



# Improving willingness-to-pay research in the water sector

Final Report by ICF Consulting Services Limited

07 July 2017

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# Improving willingness-to-pay research in the water sector

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A report submitted by [ICF Consulting Limited](#)  
in association with

[Economics for the Environment Consultancy \(eftec\)](#)

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## Executive summary

CCWater commissioned ICF in association with Economics for the Environment Consultancy (eftec), to examine how stated-preference (SP) and revealed-preference (RP) techniques can be used alongside other research methods to improve Willingness-To-Pay (WTP) evidence in the water sector. Water companies are increasingly recognising the potential to improve WTP research and the way they use it in business planning. This study aims to support water companies in their efforts to do so.

### Objectives

This study aims to:

- support CCWater's objective to help water companies improve their understanding of customers' preferences and build these into their business planning;
- identify how water companies can use SP and RP research to understand how much customers value different aspects of service; and
- examine how the resulting estimates are used and how they can be applied in an appropriate way.

Within this, the study highlights how water companies can respond to general and sector-specific issues they face when using customer valuations, such as inter-generational preferences, the application of customer valuations to outcome delivery incentives, treatment of inflation and accommodating customer diversity.

To meet these objectives, the report presents recommendations on the use and application of customer research, for debate across the sector in the context of other important considerations for water companies' business planning. It also draws conclusions on the specific research objectives set out by CCWater.

### Approaches to valuing customer preferences

WTP is simply a measure of the (economic) value of goods and services, whether traded in competitive markets, provided without markets, or in a regulated market. The water sector in England and Wales is a series of regulated regional monopolies and in this context, WTP research in the sector seeks to estimate the economic value that customers give to aspects of water and wastewater services.

Water companies use customer valuations to understand the benefits of investments that improve or maintain service levels. WTP valuations feed into 'Cost-Benefit Analysis' (CBA). This integral part of companies' business-planning processes helps water companies to prioritise investment across the range of services they provide (e.g. wholesale, retail; water, wastewater).

A hierarchy of valuation approaches can, in principle, be applied to estimate WTP:

1. Actual market choices: the observation of actual market choices in a competitive market; this is generally the best way to observe the economic value of a product or service. But prices do not reflect the full economic value of goods (sometimes people might be willing to pay more than they had to). And in the water sector customers have little real choice, so the price they pay is less revealing of their true preferences.
2. Revealed Preference: again this reflects consumers' actual market choices, though it concerns choices about other goods purchased either as a substitute or complement to water services (such as bottled water).

3. Stated Preference: when these two methods are impractical (because there are few or no goods/services whose consumption is related to the one being examined, or insufficient data are available) companies can ask customers about their values via SP research, which in principle is third in the hierarchy.

In practice, there are few opportunities for water companies to observe market choices that reveal the customer valuations that matter for their business planning. This report examines opportunities for water companies to use RP, whilst recognising the practical limitations. The application of RP methods is limited to situations where market prices are available for goods that are related to the service outcome for which water companies wish to estimate value. For water services, there are few goods that match all (or some) dimensions of water services that water companies wish to value in their business planning. Those that do exist can be hard to compare, practically speaking. This study outlines which water sector service attributes may offer greatest potential for RP research.

Consequently, water companies have tended to use more SP than RP research to inform their estimates of how much customers value water and sewerage services.

## Current context for valuations in the water sector

The sector is currently preparing for the next periodic review; PR19. At the time of writing, Ofwat was due to publish its methodology for the periodic review on 11<sup>th</sup> July 2017. Water companies will be required to submit their business plans in the summer of 2018, beginning the process of determinations that culminates in Ofwat setting final determinations by the end of 2019. Ofwat has stated that it will take a different approach in PR19, based on greater scrutiny of WTP evidence.

Some water companies have already begun conducting their initial customer valuation research, which will be refined, updated and added to leading up to the submission of their business plans in 2018. Nonetheless, this report aims to help support that refinement or to help companies that have not yet specified their research, in conjunction with Ofwat's PR19 methodology statement.

## Research approach

This study looked at examples of WTP research in the water sector and in other sectors with a similar regulatory context. The study consisted of three stages: desk research, interviews with key stakeholders and analysis of this evidence base.

At the first stage, a long-list of sources was prioritised according to a set of criteria for relevance to the characteristics of the water sector and the application of customer research in business planning. At the second stage, interviews were conducted with 17 stakeholders, including four regulators, nine water companies and four Customer Challenge Groups (CCGs).

WTP research is not new in the water sector, nor more generally. Consequently, existing good practice guidelines describe detailed methodological approaches that can be used to address the various challenges associated with carrying out SP and RP research. This study does not seek to reproduce those detailed technical methodologies, but to identify specific challenges that water companies face when carrying out WTP research and explain in practical terms how water companies can approach and specify their analysis to meet those challenges (many of which are common across other sectors or even across consumer research more broadly).

## Recommendations

This report identifies a number of recommendations that water companies could follow in SP research to improve the quality of customer valuations. These focus on ensuring that customer evidence gathering takes a strategic approach that selects methods according to the specific needs of business planning, determined at the outset before the research is conducted. This can involve using a variety of types of research and research methods and engaging stakeholders in the design of research throughout the process. To make sure that water customers participating in research understand what they are being asked, water companies need to prioritise the service attributes that they wish to include in SP research, based on how important they are for business planning.

While each piece of research therefore needs to explore what methods and materials are most appropriate to its specific objectives, validity testing always plays a vital role. That is, testing and refining survey questions and materials to ensure that respondents fully understand what is being asked and to maximise the robustness of responses.

Water companies should consider the full range of SP and RP methods when planning their long-term research programmes. Doing so from the outset can help maximise the complementarity of different approaches, as an integral part of designing an evidence-gathering strategy. For example, surveys can be designed to collect SP and RP information targeted at the same attributes. Reviewing and identifying what can be gathered via RP methods could help companies to prioritise areas where SP research is most valuable to their business planning. This report provides a starting point for potential methods.

This report also highlights innovations in carrying out WTP research (and SP research more specifically). For example, it describes innovations such as using SP and RP together in one survey to generate a wider evidence base within individual studies, and innovations applied to materials used in surveys and the way they are shown to customers.

This study also identified findings in relation to several research objectives specified by CCWater. These questions are set out below, alongside findings from this study.

**Research objective 1: Examine the limitations of stated preference surveys in collecting evidence of customers' priorities for service delivery and the price they are willing to pay. This includes looking at limitations in the extent to which customers can engage with the research to give informed views, and how valid the results are for use in business planning.**

Although SP research has limitations and people are subject to known biases when asked for their views, it is a valid and important tool for water companies to use to inform their business planning. This study considers several specific limitations of SP research in the water sector. It identifies good practice guidelines that can help water companies to mitigate these limitations. For example, water companies can improve the validity of results by prioritising research into consumers' views on the most important water service attributes, reducing the cognitive load that respondents must cope with. All people are subject to biases when reporting their views, but this report describes how best practice can ensure these are minimised, or their effect on the validity of results communicated. Combining SP research with other methodologies and sources can also help companies to prioritise SP research on those areas that have greatest impact on their business planning. Additionally, water companies should ensure that the SP methodologies they use account for the full range of possible biases that SP research can introduce. The nature of SP research in the water sector means that challenges will remain in terms of engaging water customers. There may always be some customers who struggle to engage fully, but best-practice approaches to designing and testing materials, and to validating results mean that the impact on the validity of estimates can and should be identified and communicated clearly in all such research.

**Research objective 2: To what extent WTP using stated preference, revealed preference, or other suitable customer research and engagement techniques can be used to identify the**



**right balance or trade-off between short-term and long-term prices and service improvements (intergenerational equity).**

This study found no evidence to suggest that SP research should not, in principle, be used to examine WTP for short-term and long-term outcomes. These outcomes can be challenging to communicate (as with others relevant to water companies), but it is not appropriate to make generalised conclusions on how effective SP research can be, because the validity of each SP study depends on many individual aspects of the study. If water companies apply best practice approaches to developing surveys, appropriate survey testing will uncover whether customers understand the questions being asked and validity testing should establish whether the results of each study are reliable. SP research should therefore not be discounted from providing valuable contributions to trade-offs between the short-term and the long-term, particularly when considered alongside other wider criteria in companies' investment decisions. Nonetheless, this emphasises the need for SP studies of these trade-offs to clearly explain how trade-offs have been communicated and how the validity of results has been tested and demonstrated (as indicated by good practice guidance). Furthermore, people tend to prioritise short-term outcomes over the long-term (which in the water sector can mean prioritising bills today over future investment). This effect must be understood, but is not a bias to be 'corrected' – but a preference that people tend to express. It is therefore important that SP analysis of such trade-offs is complemented by evidence of other considerations that should reasonably influence companies' investment plans (regulatory, legal, health and safety etc.).

**Research objective 3: Identify how stated preference and other approaches to WTP (including revealed preference) can work together to provide valid inputs for CBA in the water industry periodic review context.**

Water companies recognise the need to use multiple methodologies to estimate WTP. SP and RP research approaches each have strengths and weaknesses. For example, there are limits to how many attributes can be tested in one SP survey, but it generates data that otherwise may not be available. RP can be used to value outcomes that have not been previously available to customers to purchase/consumer, but data can be difficult to obtain in sufficient depth and coverage.

Therefore, practically it can be helpful to combine research methods, which can include carrying out multiple methods to generate customer research, or it can even include asking SP and RP questions within one survey, for example. In practical terms, considering SP and RP methods allows different research to be designed to be complementary. If water companies are commissioning their research, they may consider less prescriptive specifications that leave methods open, to encourage innovation. This also emphasises the need for research to be planned in the early stages of the periodic review process, which is consistent with good practice advice to clearly scope how research will inform the evidence base for decisions. Furthermore, a clear decision framework for choosing methods can help to ensure all options are considered and to explain the rationale for the combination of methods chosen.

The appropriate balance between SP and RP methods (or others) will depend on the specific characteristics that water companies aim to value and the specifics of the water customers they seek to engage in research. SP research will therefore remain an important tool for water companies looking ahead to PR19.

**Research objective 4: Identify how to conduct revealed preference research in the context of a monopoly industry.**

RP research has a role despite the water sector being a regulated monopoly, although the direct application of RP methods in the water sector to some types of water service attributes is constrained by the forward looking nature of planning and investment in future service levels. Some of the substitutes and complements for water and wastewater services are

provided in competitive markets that do reveal customer behaviour and values. Where data are available, RP research can therefore supplement SP research. There are some limitations to what RP can be used for. Specifically, since RP methods are based on observed behaviour, they can only be used to estimate the value of goods or levels of service/quality that are currently experienced or have previously been available. It is important to demonstrate the relevance and equivalence of such estimates when applying such estimates to future service levels. This does not preclude applying estimates derived from RP methods to future changes that water companies seek to make. In this context, this study provides a starting point for RP analysis across a number of attributes of water and wastewater services. More detail on this can be found elsewhere in the existing literature (see main body of this report).

**Research objective 5: Explore the issues of presenting inflationary bill changes to customers within WTP research, and whether/how these could be overcome.**

WTP research involves asking respondents about costs, usually presented as bill changes. This requires a decision to be made about whether or how to present inflation in such research. Generally this can be simplified to presenting survey materials and questions in real terms (or 'today's prices'). Materials presented to respondents should remind them of the budgetary constraints that they need to consider when answering questions. At times when household incomes and inflation in bills (water, wastewater and other bills) are not widely divergent, there is little reason to present inflation when estimating WTP. Indeed, doing so can reduce respondents' cognitive capacity to consider questions about their WTP. This emphasises the need to examine the balance of these factors for specific customer groups being targeted in each study. This decision depends on the specifics of the survey and budget constraints of respondents, but should always be transparently considered and explained in research methods.

**Research objective 6: Explore the issues of using WTP research to identify customer preferences for Outcome Delivery Incentives (ODIs) and whether/how these could be overcome.**

The suitability of WTP valuations for informing Outcome Delivery Incentives (ODIs) is as yet not well established. Concerns were raised about how this was done for PR14 because WTP estimates that were framed with reference to customer bills were subsequently used to set water companies' financial incentives (a different question). Further testing is needed on the validity of using SP-based WTP estimates for ODIs, and the circumstances/methods under which WTP estimates can be applied to ODIs. In any such study, the effect of framing WTP questions differently would need to be tested and communicated clearly in results. In general terms, the use of SP research to estimate customer valuations, when applied to ODIs, emphasises the need for that research to establish genuine preferences for ODIs and to demonstrate that survey designs, analysis and results are valid in their own right, based on good practice protocols for validity testing. More specifically, water companies should consider and research whether the framing of the research matters, before applying WTP valuations to ODIs. The key distinction that requires testing is whether customer valuations vary according to whether they are being asked to value financial incentives for water companies or bill payments. Finally, good practice would dictate that the accuracy for WTP estimates should match the scale of consequences associated with its use. Setting financial rewards and penalties directly should therefore require WTP estimates to have greater accuracy and levels of assurance than using WTP estimates as one component of cost-benefit analysis, in which the magnitude of costs and benefits of different options is compared.

**Research objective 7: Make recommendations for how survey and show-card materials could be presented to customers so that they can engage with the subject matter, and give meaningful responses.**

A variety of materials could be used to improve respondents' engagement in WTP research. The literature also demonstrates that visual cues can play a vital role in helping respondents understand questions. But there is no single best way to present materials, as this depends on the questions and respondents being asked. Contextual information can help respondents understand what they are being asked, as can individually adapted questions. Comparative information may help, but current research for the water sector is not conclusive. This could therefore be explored further with additional research. The influence of comparative information may depend on factors specific to individual studies. Testing for such effects could therefore be incorporated into the design phase of WTP research. In all cases, innovative and well-established material must be validity tested for each piece of research, with the goal of using as little information as possible to inform respondents fully about the questions being asked and the things they must consider when answering.

For practitioners, this study also identified a range of specific practical recommendations in relation to each of the following aspects of carrying out customer research and SP research, set out in Section 6.2.

# 1 Introduction

The Consumer Council for Water (CCWater) commissioned ICF to research how stated preference (SP) research and other consumer engagement approaches, such as revealed preference (RP) methods, can work together to provide robust and insightful inputs for water companies' business plans in the water industry periodic review context. This section presents the background to the study and its objectives. It provides a description of the methodology adopted to conduct this study and sets out the structure of this report.

## 1.1 Background to this work

PR14 represented a step change in fostering deeper and stronger customer engagement in companies' planning for the future. Companies increased the amount and quality of evidence on customer preferences to justify their five year business plans.

Water companies gather evidence of customer preferences in many ways to inform their strategic business planning (alongside other regulatory, financial and affordability considerations). CCWater has stated that its priorities for future price setting are to make sure that "customers' views and willingness to pay are at the heart of the price setting process", to ensure that prices, investment and services reflect what customers expect to receive from companies, the acceptability of water company investment proposals and their willingness to pay.<sup>1</sup> Ofwat has emphasised the importance of water companies "understanding what their customers want, and of customers having trust and confidence that this will be reflected in the decisions that companies take on an ongoing basis"<sup>2</sup>, given their position as regulated monopolies. In the context of the UK water industry 2014 periodic review (PR14), water companies were largely reliant on SP studies to estimate customer values for changes in service levels by surveying household and business consumers, to examine their views and preferences on service levels, and to estimate a collective value for a particular aspect of service.

Today, stakeholders across the sector increasingly recognise that water companies have significant scope to improve customer engagement and research, including the application of SP and RP methods.

After PR14, Ofwat highlighted large discrepancies between the WTP values that water companies used in PR14 business plans, based on customer research.<sup>3</sup> This comparison of aggregate values highlighted the need to control for a wide variety of variables that differ across companies' research.

Ofwat concluded that WTP values should be validated further and called for water companies to supplement SP with a wider set of methods for estimating the value that customers place on certain outcomes, including RP methods.<sup>4</sup> The emerging consensus across the sector is that water companies should test WTP estimates for validity and cross-check these estimates against other evidence sources as an

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<sup>1</sup> CCWater website <https://www.cewater.org.uk/priorities/your-priorities/2019-price-review/pr14/futurepricesettingccwatersviews/> accessed 5 June 2017.

<sup>2</sup> Ofwat (October 2015), *Towards Water2020 – policy issues: customer engagement and outcomes*, accessed 13 December at: [http://www.ofwat.gov.uk/wp-content/uploads/2015/10/pap\\_tec201507engagement.pdf](http://www.ofwat.gov.uk/wp-content/uploads/2015/10/pap_tec201507engagement.pdf), p.2.

<sup>3</sup> Ofwat (October 2015). Ibid.

<sup>4</sup> Loc cit. p9.

essential part of the process for developing the evidence base that supports business planning.

Interviews conducted with stakeholders<sup>5</sup> for this study revealed that water companies are making first steps in this direction, allowing them to better understand customer views. Water companies are currently conducting their own WTP research with no shared or published results to date.

Several companies have also publicly recognised the need for a better evidence base on customer preferences and values<sup>6</sup>, as has CCWater. In commissioning this study, CCWater aimed to participate in this debate and contribute to the evidence base that water companies can use to refine and improve their approaches to customer engagement in PR19, the next periodic review.

## 1.2 Objectives of this study

This study aims to support CCWater in its objective to help water companies improve their understanding of their customers' preferences and build these into their business planning. It aims to identify improvements in approaches to customer engagement via SP and RP methods to ensure that water customers are able and empowered to provide meaningful estimates of the value they place on certain outcomes.

To meet this aim, the overarching objective of this study is to provide the necessary evidence that will help CCWater to engage in a constructive debate with industry and the regulator about the role of information on customers' preferences in the PR19 process.

Within this overarching objective, this study highlights sector-specific issues with the application of WTP to companies' business planning requirements (e.g. inter-generational preferences, outcome delivery incentives (ODIs)). It also identifies universal challenges with applying survey-based methods (SP), such as the treatment of inflation and accommodating customer diversity. It presents recommendations that can be debated within the sector in the context of other potential supporting methods for informing planning decisions about company investment and service standards.

This study seeks to translate the principles and guidance in good practice methods to the specific issues faced in designing and implementing customer research in the water sector. There are several specific research questions associated with this study. Table 1.1 describes these objectives and indicates where they are addressed within this report.

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<sup>5</sup> For example, Severn Trent, YourVoice, UK Environment Agency, Northumbrian Water.

<sup>6</sup> For example, United Utilities (February 2016), *Improving Customer Research and Engagement*, accessed 13 December at: <http://corporate.unitedutilities.com/documents/Water2020-Feb16-CustomerEngagement.pdf>

Table 1.1 Answering CCWater’s specific research questions

Research question	Where in this report
The limitations of stated preference surveys in collecting evidence of customers’ priorities for service delivery and the price they are willing to pay. This will include looking at limitations in the extent to which customers can engage with the research to give informed views, and how valid the results are for use in business planning	Sections 5.2, A1.3, and summarised in Section 6.1.1
To what extent WTP using stated preference, revealed preference, or other suitable customer research and engagement techniques can be used to identify the right balance or trade-off between short term and long term prices and service improvements (intergenerational equity)	Sections A1.3 and summarised in Section 6.1.2
Identify how stated preference and other approaches to WTP (including revealed preference) can work together to provide valid inputs for CBA in the water industry periodic review context	Sections 2.2, 3.1, 4.3, 4.5, 4.3 and summarised in Section 6.1.3
Identify how to conduct revealed preference research in the context of a monopoly industry	Sections 2.4, 4.5 and summarised in Section 6.1.4
Explore the issues of presenting inflationary bill changes to customers within WTP research, and whether/how these could be overcome	Section A1.2 and summarised in Section 6.1.5
Explore the issues of using WTP research to identify customer preferences for Outcome Delivery Incentives (ODIs) and whether/how these could be overcome	Section 4.3.1 and summarised in Section 6.1.6
Based on the above, make recommendations for how survey and show-card materials could be presented to customers so that they can engage with the subject matter, and give meaningful responses	Section 5.2.3, Section 5.2.4 and summarised in Section 6.1.7

### 1.2.2 Meeting study objectives

This study focuses on how water companies can improve the way they use SP and RP research to estimate customer valuations. It examines how WTP analysis has been conducted to date in the water sector and how it has been used in similar contexts in other sectors. It also examines guidance on SP and RP research, to establish how water companies could improve the way they apply WTP research, in practical terms.

### 1.3 Structure of this report

The remainder of this report is structured as follows:

- Section 2 describes WTP and some of the evidence-gathering methods used to estimate customer preferences and values;
- Section 3 describes how WTP is used in the water sector and in other sectors;
- Section 4 describes how WTP research in the water sector can be improved, including practical recommendations for doing so;
- Section 4 examines how SP research in particular can be improved, including how good practice approaches can be applied in the context of the water sector; and
- Section 6 summarises recommendations and draws conclusions from the study.

This report also includes annexes that describe challenges in applying SP research to the water sector (Annex 1) the method used for this study (Annex 2) and the sources used (Annex 3).

## 2 Types of WTP research

This section outlines the range of methods that can be used to estimate water customers' willingness-to-pay for water services.<sup>7</sup> It provides background theory and context to underpin the remainder of the report, which focusses on how these methods are applied in the UK water sector. It also explains the hierarchy of preference from 'real' data on customers' actual market choices, to estimates inferred from choices about *other* goods (revealed preferences), to what customers say are their preferences (stated preferences).

### 2.1 What is WTP?

This study examines how to estimate WTP. WTP estimates are one of many research outputs conventionally known in other settings as economic valuation or non-market valuation. Other outputs include individuals' opinions, attitudes, and uses they make of the resource in question and their socio-economic characteristics.

The blue box below considers this in the context of the concept of economic value.

#### Willingness-to-pay and economic value

Willingness-to-pay (WTP) is simply a measure of **economic value**.<sup>8</sup> It applies (universally) to all types of goods and services, whether they are traded in competitive markets, provided in a regulated market setting (e.g. water), or non-market in nature (e.g. environmental goods and services).

##### What is economic value?

The Valuing Nature Programme (2016) describes it as a concept that captures "why and how individuals value the benefits received" and breaks down into various types of value that, together, comprise 'total economic value'.<sup>9</sup>

- **use value** – which describes the benefit from directly experiencing or using benefits (e.g. drinking water);
- **option value** – which describes the benefit from knowing that resources are available, even when we are not using them for now, but could do in future (e.g. the benefit of knowing water is available to drink, even when not actually drinking water);
- **non-use values** – which comprise three types of value that are derived from wanting something to be available for others, over and above the value derived from use and option value. This includes the value of knowing something is available for others living at the same time (altruistic value), for others in future

<sup>7</sup> Throughout this report, 'water services' and 'water companies' are used to describe both water and wastewater services and companies.

<sup>8</sup> In the water sector, the term 'willingness-to-pay' is often used in broad terms and not always in the context of understanding the value that customers derive from the provision of water and wastewater services. It is therefore important to understand that: (a) WTP does not provide a measure of customer acceptability (e.g. of bill changes), (b) nor does it does not represent the actual cost (i.e. customer bill impact) of delivering water and wastewater services.

<sup>9</sup> Valuing Nature Programme, (2016), *Demystifying Economic Valuation: Valuing Nature Paper, June 2016* <http://valuing-nature.net/demystifying-economic-valuation-paper> The term 'natural environment' is used here but WTP and WTA can be used to measure the economic value of any change, including non-market/public good aspects of water services.

generations (bequest value) and value of the thing independent of current or future generations' use of it (existence value).

These values (referred to as 'Total Economic Value') are expressed in monetary terms through two measures. **Willingness-to-pay** is a measure of what individuals are willing to pay to secure positive changes (or to avoid negative changes) in the provision of a good or service. **Willingness-to-accept** (compensation) is a measure of what individuals are willing to accept to tolerate negative changes in the provision of a good or service.

This report primarily discusses willingness-to-pay (WTP) rather than willingness-to-accept (WTA), since generally the context for water companies is positive changes to consumers' services. However, WTA is also relevant to water companies and have been used in the context of examining deterioration in levels of service (for example where exploring trade-offs for lower bills). Both approaches are used in other sectors too, as highlighted by Ofcom in its interview for this study.

The use of willingness-to-pay or willingness-to-accept may come down to the strategic planning issues that water companies are assessing as well as the choice of these measures based on economic theory.

Furthermore, prices even in competitive markets do not reflect total economic value for two reasons. First, consumers' WTP may be greater than the price they pay in a market, with any difference over and above the price paid being called 'consumer surplus'. Second, market prices may not reflect the full economic cost of production, as externalities from consumption or production may not be priced (such as the cost of depleting natural resources).

Prices can therefore only be viewed as a lower-bound (minimum) estimate of WTP. In addition, there are no prices for services or service attributes provided in the water sector, because they are not offered in a competitive market. Consequently, other methods must be used to estimate consumer values.

## 2.2 Choosing an approach to estimating WTP

Water companies use customer valuations to understand the benefits of investments that improve or maintain service levels. WTP valuations feed into 'Cost-Benefit Analysis' (CBA). This is an integral part of companies' business-planning processes, through which companies prioritise investment across the range of services they provide (e.g. wholesale, retail; water, wastewater).

Within this context, 'WTP research' is an input to companies' business planning processes. It does not provide an answer as such; rather it is part of the mix of factors that companies balance in preparing a business plan. Alongside customer priorities and demand, companies also take into account legal and regulatory obligations, and the costs of investments, along with customer affordability and company financing constraints.

The following conceptual approach underpins the method of choice for estimating WTP; it is based on a three-step hierarchy that in principle sets out how types of evidence can be prioritised:

- actual market choices - based consumers' real-world decisions regarding the goods or services in question;



- revealed-preference - based on consumers' real-world decisions but about goods or services that are in some way related to the goods or services in question; and
- stated-preference - based on asking consumers to report their preferences.

Each step is explored further below.

**Actual market choices** can sometimes provide strong evidence on customers' preferences. In conventional market settings, consumers reveal their preferences through their purchasing behaviour. In regulated markets, actual market choices are limited by the relative lack of choice, which can limit or prevent opportunities to estimate customers' preferences by directly observing their behaviour.

In the water sector, many goods and services (including environmental goods and services) are not traded at all, or are traded in markets that are not fully competitive. These goods and services therefore either have no price (though they do have value), or the price may not reflect the true price that consumers would pay in a competitive market context.

Moreover, in any context, prices often do not reflect the full value that consumers place on goods (see Section 2.1). In the absence of being able to estimate customers' valuations through their actions in markets, water companies are reliant on a range of non-market (economic) valuation methods for estimating consumers' preferences and valuations.

Observing consumer choices in other, related, markets to infer the preferences for the non-market good (**revealed preference**) is generally the next-preferred option after data on market choices, as highlighted by UKWIR (2010).<sup>10</sup> Those guidelines state that water companies should first check whether market data is available for prioritised attributes that they wish to value, then using market data where it is available. Cascade and eftec (2011) also report a general view that RP methods tend to be favoured where it is feasible to apply them. This preference is based on these methods being grounded in observations of actual behaviour, albeit in a different market.

A potential advantage of RP methods over SP is that they are not subject to some of the potential behavioural biases that must be accounted for in SP analysis, "based on the assumption that what individuals do is a more accurate reflection of their preferences than what individuals say they will do".<sup>11</sup>

However, the application of RP methods is limited to situations where market prices are available for goods related to the target good being valued. In the water sector there is no equivalent market good that matches all service dimensions of water and wastewater management. For those goods that are used, limited variation in their provision often makes it hard to compare them to the services or changes to services that water companies consider in their evidence-gathering for business planning.

Finally, since RP methods are based on observed behaviour, they can only be applied to goods or levels of service/quality that are currently experienced or have previously been available. They cannot be used to estimate valuations for new or enhanced goods, or future service levels that people have not previously

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<sup>10</sup> UKWIR (2010), Review of Cost-benefit Analysis and Benefits Valuation <https://www.ukwir.org/eng/forefront-report-page?object=66869>

<sup>11</sup> Cascade with eftec for Ofwat (April 2011), Ibid.

experienced (because there is no price to observe). Prices for existing goods, services, or service attributes can be used to assess future services

This does not preclude applying estimates derived from RP methods to future changes that water companies seek to make, if existing observations that are equivalent to future services can be found. However, the need to demonstrate equivalence can limit the availability of relevant data, whether a water company is using RP analysis to inform cost-benefit analysis specifically, or more generally as evidence to support its business plan.

This hierarchy is theoretical. In practice, both SP and RP methods are valuable, which is increasingly recognised in the water sector. SP and RP are described below, while the rest of this report discusses their practical application in the water sector.

## 2.3 Revealed preference methods

RP methods exploit the relationships that exist between the demand for non-market goods and services and the provision of market goods and services. For example, house-buying decisions (a market good) are based on consideration of a number of factors, including local environmental quality (a non-market good). In a water sector context, house-buying decisions could reflect the nuisance from sewage treatment works, the dis-amenity value of which could be estimated from local property prices.

### 2.3.1 Types of revealed preference methods

RP analysis takes various forms, according to the relationships between the ‘target’ good/service being valued and the market goods or services for which data are available. These relationships are generally categorised into three types, as explained in eftec (2011).<sup>12</sup>

- **Substitute relationships** – where a customer can derive the same or a similar benefit from the market good as from the ‘target’ service provided by the water company. An example is bottled water as a substitute for tap water, whereby data on WTP for the price of bottled water can be indicative of customers’ WTP for water services.

Methods based on substitute relationships are sometimes called ‘avertive behaviour’ or ‘avertive expenditure’ approaches.

- **Complement relationships** – where a ‘target’ service provided by a water company requires joint consumption of another market good/service; eftec (2011) highlight the classic example where recreational activities depend on water environment services provided by water companies<sup>13</sup>. The implied value of water environment can be estimated based on customers’ WTP for recreational activities which, in turn, can be estimated through what they spend – i.e. ‘give up’ – on travel time and cost, accommodation, food etc. to get to the recreational sites and to undertake the said activities.

<sup>12</sup> Cascade with eftec for Ofwat (April 2011), *The Use of Revealed Customer Behaviour in Future Price Limits*. [http://www.ofwat.gov.uk/wp-content/uploads/2015/11/rpt\\_com\\_201105eftec\\_casc\\_reveal.pdf](http://www.ofwat.gov.uk/wp-content/uploads/2015/11/rpt_com_201105eftec_casc_reveal.pdf)

<sup>13</sup> One important stage of RP research is to test whether a complementary relationship can be established (i.e. whether empirical evidence can be found to support a relationship hypothesised based on economic theory). This can be tested by analysing demand for different goods that are hypothetically related, to identify whether there an observed relationship, on which conclusions can then be drawn. For example, for avertive behaviour in the water context, RP analysis would test how much of the demand for water filters is driven by the (perceived) quality of tap water, compared with other preferences (such as wanting to drink cooled water from the fridge).

Recreation-demand models, including single-site travel cost models, apply analysis that exploits complement relationships.

- **Attribute relationships** – where a ‘target’ service provided by the water company is viewed as an ‘attribute’ or ‘characteristic’ of another market good. Methods that use this relationship include ‘hedonic pricing’ methods, which explore consumers’ purchasing decisions in markets related to the ‘target’ good/service through an attribute relationship. Some recreation demand models – in particular multi-site travel cost models – are also reliant on the attribute-based relationship.

A classic example of this approach is where the economic value of environmental quality can be estimated by assessing neighbourhood house prices as a function of other factors. Water sector examples include valuing visual or other inconveniences of proximity to sewage treatment works, or the benefits of water quality in lakes/ponds etc.<sup>14</sup>

The table below outlines the key features of each of the methods mentioned above (Table 2.1). Applicability of these measures to water sector attributes is summarised in Table 4.5.

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<sup>14</sup> BritainThinks and London Economics (2016) *Stakeholder Engagement on Complex and Long-run Issues in the Energy and Water Sectors*. [http://www.sustainabilityfirst.org.uk/images/publications/new-pin/New-Pin - Research Approaches for Stakeholder Engagement - Overview - Britain Thinks and London Economics - FINAL - November 2016.pdf](http://www.sustainabilityfirst.org.uk/images/publications/new-pin/New-Pin_-_Research_Approaches_for_Stakeholder_Engagement_-_Overview_-_Britain_Thinks_and_London_Economics_-_FINAL_-_November_2016.pdf)

Table 2.1 Key features and limitations of revealed preference methods

Method	Description	Limitations on application
All RP methods	n/a	Can only value service levels that have been previously or currently experienced (i.e. not new goods or services or enhanced/deteriorated levels of service outside of recent performance levels) Only captures use value.
Avertive behaviour method	What customers spend in markets buying goods that provide them with the benefits they seek, or to avoid deterioration of quality in other similar goods	Relatively limited scope of application. This method requires a substitute good that can make up for a shortfall in service for the good in question (e.g. bottled water for tap water), or another market good that can complement the service level to make up for a shortfall in quality (e.g. a filter jug for tap water).
Recreation demand models	The travel-cost method is based on the premise that the time and travel expenses that people incur to visit a site is a minimum expression of the value of the visit (on the assumption that otherwise the visit would not take place). By observing how these trade-offs vary across people the demand (value) for recreational use of sites can be estimated.	Applied in the context of recreational demand, i.e. determining the importance of different factors that influence the choice of which recreation sites households visit and how often they visit (e.g. beaches/bathing waters), including aspects of environment quality (e.g. water quality status)
Hedonic pricing	Hedonic pricing is where marginal values for non-market goods can be inferred from price differentials observed in a related market good. For example, hedonic property pricing, analyses the variation in property prices to estimate the premium of environmental factors like clean air, views, peace and quiet etc.	This method requires that an appropriate market good can be found. The most common application is to the housing market, where the value of certain environmental factors (e.g. availability and quality of green space, presence of sources of disamenity such as treatment works and odour) can be considered as influencing the market value of housing. <sup>15</sup>

Source: ICF

## 2.4 Stated preference methods

Stated preference (SP) methods are survey-based approaches that present a ‘simulated’ market choice for respondents (in this case water bill payers) to elicit their preferences and valuations.<sup>16</sup>

SP methods can also be used to estimate valuations for both currently-experienced goods and levels of service/quality and/or new or future enhanced goods, or service levels that people have not previously experienced. As SP methods can also capture non-use value and option value<sup>17</sup>, it can be used to generate evidence on

<sup>15</sup> HM Treasury (July 2011), *Valuation Techniques for Social Cost-Benefit Analysis: Stated Preference, Revealed Preference and Subjective Well-Being Approaches*.

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/209107/greenbook\\_valuationtechniques.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209107/greenbook_valuationtechniques.pdf)

<sup>16</sup> Simulated choices presented to customers in the context of water sector research can include presenting customers with alternative scenarios that water companies could deliver. In this context choices are not purely hypothetical.

<sup>17</sup> These terms are explained above in Section 2.1.

consumer valuations of proposed future services.<sup>18</sup> This is particularly useful for research in the water sector that seeks to support planning for the future in water companies' business plans.

There are various SP methods, but a useful distinction can be made between methods that (typically) estimate the value of a discrete change in the provision of a good, versus methods that estimate value as a function of multiple attributes<sup>19</sup>:

- **contingent valuation** provides a value of a 'bundled' or 'whole' good, or a discrete change from one level of provision to another; and
- **choice-modelling** is (usually) an attribute-based approach that breaks a good down into its characteristics and provides a value for changes in *individual* characteristics or attributes.

Each is described in further detail below.

### 2.4.1 Contingent valuation

In contingent valuation studies, respondents are generally asked whether they would vote for a proposed change at a specified cost, or asked what they would be willing to pay for that change. Contingent valuation is widely used to research consumer valuations for development and the environment. For example Tussupova et al. (2015) reported that it is used in applications such as by the World Bank in assessing demand for water and sanitation services, and by the Department for International Development (DfID) in other settings.<sup>20</sup> It has also been used in the water sector.<sup>21</sup>

### 2.4.2 Choice modelling

**Choice-modelling** is an umbrella term for (usually) an attribute-based approach that breaks a good down into its characteristics and provides a value for changes in *individual* characteristics or attributes.<sup>22</sup>

There are many different methods that could be classed as choice modelling. This includes **rating and scaling approaches**, which can give quantitative views on what customers prefer, but are not consistent with economic theory, so cannot be used to generate WTP estimates.<sup>23</sup>

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<sup>18</sup> The Competition Commission (2011), Ibid.

<sup>19</sup> Robert J. Johnston, Kevin J. Boyle, Wiktor (Vic) Adamowicz, Jeff Bennett, Roy Brouwer, Trudy Ann Cameron, W. Michael Hanemann, Nick Hanley, Mandy Ryan, Riccardo Scarpa, Roger Tourangeau, Christian A. Vossler, (2017), *Contemporary Guidance for Stated Preference Studies*, Journal of the Association of Environmental and Resource Economists 2017 4:2, 319-405

<sup>20</sup> Tussupova, K., R. Berndtsson, T. Bramryd and R. Beisenova (2015) Investigating Willingness-to-pay to Improve Water Supply Services: Application of Contingent Valuation Method. <http://www.mdpi.com/2073-4441/7/6/3024>

<sup>21</sup> For example, Solino, M., J. Joyce and B. A. Farizo (2014) *Improving Water Quality in England and Wales: Local Endowments and Willingness to Pay*. [https://ijer.ut.ac.ir/article\\_642\\_0.html](https://ijer.ut.ac.ir/article_642_0.html) and Ferrini, S., M. Schaafsma, and I. Bateman (2014), Revealed and stated preference valuation and transfer: A within-sample comparison of water quality improvement values, *Water Resour. Res.*, 50, doi:10.1002/2013WR014905. <https://ore.exeter.ac.uk/repository/bitstream/handle/10871/19372/Ferrini%20et%20al%202014%20water%20benefits%20WRR.pdf?sequence=1>

<sup>22</sup> See, for example, The Competition Commission (2011), Ibid

<sup>23</sup> Louviere, J. L., T. N. Flynn and R. T Carson (2010) Discrete choice experiments are not conjoint analysis. *Journal of Choice Modelling* 3(3), pp 57-72.

Choice-modelling also captures **choice-based methods**<sup>24</sup>, which can be used to generate theoretically-valid WTP where certain criteria are met. Three general types of choice-based method are:

1. dichotomous choice contingent valuation<sup>25</sup> (sometimes referred to as a ‘package’ choice or question in the water sector) – usually a single question where respondents select their preferred option from two alternatives, one of which is the current situation (status quo);
2. discrete choice experiments (DCE) (or ‘stated choice experiment’ or simply ‘choice experiment’) – whereby respondents choose one alternative out of two or more presented in a series repeated choices;
3. paired comparison – where respondents are asked to choose from two options in a series of repeated choices, and, in some applications, are also asked to rate the strength of their preference.

Beyond these methods there are alternatives and hybrids that combine different aspects of choice-based and rating/scaling approaches. This includes variants of ‘best-worst scaling’ (BWS) of which a commonly applied method is ‘max-diff’ (or ‘MaxDiff’). This requires that the respondents select the attributes of a single option that they most prefer (i.e. ‘best’) and least prefer (i.e. ‘worst’).<sup>26,27</sup> The BWS/max-diff method has largely developed in response to concerns with rating and scaling approaches, about which there are concerns about the comparability of rating scales between respondents.<sup>28</sup> It has not developed as an alternative to choice based approaches.

For PR19 some water companies have reported that they are exploring the relative merits of various stated preference methods, particularly with respect to the cognitive load for respondents. This includes DCE as well as BWS/max-diff approaches. In themselves, no method or approach is inherently ‘simpler’ or ‘easier’ for respondents to cope with. Cognitive load is determined by a combination of survey design factors, including the number of attributes respondents are asked to consider, the levels for these attributes and the range they cover (e.g. the improved/deteriorated levels of service), the number of options respondents are asked to choose between, and the number of choices they are asked to make<sup>29</sup>. This helps to emphasise that the validity of stated preference research from the perspective of respondent understanding can only be judged at the individual study level. Notwithstanding this point, the testing and use of a wider set of methods by

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<sup>24</sup> Note that choice modelling terminology can often be confusing and ambiguous. For example the umbrella term ‘conjoint analysis’ can be used in marketing and product development applications and this could refer to both rating/scaling and choice based approaches.

<sup>25</sup> Whilst contingent valuation can be classified separately to choice modelling methods (Section 2.3.1), the dichotomous choice format is essentially a discrete choice task.

<sup>26</sup> Note this description is based on ‘Case 2 (profile)’ application of BWS set out in Louviere et al. (2015) *Best-Worst Scaling Theory, Methods, and Applications*, Cambridge University Press.

<sup>27</sup> Technically the term ‘max-diff’ describes just one way in which best-worst scaling responses can be analysed. It essentially assumes that the respondent simultaneously assesses all combinations of what could be the best and worst aspects of the good. This may be considered a strong assumption and may not match (a) the respondent’s actual thought process and (b) how they are actually directed to answer the question. For instance it may be that the respondent chooses the best aspect first, then the worst from the remaining attributes (or vice versa). This is a sequential response process, rather than a max-diff choice, and it can be analysed in a number of different ways. For further detail see Louviere et al. (2015), *ibid*.

<sup>28</sup> For example, what a rating of “2” relative to “1” means to individual A can be different to what it means to individual B. In contrast what individual A and B rate as “best” and “worst” should be comparable as there should be no inconsistency in the interpretation by the respondents.

<sup>29</sup> Caussade, S., Ortúzar, J., Rizzi, L. and Hensher, D. (2005) ‘Assessing the influence of design dimensions on stated choice experiment estimates’, *Transportation Research Part B: Methodological*, Vol. 9., Issue 7, 621-640.

companies is encouraging since it should generate evidence on what the reasonable limits are in terms of respondent burden for these various survey design factors across different methods that are available (but still keeping in mind what evidence can be provided by each method and what represents the theoretically consistent basis for estimating WTP and measuring the 'value for money' of maintaining and improving service levels).

The most recent guidance on using SP methods in the context of economic valuation<sup>30</sup> highlights that BWS/max-diff methods by themselves are usually not valid approaches for estimating WTP because they are not consistent with economic theory. However, a hybrid of the DCE approach which asks respondents to state which option they prefer most (the 'best') and the option they prefer least (the 'worst') *can* be consistent with economic theory<sup>31</sup>. This should not discount BWS applications as being useful for understanding customer priorities, or indeed being used in conjunction with other approaches in a survey. However, it emphasises that any assessment about SP methods needs to be guided by the purpose of undertaking the research. When applied in the right context and scope of their valid uses, each method can provide valuable evidence about what customers prefer and what they want from water companies.

Reflecting the main objective being the estimation of customer valuations, PJM and Accent (2015) found that at PR14 water companies mainly used discrete-choice experiments that presented consumers with choices between alternative packages of water services, with valuations obtained for individual incremental changes to water services.<sup>32</sup> This stems from the fact that they are a theoretically consistent method for estimating WTP and flexible enough to be able to elicit valuations in a broad set of situations concerning the provision of water and sewerage services. Whilst the RP alternatives are also theoretically consistent, they cannot match this flexibility. It is also because water companies generally need to present evidence of consumers' views on incremental differences in the level of service in their business plans, rather than binary choices about whether services should be provided or not.<sup>33</sup>

In similar applications in other sectors, choice modelling is generally preferred, for the same reasons. London Economics (2013) attributed the prevalence of choice modelling in research in the electricity sector to its ability to generate evidence on multiple service attributes.

Stated preference methods must exhibit two characteristics to estimate WTP in monetary terms.<sup>34</sup> First the choice format must present a trade-off to respondents that involves giving something up in order to secure the provision of a good or service (see Section 2.1). Conventionally this means there is a 'cost' attribute in the choice. Second, the choice needs to be grounded in the economic concepts of demand and value. Conventionally this means the choice should include at least one feasible option, which is usually presented as the 'baseline' or status quo (note that 'feasible' in this sense means within the respondent's budget constraint – i.e. their income). This also means that respondents are not forced to make a costly choice when they would be happy with the baseline, or for any reason cannot pay

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<sup>30</sup> See Section 5.1

<sup>31</sup> This the 'Case 3' (multi-profile) application set out in Louviere et al, which results in a more complete preference ranking than the otherwise identical 'choose the most preferred option' DCE. See Johnstone et al. (2017) *ibid*.

<sup>32</sup> PJM and Accent (November 2015) Willingness-to-pay at PR19

<sup>33</sup> RP methods can also potentially produce estimates of incremental changes too.

<sup>34</sup> Johnstone et al. (2017) and Louviere et al. (2010), *Ibid*.

more. Of the choice-based methods above, discrete-choice experiments and dichotomous choice contingent valuation have the advantage of being consistent with economic theory, allowing econometric analysis to estimate economic values associated with the goods about which respondents are surveyed.

Certain methods are more compatible with estimating WTP, as summarised in Table 2.2. For all of these methods, WTP can only be estimated if one of the attributes included is cost (in monetary terms).

Table 2.2 Stated preference methods

Method type	Description	Use for estimating WTP*
Contingent valuation	Respondents asked whether they would vote for a specified change at a specified cost or asked to state their WTP.	Used to value 'whole' goods/discrete changes.
Discrete-choice experiment	Respondents choose one alternative from two, three or more options presented.	Used to value individual attributes.
Discrete-choice experiment and best-worst hybrid	Respondents choose most preferred (best) and least preferred alternative (worst) from three or more options presented.	Used to value individual attributes.
Contingent ranking	Respondents asked to rank two or more options.	Usually not compatible with estimating WTP.
Contingent rating	Respondents asked to rate or scale two or more options.	Usually not compatible with estimating WTP.
Best-worst scaling (incl. 'max-diff')	Respondents select the attributes of a single option that they most prefer (i.e. 'best') and least prefer (i.e. 'worst')	Usually not compatible with estimating WTP.
Paired comparison	Respondents asked to choose from two options. Some ask respondents to rate the strength of their preference.	Used to value individual attributes. Can be compatible with estimating WTP** (effectively this would be a DCE with two options).

Source: ICF based on various sources including Bateman et al. (2002), Louviere et. al (2010), Johnston et al. (2017), and UKWIR (2011).

Notes: \*Where methods are described as not being compatible with estimating WTP this mainly applies to its individual application. There can be cases where a combination of methods are used in a survey to provide a range of customer priority and valuation evidence. \*\* The distinction between discrete-choice experiments and paired comparison is not always clear, as discrete-choice experiments may include choices between pairs of alternatives (as well as between multiple options).



### 3 Using WTP in the water sector and beyond

This section describes how SP and RP research (primarily in terms of estimating customer WTP for maintaining or improving service levels) has been used in the water sector to date. It also explores how water companies are using and planning to use SP research for the next periodic review, PR19.

#### 3.1 The role of WTP in the water sector

This section examines how WTP estimates of customer values are used in the water sector. It looks, first, at how water companies use WTP estimates in business planning.

SP approaches are commonly applied in the water sector to explore customers' WTP for a broad range of service level changes. This is done by examining how consumers respond to a range of choices, to establish the extent of collective WTP for a particular service level.

In 2011 Ofwat commissioned research (Cascade and eftec, 2011) that recommended that water companies develop an approach that combined RP and SP research as a basis for valuing changes in service levels associated with water, wastewater and environmental services.<sup>35</sup> Specifically, information from RP research can be used to inform the design of further SP research, for example by helping to indicate which service attributes should be included in SP research, or to help develop SP materials that provide participants with a strong grounding in actual and experienced service levels for SP valuations.<sup>36</sup> For PR14 water companies typically triangulated SP studies with qualitative and quantitative research.<sup>37</sup> Some also used WTP research to validate customer preferences against high-level strategic priorities, such as asking customers to rank strategic objectives or assess their willingness to subsidise social tariffs.<sup>38</sup>

Many water companies used choice-modelling SP techniques in their research, since these methods allow for valuation of specific attributes of water services in the absence of valuations arising from observed consumer behaviour.

Several companies have also publicly recognised the need for a wider set of methods<sup>39</sup>, as has CCWater (see blue box below).

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<sup>35</sup> Cascade with eftec for Ofwat (April 2011), *The Use of Revealed Customer Behaviour in Future Price Limits*. [http://www.ofwat.gov.uk/wp-content/uploads/2015/11/rpt\\_com\\_201105eftec\\_casc\\_reveal.pdf](http://www.ofwat.gov.uk/wp-content/uploads/2015/11/rpt_com_201105eftec_casc_reveal.pdf)

<sup>36</sup> This is not withstanding the potential for triangulating WTP estimates from different SP and RP methods to strengthen the evidence base (see Section 4.3).

<sup>37</sup> See for example, Bristol Water (2013), *Bristol Water PR14 Business Plan. Company Wide Overview* <http://www.bristolwater.co.uk/wp/wp-content/uploads/2013/12/Company-Wide-Overview-PD.pdf>

<sup>38</sup> For example, Sembcorp Bournemouth Water (October 2013) *The appointed business plan*. <http://www.bournemouthwater.co.uk/Uploads/Docs/Report%20and%20accounts/SBW%20BP%20The%20Appointed%20redacted.pdf>

<sup>39</sup> For example, United Utilities (February 2016), *Improving Customer Research and Engagement*, accessed 13 December at: <http://corporate.unitedutilities.com/documents/Water2020-Feb16-CustomerEngagement.pdf>

### CCWater on WTP in PR14

CCWater reviewed companies' and Ofwat's delivery of PR14 from a customer perspective and concluded the following.<sup>40</sup>

*“WTP should not be used as evidence to justify ODI proposals as it is not a literal measure of the amount of money customers would be willing to pay for specific service improvements. Rather, it produces numerical outputs which feed into cost versus-benefit modelling to derive potential service improvements.*

*WTP research measures customers' service preferences and places a numeric value on their choices. It is a feature of periodic review research that is well understood by market researchers and water companies. To avoid misinterpretation (as the phrase 'willingness-to-pay' can be taken literally), explanation should be provided to Customer Challenge Group (CCG) members as to what this research does.”*

As noted above, this recognises that WTP should not be taken to be a measure of acceptability of company proposals.

It also commented on the use of SP and RP techniques in its response to Ofwat's publication 'Water 2020 – Regulatory framework for wholesale markets and the 2019 periodic review'.<sup>41</sup>

*“There are weaknesses in the approach to WTP surveys and [we] support an assessment of different techniques that can be used to improve it. The revealed preference approach may have value, but such research should be part of a 'suite' of customer evidence. We would support any testing of revealed preference approaches by companies to explore how this could provide additional value.”*

### 3.1.1 Using WTP estimates in business planning

All water companies carried out WTP analysis to inform their business planning at PR14.<sup>42</sup> Customer engagement plays an important role for companies, helping them to demonstrate that customers value the outcomes they commit to delivering in their business plans and, in particular, to justify their planned expenditure. In this context, customer valuations constituted inputs to companies' investment planning, providing estimates of the benefits (costs) in cost-benefit analysis (CBA)-based decision support tools.

Potential for improving the application of WTP estimates to business planning is explored further in Section 4.3.

### 3.1.2 Application to Outcome Delivery Incentives (ODIs)

For PR14, some water companies used their WTP research to inform the development of 'Outcome Delivery Incentives' (ODIs), which are financial incentives for water companies based on performance across a wide range of service

<sup>40</sup> CCWater (August 2016), *CCWater's Assessment of PR14: A Step in the Right Direction*, accessed 13 December at: <http://www.ccwater.org.uk/wp-content/uploads/2015/08/A-Step-In-The-Right-Direction-CCWaters-assessment-of-the-2014-Price-review.pdf>

<sup>41</sup> CCWater (February 2016), *Response to: Water 2020 – Regulatory framework for wholesale markets and the 2019 price review*, accessed 14 December at: <http://www.ccwater.org.uk/wp-content/uploads/2016/02/CCWaters-response-to-Ofwats-Water-2020-framework-FINAL2.pdf>

<sup>42</sup> Ofwat (October 2015), *Towards Water2020 – policy issues: customer engagement and outcomes*, accessed 13 December at: [http://www.ofwat.gov.uk/wp-content/uploads/2015/10/pap\\_tec201507engagement.pdf](http://www.ofwat.gov.uk/wp-content/uploads/2015/10/pap_tec201507engagement.pdf)

categories. Ofwat determines categories of performance that companies are incentivised to deliver, how that performance is measured and also the magnitude of financial reward or penalty associated with different levels of performance in each category. WTP estimates were used to set the rates for ODI penalties and rewards, which the WTP research used was not designed to support.<sup>43</sup> For example, respondents were not aware that their responses would be used in this way. At PR14, customer engagement was also used as supporting evidence for companies' outcome delivery incentive (ODI) rewards and penalties – how much companies would be rewarded or penalised for delivering/not delivering the outcomes specified in their business plans. Several parties have questioned whether this was an appropriate use of research that was not originally designed for this purpose.

One water company in an interview for this study reported this as a weakness of how WTP estimates were applied by some companies in PR14. That company stated WTP estimates used to set incentive rates and performance commitments were not sufficiently accurate or robust for that purpose. Another water company reported in an interview for this study that not all companies used WTP methods extensively at PR14.

The potential for improving the application of WTP estimates to ODIs is explored further in Section 4.3.1.

## 3.2 The role of WTP in other sectors

Estimates of customer values are widely used across a range of sectors to estimate the value consumers place on goods or levels of service/quality. In the energy sector, SP choice experiments have commonly been used to estimate how domestic and business customers value a range of potential improvements in the provision of electricity services. This type of research has been used to support network companies' business planning process. For example, in 2008, Ofgem undertook SP analysis to estimate domestic and business customer priorities and WTP for investments by the Distribution Network Operators (DNOs).<sup>44</sup> SP analysis has also been used to estimate preferences between alternative renewable energy sources. In Japan and the US, for instance, SP research has been used to test consumers' WTP in relation to alternative fuels as replacements for fossil fuels, such as nuclear and renewable sources.<sup>45</sup>

SP and RP methods can be used to generate rich information about customer preferences, not just WTP values. For example, these methods can be used to predict demand for different modes of transport, or market shares in commercial scenarios (such as choice of telecoms provider).

SP research is used in the transport sector to investigate travel behaviour and for modelling passenger demand. For instance, SP surveys have been used to test consumers' preferences among different transport modes. The information gathered through SP surveys can thus play an important role in the development of sustainable urban transportation systems. In the UK, SP research has also been used to deepen understanding of passengers' views on transport attributes, notably

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<sup>43</sup> As highlighted in Northumbrian Water, *Improving the outcome and delivery incentive regime; a water 2020 paper*, [https://www.nwl.co.uk/assets/documents/Outcomes\\_-\\_a\\_Water\\_2020\\_paper.pdf](https://www.nwl.co.uk/assets/documents/Outcomes_-_a_Water_2020_paper.pdf)

<sup>44</sup> Ofgem, 2008. 'Expectations of DNOs & Willingness-to-pay for Improvements in Service.' Available at: <https://www.ofgem.gov.uk/ofgem-publications/47387/1704rep04final-pdf>

<sup>45</sup> University of California, 2014. 'Consumers' willingness-to-pay for renewable and nuclear energy: A comparative analysis between the US and Japan.' Available at: [https://gspp.berkeley.edu/assets/uploads/research/pdf/GSPP\\_Working\\_Paper\\_3\\_Energy\\_Mix\\_081814.pdf](https://gspp.berkeley.edu/assets/uploads/research/pdf/GSPP_Working_Paper_3_Energy_Mix_081814.pdf)

pricing. For instance, the Office of Rail and Road (ORR) recently undertook SP research in the rail ticket retailing space. The research improved ORR's understanding of passengers' views on rail ticketing, in particular their ability to buy "inter-available tickets" (i.e. tickets that provide flexibility for using different train operating companies, flows and terminals) and "through tickets" (i.e. tickets that enable travel across the rail network with one rather than multiple tickets)<sup>46</sup>.

In an interview for this study, Ofcom noted that WTP research plays a significant role in the telecoms sector. Ofcom itself carries out ad-hoc qualitative and quantitative research, which often includes WTP research. This research can cover topics such as television content policy, views on free speech and the value of customer service to mobile phone users. Ofcom also reported that companies in the sector carry-out extensive consumer research. Ofcom reported that this research generally supports companies' setting of price points to differentiate products, such as mobile phone packages. However, such research is of commercial value and therefore not publicly available.

In aviation, SP choice modelling has been used to shed light on consumers' airline choices and to estimate their willingness-to-pay for airline service attributes, such as flight frequency, punctuality warranties and / or comfort. In the UK, the Civil Aviation Authority (CAA) regularly uses WTP experiments to understand the nature of trade-offs in consumer decision-making. These experiments are aimed at providing greater clarity around air transport demand, including consumers' overall satisfaction with their airport / flight experience.

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<sup>46</sup> ORR, 2015. 'Rail ticket retailing: the passenger perspective.' Available at: [http://orr.gov.uk/data/assets/pdf\\_file/0007/18187/Rail-ticket-retailing-passenger-perspective-report170615.pdf](http://orr.gov.uk/data/assets/pdf_file/0007/18187/Rail-ticket-retailing-passenger-perspective-report170615.pdf)

## 4 Improving WTP research in the water sector

This chapter looks ahead to PR19 and explores how consumer research can be improved in the water sector, combining findings from stakeholder interviews and the literature review conducted for the study. The chapter sets out how water companies can respond to challenges in carrying out and applying WTP research. These challenges are separated into those that apply in all customer research (Section 4) and those that are specific to SP research (Section 5). It then explores how water companies could improve customer research by triangulating multiple WTP methods, how SP and RP methods can be combined and how WTP estimates can be used in business planning.

In each of the following sections this study includes recommendations for how water companies can carry out WTP research. Some of these recommendations are based on dos and don'ts from UKWIR guidelines (2011), where applicable and relevant to the study findings.

### 4.1 Looking ahead to PR19

Since PR14, many stakeholders in the water sector have noted that more can be done to improve water companies' evidence and representation of consumers' views in their business plans. Ofwat called for greater consideration of a wider set of methods for informing estimates of the value that customers place on certain outcomes.<sup>47</sup> It also reported in an interview for this study that its risk-based-review for PR14 looked at whether each company's business plan was supported by WTP, but not the relative merits of different approaches to derive WTP. WTP values used varied considerably between companies, but the commentaries provided and the assessments that were conducted were not underpinned by robust comparative analyses of customer valuations.<sup>48</sup> For example United Utilities (2016) identified large variations in aggregate WTP values used in PR14 for notably the same improvement. However, these values were based on multiplying unit values by the size of the customer base. This simplified approach could amplify any errors in WTP results, so may contribute to the variations in estimated WTP between companies.<sup>49</sup> It has been suggested that survey design and a lack of contextual information was also a factor (PJM and Accent, 2015)<sup>50</sup>, but such conclusions should be interpreted with caution as the supporting evidence does not unequivocally separate methodological and context factors.

Furthermore, a number of reports criticised other elements of water companies' approaches to WTP in PR14. One highlighted by PJM and Accent (2015)<sup>51</sup>, is that WTP estimates at PR14 did not take into account the comparative performance of water companies. Although one study has since found that presenting comparative performance did not influence results, in other circumstances comparative information may affect valuations (with different respondents, service attributes or

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<sup>47</sup> PJM and Accent (2015), Ibid.

<sup>48</sup> See UKWIR (2010), which conducted a meta-analysis of PR09 valuation estimates using statistical and econometric techniques to control for confounding factors. UKWIR (2010) Review of Cost-benefit Analysis and Benefits Valuation <https://www.ukwir.org/eng/forefront-report-page?object=66869>

<sup>49</sup>United Utilities (2016), *Improving Customer Research and Engagement* <http://corporate.unitedutilities.com/documents/Water2020-Feb16-CustomerEngagement.pdf>

<sup>50</sup> PJM and Accent (November 2015), Ibid.

<sup>51</sup> PJM and Accent (2015), Ibid.

methods). This is potentially one area for further investigation during company research for PR19 (see section 5.2.4).

Ofwat also highlighted that WTP values tend to be sensitive to framing. This may explain some of the discrepancies between WTP values used in different companies' business plans, as they were generated from studies that were bespoke to each company. Another company noted that water companies faced significant challenges presenting WTP research in a manner that water customers could easily grasp, which is an essential requirement for WTP research to be effective.

Despite these challenges, several companies noted that WTP and SP methods in particular are still perhaps the most robust method available to estimate consumer preferences, and build these into business planning for their price reviews. All of these companies indicated they plan to continue using such research in PR19, and some of those aim to improve upon methods used in PR14. One noted the particular value of WTP and SP methods in feeding into cost-benefit modelling that many companies carry out to produce their business plans. In particular, it noted that in a business planning context, SP is particularly valuable as it can generate estimates of the value customers put on specific service levels or attributes. Another identified that it would be combining SP and RP methods as much as possible, which it considered a more robust approach. Yet another indicated that it would be investigating how to improve research materials to help customers to better understand research questions.

Ofwat reported that for PR19 it will take a different approach based on greater scrutiny of WTP evidence. It also noted that some CCGs are improving their capabilities to thoroughly scrutinise this type of evidence as part of the process.

## 4.2 Matching customer research to business-planning needs

The learning from PR14 described above clearly shows the importance of water companies identifying their customer-research requirements from the outset, so that customer research can be designed for the specific purposes required. This requirement is explored further in the ICF report *Defining and Using Triangulating in the Water sector*.<sup>52</sup>

**Recommendations:** This study highlights various recommendations in UKWIR's 2011 guidance, as reproduced below (Table 4.1).

Table 4.1 Recommendations relevant to matching customer research to business-planning needs (based on UKWIR 2011 guidance)

Do	Don't	Consider
Identify business-planning requirements early. Carry out a company-specific scoping assessment to establish what valuation evidence is needed and prioritise research according to which are the most important gaps to be filled.	Force unrealistic timescales on studies	All possible inputs to the study that will be required from within the company.
Design research programme to align with business-planning requirements	Avoid engaging with researchers and CCGs until the research is complete	All possible ways that the company may wish to use the study.

<sup>52</sup> ICF (July 2017), *Defining and applying 'triangulation' in the water sector*, <https://www.cwater.org.uk/research/defining-triangulation-and-willingness-to-pay-in-the-water-sector/>

Do	Don't	Consider
Determine requirements for research studies prior to setting terms of reference. Relate requirements to overall approach to business planning	Extrapolate research beyond the bounds of credibility	Undertaking further research if extrapolation is not credible (e.g. on specific customer groups)

### 4.3 Using WTP estimates in business planning

Integrating WTP estimates into water companies' business plans is not always straightforward. UKWIR recognise that this can only be done through a process of testing different methods and validating responses.<sup>53</sup> One review of how WTP analysis was used in PR14 reported that many stakeholders in the sector did not understand well how WTP research was used in business planning.<sup>54</sup> It noted that this may have been explained by a lack of direct contact between researchers and those stakeholders.

In interviews for this study, several water companies explained aspects of how they incorporate WTP results into their business planning. One indicated that WTP results are used primarily to inform decisions about incremental improvements to services, to justify any additional expenditure required. For example, this might include evidence on how much an average household is willing to pay to alleviate sewer flooding. This would then be combined with data on the costs of doing so to inform a 'cost-benefit analysis' of the case for doing so. Another water company similarly reported that SP evidence supplements cost data in its business planning process.

One water company interviewed for this study explained that it used WTP estimates in its 'cost-benefit model', which quantitatively assesses different options. It noted that WTP is useful for generating evidence on customer preferences with regard to simple choices (i.e. to pay or not to pay). But noted that WTP is less useful for estimating preferences that are not binary decisions, but may depend on subtle differentiation between options or levels of risk. This mirrors findings outlined above, that WTP evidence generates better evidence when options can be more differentiated in research.

Yorkshire Water reported that in its business planning it compared customers' WTP with the whole-life cost of options to understand which options customers benefit most from, based on calculating net present value. The WTP findings were used to calculate an annuitised monetary benefit to feed into the CBA. This enabled Yorkshire Water's "optimisation engine" to compare customer valuation to the annuitised whole life cost and understand where the maximum customer benefit was being derived.<sup>55</sup>

Other water companies take a technically more complex approach that involves estimating their customers' 'elasticity' for paying for an additional benefit, and to determine how elasticity varies according to the options. Nonetheless, this approach does not differ considerably from that described above, as these elasticities are then fed into investment modelling to determine the level of investment that would be

<sup>53</sup> UKWIR (2011), Ibid.

<sup>54</sup> PJM and Accent (2015), Ibid.

<sup>55</sup> Yorkshire Water (December 2013) *Our Blueprint for Yorkshire. The right outcome for Yorkshire. Our Wholesale Water Business Plan*, <https://www.yorkshirewater.com/sites/default/files/the-wholesale-water-business-plan.pdf>

supported by customers.<sup>56</sup> Another water company reported that its approach to this incorporates econometric modelling to estimate WTP analysis for a mix of different service packages, from which a preferred package of measures is then chosen and proposed.<sup>57</sup> As noted above, many companies do then test the ‘acceptability’ of their conclusions to customers, based on further research.

One water company reported that for PR14 there was generally little dialogue between Ofwat and water companies regarding the WTP evidence in their business plans. But it also reported an expectation that this will change for PR19. Ofwat noted that for PR19 it expects that water companies will bring WTP into their business-planning process earlier than in PR14 and will use a wider range of evidence to support their plans.

#### 4.3.1 Application to Outcome Delivery Incentives (ODIs)

In PR14, many water companies used customer valuations from SP surveys to inform Outcome Delivery Incentives (ODIs). The key piece of evidence used was the ‘aggregate benefit’ estimate, associated with a unit change in service. The overall penalty or reward was therefore based on the value that individual customers gained or lost from service level changes, multiplied by the total number of customers.

But the application of WTP estimates to ODIs is not straightforward and should consider the following perspectives, which are adapted from Defra’s value-transfer guidelines.<sup>58</sup>

- The accuracy demanded from WTP evidence should vary according to its purpose. The main requirement for customer evidence for use in cost-benefit analysis is to permit companies to weigh-up costs and benefits to determine whether investment proposals can be justified on economic grounds. This is often concerned with orders of magnitude (whether benefits exceed costs, or whether the overall benefit of one proposal exceeds another). Generally investments lead to ‘step’ changes in service levels (rather than small incremental improvements) and valuations are used to determine whether the ‘lumpy’ investments associated with those changes are justified. The information is then also combined with several other considerations to evaluate investment proposals.
- Where analysis is focussed on improving knowledge – such as ‘highlighting the importance of an issue’ – or if an initial assessment of policy outcomes is required, relatively low levels of accuracy are likely to be acceptable (e.g. scoping/screening exercises). Moving towards actual policy decisions and financial instruments and incentives is likely to require greater confidence in results and require compelling evidence as to their accuracy. A high degree of accuracy should be demonstrable for customer valuations that are applied to ODIs, as there are direct financial implications for companies and for customers.
- The use of SP research to estimate customer valuations, when applied to ODIs, emphasises the need for that research to establish genuine preferences for ODIs and to demonstrate that their survey designs, analysis and results are valid in their own right, based on good practice protocols for validity testing. It also emphasises the need for such analysis to develop an evidence base over time to

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<sup>56</sup> Sembcorp Bournemouth Water (2013), Ibid.

<sup>57</sup> Bristol Water (2013), Ibid.

<sup>58</sup> Eftec for Defra (2010), *Valuing Environmental Impacts: Practical Guidelines for the Use of Value Transfer in Policy and Project Appraisal*.

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/182367/vt-annex2.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/182367/vt-annex2.pdf)



provide greater assurance on the accuracy of such evidence. To establish greater levels of confidence in customer valuations, companies' strategies should be to directly test the consistency of values (across time, place and changing circumstances) through repeated studies, in preference to limited comparisons between companies (which examine the preferences of a different group of customers).

- Another key issue for water companies to consider and research is whether the framing of the research matters, before applying these to ODIs. The key distinction that requires testing is whether customer valuations are affected by the context of the valuation – i.e. whether it is being used to inform investment decisions or whether it is being used to determine financial rewards for water companies. A difference between the two would indicate that the actual value to customers of changing service levels differs from the acceptability to customers of equivalent financial rewards and penalties for companies. Whether this matters can only be established by testing and specifically testing and comparing valuations that are derived in these two contexts. Further research on this would help companies to validate their use of customer valuations to inform ODIs.

Some companies recognise these challenges. Northumbrian Water (2015) noted in a forward-looking paper that using WTP values to set ODIs was generally not consistent with the contextual information provided to respondents in this kind of research.<sup>59</sup> One company reported in an interview for this study that its research asked customers for their views on specific financial targets that should be set for the company.<sup>60</sup> A review of customer research used in PR14 noted that this approach may not sufficiently account for the effect of framing, which can bias WTP estimates, as discussed in this report above. It noted that WTP estimates framed as informing water companies' financial incentives may generate different estimates of customers' views on those incentives.<sup>61</sup> Further, Ofwat reported at interview that companies' application of WTP research to ODIs in PR14 did not sufficiently take into account longer-term considerations. ODIs only last for the duration of the price control (5 years), but the WTP research used to support those generally examined long-term preferences.

Northumbrian Water (2015) also noted that WTP research to inform ODIs is not appropriate when it was designed earlier in the periodic review process for a different purpose. It concluded that this practice resulted in a disconnect between customers' views and the bill impact of the difference between water companies' 'base package' and the package taking into account ODI rewards and penalties.<sup>62</sup> One company interviewed for this study noted its WTP research generated 'unusual' estimates that suggested a disconnect between customers' WTP and ODIs. It therefore used a combination of different evidence to support its case for setting ODIs, which did not refer significantly to its WTP analysis.

It concluded that if WTP research is used to inform ODIs in future, it should be specifically designed for that purpose, taking into account several considerations when designing and implementing the research, including:

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<sup>59</sup> Northumbrian Water (2015) Improving the Outcome and Delivery Incentive Regime. <https://www.nwl.co.uk/assets/documents/Outcomes - a Water 2020 paper.pdf>

<sup>60</sup> For example, see ESAN (2016), Ibid. and discussion above in this report.

<sup>61</sup> PJM and Accent (2015) *Willingness-to-pay at PR19*

<sup>62</sup> Northumbrian Water (2015), Ibid.

- whether ODIs are a cost-recovery mechanism for additional improvements over and above a ‘base’ level of performance, or a financial incentive with a reward element that may be greater than customers’ WTP;
- the timing of incentive payments and how long they would last, so that this could be reflected appropriately in WTP research; and
- the need to accommodate the fact that ODI incentives are set by using national comparisons, whereas water companies’ WTP research generally focuses on their own (regional) customers’ preferences. This is an important factor, because estimates of WTP may differ regionally for the same performance rating, because relative performance nationally already differs by region (for example, a ‘leading’ company’s customers may value outperformance less than a ‘laggard’ company’s customers). In conclusion, looking ahead it is important for the WTP research used as supporting evidence for ODIs to be designed for that specific purpose and to address the challenges outlined above.

This question can be asked separately for the context of acceptability research, where it is important that customers understand. This should be distinguished from research to estimate the value of services (but is nonetheless an important part of the process for water companies). In the context of acceptability research, water companies could test whether respondents understand:

- that they are being asked about the size of rewards that *companies would get* from achieving certain service levels;
- the difference between financial incentives and the impact on their bill (an understanding that financial incentives would only partially be passed through to bills, if at all); and
- that they are only being asked about financial incentive payments over the next price control period (5 years) (in contrast to bill-change WTP).

**Recommendations:** Table 4.2 sets out recommendations in relation to using WTP estimates in business planning, including specifically applying WTP to ODIs.

Table 4.2 Recommendations relevant to using WTP in business planning

Do	Don't	Consider
Communicate WTP research to customers and other stakeholders as early as possible and be open to feeding back to researchers based on this engagement	Over-simplify the representation of WTP values in business planning.	Consider how WTP estimates will be used from the outset and feed this into the commissioning / research process
Encourage dialogue between water companies and Ofwat regarding how WTP estimates are used.		How WTP research contributes to ongoing plans for research and how the company can demonstrate a commitment to generating a growing body of evidence on consumer views over time.
Explore whether customers' WTP is affected by whether it is applied to bills or financial incentives.	Apply WTP framed in terms of bills directly to financial incentives that would influence payments in a different way.	Whether specific research should be carried out to explore customers' views on financial incentives.
Incorporate sensitivity testing into use of WTP results in business cases, using confidence intervals quantified in WTP studies as the basis.	Arbitrarily scale WTP values without comparing and considering the context in which estimates were made with the context to which they are being applied	

## 4.4 Triangulating multiple WTP methods

This report has described that SP analysis is prevalent in the water sector due to its flexibility to generate valuation evidence in a wide set of circumstances and in a format that can be used in business planning. As noted above, Ofwat has called for water companies to use a combination of methods to provide cross-checks and validation of results. It is therefore appropriate to explore whether SP can be supplemented with other methods, to estimate customer preferences and valuations based on a wider range of evidence sources.

Any type of WTP analysis can be strengthened through triangulation with other WTP methods. This was a point that was also emphasised by several water companies and other stakeholders interviewed for this study. In this context, this section considers approaches to triangulating multiple WTP methods, while Section 4.5 specifically explores the application of RP analysis to supplement SP methods.

The principle of triangulation is also demonstrated in water companies' practical application of WTP research. For example, Scottish Water (2012) used both discrete-choice experiments and contingent valuation in the same SP survey to generate WTP estimates for a range of service level changes. This is also typical of English and Welsh water companies approach to PR14. For example, Southern Water used both discrete choice experiments and contingent valuation questions in the same SP survey, which is also in line with UKWIR guidance.<sup>63</sup>

Nonetheless, several water companies reported their view in interviews for this study that there remains further potential for triangulating WTP methods in their business planning for PR19, a point corroborated by PJM and Accent (2015).<sup>64</sup> One water company reported that it has already begun to employ multi-method WTP research to explore how this can affect responses, with the aim of using this information to calibrate and/or validate its WTP findings for PR19. Another water company reported using multiple WTP methods when piloting its research for PR19, so that it can compare results before rolling out its research to the full sample of customers.

Researchers in other sectors have also used this principle extensively. For example, Environment Agency research into environmental benefits used multiple methods in one survey, including two separate contingent valuation methods alongside multiple methods of choice-experiment.<sup>65</sup> This research also explored how results from different methods could be compared (see separate triangulation report).<sup>66</sup> Value transfer methods can also be considered. In short, value transfer involves taking economic value evidence estimated in one context and applying it to another. Defra set out guidelines for value transfer approaches.<sup>67</sup> In the business planning context for water companies, it is important for them to consider the level of accuracy required – generally the more accurate a valuation is required, the higher the level of effort is justified and so the more likely direct evidence will be required (rather than value-transfer methods). Defra guidelines set out how value-transfer methods can

<sup>63</sup> Accent (April 2013) Southern Water Customer Engagement (Economic) – Willingness-to-pay. [https://www.southernwater.co.uk/Media/Default/PDFs/A05\\_WillingnessToPay.pdf](https://www.southernwater.co.uk/Media/Default/PDFs/A05_WillingnessToPay.pdf)

<sup>64</sup> PJM and Accent (2015), *Ibid*.

<sup>65</sup> Environment Agency (2013). *Updating the National Water Environment Benefit Survey values: summary of the peer review*, [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/291464/LIT\\_8348\\_42b259.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291464/LIT_8348_42b259.pdf)

<sup>66</sup> [Refer to triangulation report – reference will be provided prior to publication]

<sup>67</sup> Eftac for Defra (2010), *Ibid*

be used and how practitioners can decide whether to use value-transfer methods.<sup>68</sup> These guidelines acknowledge that there are pros and cons to doing so, which should be considered before such approaches are applied.

Ofcom also noted in its interview for this study that it often aims to combine two to three different WTP approaches when carrying out research to estimate consumers' WTP for goods/services in the telecoms sector. It then compares the results of each approach to support its overall conclusions on WTP. In practice, this means designing different experiments and surveys, and carrying out separate analysis on each. For example, when carrying out research, Ofcom will use different approaches with different sub-groups of respondents, so that estimates can be compared within one study. Ofcom viewed this as a way to recognise and account for risks associated with the use of WTP, so as to increase its value as a method. This approach has also been used in the energy sector. London Economics used a combination of choice experiments to examine both WTP and WTA interruptions to electricity supply, as well as combining these with contingent valuation questions.<sup>69</sup> Academic studies have also sought to combine WTP methods to improve WTP estimates. For example, Ferrini et. al (2014) combined SP and RP methods to estimate river water quality values from a large-scale sample of households.<sup>70</sup> They did so by collecting SP information for choice modelling and revealed-preference information to inform a travel-cost estimation, all within the same survey.

HM Treasury also note that the life-satisfaction approach has been gaining popularity as another supplementary approach to WTP analysis. This approach estimates the value of non-market goods through their impact on life-satisfaction, based on the proposition that actual well-being or welfare may not be well-represented by people's preferences (whether stated preferences or revealed preferences).<sup>71</sup> This method is, though, dependent upon being able to link measures of life satisfaction to changes in goods or services, which is likely to be challenging in the water sector, particularly in relation to the incremental value of different attributes or services levels, which is the primary value of WTP estimates for business-planning in the water sector.

**Recommendations:** This study recommends the following in relation to triangulating WTP methods (Table 4.3).

Table 4.3 Recommendations relevant to triangulating WTP methods

Do	Don't	Consider
Explore multiple potential WTP methods for each specific application required for business-planning purposes	Simply carry out one WTP method without justifying why that method was chosen.	Whether to incorporate multiple WTP methods into one survey, building in triangulation from the outset when designing research.

<sup>68</sup> Eftec for Defra (2010), *Ibid*

<sup>69</sup> London Economics for Ofgem. (2013). The Value of Lost Load for Electricity in Great Britain. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/224028/value\\_lost\\_load\\_electricity\\_gb.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/224028/value_lost_load_electricity_gb.pdf) This allowed comparison of methods to inform conclusions on the validity of each method.

<sup>70</sup> Ferrini, S., M. Schaafsma, and I. Bateman (2014), Revealed and stated preference valuation and transfer: A within-sample comparison of water quality improvement values, *Water Resources*, 50, doi:10.1002/2013WR014905. <https://ore.exeter.ac.uk/repository/bitstream/handle/10871/19372/Ferrini%20et%20al%202014%20water%20bentans%20WRR.pdf?sequence=1>

<sup>71</sup> HM Treasury (July 2011), Valuation Techniques for Social Cost-Benefit Analysis: Stated Preference, Revealed Preference and Subjective Well-Being Approaches. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/209107/greenbook\\_valuationtechniques.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209107/greenbook_valuationtechniques.pdf)

Do	Don't	Consider
Take into account the level of assurance/accuracy required for each element of WTP estimates, depending on how it will be used.	Approach WTP method selection in an ad-hoc manner.	All approaches to benefits valuation that may be feasible.

#### 4.4.2 The temporal nature of research

Any customer research, on its own, offers a snapshot in time, so estimates may vary depending on circumstances at that specific point in time. For example, consumers' valuations may be influenced by general macro-economic conditions, or, in the water industry, a major resilience event affecting services. Anglian Water noted this in its research for PR09, which occurred in the midst of a significant economic downturn.<sup>72</sup> Consumers' estimates can also be influenced by events specific to individuals or groups of individuals participating in research.

In interviews for the study, two water companies reported cross-checking WTP results from individual pieces of research with previous results from WTP estimates for comparable questions and comparable groups of customers. One of these water companies noted that it carries out WTP research on a continuous basis, not just when required for the periodic review process. Since PR14, it decided to complete this kind of research every two years, to track changes in WTP over time and learn more about the external factors that influence WTP. It uses the same method in each survey but a new sample of customers<sup>73</sup>.

Another water company reported that it is investigating whether to undertake WTP research more frequently, to generate early warning evidence of any shifts in customer preferences (while noting that currently its plans are not firm).

Another water company highlighted its intention to carry-out continuous testing in future, not just for the periodic review process. It reported that WTP would likely change over time in response to local water events and wider economic conditions. It reported that it hoped surveying WTP more frequently would generate more accurate WTP estimates, but also generate insights into factors that influence WTP.

These methods could help to identify changes in customers' WTP over time and increase the number of 'data points' for comparison. United Utilities (2016) noted the importance of this comparative process, including comparing results with those of other companies, including comparing the influence of different methodologies on results.<sup>74</sup>

**Recommendations:** This study recommends that water companies implement continuous research programmes that generate insights over time, making these comparable with previous analysis where possible. This could help water companies to triangulate WTP estimates over time and show how external factors influence WTP.

<sup>72</sup> Anglian Water (2008), Ibid.

<sup>73</sup> Comparison over time requires repeating all aspects of the method, including investigating the same service levels or service attributes.

<sup>74</sup> United Utilities (February 2016), Improving Customer Research and Engagement. <http://corporate.unitedutilities.com/documents/Water2020-Feb16-CustomerEngagement.pdf>

### 4.4.3 Triangulation with other sources

This report should also be read alongside ICF's further study on triangulation.<sup>75</sup> This report, outlines how triangulation of multiple WTP methods can help to validate WTP findings. This point is explored in more detail in the report on triangulation, which also explores several other aspects of triangulation and how it can be applied to improve business planning in the water sector.

**Recommendation:** Water companies should consider triangulation with other sources of information on consumer preferences and values as far as possible.

## 4.5 Using RP methods in the water sector

This section examines the opportunity that RP analysis offers to inform water companies' business planning and submissions for PR19. This is one area where there is potential for water companies to explore innovative approaches that have not previously been applied in the sector. This section also examines the potential strengths and drawbacks of RP methods. Also described above is Ofwat's call for a greater focus on improving WTP estimates (Section 1.1) and consumer research in PR19 which indicated that this may include greater use of RP methods.

One water company reported its intention, in an interview for this study, to increasingly use RP analysis to calibrate the findings of its SP analysis. Another company reported that it has already contracted a research provider to undertake research that will supplement an SP approach with RP methods, as well as qualitative research and use of a wider set of evidence collected through day-to-day contact with customers. It aims to reduce its dependence on SP research methods alone.

United Utilities (2016) note that it is sometimes possible in the water sector to use a market price to estimate WTP for water services. It highlights an example provided by UKWIR guidelines, where for example, the price of fish is used as a starting point for valuing water quality. One water company at interview reported examining public data on beach visits and bathing water with the aim of deriving monetary estimates for the value of bathing water quality, which it is planning to use in its business plan.

The Environment Agency, in its interview for this study, also reported increasing its use of RP methods. In particular, it indicated that where possible it tries to make use of market data to estimate revealed preferences, to achieve estimates that are a more accurate representation of what people would actually pay for environmental services. It also gave an example that is directly applicable to the water sector, whereby the value of reducing flooding risk could be estimated through avoided property damage cost. This approach is described in *Flood and Coastal Erosion Risk Management: A Manual for Economic Appraisal*.<sup>76</sup> Examples from the water sector show that it is possible to collect data on customer behaviour and analyse this to identify RP values to support SP research.<sup>77</sup> These examples use a national-level survey with approximately 4,500 respondents to examine how customers respond to hardness and to poor taste, odour or colour of tap water. The analysis

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<sup>75</sup> ICF (July 2017), *Defining and applying 'triangulation' in the water sector*, <https://www.ccwater.org.uk/research/defining-triangulation-and-willingness-to-pay-in-the-water-sector/>

<sup>76</sup> Eftec for Defra (2010), *Ibid*

<sup>77</sup> Lanz, B. & Provins, A. (2017) '*Using averting expenditures to estimate the demand for public goods: Combining objective and perceived quality*', *Resource and Energy Economics*, 47(3): 20–35 and Lanz, B. & Provins, A. (2016) '*The demand for tap water quality: Survey evidence on water hardness and aesthetic quality*', *Water Resources and Economics*, Volume 16, October 2016, Pages 52–63.

examined how expenditure on complementary goods changes as water hardness and aesthetic quality changes, to infer WTP values for those qualities.

One study of WTP in transport demonstrates the benefits of considering RP methods prior to designing an SP survey. In that survey, a SP survey of transport users was designed specifically to generate data on the same transport preferences for which RP data was available.<sup>78</sup>

However, RP methods also have drawbacks. RP methods can only estimate use values – the value that individuals derive from using a good or service – and cannot incorporate non-use value or option value.<sup>79</sup> This is because market prices, which are the data RP uses, do not reflect non-use values.

In addition, Cascade and etec (2011) report that RP methods can only reflect the value of a change that is known or has already been experienced. For example, ESAN (2016) noted that a study of the impact of sewer flooding risk on house prices would not reveal the full benefits of this value if customers are not aware of the risk of sewer flooding.<sup>80</sup> RP methods also only generate evidence on existing and historic goods and services. These methods are based on real data, which generally does not exist for future or hypothetical goods.<sup>81</sup> Investment planning and the use of WTP evidence in the water sector is generally forward-looking, which therefore constrains the direct application of RP methods for business-planning in the water sector.

Beyond theoretical limitations and challenges with using RP analysis, there are also practical considerations that limit water companies' ability to use it. A well-reported and clear drawback of RP analysis (for example, see BritainThinks (2016)) is its strong dependence on appropriate data being available.<sup>82</sup> ICS and etec (2016) conclude that this is one of the reasons why there is currently only a limited amount of RP analysis in the water sector.<sup>83</sup> Cascade and etec (2011) noted that RP methods all require good quality datasets and also advanced technical skills and econometric estimation to generate value estimates and noted that this may contribute to explaining the relative lack of RP analysis at that time.<sup>84</sup>

In the energy sector there appeared to be a similar lack of use of RP methods to estimate consumer preferences, where it is recognised that it is challenging to generate good value estimates of low-probability high-impact outcomes using RP analysis (such as power cuts).<sup>85</sup> These characteristics are common to some service attributes in the water sector. For example, London Economics (2013) highlight that although people may be less comfortable during power cuts, generally they do little about it because there are few available alternative ways to purchase the same amenities that electricity supply provides. Or where there are alternatives, they may be poor substitutes, which can bias estimates that use RP methods (as they may not capture the full value of the 'target' good/service).<sup>86</sup> These are common

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<sup>78</sup> Department for Transport (DfT) (2015). Ibid.

<sup>79</sup> See, for example, Cascade with Etec (2011), Ibid.

<sup>80</sup> See, for example, ESAN (2016) *ESAN conference paper: How can the consumer voice be better heard in the regulation of essential service?* Ibid.

<sup>81</sup> Except in financial products linked to future product trading, which generally does not occur in the water sector.

<sup>82</sup> See, for example, BritainThinks and London Economics (2016) and ESAN (2016).

<sup>83</sup> ICS and etec (2016) *Customer Engagement: The next big push for valuation*.

<sup>84</sup> <http://www.icsconsulting.co.uk/uploads/2016-06%20ICS%20eftec%20Valuation%20Brochure%20V1.1.pdf>

<sup>85</sup> Cascade with Etec for Ofwat (2011), Ibid.

<sup>86</sup> London Economics for Ofgem. (2013). Ibid.

<sup>86</sup> London Economics for Ofgem. (2013). Ibid.

challenges when attempting RP analysis in the water sector (as explained in Section 2.2).

However, RP methods have been used to supplement SP methods in the transport sector. The Department for Transport undertook research to explore business and non-work travellers' WTP for journey time improvements. Values of travel time savings play an important role in developing business cases for transport investments. They are used to place a value on changes in journey times arising from an investment and to value changes in travel behaviour, as people and businesses might choose to travel to different locations to undertake different activities as a result of the investment. The research applied SP survey methods to estimate values for business travel. To validate the results of the SP survey, RP evidence was used based on real-world choices between rail journeys provided by different train operators, where different operators offer different journey times and fares on the same or very similar routes. Using SP to complement RP also allowed the resulting values to incorporate the full range of factors that might affect how businesses benefit from journey improvements, such as whether they are able to work during the journey and how any 'saved' time would be used.<sup>87</sup>

Other forms of research could also potentially supplement and inform SP analysis. For example, BritainThinks and London Economics (2016) report the increasing use of behavioural experiments by regulators. Similarly to RP methods, these are based on real-world behaviour, but in an experimental setting which compares how behaviour changes under different interventions. However, some experiments use stylised settings, which limits the extent to which they can be viewed as 'observed behaviour', as this is limited by the extent to which a real scenario is created by the experiment. Other experiments are carried out in real-world settings such as 'randomised control trials' where consumers are allocated to real-world conditions and their behaviour is observed. Consequently there is a fine line between these 'real-world' experiments and RP methods outlined above. Hahn et. al. (2017) give examples of how such experiments can be used to estimate demand for particular commodities, estimating the economic and environmental impacts of price changes, helping with take-up of smart technology and getting customers to conserve energy in times of shortage.<sup>88</sup> These approaches may offer potential operational improvements but are relatively untested as ways to estimate customer values.

There are also specific challenges associated with using RP methods in the water sector, as recognised by some water companies that were interviewed for this study. One company highlighted that there are few areas where good alternatives to water sector services exist (i.e. strong complement or substitute relationships). This challenge is also recognised by United Utilities (2016).<sup>89</sup> Nonetheless, the same company reported that it was carrying-out research aiming to supplement and verify SP evidence with RP methods. It reported seeking to apply these methods where there are complementary or substitute relationships between market goods and water services, such as the market for bottled water.

**Recommendations:** The recommendations set out below aim to help water companies to maximise the complementarity of SP and RP methods, aiming to inform prioritisation of research resources to maximise the insight gained over time.

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<sup>87</sup> Department for Transport (DfT) (2015). *Understanding and Valuing Impacts of Transport Investment*

<sup>88</sup> For example, see Robert Hahn, Robert Metcalfe and Florian Rundhammer (June 2017), *Power to the People: A New Trend in Regulation* (Working Paper), <https://www.brookings.edu/research/power-to-the-people-a-new-trend-in-regulation/>

<sup>89</sup> United Utilities (2016), *Improving Customer Research and Engagement*. <http://corporate.unitedutilities.com/documents/Water2020-Feb16-CustomerEngagement.pdf>



**Table 4.4 Recommendations relevant to matching customer research to business-planning needs**

Do	Don't	Consider
Consider the full range of SP and RP methods and assess which is most applicable to each specific need for customer evidence	Specify research too tightly – making sure to avoid ruling out new innovative methods.-	Be open to new developments such as behavioural experiments.
Consider which service attributes may be most easily estimated using RP methods (see Table 4.5).		
Consider whether RP and SP methods can be used together in the same survey, from the outset.		

Table 4.5 gives an overview of the potential suitability of RP methods for a range of different water and wastewater service attributes.

Table 4.5 Outline of suitability of RP research for water and wastewater service attributes

Water / wastewater services attribute	Potential data source (some relate to quality impacts, others to preferences)	Possible non-use value?	Suitability of RP to supplement evidence base
<b>Water services</b>			
Drinking water quality (risks to health))	Household survey, business survey, Health and Safety Executive (HSE) Cost of Injury Approach <sup>90</sup> , Use the World Health Organization “Guidelines for Drinking Water Quality” <sup>91</sup>	May not be significant for small changes in quality in the short term. May be more significant in the longer-term.	Potentially suitable. Avertive behaviour model could be used to examine WTP for alternatives if suitable data can be found. <sup>92</sup>
Drinking water quality (aesthetics, taste, odour)			
Water supply interruptions (Water as an input to production processes)	Household survey, business survey		Potentially suitable. Avertive behaviour model could be used to examine WTP for alternatives. For example businesses that use water as an input to a production process or as an essential input to their services (e.g. recreational uses) may purchase water storage.
Water pressure	Household survey, business survey	Likely not to be significant.	Potentially suitable. Avertive behaviour could be used to model valuations using data on substitutes for water pressure. Examples might include pumps for outdoor use, ‘water pressure boosters’ for internal use, plumbing work or prices for shower pressure boosters.
<b>Wastewater services</b>			
Sewer flooding inside customers’ properties	Household survey, business survey / defensive expenditure	Possible non-use values, but may not be a significant consideration for valuation methods	Potentially suitable if data available. Could use hedonic property pricing if the information on sewer flooding were publicly available (but it is not currently). Could potentially use avertive behaviour to identify expenditure on measures to prevent sewer flooding. For example, maintenance charges for properties with septic tanks, or drainage repair costs (though this is would generate a minimum WTP estimate).

<sup>90</sup> See HSE (2003), Cost and Benefit (CBA) checklist at <http://www.hse.gov.uk/risk/theory/alarpcheck.htm>

<sup>91</sup> WHO (2011), *Guidelines for Drinking Water Quality*, 4rd Edition, [http://www.who.int/water\\_sanitation\\_health/publications/2011/dwq\\_guidelines/en/index.html](http://www.who.int/water_sanitation_health/publications/2011/dwq_guidelines/en/index.html)

<sup>92</sup> See, for example, Lanz, B. & Provins, A. (2017), *Ibid*, and Lanz, B. & Provins, A. (2016) *Ibid*.

Water / wastewater services attribute	Potential data source (some relate to quality impacts, others to preferences)	Possible non-use value?	Suitability of RP to supplement evidence base
Sewerage flooding outside customers' properties, and public areas	As above	Non-use value for public spaces may be higher.	No clear use for RP. The replacement / clean-up cost would not reflect WTP of customers. Individual customers would not pay to avert a public risk. The best RP method may be to use hedonic pricing if sufficient information on the risk were available, but may not be sufficient to implement hedonic pricing.
Odour from sewerage treatment works	Residential property sales, characteristics, etc. Geographic information systems (GIS) could be used to calculate travel times and travel costs between the respondent's home and the choice set of sites.	Non-use values may not play a significant role.	Hedonic property pricing methods applied to house prices in areas where odour from sewage treatment is experienced. This is a more uniform impact than sewer flooding so we can assume people living in a given distance band from the treatment works are similarly affected by odour.
<b>Recreational services</b>			
River-water quality, coastal bathing water quality	Data on expenditure on travel and recreation. Household survey (i.e. on-site or off-site survey), geographic information systems (GIS) data, environmental quality data, other sources for costs (e.g. fuel costs)	May be relevant, so any values derived from RP research could need to be supplemented with SP research.	May be possible to use the travel cost method, though can only be applied to estimate recreational demand (value of activities that make use of the environment without consuming it).

## 4.6 Communicating research and how it has been used

As noted above, stakeholders across the sector have noted drawbacks or concerns with how WTP estimates were used in PR14. Similarly, the extent to which water companies followed best-practice guidance in carrying out their WTP research is not well understood across stakeholders in the water sector.

**Recommendation:** To tackle this, water companies could do more to communicate their research to stakeholders, at every stage. This could include transparently engaging with their stakeholders to explain how they have considered the stages of research outlined in this study. It could also include explaining how their WTP research is applicable to the specific applications for which they use it in their business planning. And finally, it could include communicating the steps they have taken to validate individual research studies and to explore combining and triangulating WTP methods (and other non-WTP information).

## 5 Improving SP research in the water sector

This chapter addresses practical considerations for water companies in carrying out SP research specifically. It briefly describes key elements of good practice guidelines that describe *how* water companies can approach SP research. It then addresses how water companies can apply the best practice to address challenges that they face in carrying out SP research (many of which are common to all types of research).

This chapter does not attempt to prescribe the methods, questions or presentation that water companies should use in carrying out SP research. These decisions depend fundamentally on the objectives of the research and the respondents in question. For each research study, these decisions need to be made to balance survey length with the amount of information collected, and to balance the simplification of issues for respondents with the complexities of water companies' strategic planning. Design choice of tasks needs to be balanced with theoretical robustness, sample sizes with resources, and time spent on design with business planning deadlines.

There is therefore no simple way to prescribe what individual companies should do. The good practice described in Section 5.1 does describe how companies can navigate these trade-offs in such a way to produce relevant and valid SP research. The remainder of the chapter explores what this means in practice for water companies and provides some practical recommendations as to how to go about commissioning or doing SP research.

Further detail on the challenges that water companies face when carrying out customer research in the water sector is set out in Annex 1.

### 5.1 Using good practice to ensure the validity of SP research

Several good practice guidance documents are available, describing how to go about SP research. This report provides a high-level summary only, rather than seeking to replace or update these guidance documents. Several key guidance documents are available, including those set out below.<sup>93</sup>

- UKWIR (2010) *Review of Cost-benefit Analysis and Benefits Valuation – Practitioners Guide*<sup>94</sup>;
- UKWIR (2011) *Carrying-out Willingness-to-pay Surveys*;<sup>95</sup> Report 11/RG/07/22.
- Bateman, et al (2002). *Economic Valuation with Stated Preference Techniques: A Manual*<sup>96</sup>;

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<sup>93</sup> There are also further guidance documents not mentioned here, in academic literature and also grey literature (official guidance). An ISO standard on monetary valuation, in the context of valuing environmental impacts, is also in development (covering all sources of WTP and WTA data, including but not limited to SP) – ISO 14008. Further information can be found at: <https://committee.iso.org/sites/tc207sc1/home/projects/ongoing/iso-14008.html>

<sup>94</sup> UKWIR (2010) *Review of Cost-benefit Analysis and Benefits Valuation – Practitioners Guide*, Report 10/RG/07/18.

<sup>95</sup> UKWIR (2011) *Carrying-out Willingness-to-pay Surveys*, Report 11/RG/07/22.

<sup>96</sup> Bateman, I. J., Carson, R. T., Day, B., Hahnemann, M., Hanley, N., Hett, T., Jones-Lee, M., Loomes, G., Mourato, S., Ozdemiroglu, E., Pearce, D., Sugden, R. and Swanson, J. (2002). *Economic Valuation with Stated Preference Techniques: A Manual*. Cheltenham. UK and Northampton, MA, USA: Edward Elgar.

- Johnston et al (2017), *Contemporary Guidance for Stated Preference Studies*<sup>97</sup>; and
- Department for Transport (DfT) (2016). *Understanding and Valuing Impacts of Transport Investment*<sup>98</sup>.

Together, this guidance include a number of general recommendations for good practice in SP research (not specific to the water sector). A very brief overview of these is set out below.

### Guidelines for general good practice in SP research

***This overview provides context for the findings of this study set out later in this report. It is not intended to be comprehensive nor to replicate, update, or replace existing guidance documents.*** In general, the following guidelines describe good practice in SP research, although the authors of the original descriptions also note that they are not intended to be prescriptive and that not all apply in all research contexts.

- Surveys should always and clearly present the 'status quo' (where this is known), the change to be valued and how the change would be implemented;
- Survey design should be tested using appropriate methods, which depend on context, but should always be documented and justified;
- The process for choosing between estimating service attributes separately or the value of a service as a whole (see Table 2.2) should be well documented and based on how respondents tend to perceive the good being valued;
- SP research should be designed to use prior information and knowledge in the experimental design, to ensure that experiments yield as efficient and unbiased estimates as possible;
- Surveys should be carried out consistent with research ethics and should be independently reviewed to ensure that is the case and that good practice is followed;
- The mode of data collection / choice of engagement method depends on context, but should always be explained and justified in the method write-up and communication of results;
- A choice between WTP and WTA can be made based on context. This may depend on theory and/or empirical considerations, and should always be explained;
- A 'decision rule' should be specified that indicates how the outcome would relate to responses to the survey (i.e. how different potential results from WTP research would be used) prior to the research being carried out);

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<sup>97</sup> Robert J. Johnston, Kevin J. Boyle, Wiktor (Vic) Adamowicz, Jeff Bennett, Roy Brouwer, Trudy Ann Cameron, W. Michael Hanemann, Nick Hanley, Mandy Ryan, Riccardo Scarpa, Roger Tourangeau, Christian A. Vossler, (2017), *Contemporary Guidance for Stated Preference Studies*, Journal of the Association of Environmental and Resource Economists 2017 4:2, 319-405

We note that this guidance document was developed in the context of environment and health applications, but the objective to estimate economic values for a non-market public good are similar to the water sector context, which similarly requires estimating economic values for goods of a similar nature (though water services are not entirely a public good).

<sup>98</sup>Available at: <https://www.gov.uk/government/publications/transport-appraisal-in-investment-decisions-understanding-and-valuing-the-impacts-of-transport-investment>

- The terms in which payments and costs are described should be selected to be realistic, familiar and binding;
- Surveys should include questions to evaluate the validity of responses to questions about value;
- Surveys should be designed to maximise validity, by maximising ‘incentive compatibility’, i.e. that respondents have incentives to give true responses (which depends on the context, but for example, by explaining how responses will be used);
- Analysis of SP data and selection of econometric approaches should i) reflect the individual data to be analysed and ii) take into account heterogeneity of preferences, depending on the type of heterogeneity observed;
- Analysis should consider behavioural biases such as protest or outlier responses, test their extent, and investigate the causes of any such outliers, then consider the impact on overall value estimates;
- Responses to validity questions contained in surveys should be accompanied by clear theoretical, survey design or empirical arguments to inform conclusions on the validity of value estimates;
- Authors should consider and make clear how well the results can be generalised to contexts other than those for which the survey was designed;
- Testing the ‘internal validity’ of research across multiple dimensions, such as the effects of study design; and
- Results should be interpreted considering the weight of available evidence, not relying on a single test or investigation.

*Sources: as listed above*

This chapter explores SP specific aspects of good practice guidance in SP research that can help water companies to overcome the challenges of carrying out SP research in the water sector.

## 5.2 Sampling and understanding customer diversity

Water is a universal service required by all, so water customers are a large and consequently diverse group. Water companies recognise that this should be taken into account when applying WTP estimates in their business plans. One water company recognised in an interview for this study that care should be taken when using WTP, to apply it as an indicator rather than an absolute value, recognising that a single WTP estimate cannot represent customer diversity well. Nonetheless, the basis of most cost-benefit assessments is the economic level of service across the company region, rather than distinguishing between particular customer types or locations, hence the use of an average WTP value is appropriate. This does not mean that customers receive the same level of service, but companies’ investment priorities and business planning aim for universal service quality. At the scale of the economic level of service at the company region what matters most is that WTP estimates indicate order of magnitudes of benefits and avoided costs. When using customer research insight to refine investment strategies and operational responses, a richer understanding of customer priorities can be useful, including how the distribution of preferences and values varies over customer segments.

Any customer research requires a representative group of customers. Two key aspects of this are to identify sufficient numbers of customers and to identify a

representative sample of customers. UKWIR (2011) provides detailed guidance on methods for sampling. Importantly companies must identify their sampling objectives prior to carrying out research (see above). Generally samples need to be representative for both their household customers and their business customers, requiring reference to different characteristics (though studies of these two groups might be carried out separately). For example, South East Water's research for PR14 highlighted the importance of age for household customers and bill size for business customers, alongside other characteristics.<sup>99</sup>

Good practice recognises diversity from the outset, and guidance offers methods to accommodate and estimate diversity, in particular by separating different customer groups and applying appropriate validity tests to each to ensure representative results. In all cases validity testing must ensure that sample sizes are adequate across all sub-groups for which WTP is estimated.

An important aspect of SP research is to design experiments in such a way as to generate evidence not only on the average WTP among a target group, but to understand the distribution of diverse views within that group. This is an area that Ofwat highlighted for improvement for PR19. One CCG noted the importance of ensuring that vulnerable customers are represented effectively and proportionately in customer research. At PR09 it had specifically challenged its water company's work and requested further specific WTP research into vulnerable customers' views. In response, water companies could present a distribution of WTP results in their business planning, rather than choosing to represent only a central value.

Some water companies have begun to take this into account in their research by commissioning follow-up work to explore specific issues that are highlighted in original surveys. These smaller surveys may be more targeted and therefore shorter, less time consuming and/or resource-intensive. For example, Bournemouth Water for PR14 carried out research to examine the groups were most likely to be affected by price and investment decisions.<sup>100</sup> This research specifically examined the needs of vulnerable customers (among residential customers) and the specific needs of farmers (among business customers).

One water company reported setting quotas and sub-samples for different types of customer (by income) to generate evidence on customers of all income levels. One CCG noted that it can be particularly difficult to take vulnerable customers into account and by definition is it more difficult to gather evidence on the preferences of customers that are hard to contact / engage. Water companies that identify this challenge at the outset can ensure their SP research is specifically designed to include and represent these customers.

In Scotland, Scottish Water carried out research that aimed to capture customer diversity by experimentally varying options throughout the sample, to generate evidence of the distribution of WTP over the Scottish population. Specifically, within a choice experiment, respondents were asked to choose between the same alternatives, but using different costs for the improvement options among different sub-groups, thereby generating evidence on the distribution of valuations.<sup>101</sup>

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<sup>99</sup> South East Water (November 2013) Ibid.

<sup>100</sup> Sembcorp Bournemouth Water (October 2013) *The appointed business plan*.  
<http://www.bournemouthwater.co.uk/Uploads/Docs/Report%20and%20accounts/SBW%20BP%20The%20Appointed%20redacted.pdf>

<sup>101</sup> Scottish Water (November 2012) Listening to our Customers, Customer Engagement Programme and Insights Report.  
[http://www.scottishwater.co.uk/assets/about%20us/images/contact%20us/listening%20to%20our%20customers\\_report.pdf](http://www.scottishwater.co.uk/assets/about%20us/images/contact%20us/listening%20to%20our%20customers_report.pdf)



Business customers can also differ widely in terms of both the way they use water services, the volume of services they use and their importance for the business. In Scotland, Scottish Water takes specific measures to recognise and account for these differences. Specifically, it included more of its largest customers in the sample, to maximise the precision of WTP estimates for those customers, as they would have a greater consequence for overall business planning.<sup>102</sup> Representing diversity in customer research is recognised as a challenge in other sectors too, for example as noted by the Competition Commission (2011).<sup>103</sup>

Water companies recognised this as far back as PR09. For example, Anglian Water found then that while a third of customers wanted to see bills stay at current levels and consequently to forego service improvements, some residential customers were prepared to pay up to £115 per year for service improvements.<sup>104</sup> This can be addressed by grouping customers, for example by socio-economic grade, or region, for example as demonstrated by Accent for Southern Water (2014)<sup>105</sup> and ensuring each group has a large enough representative sample.

Finally, water companies at interview reported the need to make sure that bill payers are those answering questions that generate evidence (or potential future bill payers for questions about longer-term priorities). This is to ensure that individuals responding to customer surveys are those that understand issues best and are therefore in the best position to give representative views.

**Recommendations:** Table 5.1 sets out recommendations in relation to using WTP estimates in business planning, including specifically applying WTP to ODIs.

**Table 5.1 Recommendations relevant to sampling and understanding customer diversity (some taken from UKWIR 2011)**

Do	Don't	Consider
Refer to good practice for sampling methods (e.g. UKWIR 2011).	Over-simplify results presentation – without explaining how and why high-level / simplified figures have been estimated and determined appropriate to apply.	Consider alternative sampling methods and communicate how methods were chosen and tested.
Define the target (affected) population clearly and completely, including the sample size required to produce valid results.	Underestimate the importance of work that goes into sampling at the start of a stated preference study	How to communicate how samples were selected and/or how specific groups were identified.
Design samples from the outset to include a range of customer groups, including household and business customers.		Whether to specifically estimate heterogeneity in customer preferences.
Explore whether specific groups should be surveyed separately or included in sub-samples (e.g. vulnerable customers).		
Communicate how samples have been selected and how they		

<sup>102</sup> Scottish Water (November 2012) Ibid.

<sup>103</sup> The Competition Commission (2011), Review of Stated Preference and Willingness-to-pay methods, [http://webarchive.nationalarchives.gov.uk/http://www.competition-commission.org.uk/our\\_role/analysis/summary\\_and\\_report\\_combined.pdf](http://webarchive.nationalarchives.gov.uk/http://www.competition-commission.org.uk/our_role/analysis/summary_and_report_combined.pdf)

<sup>104</sup> Anglian Water (2008) *PR09 Final Business Plan. Part C1: Consumers' Views*. Ibid. This conclusion is also supported by a wider literature, as discussed in Robert J. Johnston et. al. (2017)

<sup>105</sup> Accent for Southern Water (2013), Ibid.

Do	Don't	Consider
represent customer groups and diversity within the samples.		

## 5.2.2 The process of SP survey development and testing

Developing an SP survey involves identifying a change in a good or service for which customer evidence is required then designing a method and materials for collecting that information.

One water company interviewed for this study also highlighted the importance of internal company focus groups to help identify the objectives of research as a first step. The Competition Commission also noted the potential value of this approach, indicating that internal focus groups can act to confirm deliverables and expectations, gain consensus on issues to be tested and agree topics for inclusion in research.<sup>106</sup> The latter two can be particularly valuable given the potential value of limiting the number of attributes to be tested in each survey/study (see Section A1.1).

As noted above, good practice guidance recommends testing SP materials to optimise questions, supporting materials and consequent method. Practically, the two main ways to do so are through:

- Qualitative / deliberative events to pilot survey materials (focus groups, workshops etc.) – generally these involve group discussion between customers conducted by a moderator. They can facilitate sharing and challenging of views that can generate qualitative insight to inform research at various stages, including in the design phase (DfT 2015)<sup>107</sup> and in telecoms (Ofcom, 2012).<sup>108</sup> The Competition Commission recommended a pilot sample size of at least 50 respondents for SP research.<sup>109</sup> Other examples have used pilots of significantly more individuals, for example Ofcom (2006) used a pilot sample size of 300 for SP research on consumer attitudes towards various telecoms services;<sup>110</sup> and
- Depth interviews – these are a way to interview respondents with draft materials, to test how easily those materials can be understood and how they could be improved. It can involve testing all aspects of the materials explored below (in Section 5.2.4), including question wording, presentation and any supplementary material. This can help to identify how the cognitive load for respondents taking surveys can be reduced and whether it could affect the validity of valuations.

Good practice guidelines (for example, UKWIR (2011)) emphasises that testing surveys is an essential part of the process<sup>111</sup>, including testing for the impact of strategic biases among respondents. This testing phase can also include review

<sup>106</sup> The Competition Commission (2011), Ibid

<sup>107</sup> For example, Department for Transport (DfT) (2015). *Understanding and Valuing Impacts of Transport Investment*

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/470998/Understanding\\_and\\_Valuing\\_Impacts\\_of\\_Transport\\_Investment.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/470998/Understanding_and_Valuing_Impacts_of_Transport_Investment.pdf)

<sup>108</sup> Ofcom (2012) *UHF Strategy Research - Summary Report*

[https://www.ofcom.org.uk/\\_data/assets/pdf\\_file/0024/71637/research\\_report.pdf](https://www.ofcom.org.uk/_data/assets/pdf_file/0024/71637/research_report.pdf)

<sup>109</sup> The Competition Commission (2011), Ibid

<sup>110</sup> Ofcom (2006), *Digital Dividend Review - A report of consumer research conducted for Ofcom by Holden Pearmain and ORC International*, [https://www.ofcom.org.uk/\\_data/assets/pdf\\_file/0021/19416/researchrpt.pdf](https://www.ofcom.org.uk/_data/assets/pdf_file/0021/19416/researchrpt.pdf)

<sup>111</sup> UKWIR (2011), Carrying out Willingness-to-pay Surveys. <https://www.ukwir.org/eng/forefront-report-page?object=66874>

from independent experts (either individuals or, for example, CCGs). This study found several examples where these testing processes had resulted in improvements to questionnaires or respondent materials. For example, one CCG noted that “bathing water” was used in one company’s original survey, but was found to have a different interpretation among customers (“bath/shower water”) compared with water company staff (“lakes and rivers”).

Tussupova et. al (2015) give an example of piloting different approaches to WTP valuation in the water sector.<sup>112</sup> Scottish Water (2012) noted the value of pilots in its research, in particular to test changes to survey materials that are recommended based on theory alone, emphasising the importance of a comprehensive approach to the testing phase. It found that minor changes to survey materials did not have the intended effect, leading it to reduce the number of attributes tested in its research, rather than just simplifying question design.<sup>113</sup>

**Recommendations:** Table 5.2 sets out recommendations in relation to using WTP estimates in business planning, including specifically applying WTP to ODIs.

**Table 5.2 Recommendations relevant to developing and testing SP surveys (including UKWIR 2011 guidance on survey development and testing)**

Do	Don't	Consider
Consider carefully how to present each specific attribute being tested (depending on attributes being tested and the specific group of customers being surveyed)	Lead participants in cognitive testing (interviews or focus groups) in answering questions- making sure that cognitive testing is not biased	Additional testing including review from CCGs and/or from independent experts, in good time prior to rolling out surveys to the full survey population
Use appropriate and varied methods for developing surveys, potentially including internal interviews, qualitative or deliberative events and depth interviews to develop survey materials		
Test surveys for comprehension using cognitive interviews – allowing sufficient time for this in planning the research study		How many focus groups and/or cognitive interviews are required in order to fully test all of the material, prior to rolling out the full survey

### 5.2.3 Survey modes

This section explores different methods for engaging customers when carrying out surveys. There are several main ways to engage customers in this kind of research, all of which were highlighted by one or more water companies in interviews carried out for this study:

- In-person interviews – with an interviewer administering the questionnaire to the respondent, in the main as a computer-assisted interview;
- Telephone calls, sometimes alongside presentation of materials that have been posted or emailed;
- Online questionnaires – alongside online presentation of materials to be presented as part of the questionnaires; and

<sup>112</sup> For example, see Tussupova, K., R. Berndtsson, T. Bramryd and R. Beisenova (2015) *Investigating Willingness-to-pay to Improve Water Supply Services: Application of Contingent Valuation Method*. <http://www.mdpi.com/2073-4441/7/6/3024>

<sup>113</sup> Scottish Water (November 2012) Ibid.

- Panels – any of the three modes above can be used to engage with panel members; panels are suitable for engagement on an ongoing basis with the same group of customers in a repeated manner over time (rather than one-off engagement).

Many water companies have used so-called ‘phone-post/email-phone’ methods to engage customers in their customer research for PR14.<sup>114</sup> As described in Accent for Southern Water (2014), this involves an initial screening and recruitment phone call, followed by sending material by post or email to the respondent, with a second phone call to carry-out the interview once the customer has received the material.<sup>115</sup> Generally computer based interviews – whether in-person or online - offer the greatest flexibility for designing and administering SP surveys with DCE type questions. These methods can facilitate relatively complex survey structures and routing, and a computer scripted survey is a more efficient means of survey administration.

One water company reported that focus groups tend to play a different role to survey methods, in particular in the ‘validation’ stage of water companies’ business planning. For example, Northumbrian Water’s Water Forum encouraged the use of focus groups as validation for business plans to confirm customers’ priorities in relation to specific issues, such as their views around the use of social tariffs.<sup>116</sup>

Another water company reported that it is adopting greater use of face-to-face surveys in parallel with online surveys, to examine and control for the effects of different engagement methods on their results. It reported the view that each engagement method has pros and cons, making it important to combine approaches to generate more robust estimates and a more balanced picture of customer valuations.

**Recommendations:** Table 5.3 sets out recommendations in relation to carrying out SP surveys and testing them to make sure they are as efficient and resistant to bias as possible.

Table 5.3 Recommendations relevant to carrying out SP surveys (including UKWIR 2011 guidance on survey testing)

Do	Don't	Consider
Use a variety of survey modes if possible	Always choose the cheapest fieldwork option	How the complexity of the survey could influence the most appropriate survey mode
Assess all potential survey modes and choose those most appropriate for the objectives of the specific survey		
Allow for response rates of different survey modes when planning surveys		The type of engagement (one-off, continuous) is more suited to the intended use of research outputs

<sup>114</sup> See, for example, Dŵr Cymru (November 2013) *Business plan 2015-2020* [http://www.dwrcymru.com/library/pr14/Welsh\\_Water\\_Business\\_Plan.pdf](http://www.dwrcymru.com/library/pr14/Welsh_Water_Business_Plan.pdf)

<sup>115</sup> Accent for Southern Water (2013), Ibid.

<sup>116</sup> Independent Northumbrian Water and Essex & Suffolk Water Forums (2013), Ibid.

## 5.2.4 Survey materials

This section examines how SP survey materials can be designed to maximise respondents' understanding of what they are being asked. A recent water industry workshop on consumer research recommended three broad areas for improvement:

- Increase the use of innovative survey techniques, including the potential of 'gamification', as a means of enhancing the respondent experience (although it is also important that this is not at the expense of providing the necessary, meaningful insight across sufficiently large and representative samples).
- Make use of recent advances in survey software and functionality to design survey interfaces that are more engaging in terms of maintaining respondent interest. For example, Ofcom reported one survey that provided additional information to respondents who pressed an 'i' symbol on a screen.<sup>117</sup> However, this can be difficult when combining telephone and post engagement methods, so using these advances would imply adapting engagement methods to engage respondents online or with computer-aided in person interviews.
- Adapt the application of SP research to work alongside other methods (e.g. using a traditional SP survey at the beginning and end of a deliberative event) to help calibrate different research approaches and explore the effect of providing respondents with detailed information on the survey results.<sup>118</sup>

This study identified the following considerations in survey material design, including recent innovations that water companies might consider implementing to improve engagement with surveys and the validity of outputs:

- **Background questions** – these include screening questions which allow researchers to establish respondent characteristics to make sure they are talking to the right kind of people and also to inform any weighting or adjustment required to maximise the validity of evidence. For example, one water company interviewed for this research added questions to establish whether respondents were bill payers.
- **Contextual information** – to address the comprehension challenge that research respondents can face, various researchers have developed materials that help to communicate background and contextual information quickly to respondents. The Competition Commission (2011) noted the importance of setting context for respondents in consumer research.<sup>119</sup> In particular by relating questions to individuals' day-to-day lives (e.g. "imagine you face a situation where..."). It also recommended that researchers include diagnostic questions to establish the extent of respondents' understanding, to support interpretation of responses.

One CCG reported at interview that one water company is including educational questions and information at the beginning of its surveys to improve respondents' knowledge and awareness, aiming to increase their engagement with the research.

Contextual information can also help respondents to understand that their responses matter, by explaining how WTP analysis will be used by companies in the price review process. This can improve engagement and help to generate un-biased and efficient estimates of customer valuations.

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<sup>117</sup> Ofcom (2012) UHF Strategy Research - Summary Report

<sup>118</sup> Britain Thinks (2016) Water Industry Workshop – Customer Engagement (Customer Preferences). Summary Report

<sup>119</sup> The Competition Commission (2011), Ibid

- **Gamification of surveys** – this method aims to increase respondents' engagement by providing an incentive of some sort, at its simplest level 'to win the game'. However, gamification should be approached with caution and tested thoroughly to ensure it is compatible with respondents providing their 'true' preferences, avoiding the biases outlined above.
- **Question simplification** – this approach aims to ensure that questions are as straightforward as possible, as reported by one water company interviewed for this study. It also includes simplifying question wording to help address challenges around customer comprehension of sector-specific terminology, as well as reduce the risk of cognitive overload biasing respondents' responses. The same company reported that for PR19 consumer research it is investigating simpler ways to present information to consumers, to help customers understand different scenarios presented in discrete choice modelling without adding complexity to the questions or research overall.

One example is found in electricity customers' difficulty in responding to survey questions about their valuations of different frequency of power cuts, alongside other attributes. Removing these questions was found to improve responses about other attributes of service.<sup>120</sup> London Economics for Ofgem (2013) simplified questions by phrasing payments in terms of one-off payments, to reduce the complexity of comparisons between different payment levels.<sup>121</sup> UKWIR (2011) guidelines also recommended that payments be presented as a monetary amount for household customers and a percentage deviation from current bills for business customers (reflecting the different scale of bills and customer perspectives).<sup>122</sup>

- **Cheap-talk scripts** – one specific behavioural challenge identified above is that respondents may over- or under-state their WTP because of its hypothetical nature. One approach to mitigating this risk is to describe this bias to respondents and request they try to account for it.<sup>123</sup> This approach also helps to limit protest responses. Nonetheless, this should be a factor considered in research material design.
- **Individually-adapted options** – some researchers have suggested that SP research could be improved by presenting options that relate more closely to individuals' own experiences (which can be identified by presenting information in ways specific to individuals). This could help to reduce hypothetical bias and to increase respondent engagement, thereby increasing the validity of results. DfT (2015) used computer-aided interviews where possible, to present respondents with bespoke information within the survey.<sup>124</sup> To mitigate for over-statement of hypothetical payments, respondents can be asked how they pay their water bill (payment method and frequency), then materials adapted to present payments in those terms (which may make those payments seem less hypothetical). This could be used, for example, to tailor questions to specific services / products that respondents are already familiar with. One way to do so

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<sup>120</sup> London Economics for Ofgem. (2013). Ibid.

<sup>121</sup> London Economics for Ofgem. (2013). Ibid.

<sup>122</sup> UKWIR (2011), Ibid.

<sup>123</sup> Atkinson, G. Morse-Jones, S., Mourato, S. and Provins, A. (2012) 'When to Take "No" for an Answer?: Using Entreaties to Reduce Protests in Contingent Valuation Studies', *Environmental and Resource Economics*, Volume 51, Issue 4. DOI: 10.1007/s10640-011-9509-3.

<sup>124</sup> Department for Transport (DfT) (2015). *Understanding and Valuing Impacts of Transport Investment* [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/470998/Understanding\\_and\\_Valuing\\_Impacts\\_of\\_Transport\\_Investment.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/470998/Understanding_and_Valuing_Impacts_of_Transport_Investment.pdf)

is to scale choices presented in discrete choice modelling according to customers' own bills.

Many water companies recognise the potential for improved survey software and functionality to offer more engaging surveys, giving more robust estimates.<sup>125</sup> One water company reported planning to introduce individually-adapted options to its WTP research for the next price control, by adjusting the package of services presented to customers according to their own preferences in the early part of the survey. This aims to ensure that the package of services is realistic and personally relevant to the customer.

Materials can also be used to adapt choice experiments to individuals, such that respondents are presented with choices that take into account their initial perceptions about their preferred package of services. For example, questions could be simplified by removing irrelevant or ignored options (e.g. those representing ignored aspects of service). These methods have also been used in research in the rail sector, where respondents' answers around aspects of service quality have been used to inform later questions on other aspects of service. However, there is a risk that by tailoring options to the individual, their heightened engagement could lead to over-statement of payments, compared to individuals who see a mix of options including those that are of less interest. This approach should be test further to understand the impact on valuations across a sample with tailored options compared to a sample without.

Another example of individually-adapted options is the presentation of risk information which can be shown either as a % probability or as 'one in x' – with respondents choosing which one to display. This allows each respondent to choose the option that they understand better (and each to see both options). There is some anecdotal evidence that this kind of personalisation could improve respondent understanding (though this would need to be tested further).

- **Using a visual approach** – there is an extensive literature in relation to stated preference studies that emphasises the merits of visual as opposed to textual or numerical provision of information to respondents.<sup>126</sup> Specifically, these articles argue that supplementing conventional numerical representations with images significantly reduces the susceptibility of respondents to rely on heuristic rules of thumb when formulating answers, resulting in a reduced rate of anomalous responses; i.e. results that are inconsistent with prior expectations. This approach has been used in the water sector, where visual representations have been reported to lead to more theoretically consistent preferences, by helping respondents to process risk levels more effectively. Examples include visual depictions of service levels and risk levels. The use of graphics was tested and refined through cognitive interviews, which concluded that the graphics were valuable as respondents either found the images helpful or simply ignored them

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<sup>125</sup> BritainThinks (2016), Ibid.

<sup>126</sup> For example, see Peters, E., Slovic, P., Hibbard, J. (2005a) *Bringing Meaning to Numbers: Evaluability and Affect in Choice*, University of Oregon, Eugene, Oregon; Peters, E., Dieckmann, N., Västfjäll, D., Mertz, C. K. (2005b) *When five out of four people have trouble with fractions and other numbers: Numeracy and mood in decisions*, University of Oregon, Eugene, Oregon; Fagerlin, A., Wang, C., Ubel, P. A. (2005) *Reducing the Influence of Anecdotal Reasoning on People's Health Care Decisions: Is a Picture Worth a Thousand Statistics?* Medical Decision Making, 25:398–405; Bateman 2009: with Day BH, Jones AP, Jude S, *Reducing gain-loss asymmetry: A virtual reality choice experiment valuing land use change*, Journal of Environmental Economics and Management, vol. 58, no. 1, 2009, 106-118; Hime, S., I. J. Bateman, P. Posen, and M. Hutchins (2009), *A transferable water quality ladder for conveying use and ecological information within public surveys*, CSERGE Working Pap. EDM 09-01, Univ. of East Anglia, Norwich, U. K.

in favour of using the text descriptions.<sup>127</sup> Visuals to be tested can also include presentation of interactive information digitally, but in all cases it is essential that visuals are tested to ensure they help respondents to make decisions without hindering their cognitive capacity by providing unnecessary information or by introducing bias.

- It can be difficult for respondents to perceive **information on risks** (for example, risks of a hosepipe ban to individual customers). Surveys in other sectors tend to display a good deal of information up front to mitigate this. A rule of thumb would be to ensure that material to ‘educate’ customers is included prior to asking them questions about any such difficult concepts, potentially including test questions to establish if the respondent has understood.

Frontier Economics, in partnership with United Utilities, undertook an SP survey to explore the use of comparative information and test its impact on consumers’ WTP for water services.<sup>128</sup> This work was undertaken in response to Ofwat’s request for water companies to provide information to their customers and stakeholders on their performance relative to other water companies. The study provides examples of how comparative information can be incorporated into an SP survey and provides further evidence of the benefits of presenting information as simply as possible, using visual cues where appropriate. For example, the respondents presented with comparative information in graphical form were most likely to say they found it easy to make choices. This study found no statistically significant impact on consumers’ responses in this particular area. However, this is one study only and further work may be required in order to fully test whether this conclusion can be applied to SP surveys in the full range of contexts that are relevant to water companies’ research.

As each SP study is individual to the attributes being tested and the participants in the study, it is not appropriate to generalise on the effectiveness of these methods, particularly where relatively new in the water sector context. As with all SP studies, the potential methods and innovations set out above would need to be tested for effectiveness and validity in accordance with best practice guidance, as is standard for any well-designed SP research.

**Recommendations:** Table 5.4 sets out recommendations on materials to be used for SP surveys (including UKWIR 2011 guidance on those materials).

**Table 5.4 Recommendations relevant to carrying out SP surveys (including UKWIR 2011 guidance on survey testing)**

Do	Don’t	Consider
Present clear information on how surveys will be used (which requires following recommendations above to identify how WTP estimates will be used prior to carrying out research)	Use materials without applying validity testing	Exploring how options can be tailored to individuals, or how materials could present questions according to respondents’ own comprehension
Present options in terms that respondents understand	Use wording that leads respondents’ answers	How to word question in the most neutral way
Test comprehension and results for all different propose materials, questions / wording to help ensure the survey will produce valid results	Ask too many questions that will not be used in the analysis or validity testing	How to include neutral visuals

<sup>127</sup> Accent (September 2013a) South East Water Customer Engagement Research for PR14. Final WTP Report – Main Stage September 2013

<sup>128</sup> Frontier economics (2016) *Keeping up with the Joneses. How customers’ valuations are affected by comparative information.* <https://www.frontier-economics.com/publications/keeping-up-with-the-joneses/>



Do	Don't	Consider
Keep wording simple		
Use visual materials as much as possible (maps, photos, graphs)		

### 5.3 Validity assessment

One of the key aspects of good practice that helps researchers to ensure they mitigate these challenges is validity testing, which describes the process of checking the results of SP research through further quantitative and qualitative research. This testing aims to ensure that the design of SP research does not bias responses and presents respondents with information that clearly communicates the questions being asked, but without over-burdening them with unnecessary information.

Validity testing can include analysis of the WTP function, to test whether it meets prior expectations. For example, it would generally be expected that those with high incomes would be more likely to have a higher WTP, other factors being equal (such as the change in the service, water use, socio-economic characteristics other than income). In this example, validity testing would examine whether the income variable in the WTP function is significant and positive. Tests such as this can indicate whether the WTP function is valid and the expectations being tested can derive from economic theory or from previous literature.

For other variables, such as for age, there may be no prior expectations. Validity testing for these variables is qualitative; testing whether the observed variable fits with the specific questions being asked. One example of validity testing from the water sector is the study by Lanz and Provins (2015) which uses SP survey data to make use of respondent profile, attitude and perception responses and feedback on the ease and difficulty of choices to understand what drives customer choices, with the aim of giving assurance that results are robust.<sup>129</sup>

This approach is also common across consumer research in many sectors, such as transport. For example, research conducted by DfT (2015) included a series of 'diagnostic' questions to test how well respondents understood questions and found them realistic, to generate insights on how robust estimates were.<sup>130</sup> Diagnostic questions can also be used to generate evidence on the extent to which respondents have taken into account 'societal' considerations, versus their own private interests.<sup>131</sup>

Another form of testing is sensitivity testing, whereby the impact of various aspects of WTP research design and application on the estimates produced can be tested. This can involve asking several questions on the same issue to compare responses. This can generate important insights into the weight that can be attached to estimates. United Utilities (2016) note the importance of carrying out this sort of

<sup>129</sup> Lanz, B. and Provins, A. (2015) 'Using Discrete Choice Experiments to Regulate the Provision of Water Services: Do Status Quo Choices Reflect Preferences?' *Journal of Regulatory Economics*, Volume 47, Issue 3. DOI: 10.1007/s11149-015-9272-4.

<sup>130</sup> Department for Transport (DfT) (2015). *Ibid.*

<sup>131</sup> See, for example, Ofcom (2006) *Digital Dividend Review - A report of consumer research conducted for Ofcom by Holden Pearmain and ORC International*, [https://www.ofcom.org.uk/data/assets/pdf\\_file/0021/19416/researchrpt.pdf](https://www.ofcom.org.uk/data/assets/pdf_file/0021/19416/researchrpt.pdf)

testing, noting that alternative questions and context, alternative options and including information on comparative performance could all be tested.<sup>132</sup>

Validity testing can involve asking follow-up questions to respondents to test how easy or difficult materials are to understand, asking respondents whether they could make clear comparisons and asking respondents how plausible they felt choice options were.

**Recommendation:** Always test all aspects of SP surveys described above for validity prior to rolling out the full survey.

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<sup>132</sup> United Utilities (February 2016), Improving Customer Research and Engagement.  
<http://corporate.unitedutilities.com/documents/Water2020-Feb16-CustomerEngagement.pdf>

## 6 Summary and conclusions

This section summarises the findings described in this report, then concludes with a number of recommendations for stakeholders in the water sector with respect to WTP research. It then draws some overall conclusions from this study.

### 6.1 Findings on research objectives

This section summarises the study findings from the perspective of the research objectives identified in the research specification for this work. For each, it brings together findings and gives examples of specific practical actions that water companies could take to ensure WTP research is consistent with good practice.

#### 6.1.1 Research objective 1: assess the value of SP research in informing water companies' business plans

*Examine the limitations of stated preference surveys in collecting evidence of customers' priorities for service delivery and the price they are willing to pay. This includes looking at limitations in the extent to which customers can engage with the research to give informed views, and how valid the results are for use in business planning.*

This study found several aspects of SP analysis that can be challenging in terms of engaging water sector customers. These challenges are neither new nor unique to the water sector. In all cases, good practice guidelines describe approaches that can help companies to produce valid research and demonstrate that results such as WTP estimates are valid. In summary, water companies can consider the following practices (Table 6.1).

Table 6.1 Ensuring SP research adequately engages water customers

Challenge for SP research in the water sector	How this can be addressed
Limits to the amount of information that respondents can take into account	Ensure that attributes tested in SP research are aligned with measures used in the company's business planning. Test how important attributes are to customers in qualitative testing. Use insight from other research (e.g. qualitative/deliberative) to help develop descriptions of attributes. Ensure choice tasks are manageable for respondents by getting the right balance of the number of attributes and repeated choices. Ensure that surveys overall balance the amount of information provided and the number of choice tasks. Quantitatively and qualitatively test questionnaires for biases before surveys are launched at full scale. This should include testing a range of attribute descriptions and testing attributes expressed in different units.
Mitigate potential biases in SP research	Follow good practice guidelines referenced in this study (and other guidelines that will follow as the methods develop), including ensuring appropriate quantitative and qualitative testing of questionnaires before surveys are launched at full scale.
Communicating the impact of inflation on customers' bills	This study has found no evidence suggesting that inflation must necessarily be included in SP surveys. However, if inflation is markedly different to changes in household incomes, inclusion should be given careful consideration. If inflation is mentioned, it must be presented in a balanced manner: water bills could go up with inflation, just as all other bills and prices do, just as incomes go up with inflation too.

Challenge for SP research in the water sector	How this can be addressed
Communicating the validity and applicability of SP research	<p>Engage with stakeholders throughout the process of designing consumer research, to ensure the aims, objectives, methods and approaches are clearly communicated to all relevant stakeholders.</p> <p>Engage with relevant stakeholders to explain how issues concerning cognitive burden and customer understanding, in particular, will be tested and transparently reported.</p>

Some customers have limited capacity and/or motivation to engage in SP research, but rather than discouraging SP research, it should be accounted for transparently. The task is to ensure that the survey is engaging and that the customer understands it is a credible undertaking that will influence a company’s business plan. From this point of view, the survey design process needs to ensure that respondents are equipped to answer the survey – the choice task question format is often unfamiliar to respondents so it should not be expected that they will immediately understand what is required. The appropriate level of instruction that is needed can be gauged from the testing phase. In addition, respondents need appropriate cues and information about the services they are being asked to consider. These need to clearly and concisely convey how these services affect customers. There are many ways in which this material can be developed to be engaging for respondents – for example using visual or animated information, or simply through good principles for layout in terms of graphic design.

All of these requirements can be successfully addressed if the proper care, thought and time is given to the design and testing phase of work. It is important that this process is reported transparently. Crucially the challenges around SP methods lie in demonstrating that each individual application (i.e. study/survey) has been implemented appropriately and found a balance across the various issues of concern. For example balancing the survey length and respondent fatigue with the amount of information collected, or balancing the design of choice tasks with theoretical robustness, and so on. Given the multiple dimensions that must be addressed in an SP study it is unrealistic to expect that there is a single ‘right way’ that companies must apply them. The reality is that each study must be judged on its own relative merits within the business planning context with which they are intended to be used.

SP research can still, therefore, form a key part of water companies’ gathering of evidence on their customers’ preferences, if well-designed, targeted at a relatively small number of prioritised attributes, using engaging materials and thoroughly tested for biases. Good practice can produce WTP results from SP research that can be valuable in water companies’ business planning, even in the absence of coordination across companies on methods. Indeed, while comparability is important, there does not need to be a common framework for WTP research across companies to support effective WTP research for PR19. Water companies’ SP research is a valuable part of their evidence base, though scope for improvement remains. This includes judging the level of assurance based on how sensitive business planning is to WTP estimates, and using SP research strategically, where it complements other methods most strongly and where it can have greatest influence in business planning.

## 6.1.2 Research objective 2: inter-generational equity

*To what extent WTP using stated preference, revealed preference, or other suitable customer research and engagement techniques can be used to identify the right balance or trade-off between short-term and long-term prices and service improvements (intergenerational equity).*

For SP research to help water companies to identify trade-offs between short-term and long-term outcomes, it needs to examine consumers' WTP for both short-term and long-term outcomes. In this context, it could be beneficial for water companies to define what they mean by short-term and long-term, with one company suggesting that the short-term may refer to the five year periodic review period. SP research should also make it clear to respondents that in the context of the water sector (where WTP is being used to inform investment decisions), investments may be needed today to deliver service improvements in the future.

These points can be challenging to communicate, but these challenges fall within the bounds of existing guidance for carrying out robust SP research and are considered to be concepts that respondents can understand, if presented with appropriate materials. For example SP methods have been used to examine customers preferences for enhanced levels of service related to severe water use restrictions (e.g. rationing), which from a respondent point of view would be a 'once in a lifetime risk'. The task is to explain what the impacts would be if the restrictions were needed. The consequence of most resilience type issues for water companies is essentially more severe cases of service failures that customers are ordinarily familiar with, even if they have not directly experienced them (e.g. interruptions to supply, flooding). This study has found no evidence that future impacts cannot be effectively communicated to participants in SP research, if appropriate steps are taken in designing, developing and testing research materials.

Yet, even when long-term outcomes are appropriately and clearly communicated, respondents may prioritise short-term outcomes over the long-term (which in a water sector context can mean prioritising bills over investment). Such a result is often found in any type of customer research (not only SP). Finding out if, and what rate individuals discount future benefits over present day costs is a legitimate research question. This rate would depend on many individual factors as well as the type of good and change. For some combinations of the latter, individuals may prefer to avoid today's costs and forgo future benefits. This does not automatically mean that long-term outcomes have not been communicated well or that analysis is not robust. For other combinations of good and change, individuals may prefer to incur costs today for benefits in the future. Similarly, this does not necessarily mean that they understood the information given to them better.

In conclusion, this study found no evidence that SP analysis cannot be used to inform trade-offs between short-term and long-term prices and service improvements. Nonetheless, SP analyses that seek to explore these trade-offs should demonstrate the validity of such research and the appropriateness of consequent estimates through the steps outlined in this report. It should also be recognised that such analysis can only reflect the preferences of customers in the present and the constraints they face now and think they may face in future, and how much they value uncertain changes to future services. They can therefore form a key part of water companies' evidence bases on their customers' preferences. As with all service attributes, that information should be considered alongside other important strategic considerations to inform companies' investment proposals in their business plans.

### 6.1.3 Research objective 3: combining WTP approaches

*Identify how stated preference and other approaches to WTP (including revealed preference) can work together to provide valid inputs for CBA in the water industry periodic review context.*

This study identified several findings in relation to the application of multiple research methods. As outlined in Section 6.1.1, the validity and robustness of each individual piece of research should be maximised with appropriate testing. Research into customers' WTP for services benefits from the application of multiple research methods, to triangulate information and evidence. Furthermore, research on customer evidence is likely to be most beneficial if research is aligned with specific requirements of evidence planning (as outlined in UKWIR 2010) to identify research needs and if research methods are chosen to suit the specific needs in the business planning process for understanding water customers' preferences.

In practical terms, there are a number of steps that water companies can take to combine approaches to WTP research:

- For each area of customer evidence, consider whether RP or SP (or a combination) is most appropriate and consider the best approach at the outset, before beginning research. SP and RP could also be combined, for example by asking customers about WTP as well as collecting RP information, such as travel cost. A range of factors will determine which methods are most appropriate, including the availability of data for RP methods and water companies' research constraints (such as budget and timescale).
- The scope and specification of consumer research should not specify methods too closely; instead, companies should be very clear about the intended purpose of customer preference data and encourage researchers to innovate as appropriate for each piece of research. Proposals to carry-out research should fully explain their choice of methods (including SP vs RP), how they complement each other and why other methods have not been chosen.
- With a growing body of WTP information available from previous periodic reviews, water companies should compare previous WTP information with new research as a potential check on new research.
- Water companies should also use a clear decision framework to choose types of research to carry out, for each aspect of water services or wastewater services. Such a framework can help to select the best combination of methods for each service attribute. It can also provide a transparent and clear explanation of those decisions. Some have already begun to develop these frameworks, such as United Utilities (2016).<sup>133</sup>

This study highlights that, for research to provide meaningful inputs for water companies' business plans, the intended use of SP and/or RP research must be known from the outset when research is scoped and then commissioned or designed. This is essential for ensuring that the outputs from SP (and RP) research are appropriate for their intended use. This emphasises the need for research to be planned in advance in the early stage of the business cycle (or as part of an ongoing research strategy) to inform the company on water customers' preferences. This is consistent with good practice, which includes a scoping/strategy phase where companies plan research and understand how individual studies will contribute to an

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<sup>133</sup>United Utilities, (2016), *Improving Customer Research and Engagement*, <http://corporate.unitedutilities.com/documents/Water2020-Feb16-CustomerEngagement.pdf>

evidence base or triangulation process. This concept is explored further in the ICF report on triangulation.<sup>134</sup>

This should include clear reference to aspects of service for which valuations are required and the level of influence that updated valuations would have on the CBA and therefore on water companies' business planning. It also requires that CBA work is sufficiently advanced in the early stages of a periodic review to allow sensitivity testing that tells the water company which customer valuations have the greatest influence on their business planning.<sup>135</sup>

#### 6.1.4 Research objective 4: RP research for a monopoly industry

*Identify how to conduct revealed preference research in the context of a monopoly industry.*

RP methods can be applied where customers have a choice to consumer alternatives to the good in question (and where those alternatives are provided in competitive markets). This means that price/cost data are available for those alternative goods. For example, while tap water is not a good provided in a competitive market, bottled water is.

There are opportunities to use RP methods as complementary approaches to derive values from actual behaviour for specific changes in water service attributes, where a relationship exists between an aspect of water or wastewater services and another good, and where these changes can be observed.

Where data are available, RP research can help to supplement customer valuations generated through other research methods. In the water sector, the use of RP is limited by the fact that there are limited aspects of service where this analysis is feasible. This is because short-term issues such as supply interruptions do not tend to lead to water customers taking avertive action. For example, supply interruptions are rare, so customers generally do not need to purchase alternative supplies. Opportunities to use RP methods are therefore more focussed on long-term issues, such as tap water aesthetics and hardness, or disamenity from treatment works. It can also be difficult to observe market behaviour in relation to some water sector attributes such as the frequency of interruption to supply, because no customer chooses their level of service (United Utilities, February 2016).

Water companies should also recognise that RP research does not capture non-use values. So in areas where non-use values are likely to form a considerable share of the total value of a service, RP methods will need to be supplemented by other methods.

#### 6.1.5 Research objective 5: presenting inflation in WTP research

*Explore the issues of presenting inflationary bill changes to customers within WTP research, and whether/how these could be overcome.*

As set out in Section A1.2, all SP research into WTP needs to ask respondents about costs, usually bill changes, and therefore requires an approach to reflecting inflation. Asking respondents to consider inflation explicitly with respect to bills also requires that inflation is estimated and presented not only for bills, but also for the

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<sup>134</sup> [Refer to triangulation report – reference will be provided prior to publication]

<sup>135</sup> United Utilities (2016), *Improving Customer Research and Engagement*, accessed 13 December at: <http://corporate.unitedutilities.com/documents/Water2020-Feb16-CustomerEngagement.pdf>

other budgetary constraints that respondents face, such as income and other bills. This can be a complex trade-off, introducing new challenges in how it is presented.

Generally this can be simplified to presenting survey materials and questions in real terms (or 'today's prices'). Materials presented to respondents should remind them of the budgetary constraints that they need to consider when answering questions. At times when household incomes and inflation in bills (water, wastewater and other bills) are not widely divergent, there is little reason to present inflation when estimating WTP. Indeed, doing so can reduce respondents' cognitive capacity to consider questions about their WTP. This emphasises the need to examine the balance of these factors for specific customer groups being targeted in each study. This decision depends on the specifics of the survey and budget constraints of respondents, but should always be transparently considered and explained in research methods.

### 6.1.6 Research objective 6: WTP research and ODIs

*Explore the issues of using WTP research to identify customer preferences for Outcome Delivery Incentives (ODIs) and whether/how these could be overcome.*

If WTP research is going to be used to inform financial incentives then it must be designed for that purpose so that it represents customers' views on the role and scale of financial incentives specifically. Financial incentives are not always calibrated according to the value of changes in service levels (for example, when companies are fined for operational failures, which are based on legal judgements by the regulator). If financial incentives *are* to be based on the value of the service to customers, or the environmental impact, then the measure of value should be explicit and WTP could be used for this purpose.

A key question is around the accuracy required to use WTP estimates to calibrate financial incentives. Good practice guidelines suggest that this sort of use would require greater accuracy, which accords with its potential for direct influence on companies' and customers' financial outcomes. This compares to using WTP to inform cost-benefit analysis for investment decisions that also depend on a range of other factors. As well as ensuring that good practice has been transparently followed, one additional way to make WTP estimates more accurate would be to gather a series of estimates over time. This is explored further in ICF's report on triangulating evidence.<sup>136</sup>

Another important question is whether the framing of the question matters i.e. whether respondents answer differently according to whether they are considering a bill change or a financial incentive (and therefore, whether WTP values derived for CBA/vfM assessment can be used for ODIs). The answer to this question will depend on the specifics of the survey and water companies would therefore need to carry out appropriate testing to examine the issue. To do so, water companies can apply good practice to test respondents' understanding of questions at the early stages of designing questionnaires.

Water companies should therefore carry out or commission further work as required to test how practicable it is to use WTP research in the context of setting financial incentives for companies (i.e. setting financial rewards for companies, not in the context of changes to customers' bills). They could also carry out research to examine whether framing matters to customers, e.g. examining whether framing WTP in terms of the ODI context influences the values derived from research, i.e.

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<sup>136</sup> ICF (July 2017), *Defining and applying 'triangulation' in the water sector*, <https://www.cwater.org.uk/research/defining-triangulation-and-willingness-to-pay-in-the-water-sector/>



comparing SP studies that frame WTP estimates in terms of services vs. financial rewards.

### 6.1.7 Research objective 7: materials for WTP research

*Make recommendations for how survey and show-card materials could be presented to customers so that they can engage with the subject matter, and give meaningful responses.*

This study found a variety of methods that could be used in show-card materials. It is standard and widely-applied practice for SP research to include visual prompts to help respondents to understand questions (for example, maps to illustrate differences in water quality at different locations). A significant volume of literature indicates that visual cues can improve respondents' understanding in SP surveys. But the specific cues will depend on context and should always be tested for validity before they are rolled out, in accordance with good practice guidelines.

Good practice guidelines also offer a range of other advice. Materials should include contextual information that clearly explains how their valuations will be used (to give them confidence that what they say matters and to ensure they understand the questions fully). Interactive materials can be used to help customers to understand questions, or to allow customers to reveal additional explanatory information if required (for example, by clicking into further information). However, there are limits to the benefits of interactive information, which can distract from the purpose of the survey. Comparative information may also be used to help respondents make choices more easily (although this can also increase the cognitive burden of surveys).

For all these factors, it is essential good practice to test the effects of these survey decisions to establish whether they help respondents to make choices more easily. The objective of this testing should be to filter survey materials down to only the information essential to ensuring that respondents understand the questions fully, thereby allowing respondents to focus on considering their valuations.

## 6.2 Summary of recommendations

This study identified a range of recommendations in relation to carrying out WTP research generally and also in relation to SP research specifically. These are summarised below in

Table 6.2 Summary of recommendations for water companies using WTP research to inform business planning

Do	Don't	Consider
<b>Matching customer research to business-planning needs</b>		
Identify business-planning requirements early. Carry out a company-specific scoping assessment to establish what valuation evidence is needed and prioritise research according to which are the most important gaps to be filled.	Force unrealistic timescales on studies	All possible inputs to the study that will be required from within the company.
Design research programme to align with business planning requirements	Avoid engaging with researchers and CCGs until the research is complete	All possible ways that the company may wish to use the study.

Do	Don't	Consider
Determine requirements for research studies prior to setting terms of reference. Relate requirements to overall approach to business planning	Extrapolate research beyond the bounds of credibility	Undertaking further research if extrapolation is not credible (e.g. on specific customer groups)
<b>Using WTP in business planning</b>		
Communicate WTP research to customers and other stakeholders as early as possible and be open to feeding back to researchers based on this engagement	Over-simplify the representation of WTP values in business planning.	Consider how WTP estimates will be used from the outset and feed this into the commissioning / research process
Encourage dialogue between water companies and Ofwat regarding how WTP estimates are used.		How WTP research contributes to ongoing plans for research and how the company can demonstrate a commitment to generating a growing body of evidence on consumer views over time.
Explore whether customers' WTP is affected by whether it is applied to bills or financial incentives.	Apply WTP framed in terms of bills directly to financial incentives that would influence payments in a different way.	Whether specific research should be carried out to explore customers' views on financial incentives.
Incorporate sensitivity testing into use of WTP results in business cases, using confidence intervals quantified in WTP studies as the basis.	Arbitrarily scale WTP values without comparing and considering the context in which estimates were made with the context to which they are being applied	
<b>Triangulating WTP methods</b>		
Explore multiple potential WTP methods for each specific application required for business-planning purposes	Simply carry out one WTP method without justifying why that method was chosen.	Whether to incorporate multiple WTP methods into one survey, building in triangulation from the outset when designing research.
Take into account the level of assurance/accuracy required for each element of WTP estimates, depending on how it will be used.	Approach WTP method selection in an ad-hoc manner.	All approaches to benefits valuation that may be feasible.
<b>Dealing with the temporal nature of research</b>		
Implement continuous research programmes that generate insights over time, making these comparable with previous analysis where possible. This could help water companies to triangulate WTP estimates over time and show how external factors influence WTP.		
<b>Maximising complementarity between SP and RP methods</b>		
Consider the full range of SP and RP methods and assess which is most applicable to each specific need for customer evidence	Specify research too tightly – making sure to avoid ruling out new innovative methods.-	Be open to new developments such as behavioural experiments.
Consider which service attributes may be most easily estimated using RP methods (see Table 4.5).		
Consider whether RP and SP methods can be used together in the same survey, from the outset.		
<b>Communicate research to stakeholders</b>		
Communicate their research to stakeholders, at every stage. This could include transparently engaging with their stakeholders to explain how they have considered the stages of research outlined in this study. It could also include explaining how their WTP research is applicable to the specific applications for which they use it in their		

Do	Don't	Consider
business planning. And finally, it could include communicating the steps they have taken to validate individual research studies and to explore combining and triangulating WTP methods (and other non-WTP information).		

**Table 6.3 Summary of recommendations for water companies using WTP research to inform business planning**

Do	Don't	Consider
<b>Sampling and understanding customer diversity</b>		
Refer to good practice for sampling methods (e.g. UKWIR 2011).	Over-simplify results presentation – without explaining how and why high-level / simplified figures have been estimated and determined appropriate to apply.	Consider alternative sampling methods and communicate how methods were chosen and tested.
Define the target (affected) population clearly and completely, including the sample size required to produce valid results.	Underestimate the importance of work that goes into sampling at the start of a stated preference study	How to communicate how samples were selected and/or how specific groups were identified.
Design samples from the outset to include a range of customer groups, including household and business customers.		Whether to specifically estimate heterogeneity in customer preferences.
Explore whether specific groups should be surveyed separately or included in sub-samples (e.g. vulnerable customers).		
Communicate how samples have been selected and how they represent customer groups and diversity within the samples.		
<b>SP survey development and testing</b>		
Consider carefully how to present each specific attribute being tested (depending on attributes being tested and the specific group of customers being surveyed)	Lead participants in cognitive testing (interviews or focus groups) in answering questions- making sure that cognitive testing is not biased.	Additional testing including review from CCGs and/or from independent experts, in good time prior to rolling out surveys to the full survey population.
Test surveys for comprehension using cognitive interviews – allowing sufficient time for this in planning the research study.		How many focus groups and/or cognitive interviews are required in order to fully test all of the material, prior to rolling out the full survey.
<b>SP survey modes</b>		
Use a variety of survey modes if possible	Always choose the cheapest fieldwork option	How the complexity of the survey could influence the most appropriate survey mode
Assess all potential survey modes and choose those most appropriate for the objectives of the specific survey		
Allow for response rates of different survey modes when planning surveys		

Do	Don't	Consider
<b>Survey materials</b>		
Present clear information on how surveys will be used (which requires following recommendations above to identify how WTP estimates will be used prior to carrying out research)	Use materials without applying validity testing	Exploring how options can be tailored to individuals, or how materials could present questions according to respondents' own comprehension
Present options in terms that respondents understand	Use wording that leads respondents' answers	How to word questions in the most neutral way
Test comprehension and results for all different propose materials, questions / wording to help ensure the survey will produce valid results	Ask too many questions that will not be used in the analysis or validity testing	
Keep wording simple		
Use visual materials as much as possible (maps, photos, graphs)		
<b>Validity assessment</b>		
Always test all aspects of SP surveys described above for validity prior to rolling out the full survey.		

### 6.3 Conclusions

This report has identified a wide range of good practice approaches and principles in WTP research that can help to improve it. These include ways to mitigate some of the risks associated with WTP research in general and to mitigate risks specific to WTP research in the water sector.

It also makes recommendations for water companies to improve the way they use WTP research within a wider approach to gathering evidence on their customers. This includes moving away from reliance on infrequent customer research involving relatively few methods, to a long-term and wide-ranging programme of evidence-gathering on customers' preferences. This will not only improve the validity of estimates by generating a longitudinal evidence base, but also can help generate new insights about how customer preferences change over time and what drives those preferences. Gathering evidence on customer preferences should also be seen as an ongoing process. Water companies are increasingly de-coupling their research from the periodic review cycle, and this should continue.

These measures could provide a more accurate, more detailed and more nuanced evidence base on which water companies could base their data gathering. This would also allow choices to be made about which methods are most suitable to gather which evidence. And it allows specific methods to be designed using insight from others – and using insight from previous research.

Furthermore, every household and every business needs water, so the 'group' of water customers includes a diverse range of consumers. Commissioning WTP research within a wider strategy for gathering customer insights will have two benefits. First, well-designed WTP research can help to identify groups that have different preferences to others, which can then feed into plans to explore those views further and/or in more detail. Second, other types of evidence generated within a coherent research strategy could help identify specific groups to be targeted with WTP analysis or to identify how WTP research can be designed in such a way as to capture the customer diversity that water companies have identified.

There are some specific requirements of the business planning process where very specific research is required. These include the requirement for evidence to support

financial incentives (ODIs) and to support some specific decisions on long-term investment. Industry stakeholders recognise that customer evidence was not always appropriately used to inform these very specific plans in PR14. This reinforces the importance that customer research to support similar plans for PR19 be targeted at the specific issues behind each decision. It is only by designing research for this purpose from the outset that a good evidence base can be generated to support those decisions.

# ANNEXES

## Annex 1 Challenges in carrying SP research in the water sector

This annex outlines how water companies can apply good practice guidance in the specific context of their research. This section draws out how the challenges identified are addressed by good practice guidelines for SP research. These references to good practice are specifically related to the design of SP research in the water sector, but are drawn from challenges that are addressed in other sectors.

Water companies may already have followed good practice in some or all areas in relation to existing research. However, these challenges must be addressed in each study (including future studies). Furthermore, WTP in new areas or with new methods

This section covers:

- Comprehension of water sector terminology and trade-offs;
- Accommodating customer diversity;
- The temporal nature of customer valuations; and
- Accommodating inflation.

### A1.1 Respondent comprehension of terminology and trade-offs

All research relies on respondents understanding the questions that they are being asked. Enabling this is therefore an important part of SP research, as outlined in the guidelines above. For example, if valuation scenarios are poorly defined or not clear, fewer people may be willing to state a positive WTP. Generally the more information is provided, the higher the WTP tends to be, until a point is reached where ‘too much information’ could have an unpredictable effect on WTP (very high or very low). Customer research in general (i.e. multiple studies and multiple research methods) should seek to establish whether there are differences in WTP between people or groups, for the same good or service, and to explain them. The European Bank of Reconstruction and Development (EBRD) (2013)<sup>137</sup> highlights that questions can be interpreted differently by different respondents. As respondents form their preference based on their own understanding, they may express a different WTP.

Comprehension of research materials has been a challenge in the water sector, but is not unique to it. Several stakeholders interviewed for this study noted that consumers sometimes find it difficult to understand water sector terminology. One water company noted that it is a challenge to find simple language that customers can understand, that nonetheless conveys different water services. Another also reported this as a real challenge during PR14 and noted that it is currently developing more sophisticated approaches to the development process for consumer questionnaires and surveys, so as to develop simpler and more easily-understood questions. Accent (2015) noted that questions about water services attributes tend to be abstract in nature, exacerbating this effect and requiring consumers to respond to questions about unfamiliar scenarios that don't relate to their experience.<sup>138</sup>

One Customer Challenge Group (CCG) interviewed for this study agreed that it can be challenging to present water sector issues simply to consumers. It gave the example of leakage statistics, which could be presented in different ways. For example, leakage can be

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<sup>137</sup> EBRD working paper (2013), Ibid.

<sup>138</sup> PJM and Accent (November 2015), Ibid.

presented as a percentage of total water supplied, in millions of litres per year or in terms of litres per property. The most appropriate metric is that which is best understood by respondents and different metrics might be more easily understood for different individual consumers. Good practice guidance suggests how materials can be presented and how the validity of WTP estimates can be tested. Each SP study is different and each customer group is different, so it is important that alternative materials and presentation of information is tested appropriately. This validity testing is important to carry out for each and every survey. This is because each individual and each group of customers is different and because individual surveys address different questions (water services attributes).

Another example taken from the Northumbrian Water Forum was the presentation of wording around 'resilience' of water supplies, in particular communicating the scale and probability of water outages when attempting to estimate consumers' valuations of changes in water supply resilience. Examples were also explored, but it was found to be challenging to present examples relevant to those consumers participating in research.<sup>139</sup> The same Forum also found challenges associated with presenting choices about discolouration of water, without consumers inferring that discoloured water is necessarily unsafe to drink (which it may not be).

This challenge is not unique to the water sector. In its interview for this study, Ofgem reported a similar situation in the electricity sector. One example provided was that of communicating environmental concerns associated with replacing electricity cables. Ofgem reported that comprehension issues are less significant for business customers in the electricity sector as business customers are more aware of electricity as a service and can therefore relate better to questions asked in WTP research. This effect may well also be observed in the water sector.

Several water companies noted in interviews for this study that some aspects of water services can be difficult for consumers to grasp immediately. One water company found in focus groups that when asked about planned interruptions, customers valued the improvements they believed would be brought about by investment, rather than basing valuations on any personal experience, which they often lacked.<sup>140</sup> But a key advantage of SP research over RP is that it can be used to value outcomes that have not been experienced by an individual. It is valid in SP research to ask respondents to respond to questions based on interpreting information given to them, even if they do not have personal experience of the information.

One water company reported that consumers who find it difficult to understand concepts not grounded in their day-to-day lives can sometimes find it difficult to fully comprehend the questions. On the one hand, the nature of water as an 'essential-service', which people may take for granted, could contribute to this, as they are not used to thinking about water services in general. On the other hand, customers may not be used to thinking about flood risk or water supplier resilience, because their impacts are infrequent. Moreover, customers may never have experienced such interruptions or flooding events. ESAN (2016) supports the view that direct questions on WTP on complex issues requiring trade-offs can be challenging for customers. In particular, where customers have not experienced a product, such as for water supply resilience.<sup>141</sup>

Ofcom, when interviewed for this study, reported observing a similar effect in some WTP research carried out in the telecoms sector, which attempted to isolate customers' WTP for customer service. It found that in its research it was not possible to isolate the value of

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<sup>139</sup> Independent Northumbrian Water and Essex & Suffolk Water Forums (2013), Ibid.

<sup>140</sup> Anglian Water (2008) *PR09 Final Business Plan. Part C1: Consumers' Views*.  
[http://www.anglianwater.co.uk/assets/media/Part\\_C1.pdf](http://www.anglianwater.co.uk/assets/media/Part_C1.pdf)

<sup>141</sup> ESAN (November 2016) *ESAN conference paper: How can the consumer voice be better heard in the regulation of essential service?* Ibid.



customer service because customers generally viewed this as an inherent part of a broadband or mobile phone package. Consequently, customers felt it should be embedded in the price for those services and so could not separate it out. In this particular case, customers were asked what they would be willing to accept to give up customer service, but this method was also found to be ineffective for the same reason.

Good practice acknowledges that explaining these concepts can be difficult and accommodates this through by describing approaches that seek to test, for individuals studies, whether participants have understood survey questions sufficiently well to generate valid results. Each study will need to be judged on its own merit in this regard. Importantly each study will need to be judged on its own application and approach. In the water sector, as in others, this good practice can be applied to topics such as water supply and flooding resilience, such that even difficult subjects can be explored using SP research. This good practice must be demonstrated for WTP estimates used in water companies' business plans.

In the water sector, water companies' business planning needs to take into account complex trade-offs. It can be challenging to elicit consumers' views on these trade-offs, as they involve communicating complex issues. For example, water companies' must make trade-offs between leakage, water efficiency and metering, but these trade-offs are difficult to convey simply to consumers and difficult for consumers to understand fully enough to inform robust valuation estimates. The Northumbrian Water Fora consequently conclude that "leakage, water efficiency and metering are best examined... via separate surveys".<sup>142</sup> Similarly to the comprehension challenges outlined above, these are not insurmountable and are addressed by using good practice to sufficiently pre-test in the design phase before questionnaires are launched. This conclusion should therefore not be generalised to WTP in general. Nor did this study find evidence that this is a widely-held view across the sector and other water companies have successfully included questions around long-term trade-offs in their research.

This is another challenge that is not specific to the water sector. The Environment Agency reported in an interview for this study that environmental trade-offs can be difficult to understand for consumers. In particular, it highlighted consumers' challenges comprehending societal benefits of environmental issues. For example the benefits associated with biodiversity, or environmental benefits of carbon storage, were reported as being difficult for consumers to understand. This challenge is directly applicable to water sector research, where reducing risks associated with flooding and increasing resilience of the water supply could have significant societal benefits beyond those that individuals may either comprehend or experience. If societal benefit is deemed to be an important aspect of value, separate SP may be required to specifically assess this (to avoid trying to assess too many different benefits in one survey), as noted by the Environment Agency in its interview for this study. This would need to be assessed on an individual basis depending on the likely scale of societal benefit arising from individual attributes being considered.

Another specific type of trade-off is customers' understanding of 'inter-generational' trade-offs; their preferences across the short-term and the long-term. This is a challenge for water companies because some of the investment decisions they make in their business plans involve trade-offs between bills in the short-term and benefits/impacts in the long-run.

One water company noted respondents' tendency to discount the future (e.g. to discount benefits that would not be received for some time, such as lower flood risk in future). This is a common preference that people have. Ofgem reported in an interview for this study that it has observed this preference among energy customers in research in the energy sector. It can also be difficult to communicate long-term benefits in the water sector, given their sometimes intangible nature and/or the involvement of changing the risk of service outcomes

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<sup>142</sup> Independent Northumbrian Water and Essex & Suffolk Water Forums (2013), Loc Cit.

that seem unlikely and so are difficult to grasp. One company noted that customers place less value on changes that are more than five years ahead. This company also reported spending further time developing and testing descriptions of long-term improvements (for example, with resilience of water supply) did increase the estimated WTP for those improvements. This emphasises the need for research in the water sector to follow good practice guidance around designing and developing explanatory material that fully communicates what is being valued, including by following good practice in testing the design of questions and questionnaire materials.

**Limits to customers' cognitive capacity** also influences customer research. This can manifest itself in several ways, in addition to the sometimes hypothetical nature of the questions (considered above). In particular, one water company reported in an interview for this study the particular challenge of estimating customer preferences around low-probability, high-impact outcomes. This is a well-recognised phenomenon. Furthermore, it is one that has been specifically recognised with respect to WTP research in the water sector, with Accent (2013) having identified in research carried out for South West Water that splitting-out water services into several attributes is likely to “test the limits of many respondents’ processing capabilities”.<sup>143</sup> Other WTP research (PJM and Accent, 2015) has also reported that customers have difficulty placing a value on services changes that affect the likelihood of low-probability, high-impact outcomes.<sup>144</sup>

Cognitive limits also restrict the number of service attributes that can be tested at once, as recognised by one water company when interviewed for this study. London Economics (2013)<sup>145</sup> highlighted this challenge in relation to WTP choice experiments in the electricity sector. In that research, it used four attributes only, in an attempt to minimise the cognitive demands on respondents. The same paper suggests a limit of four or five attributes for testing in any one question, as answering questions on more attributes can be difficult for research respondents.<sup>146</sup> As is common practice and has been applied in the water sector, more attributes can be accommodated within one survey if asked in different questions (blocks). For example, a 15-minute survey could accommodate two choice tasks.

In terms of timing, the Competition Commission indicates that, generally, questionnaires should take less than 30 minutes.<sup>147</sup> This aims to reduce cognitive load and thereby reduce the risk of this effect harming the validity of responses given by respondents. Another way to minimise the influence of cognitive load on results is to restrict the number of different choices that respondents are asked to make. Studies in the transport and electricity sectors have also sought to limit cognitive load by reducing the number of options tested.<sup>148</sup> Increasingly respondents are being paid for their time, which can help to improve motivation and attention. UKWIR guidelines also state that cognitive tests and pilots should be conducted to ensure that the number of choice options (within each question) and choice sets (within each questionnaire) should be limited, as well as attribute choices being sufficiently differentiated for consumers to consider each option to be distinct from others.<sup>149</sup>

<sup>143</sup> Accent (2013), *South East Water Customer Engagement Research for PR14*  
[http://www.southeastwater.co.uk/media/185403/APP20TPS\\_FinalWTPmainstagereport.pdf](http://www.southeastwater.co.uk/media/185403/APP20TPS_FinalWTPmainstagereport.pdf)

<sup>144</sup> PJM and Accent (2015), *Ibid.*

<sup>145</sup> London Economics for Ofgem. (2013). *Ibid.*

<sup>146</sup> London Economics for Ofgem. (2013). *Ibid.* This paper also notes that Hanley et. al. (2001) indicates that the number of choice attributes that can be tested also depends on sample size in the survey. Hanley, N., Mourato, S., and Wright, R. E. (2001). *Choice modelling approaches: a superior alternative for environmental valuation?* J. Econ. Surveys 15, 435–462. doi: 10.1111/1467-6419.00145

<sup>147</sup> The Competition Commission (2011), *Ibid.*

<sup>148</sup> RAND. (2011). *Modelling Demand for Long-Distance Travel in Great Britain.*  
[http://www.rand.org/content/dam/rand/pubs/technical\\_reports/2011/RAND\\_TR899.pdf](http://www.rand.org/content/dam/rand/pubs/technical_reports/2011/RAND_TR899.pdf) and London Economics for Ofgem. (2013). *Ibid.*

<sup>149</sup> UKWIR (2011), *Ibid.*

Good practice sets out an approach to designing and developing explanatory material requires that it is clear, concise and engaging, so that respondents can understand terminology and trade-offs. Appropriate testing of materials can be reinforced by following good practice in the design and testing phases of SP research which should ensure that all survey questions are well-understood. Furthermore, water companies should consider how they can present information in SP surveys so as to improve customer engagement. This report also explored new and innovative ways in which this can be done (Section 4).

## A1.2 Treatment of inflation

The research objectives for this study included examining the treatment of inflation within WTP research, particularly in terms of how it is presented to consumers participating in studies.

As noted above, all SP research relies on cost being presented to respondents as one attribute of service. This poses the question of how to treat inflation when presenting those costs alongside service attributes being considered). This could include presenting a package that features some improved services levels and an increased bill, or one that features deteriorated service levels but with a decreased bill, or even no change at all from the current service levels and bill amount.

Generally, inflation is presented in terms of its effect on overall household income and expenses, rather than just in water bills. This is because inflation represents the general rise in nominal prices over time, rather changes in real values. Conventionally, cost-benefit analysis uses real values which factors-out changes in nominal prices.<sup>150</sup> This is because all prices are affected by inflation, so the real value of different goods tends to remain more stable than nominal price changes would indicate. Inflation also has a similar effect on household incomes generally and because water bills are generally a small proportion of total household budgets, the inflationary impact on this proportion is generally quite small. For some households with smaller household budgets, this may not be the case. These considerations should be taken into account individually for each study, to assess the potential effect is sufficient to warrant presenting inflation separately. Unless respondents are presented with that information too and can fully take it into account, presenting cost inflation could risk overstating the real impact of cost rises. Asking respondents to consider both changes to nominal prices and to household incomes is generally undesirable and adds little from the perspective of estimating WTP.<sup>151</sup>

It is therefore a common practice for research in the water sector to present respondents with bill changes in today's prices (a simple way of explaining real terms), which aims to get customers to focus on the 'trade-off' between cost and service and the task of judging value for money of proposed changes in service levels. Examples of materials that used this approach involve including statements such as the following: "*Remember this does not include any increases due to inflation which would be added on top*", and "*the new bill level will also apply in all later years and excludes inflationary changes*".<sup>152</sup>

Respondents are also often presented with reminders to consider their overall household income and expenses, when weighing up cost (as well as whether service changes are important to them). These budget factors often *include* inflation, among other important factors, such as:

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<sup>150</sup> See for example: H.M. Treasury (2003), Ibid.

<sup>151</sup> Doing so would only be desirable if the general price level and household incomes are developing at significantly different rates and, even in those circumstances, would need to be weighed up against consequently reduced cognitive capacity among respondents to consider the trade-offs and valuations that the research sought to research.

<sup>152</sup> Accent for South East Water (2013), Ibid.

- bill changes are relative to current bills;
- other service attributes may also change, which could affect bills (e.g. other improvements might push bills up);
- money paid to improve water/wastewater services will not be available to spend elsewhere on other items;
- other household bills may go up or down; and
- household bills, including for water and wastewater services, may be affected by the rate of inflation each year.

This can also be supplemented by a similar prompt in materials that are shown to customers during the survey.

Good practice methods offer guidance on how inflation can be accommodated within question design and under what circumstances it should be incorporated. Prompts can be included at the beginning of surveys and during surveys to encourage respondents to take into account all budget constraints.

### A1.3 Potential biases in SP methods

This section identifies potential biases that should be tested/controlled for when carrying-out SP methods (in any sector) both through design and validity testing. A large part of the detail in the good practice guidance listed in Section 4.1 is intended to help practitioners identify how and where biases might impact research and how to address this. SAN (2016) also explored biases relevant to customer research, in a context more specific to the water sector.<sup>153</sup>

This is not intended to be an exhaustive list of methodological considerations for WTP analysis, but to summarise the main challenges identified in the specific research carried out for this study. There is a large literature on these biases and this section seeks only to give an overview of those biases for context, as it does not seek to recommend specific methods to deal with each. The biases outlined here are known biases which good practice methodologies and application aim to address. A summary of possible biases is set out below (Table 6.4), based on Defra guidelines, in which a full summary can be found.<sup>154</sup>

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<sup>153</sup> ESAN (2016) *ESAN conference paper: How can the consumer voice be better heard in the regulation of essential service?* Ibid.

<sup>154</sup> Eftec for Defra (2010), *Ibid*

Table 6.4 An outline of potential biases (based on Defra guidelines, in which a full summary can be found)<sup>155</sup>

General type of bias	Bias	Description	Possible mitigations
<b>Availability</b> People do not process information perfectly so respond as if they lack information	Reference point	Respondents' views of 'normal' differ, so might value changes from 'normal' differently.	Clearly state the reference point from which to begin, or ask people what their reference point is ('how much do you pay now?').
	Status quo / endowment	Respondents prefer the norm over different situations.	Include a status quo, identify respondents choosing the status quo and remove them.
	Availability	Respondents focus on easily-retrieved information (over hard to information that is harder to find/understand).	Simplify difficult information, particularly information describing difficult-to-understand concepts.
<b>Superstition</b> People include subjective beliefs when they process information	Certainty	For the same expected value, people prefer a certain outcome.	Ask qualitative follow-up questions to ask for rationale. Account for bias in analysis.
	Focal	Quantitative information viewed as categorical (i.e. 10 compared to 1,000 is viewed by individuals as 'small' and 'large').	Include cues in questionnaires to educate respondents about the relative sizes of numbers.
	Isolation	Evaluate elements separately.	Evaluate elements separately.
	Recency and regression	Recent events more easily remembered. Coincidences are given undue weight and can be viewed as the defining the norm.	Questioning should avoid focus on recent events and remind respondents of the longer-term 'norm'.
	Representativeness	People over-estimate <i>conditional</i> probabilities (if the probability of A is high, given B, then people think the probability of A is high, even if the probability of B is low).	Information should present cumulative probabilities (rather than conditional).
	Credulity	People are quick to infer causality.	Include reminders that correlation does not mean causation.
	Disjunctive	People do not think through cause and effect.	Make outcomes very clear (leave nothing to deduction).
<b>Process</b> People have a limited computational ability and often adopt bounded rationale (i.e. simple rules of logic)	Superstition	People attribute causality to coincidences.	Avoid presenting un-related events together, to avoid inferring causation where none is established.
	Suspicion	People mistrust offers, particularly monetary valuations.	Make offers (such as payments / bill changes) seem as realistic as possible. Such as by explaining practically how they would happen.
	Rule-driven	People have their own 'rules', which may influence their thinking, above evidence and logic.	Include follow-up questions if this is deemed a risk, to understand rationale.
	Temporal	People may choose short-term gains over long-term gains.	

<sup>155</sup> Etec for Defra (2010), *Valuing Environmental Impacts: Practical Guidelines for the Use of Value Transfer in Policy and Project Appraisal*, Ibid.

General type of bias	Bias	Description	Possible mitigations
<p><b>Projection</b> Surveys should be as anonymous and politically neutral as possible</p>	Misrepresentation	<p>Respondents may report self-interested views if they perceive an advantage in doing so (which could be real). London Economics (2011) highlights two types: 'strategic bias', where respondents aim to generate a more positive outcome for themselves through their responses; and 'protest valuations', where respondents submit 'null' responses as a protest, for example if they believe that morally a good or service should not be paid for when they do in fact value the good or service.</p>	Indicate that values will not influence policy.
	Projection / compliance	Respondents wish to project a certain self-image.	Put respondents in a neutral setting.
	Anchoring	People may 'anchor' their response against cues in questions	Do not include these in questionnaires.
	Framing	<p>Presentation of events/options can affect outcomes. United Utilities (2016) highlighted the potential framing effect of background information and the impact the way in which a question is asked has on WTP values derived from consumers' responses. HM Treasury and DWP also note this effect</p>	Frame questions as they would be presented in the real world as far as possible.
	Prominence	People weight question elements differently depending on format of the question.	Format questions as they are experienced in the real world. Mix up question format (e.g. order of responses) to account for this.

In addition to these biases, self-selection can lead to some people choosing not to participate in the research, which can lead to 'non-response error', which can undermine attempts to achieve a representative sample.<sup>156</sup>

Willingness-to-pay and willingness-to-accept (i.e. pay less for a reduced service level) are not always necessarily equal to each other (though there are often economic explanations of this loss-aversion, so it is not always reflective of a bias). Typically, willingness-to-accept is often greater than willingness-to-pay, because people experience loss-aversion, whereby losses are felt more than gains of the same magnitude, due to the loss-aversion.<sup>157</sup>

SP guidance seeks to address these challenges. Each study should make an assessment of any biases pertinent to the research and this could be incorporated into water companies' write-up of their methods. Water companies should also assess any potential influence on the interpretation of results and seek to demonstrate how such biases have been controlled for, and make an assessment of the extent to which this has been possible.

These are known biases. The SP literature includes many established methods for dealing with these biases. Good practice highlights alternative SP methodologies that can be applied to test for an account for the effect of these biases, so as to minimise any resulting bias in estimates of customer valuations. Assessments of such biases, efforts to account for them and the implications for conclusions from the study should be clear.

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<sup>156</sup> The Competition Commission (2011), Ibid.

<sup>157</sup> Lanz, B., PROVINS, A.J., Bateman, I.J., Scarpa, R., Willis, K.G. and Ozdemiroglu, E. (2010) '*Investigating willingness-to-pay – willingness-to-accept asymmetry in choice experiments*', in Hess, S. and Daly, A. (eds.) *Choice Modelling: the state-of-the-art and the state-of-practice - Proceedings from the inaugural International Choice Modelling Conference*, Emerald.

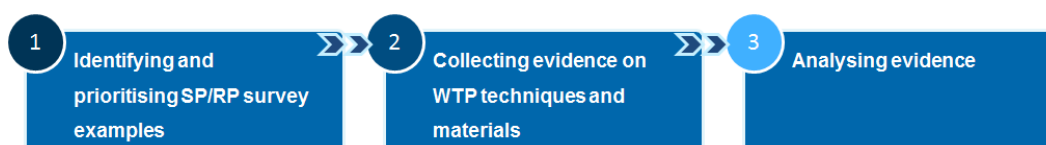
## Annex 2 Methodological approach

This section briefly describes the method that was applied in this study.

### A2.1 Approach to the study

The study was based on three key stages, outlined in A2.1 and each stage is described below.

Figure A1.1 Three key stages in the study framework



#### 1 Identifying and prioritising SP/RP survey examples from other regulated sectors

The first stage of the study identified potential sources of information relating to SP and RP methods in the water sector and in other sectors. Sources were identified through:

- desk research; and
- interviews with key stakeholders in the water sector and other sectors.

This search initially focussed on highlighted in the ITT, including addressing intergenerational preferences, accommodating inflation and application to ODIs. But it will also seek to identify any other issues particularly relevant to the water sector.

This research generated a long-list of sources that were then reviewed in brief, to identify where they were sufficiently relevant for the study to be reviewed in detail. Sources were prioritised according to:

- where the source discussed a product similar to water, i.e.
  - an essential utility / service;
  - **with low consumer engagement / awareness of the product** - often is not at the forefront of customers' minds, in part because it is often considered an 'essential service';
  - **rarely subject to interruptions of service**, which may, in part, explain why consumers may not spend a significant amount of time engaging with, thinking about or discussing the service (compared with services in other sectors e.g. transport);
  - **a complex product - 'quality' aspects numerous** that is exercised by domestic consumers (hard/soft water, water pressure, taste, clear/grey water, drainage, mains/off-mains provision). For business customers, no real choice (yet), and future choice may have a limited range of parameters that do not include water quality dimensions set out above; but
  - **generally there is little real choice** that consumers can exercise in relation to these different aspects of choice;
- sector characteristics:
  - Relevant water sector characteristics include the following:
  - **monopoly provision**; regulated companies must incorporate consumer preferences into their regulatory submissions – in particular, the regulator (Ofwat) has a role in price setting;
  - **low consumer engagement with suppliers unless there is a problem**;



- **the nature of investment in providing the service**; shorter-term and longer-term trade-offs are necessary, including dealing with long-term challenges such as resilience of water supply (and to flooding) – none of which are reflected in customers' choices (which could limit the applicability of RP methods, as there are few choices that customers' make to which RP methods could be applied (such as filtering water / buying bottled water).
- how WTP methods were applied, in particular whether the source included evidence relating to:
  - **SP or RP or a hybrid approach** used to create values for CBA;
  - **alternative approach** used to create values for CBA;
  - valuations generated by **surveys of consumers or the public**;
  - Valuations that accommodate **specific complex issues**:
    - outcome delivery incentives (ODIs) or other similar incentives;
    - strategic planning/investment appraisal/cost-benefit analysis;
    - operational planning; and
    - service propositions (offering added services to customers); and
    - Engagement involving presenting products/choices to respondents; or
    - A high cognitive burden which is a risk to gaining meaningful/valid responses

Each source was assessed for relevance in each of these categories – with any source that was rated as 'moderate' or 'high' relevance to the study taken forward to the next stage; a detailed review of relevance sources. A list of references can be found in Annex 3.

## **2 Collecting evidence on WTP techniques and materials**

This stage involved detailed analysis of each source that was prioritised. Specifically, this involved collecting and recording information in the following areas, to inform later analysis.

Table A1.2 Characteristics of techniques and materials

<b>Characteristic</b>	<b>Relevant to SP research?</b>	<b>Relevant to RP methods?</b>
<i>Information-gathering methods applied (e.g. stated preference, revealed preference, or others)</i>	Yes	Yes
<i>Strengths of the method recognised in the example &amp; conclusions on implications for use in the water sector</i>	Yes	Yes
<i>Weaknesses of the method. Mitigations applied in the example &amp; conclusions on implications for use in the water sector</i>	Yes	Yes
<i>How many respondents did the research involve?</i>	Yes	Yes
<i>Distribution of customer types among respondents (e.g. household vs. business customers, income characteristics etc.).</i>	Yes	Yes
<i>How research has been framed?</i>	Yes	<i>Depends on how information was collected</i>
<i>How has research identified and mitigated for complexity / cognitive load?</i>	Yes	
<i>What method of engagement was used (e.g. survey, focus group etc.)</i>	Yes	
<i>What materials were used with respondents and how?</i>	Yes	<i>Not if no survey involved</i>
<i>What analytical methods were used (e.g. cross-section, time-series or panel data)?</i>	<i>Possible</i>	Yes
<i>What was the market scope / coverage of the research?</i>	<i>Possible</i>	Yes

This stage also involved carrying-out interviews with a range of stakeholders, summarised below (Table A1.3).

Table A1.3 Stakeholders interviewed for this study.

<i>Type of organisation</i>	<i>Organisation</i>
Regulator	Ofwat
	Ofgem
	Ofcom
	Environment Agency
Water company	Anglian Water
	Thames Water
	United Utilities
	Severn Trent
	Southern Water
	Dwr Cymru
	Northumbrian Water
	Wessex Water
	Bristol Water
	CCG
Thames Water CCG	
Severn Trent Water CCG	
YourVoice (United Utilities CCG)	

Having analysed each prioritised example to produce the information set out above, we will assess the lessons that can be learned for the water sector across each issue. For each example from another sector, our analysis will identify any relevant learning points for the water sector. The team's experience of the regulatory process in water and in other example sectors will be crucial here. It is this experience that will allow us to identify which learning points will be most valuable when applied to the PR19 process.

### 3 Analysing evidence

The final step was to analyse the evidence to draw conclusions and recommendations on how WTP methods can be deployed in the water sector to maximise their contribution to the price control process, including at PR19. As set out in the scope that we were set for this study, this focuses on SP and RP methods. It therefore did not include a full assessment of all possible methodologies for estimating consumer preferences in the context of PR19.

The scope of this analysis does not include a detailed analysis of technical aspects of WTP methods, but focuses on higher-level methods and, in particular, how WTP analysis can be used within the water sector and in a business-planning context.

Key research questions used at this stage of the analysis are set out below.

- How has SP/RP evidence been sense-checked / verified by comparison to alternative methods or historical precedent?
- What other research methods have been employed in conjunction with SP/RP survey methods, such as additional consumer research, focus groups, pilots?
- What other analytical methods have been employed in conjunction with SP/RP survey methods, such as analysing market data to infer consumers' values?

- Where drawbacks have been identified with SP/RP survey methods, has an alternative been proposed? To what extent do those alternatives address these drawbacks?

The analysis categorised conclusions and insights according to their relevance to the methods, materials, process and role of WTP analysis, with a particular focus on how WTP analysis is used in the water sector to inform water companies' business planning.

## Annex 3 References

This annex includes a full list of sources used in this study.

Table A3.1 References

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