

PR09/08

**TO ALL REGULATORY DIRECTORS OF
WATER AND SEWERAGE COMPANIES
AND WATER ONLY COMPANIES**

19 December 2007

Dear Colleague

**FURTHER OFWAT GUIDANCE ON THE USE OF COST BENEFIT
ANALYSIS FOR PR09**

1. Introduction

In our [PR09 methodology consultation paper](#) we explained how we expected each company to use cost benefit analysis (CBA) as a key tool for planning and making decisions in all areas of business. This letter provides more detail on the approach we expect companies to adopt.

Each company must submit, by 11 August 2008, a draft business plan developing the business strategy set out in its strategic direction statement for the five-year period 2010-15. Each company must produce a draft business plan that:

- is consistent with its strategic direction statement;
- is owned by the company;
- puts in place a package of outputs which will deliver specified statutory and other defined outcomes;
- is in line with consumer priorities for service levels and bills; and
- optimises and exposes the costs and benefits of the plan at the overall and component level.

We propose that each company should conduct CBA on all components of its investment programme, irrespective of their cost-drivers. This will:

- ensure transparency to consumers by showing the benefits alongside the costs of the investment that they will have to pay for;
- ensure solutions to all requirements are compared to the benefits so that if necessary the design of solutions can be challenged and reviewed; and
- enable each company to set its own effective priorities.

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Fiona Pethick, Director of Corporate Affairs

Direct line: 0121 625 1344 Fax: 0121 625 1346

e-mail: fiona.pethick@ofwat.gsi.gov.uk Website: www.ofwat.gov.uk

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1.1 Using cost benefit analysis

The use of CBA to inform the construction of each company's business plan is vital for ensuring transparency of investment proposals to consumers. A company can use a CBA developed plan to explain its investment decisions to its consumers, regulators and other stakeholders and demonstrate that its business plan maximises the benefits relative to the costs. Full justification and understanding will increase the likelihood that consumers will be willing to pay in the future for further improvements.

The use of CBA will allow a company to investigate all costs and all benefits, including impacts on society and the environment. However, it is important to ensure that the decisive factor in company decision making is the effect of societal and environmental impacts on water consumers. Therefore, it is important that a company considers where the costs and benefits lie and incorporates this into its proposals.

2 Business plans

2.1 Cost benefit analysis in the draft business plan

Each company must follow a two-step process to undertake the appraisal of its investment proposals as it builds a coherent and economically efficient draft business plan. It must:

- (i) use least cost planning to identify the most efficient mix of inputs to produce different levels of output/service provision (i.e. the supply curve). This supply curve represents the mix of inputs that minimises the cost of producing each level of output i.e. “productive efficiency”; and
- (ii) use CBA to determine the economic level of output/service provision i.e. identify the point of “allocative efficiency”.

Where a company cannot produce a single draft business plan that optimises the costs and benefits of the plan at overall and component level, we invite it to put forward an additional draft business plan, in parallel, which incorporates

alternative proposals that better meet consumers' valuations. This could be through a more flexible interpretation of outputs and timing of delivery, by contributing to outcomes in an innovative way or by taking more account of consumers' concerns. If a company is unsure whether its plan meets the required criteria we will discuss with them whether it will be appropriate to submit an additional plan.

The information requirements for an additional plan will be the same as for the primary draft business plan. However, the alternative proposals will need to demonstrate how they improve the benefits relative to the costs and are more in line with consumers' preferences.

The submission of an additional business plan may contribute to a better understanding of consumers' views regarding issues where there are concerns over their possible inclusion in the plan. Additional plans will enable further research, such as stage three of the joint stakeholder research (see section 3.2.4), to better explore these issues and will help inform the nature of questions to be included in these surveys.

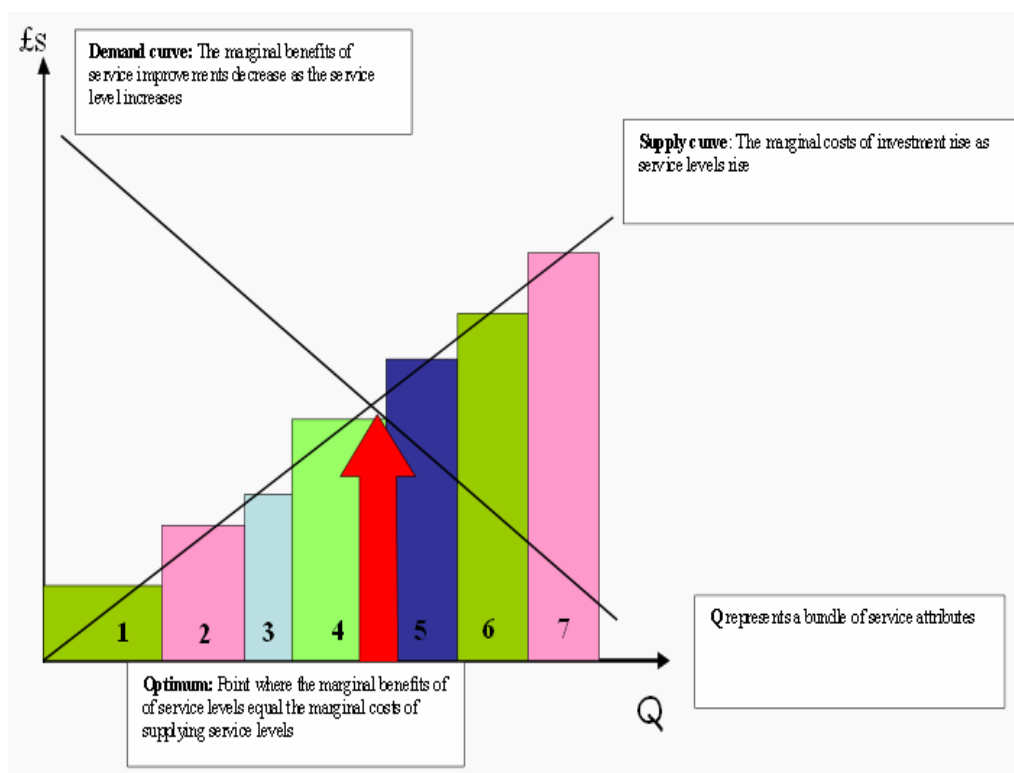
2.2 Developing the business plan

To develop its draft business plan, we expect a company to carry out 'top-down' and 'bottom-up' appraisals:

(i) 'Top-down' approach

It is essential that the top-level strategic plan clearly represents the optimal level of investment, i.e. where the surplus of benefits is maximised over costs, showing that the plan reflects consumers' preferences/willingness to pay (WTP). To do this, each company must demonstrate that its business plan incorporates investment up to the level where marginal benefits equal marginal costs, but not beyond. Each company needs to build up a set of schemes that increase the marginal benefits above the increase in the associated marginal costs to meet this optimal level (see figure 1).

Figure 1: Optimisation of benefits to consumers¹



It is likely that companies will derive much of the information used in this analysis from their own surveys of its consumers' preferences across a range of issues. They may supplement this with information from stages one and two of the joint stakeholder research.

(ii) 'Bottom-up' approach

Each company will also need to carry out analysis and justification at the component (either sub-programme or project) level. To demonstrate that the strategic plan is optimal a company must show that the components of its investment programme are required to deliver this level of output/service provision. For small individual schemes it may not be necessary to demonstrate the benefits of each, although it is important to show how these schemes form sub-programmes that deliver the optimal level of service provision. The overall benefits of sub-programmes do, therefore, need to be demonstrated alongside the associated costs.

To build its plan and deliver optimal outputs a company will need to include these small individual schemes delivering simple outputs as well as multi-driver projects where the benefits range across a number of service areas. This will allow the company to combine the relevant costs and benefits, thus building up its integrated programme. The smaller individual projects may need a ranking system to show which ones deliver maximum benefits up to the point where the marginal benefits equal the marginal costs. Companies must individually justify larger projects, such as those that make up a significant part of a sub-programme or deliver benefits across different sub-programmes, to demonstrate that they are worthwhile. Each company will need to demonstrate this to consumers and other stakeholders.

Where a company can quantify the benefits of a whole programme and its individual components and can show these are maximised relative to costs, there should be few issues. However, there may be cases where a company wishes to include schemes where the costs exceed the benefits and are not in line with consumer's preferences. If this is the case, the company must explain why it has included these schemes.

2.3 The interface between top-down and bottom-up

If the consumer survey work and subsequent analysis are performed correctly the top-down and bottom-up appraisals should give the same outcomes. However, care should be taken where schemes have impacts that overlap with other proposed schemes. It is possible that the benefits of a scheme could be shown to exceed the costs when assessed individually against the current situation, but not when included in the strategic plan. Therefore it is important that the benefits of a scheme are assessed relative to the impact of other schemes that will be included in the plan i.e. companies should be assessing the marginal impacts of schemes.

2.4 Base service outcomes – maintaining service

Each company has choices to make in deciding how to maintain their assets and ability to deliver service in line with consumers' priorities. This is reflected in the cost benefit approach to the capital maintenance planning common framework. Many aspects of investment to maintain service will lend themselves to a top-down style approach. Here companies will need to

demonstrate that they have identified an optimal set of investments to deliver the economically efficient level of service, taking account where relevant of wider social and economic impacts including carbon impacts.

However, for some aspects of base service, for example where the company is proposing a material change in strategy, or where it is proposing a change focused on a particular service metric or asset group, a more bottom-up approach to cost benefit analysis may be appropriate. A company may make a case for changes to serviceability reference levels (based on past performance) for individual indicators (e.g. the number of mains bursts) using CBA. This would mean justifying a change up or down to the reference level for an indicator, balancing cost impacts based on CBA taking account of the value placed by consumers on relevant service attributes, and any associated social and environmental impacts.

Where a company proposes a downward change to a reference level for an individual serviceability indicator we will require compelling evidence that the associated level of service is economically efficient over the long- as well as the short-term. The company needs to demonstrate how the proposed changes in costs and service from current base service align with consumers' valuations.

2.5 Additional guidance

We do not wish to be overly prescriptive in explaining how a company should perform its CBA. However, since PR04 the range of relevant literature has increased and we set out some useful references in Annex A.

3 Assessing the impact of investment

For a company to compare the costs and benefits of proposals in monetary terms it is essential that it uses expert technical, engineering and scientific assessments to estimate the actual impacts of its investment proposals. Without quantification of the impacts, it is not possible to estimate accurate monetary values.

When submitting its analysis a company should show the impacts of its investment plan alongside the associated monetary valuations. The plan must show how the impacts were quantified as well as setting out any benefits

assessment work demonstrating how these impacts were converted into monetary values.

Each company's CBA should consider all costs and all benefits regardless of whom they affect. This will determine the true impact it has on consumers, the environment and society as a whole. However, each company needs to identify whether proposed improvements are in-line with its consumers' preferences, or society as a whole. Distributional impacts around the costs and benefits should be factored into a company's proposals, or it should highlight these issues to inform final decisions. This could arise when the benefits accrue to the environment or where they accrue to people outside the region.

Each company must also ensure they consider both financial and non-financial impacts. Financial impacts should be valued as the impact of investment proposals on customers' bills. Non-financial impacts are valued as those perceived by consumers or those quantified as the effects of environmental and social impacts on consumers. Non-financial impacts could include positive impacts, such as improved river quality, or negative impacts, such as the shadow price of carbon.

3.1 Costs

Each company must continue to demonstrate that all investment proposals are the least-cost methods of delivering the optimal balance of inputs and outputs. As at previous price reviews it is vital that a company is innovative in driving down costs.

A company must estimate cost drivers as explained in section C5 of [Ofwat's business plan reporting requirements](#). It is important that financial costs are linked to the impact on customers. Each company has the financial model Aquarius 3 which will allow them to assess the capex and opex implications of schemes as annual impacts on customers' bills. It should explain the economic and financial assumptions it has used (including the cost of capital). These should be consistent with the assumptions used throughout the business plan.

3.1.1 Sustainability and climate change

We expect each company to assess social and environmental costs in a similar manner to its assessment of benefits. There is a need to understand the impact on greenhouse gas emissions of planned investment programmes to deliver environmental or service improvement (see below). Issues such as traffic disruption and noise pollution should also be assessed to ensure all non-financial costs are considered. To measure these impacts a company should use similar techniques to those described in section 3.2. Each company must consider these over the long-term to take full account of sustainability issues.

3.1.2 Greenhouse gases

To address climate change issues we are encouraging companies to propose innovative solutions to mitigate their carbon footprint and emissions of other greenhouse gas, such as methane and nitrous oxide. We want each company to estimate and use the carbon dioxide equivalent (CO₂e) of its investment options in its CBA work. This will allow the company to balance local (quality) and global (carbon) issues, ensuring the potential total impact on society and the environment is transparent, which is vital for decisions relating to sustainable development.

Measuring the impact of CO₂e is a 2-step process. Firstly, a company must estimate the CO₂e of building, operating and maintaining its assets. This includes the conversion of both carbon and other greenhouse gas emissions into their CO₂e. We recommend the use of established literature, such as UKWIR's "Workbook for quantifying greenhouse gas emissions" (and its 2007 update 'Carbon Accounting Methodology') to estimate the CO₂e of proposals. These estimates can then be converted into monetary valuations. To do this, we recommend that companies follow the methodology set out in Defra's "How to use the Shadow Price of Carbon in policy appraisal".

Because there is rapid progress on how to measure and value CO₂e, it is important that each company ensures its model(s) can adapt to take into account any necessary changes to the CO₂e values that may come about from further research in this field. Using Defra's methodology should allow the company to update easily its analysis if necessary.

3.2 Benefits

Once a company has measured the actual benefits of its investment proposals it must then convert them to monetary valuations for direct comparison with the costs. We recommend reference to the recent UKWIR reports for generic technical guidance for valuing benefits.

It is important that a company does not double count benefits by attributing them to both the company and consumers. Effects that are a direct transfer from the company to customers, such as GSS payments for service failures, should not be included. A company must also ensure that impacts are not factored into consumers' stated preference valuations as well as being quantified as social impacts. It is important that a company considers this when designing and applying its consumer surveys or when deciding upon the social or environmental impacts to be quantified.

3.2.1 Benefit assessment techniques

To obtain benefit estimates we expect a company to measure consumers' willingness to pay (WTP). There are three general techniques that could potentially be used for the valuation of benefits for PR09, which are all described in greater detail in the generic ICF report. Because there are limitations with the use of each method we expect companies to use a combination of approaches to reach the optimum conclusion.

- **Revealed preferences**

Revealed preferences are usually the preferred option for obtaining consumers' valuations as they are based on actual behaviour. The monopolistic nature of the water industry means that there is little scope for the use of these techniques when performing benefits assessments. While there is some potential for the use of these to value some environmental or social benefits a company would need to clearly justify the use of the revealed preference approach.

- **Stated preferences**

Stated preference surveys are probably the most appropriate approach to estimating consumer valuations for the majority of service areas. However, choices consumers are given should be set in the context of other pressure on water bills as well as the overall demands on

consumers' budgets. The surveys should clearly set out what current levels of service for each attribute are and how these could improve/deteriorate for a given change in price. The surveys must also include some mechanism for checking people fully appreciate the overall bill changes implied by their choices and ensure they are not selecting each improvement/deterioration in isolation.

- **Benefits transfer**

Benefits transfer techniques are attractive options for benefits assessment as they offer the cheapest form of eliciting valuations. Companies could use this method to place consumers' valuations on environmental or social impacts, using generally accepted figures, such as the shadow price of carbon. Alternatively, it could be used to transfer consumers' valuations from one study site to another.

Where a company wishes to transfer the results from another benefits assessment to use in its analysis it must not only show that the first study was reliable but also that the results are relevant for the new site. This is especially important if a company wishes to transfer consumers' valuations from one site to another.

3.2.2 Individual benefits surveys

It is obviously not practical to perform original benefits surveys for each project, thus we expect a top-level survey to value the benefits of the majority of schemes. However, where schemes are so large that the physical benefits would be outside the range covered by the benefits survey, they will need their own separate study.

3.2.3 Segmentation

When collating the benefit valuations it is important that the results are robust and representative of the relevant population demonstrating segmentation of results, for example socio-economic groups as well as examining metering and regional issues. Where views from a particular group are lacking, a company may wish to boost samples from this group to understand its views.

3.2.4 Joint stakeholder research

To supplement research carried out by the companies separately, CCWater are coordinating collaborative joint stakeholder research. Stages 1 and 2 are qualitative/deliberative stages to ascertain consumers' views but without eliciting quantitative valuations on their preferences. Once draft business plans have been submitted, Ofwat will coordinate Stage 3, looking at consumers' views on the value and affordability of proposed investment strategies. This information will then be available for companies to use to determine their final business plan, along with views from other stakeholders.

3.3 Analysis

We expect the results to be set out clearly following the guidelines above regarding the performance of CBA at both strategic and component levels. Each company needs to explain and justify the entire business plan investment proposal.

3.3.1 Decision rules

The basic decision rule for CBA is that the net present value (NPV) of investment should be positive (or strictly non-negative). However, this rule must be used appropriately dependent on the level of the analysis it is being applied to:

- At individual scheme level the rule follows the basic principle that the NPV of investment is positive
- At strategic level the rule applies at the margin i.e. invest up to the point where the NPV of the marginal investment is greater than or equal to zero.

However, CBA should not be used mechanistically (i.e. including all schemes with positive NPV and excluding all those with negative). There will be many schemes that are around the margin and a company should consider whether or not to include these in its investment proposals using all available evidence and form decisions accordingly.

For substantial investments we will expect companies to have examined the sensitivity of cost benefit assessments to key parameters, particularly where there is uncertainty around valuations (see 3.3.3 below).

3.3.2 Discounting

Each company must take account of the difference between the values placed upon current impacts and those occurring in the future. Different discounting techniques should be used dependent on whether the impact is financial or non-financial. This is to ensure there is a direct comparison of the effects on consumers.

Financial impacts over the longer-term should be discounted using a two-step technique to ensure they are converted into the effect they have on consumers. Firstly, financial monetary streams should be converted into equivalent annualised values (EAVs) by converting the financial impacts of building, maintaining and operating the company's assets into the annualised impacts on customers' bills using its cost of capital (see section 3.1). The annualised impacts on customers' bills should then be discounted at the social time preference rate (STPR), as set out in [HMT Green Book](#).

Future values of non-financial impacts require a one-step discounting technique. These impacts, whether positive or negative, should be discounted at the STPR to convert them from the date they accrue into present values.

3.3.3 Uncertainty

Uncertainty is inevitable when valuing benefits and drawing up cost estimates. It is therefore necessary that a company takes account of this when forming decisions around the schemes that will be included in its proposals. For example, a company's analysis may show the expected value of benefits of a scheme to exceed the expected cost estimates. However, the uncertainty surrounding it could be so great that the company may decide that it should not be included at this time.

Although the long-term approach will help a company deliver the optimal strategy, it must recognise that this increases the uncertainty within the analysis. It is important that the company manages this and demonstrates how it has dealt with the development of the long-term approach.

ICF's generic guidance (see Annex A) gives examples of established techniques for dealing with uncertainty, such as sensitivity analysis, and we expect a company to make use of these. However, there are no definitive rules on how to use the information derived. It is for the company to decide how it treats this uncertainty and ensure it is incorporated into its decision making, especially when the expected values of potential investments are around the margin.

4 Scrutiny of business plans

It is important that a company justifies its business plan with significant supporting information so that it stands up to scrutiny from stakeholders and is transparent to its consumers. With every CBA there will be assumptions made when producing values for costs and/or benefits. It is necessary that each company includes a description of these assumptions with the reasoning behind them.

4.1 Peer and academic review

The methodology used by a company for performing its economic analysis must be reviewed by academic or other experts to ascertain the accuracy and robustness of the work. These reviewers should have substantial experience of CBA, enabling them to pass judgement on the robustness and suitability of the economic analysis and the conclusions drawn from it.

Each company will need to demonstrate that its work has been performed consistently across its whole business plan, for example, using similar assumptions. The use of CBA alongside other tools and methodologies should also be demonstrated as well as showing how the company has considered all available evidence in its decision making.

Each company needs to demonstrate how it has addressed the uncertainty present in its CBA. This includes the uncertainty around cost estimates, consumers' valuations and the actual impacts of schemes, as well as the increasing uncertainty due to the long-term analysis horizon.

4.2 Ofwat challenge

Ofwat will continue to challenge company proposals. We will still perform cost comparisons to ensure each company is driving down costs in its least-cost planning. We will also review benefits assessments, taking account of the potential for regional differences in consumers' preferences.

Where a company presents a business plan that is based on poor CBA results or has CBA results that are out of line with industry results in the same area, we may ask companies to undertake more work on the CBA, or the reporter to investigate further.

5 Conclusion

In our PR09 methodology paper we explained our proposals for the use of CBA as the key business planning tool for companies in the price review. We had seen CBA used to good effect in PR04 and we believe that its widespread use now will lead to real benefits for all stakeholders. We have held workshops to develop and pass on guidance on the use of CBA. This letter has set out additional guidance for companies as they undertake the business planning process and consider responses to our methodology consultation.

Fiona Pethick
Director of Corporate Affairs

Annex A – Additional sources of CBA guidance

In this annex we set out sources of relevant guidance on using CBA.

Generic guidance

For more generic guidance we recommended the following recent UKWIR publications regarding CBA:

- *The role and application of cost benefit analysis: Generic guidance*, ICF International for UKWIR (2007);
- *Sewer flooding CBA*, ICF International for UKWIR (2007)
- *Environmental benefits assessment*, Ken Willis for UKWIR, 2004;
- [Lessons from recent assessments of benefits of water service improvements](#), Vivid Economics for Ofwat and UKWIR, (2007).

These documents provide extensive guidance regarding the application of CBA. They highlight the need to understand the implications of investment decisions and that CBA is a vital tool for achieving this. They also show the development of benefits assessment techniques since PR04 and the uncertainties and issues that still prevail.

ICF's sewer flooding CBA paper gives an example of the application of CBA to a water industry related issue. This is a detailed example of how CBA can be performed and is especially relevant where CBA is being performed at sub-programme level or to address an individual issue. This report also highlights many potential problems that can occur when CBA is performed for a single issue. We therefore highlight the need for referring to this document when performing "single-issue" CBA.

Specific guidance

There are further documents that we recommend for more specific issues. When valuing the effects of investment strategies on greenhouse gas emissions we advise the use of the first two of the following documents as a starting point for assessing the actual impact of the schemes along with their CO₂e and the final document for converting impacts into monetary valuations.

- *Workbook for quantifying greenhouse gas emissions*, WRc plc for UKWIR, (2005);

- *Guidelines to Defra's GHG conversion factors for company reporting*, Defra, (2007)¹;
- [*How to use the shadow price of carbon in policy appraisal*](#), Defra, (2007).

Where a company decides not to follow the advice set out in these documents they must clearly show their reasons for doing this and demonstrate that their analysis is valid.

¹ <http://www.defra.gov.uk/environment/business/envrp/pdf/conversion-factors.pdf>