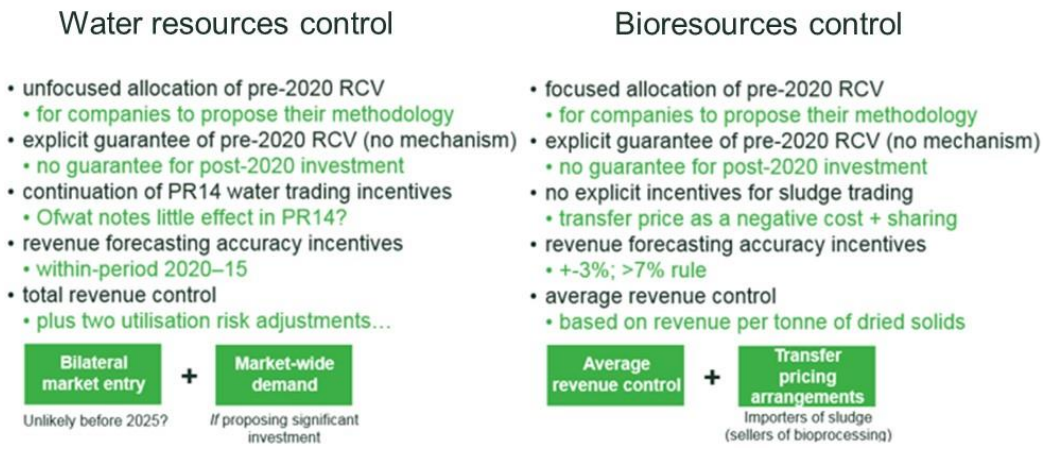
Figure 5.2 PR19 form of control



Source: Adapted from Ofwat (2015), 'Water 2020: Regulatory framework for wholesale markets and the 2019 price review – explanatory document', December, p. 164, Figure 29. This also takes account of the subsequent decisions in Ofwat (2016), 'Water 2020: our regulatory approach for water and wastewater services in England and Wales' (decision document), May, and the latest information provided in Ofwat (2017), 'Delivering Water 2020: Consulting on our methodology for the 2019 price review', July.

Figure 5.3 also shows that the water resources and bioresources caps in PR19 will be subject to revenue forecasting incentives.

Figure 5.3 Upstream contestable services controls



Source: Based on text in Ofwat July 2017.

The above illustrates how, over time, companies have been increasingly insulated from revenue risk exposure to volumes that are greater (or lesser) than forecast. Once RPI-X prices are set at a given level, outturn prices are adjusted downwards (or upwards) to maintain a given revenue allowance in any one year.

However, revenue caps increase profit exposure to volume risk—particularly if costs increase or decrease markedly with volumes. This is because simple profits are the difference between revenues and costs; under a revenue cap, if volumes increase beyond forecasts, prices fall to compensate and maintain forecast revenues.

This is problematic if—at the same time—a steep positive relationship between volumes and costs means that costs are higher than forecast. Taking into account Figures 3.1 and 3.2, this situation could be more problematic in the South East. Companies in these areas could now be subject to more profit risk associated with deviations between forecast and actual growth, at a time where pressures are increasing the costs of alternative options.

In the short term, the direct relationship between increased volumes of water supplied and increased costs will be much less than one for one, as the marginal costs of extra water supplied are likely to be low. However, in the longer term, with new connections stemming from population growth, this is not the case for most water companies, as there are costs associated with the new connections, network re-enforcement and new sources of water. The problem is amplified in the South East, due to above-average underlying population growth.

Oxera's understanding is that Southern Water is not seeking to amend the underlying form of the four wholesale controls proposed by Ofwat for PR19 (as set out in Figure 5.2). Rather, it is important to note that the forms of control proposed expose companies in the South East to more risk than to companies in the rest of England.

This highlights the importance of adapting the models (as described in section 2). Another question is whether the PR19 revenue forecasting incentive, as a bolt-on to the wholesale controls (see, for example, Figure 5.3), is appropriate for issues beyond a company's control.

5.2 Treatment of different expenditure elements

The above discussion has focused on the core wholesale price controls. However, this is not the only way in which companies earn revenues stemming from growth-related activities and expenditure.

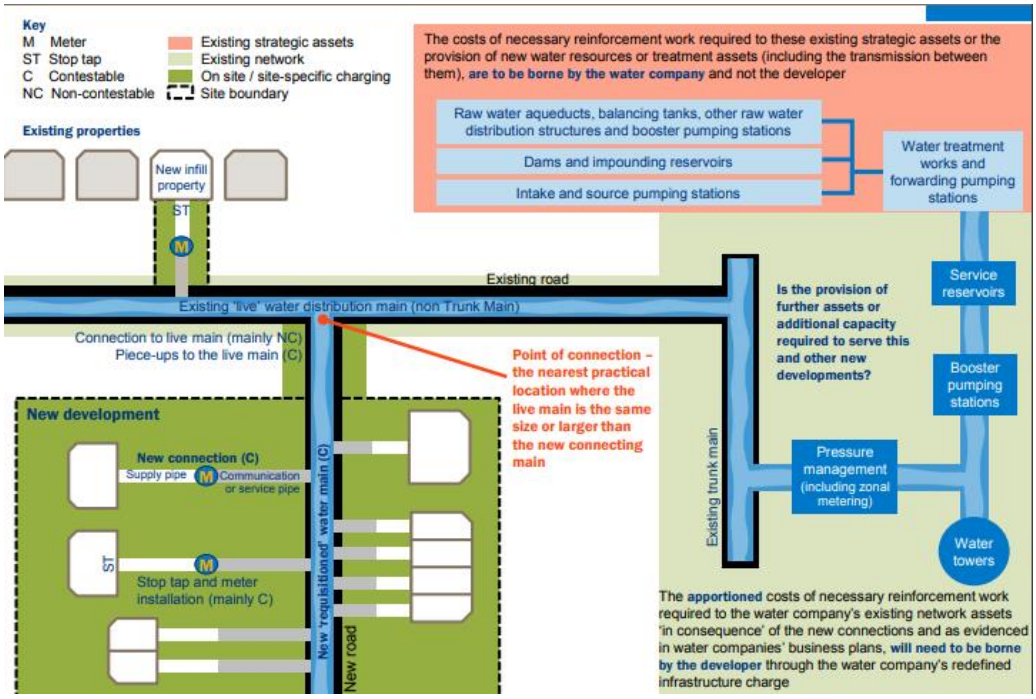
Different elements of growth are recovered through the revenue building blocks in different ways, as follows.

- Building new strategic assets or increasing the capacity of existing strategic assets—recovered through PAYG and non-PAYG additions to the RCV to the extent that it is viewed efficient in the cost assessment.
- Examples of new strategic assets for water include:
  - raw water distribution structures and booster pumping stations;
  - dams and impounding reservoirs;
  - intake and source pumping stations;
  - water treatment works and forwarding pumping stations.
- Examples of new strategic assets for wastewater include:
  - sea outfalls;
  - sewage treatment works;
  - terminal pumping stations.
- In contrast, offsite reinforcement of network assets (for wastewater this relates to sewage pumping stations, combined sewer overflows, storage

tanks and the sewer network) are recovered through infrastructure charges as an additional revenue item.

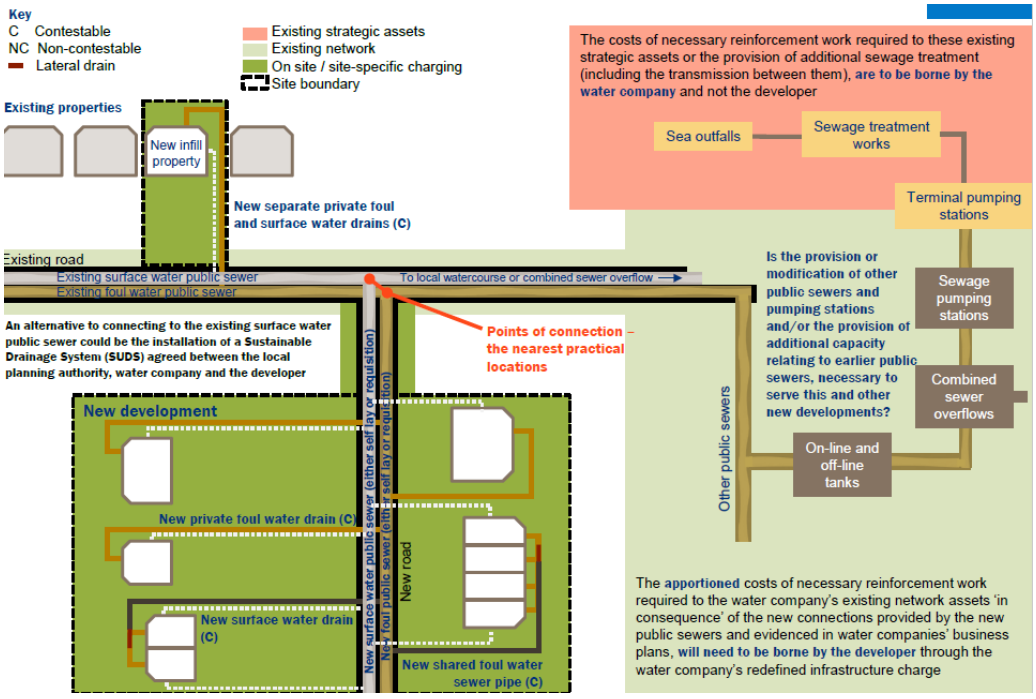
Figures 5.6 and 5.7 provide a graphical representation of these boundaries for different growth works.

Figure 5.6 Boundaries for new water connection charging



Source: Ofwat (2017), 'New connections. Cost Data Straw Man', March.

Figure 5.7 Boundaries for new wastewater connection charging



Source: Ofwat (2017), 'New connections. Cost Data Straw Man', March.

Ofwat has introduced new charging rules for new connections to the water and wastewater network, with these rules coming into effect in April 2018. These rules require companies to set the infrastructure charge to cover all expenditure on offsite network reinforcement (i.e. it is no longer set with reference to the WIA91). Furthermore, the revenues from infrastructure charges must align with the relevant expenditure over a rolling five-year period.[8]

The implication from the above is that (in theory) each company sets the infrastructure charge to recover the expenditure on offsite network reinforcement. Therefore, a key question is whether the cost assessment models sufficiently allow for the increase in capacity at strategic assets (see section 2 above) as driven by new developments. A further important question is whether there are any network reinforcement costs that are not apportioned to the developer.

Water companies receive capital contributions and infrastructure charges from developers connecting to the water network. Our understanding is that capital contributions are treated as follows:

- TOTEX allowance is expressed net of capital contributions and infrastructure charges (i.e. deducted from the TOTEX allowances);
- TOTEX associated with third-party services (e.g. bulk supplies) is added to TOTEX; income is deducted from revenue allowance;
- capital contributions and infrastructure charges are added to allowed revenues only;
- outturn expenditure associated with works is then included in outturn CAPEX (for the purposes of the future assessment of the menu).

The third bullet above means that the cost of new connections is assumed to be recovered through allowed revenues on a pay-as-you-go basis in each year of the AMP.

However, actual capital contributions and infrastructure charges may differ from forecast. In so far as they were added into the total revenue control when prices were set, deviations in these from forecast will necessitate adjustments to outturn prices to maintain the assumed revenue profile.

It is unclear whether this exposes companies in the South East of England to the same degree of profit risk identified in the case of the overall form of wholesale controls discussed in section 5.1 above. This is because the charges are associated with the costs of connection—fewer charges means lower connection costs; a higher number of charges means higher connection costs.

Nonetheless, it will be important to take into account the relationship between connection income, connection costs and overall costs.

[8] See Ofwat (2017), 'New connections charges for the future - England', July.

A1 Unit cost models

A1.1 Water

Table A1.1 PR14 unit cost models for the water service

Ref	Cost item	Explanation	Volume driver	Growth component?
W1	Enhancements to the supply demand balance	Costs to ensure that there is enough water to meet customers' demand for water into the future	Enhancements to the supply demand balance (Ml/d)	✓
W2	Lead reduction	Costs to ensure compliance with the lead standards at customers' taps	Number of lead communication pipes replaced for water quality	×
W3	New developments	Expenditure to connect new customers to the water network	Number of new connections	✓

Source: Oxera assessment, based on Ofwat (2014), 'Basic cost threshold model: Appendix C enhancement modelling', April.

A1.2 Wastewater

Table A1.2 PR14 unit cost models for the sewerage service

Ref	Cost item	Explanation	Volume driver	Growth component?
S1	First time sewerage	Costs to connect properties to sewerage for the first time, where existing arrangements (e.g. septic tank) cause environmental or amenity problems (Section 101A)	Connected properties	✓
S2	Sludge enhancements	Costs of treating and disposing of additional sludge generated because of an increase in population or a tighter consent	Additional sludge produced	✓
S3	Event duration monitoring	Cost of monitoring sewage overflows where this is required by the NEP	Number of sites where monitors are installed	×
S4	Storage at intermittent discharge sites	Cost of providing storage to reduce the number of times untreated sewage is discharged to the environment	Total volume in m^3 of storage installed	×
S5	Groundwater schemes	Cost of improving the treatment of sewage which may affect groundwater	Current population equivalent	×
S6	P removal at filter works	Costs to remove phosphorous to meet a tighter consent	Current population equivalent	×
S7	Reduction in sanitary determinands	Costs to meet a tighter consent	Current population equivalent	×
S8	UV disinfection	Costs to reduce microbiological pollution	Current population equivalent	×
S9	Odour	Costs to reduce odour	Odour related complaints	×
S10	Sewage treatment growth	Costs to provide additional sewage treatment capacity required to serve a growing population	Four year increase in population (2008–12)	✓
S11	Sewer flooding	Costs to reduce the risk of sewer flooding	Number of properties (2013)	×
S12	Private sewers—pipes	Costs to operate and maintain private sewers transferred in 2011	Number of collapses and blockages in private sewers transferred in 2011	×

Source: Oxera assessment, based on Ofwat (2014), 'Basic cost threshold model: Appendix C enhancement modelling', April.