PJM economics

Collaborative ODI Research

Final Survey Values Report

June 2023

Report for:

Ofwat
7 Hill Street
Birmingham
B5 4UA

Disclaimer:

Prepared by:

PJM Economics Ltd
Unit C, Regent House
9 Crown Square
Poundbury
Dorchester
DT1 3DY

Study team:

Dr. Paul Metcalfe
Dr. Ali Chalak
Dr. Antara Sen
Dr. Paulo Anciaes
Daniele Bortolotti

Document versions:

No.	Date
V0.2	12 April 2023
V1.0	12 May 2023
V2.0	8 June 2023
V3.0	19 June 2023

Contents

Executive Summary

Introduction

Valuation evidence has played a crucial role in business planning for the water industry, including for cost-benefit analysis and the setting of outcome delivery incentive (ODI) rates. Ahead of the 2024 water price review (PR24), Ofwat and CCW instigated a programme of collaborative industry-wide research with the aim of ensuring a common basis for the setting of ODI rates for the common performance commitments (PC) anticipated to be in place for PR24. This research was proposed for PR24 to address the problem of excessive variability in results found at PR19, and previous reviews, which was thought to be caused by differences in design, quality and approach between water companies.

Accent and PJM Economics were commissioned by Ofwat and CCW initially to design and develop the survey instrument for the collaborative research, and subsequently to deliver the fieldwork for the main survey on behalf of the companies. Separate reports from these stages have already been delivered to Ofwat, CCW and the water companies. PJM Economics was later commissioned to complete the analysis and modelling stage of the study, with the aim of deriving customer values and marginal benefit values for common PCs.

A peer reviewer, Prof. Stephane Hess, was appointed to assure the quality of the design, analysis and reporting of the study.

The present document is the final report on the analysis and modelling stage of the study. This part has been focussed on obtaining evidence on household and non-household values for service issue failures. The report provides an explanation of the methodology used, and the findings generated, and provides an appraisal of the validity of these findings, including comparisons to comparable estimates from PR19.

Survey design

A new approach to water service valuation was developed for the study, based in part on a review of the strengths and weaknesses of techniques previously used in the water and energy sectors. Crucially, this new approach avoided the need to present participants with service levels, which have often taken the form of small changes in the risk of experiencing different forms of service issue, and to which participants have been found to be inadequately sensitive (Metcalfe and Sen, 2022).

The design centered around two linked stated preference choice exercises:

- **SP1 Impact exercise**: A pairwise choice exercise in which customers saw a series of ten questions each asking which of the two service issues shown would have the most impact on them. The intention of this exercise was to obtain estimates of the relative impacts of 26 service issue scenarios.
- **SP2 Compensation exercise**: A contingent valuation exercise in which customers were asked to choose between experiencing a service issue and being compensated for it, or not experiencing the issue and not receiving any compensation. Two service issues were included in this exercise: a short, planned supply interruption, and a boil water notice. The intention of this exercise was to obtain valuations for all service issues by pivoting off the values obtained for the two pivot service issues, using the relative impacts derived from the impact exercise.

Importantly, the approach focussed on service issues as they would directly impact upon customers, rather than on the performance commitment measures as they are defined for the purposes of measuring company performance. This meant that a further stage of analysis was needed to map the performance commitment measures to the service issues included in the survey. This mapping stage is outside of the scope of the present report.

Survey administration and data

Household survey administration

The questionnaire was administered to households using an approach combining commercial panel samples and a sample drawn from the Postcode Address File (PAF).

The Panel survey achieved 5,338 interviews; the PAF survey achieved 7,229 interviews, of which the vast majority completed the survey online, with the remainder completing a paper version of the questionnaire and sending back by post. This comprised the total household sample achieved of 12,567 interviews.

All household interviews were completed between July and September 2022.

Following survey completion, the data were anonymised and weighted to be representative within company and between companies using Census data on numbers of households in water and wastewater company areas by age, sex and social grade (SEG).

Non-household survey administration

Ofwat was able to use its regulatory powers to obtain non-household customer lists from water providers. This allowed for a unique sampling frame to be developed and used for the non-household survey, based on combined MOSL-Retailer data for England, and company data for Wales. This ensured almost complete coverage of the full non-household customer base and afforded multiple contact options for each customer.

Non-households were contacted via Email, Post and/or by Telephone, of which the majority completed the survey online. The total non-household sample comprised of 3,838 interviews.

All non-household interviews took place over August to October 2022.

Following survey completion, the data were anonymised and weighted to be representative (by employment size) within company and between companies.

Experience, usage and attitudes

The report presents a range of findings on the characteristics of the sample of customers in England and Wales with regard to:

- Experience of service issues
- Use of rivers and canals in the UK for various activities (e.g. fishing, walking, cycling etc.)
- Use of beaches and sea in the UK for various activities (e.g. fishing, walking, cycling etc.)
- Use of hosepipe or sprinkler for any purpose (e.g. washing/cleaning or watering plants)
- Attitudes about pollution control and the costs of pollution control

In addition to providing insight in their own right, these findings provided the basis for analysing the variability of the stated preference results to test whether it was in line with expectation. This analysis contributed to the appraisal of the validity of the results.

SP1 Impact analysis and findings

Participant feedback following the SP1 exercise was very positive, and there were no signs of non-trading, suggesting good performance of the SP1 choice exercise[1].

The main results on relative impacts for all the service issues were obtained via an econometric analysis of responses to the SP1 stated preference exercise using a Bayesian mixed logit modelling approach. Sensitivity analysis was conducted examining different approaches to sample exclusions, with some non-negligible impacts on the results. A segmentation analysis was also undertaken to explore how impacts varied across the population.

As expected, internal sewer flooding incidents were by far the highest impact scenarios, and the impact ranking of the various other service issues was almost universally as expected. For example, longer duration service issues were found to have a greater impact than shorter service issues of the same kind; nearby incidents were found to have a greater impact than similar incidents occurring further afield. Furthermore, relative impacts also varied across people in a manner also consistent with expectation. For example, those using a hosepipe or sprinkler assigned higher impacts to a hosepipe ban; those frequently using rivers for recreation assigned higher impacts to service issues affecting rivers; those regularly visiting beaches assigned higher impacts to bathing water quality.

While impact scores for household customers were relatively precisely estimated, the confidence intervals around non-household impact scores were wider, leading to wider confidence intervals around non-household customers' valuations. This lack of precision could be at least partly attributed to the substantially smaller sample size of the non-household survey in comparison to the household survey, but could also be attributable in part to a more heterogeneous population amongst non-households.

SP2 Compensation analysis and findings

Participant feedback following the SP2 exercise was similarly positive. An analysis of the reasons for participants' choices revealed that the vast majority were valid in the sense that their choices were based on the impact of the service issues and/or the sufficiency of the amount of compensation offered to them. There were, however, approximately 5% of households and 7% of non-households whose responses could be considered potentially invalid. These included cases where participants objected to the principle of accepting compensation, expressed disbelief in the maintained payment vehicle or they may have considered broader impacts on investment or service levels that were not intended to be considered within the valuation framework.

Whether or not these invalid responses should be excluded from analysis is a matter of debate amongst practitioners. Following best practice guidelines for stated preference research [Johnstone et al, 2017] we include all responses to generate the main results and test the sensitivity to their exclusion within the analysis. Results were somewhat sensitive to exclusion of potentially

---

[1]Non-trading behaviour refers to participants making the same choices repeatedly (e.g., participant chooses the same alternative in all choice situations). This type of behaviour is usually indicative of non-engagement with the survey, and a large number of such non-traders implies a poor-quality dataset for analysis.

invalid responses to the SP2 compensation exercise. Removing these responses resulted in values that were lower by 12%-14% for households and by 29%-30% for non-households.

The main results on valuations for the two pivot service issues, i.e. a planned 6 hour supply interruption, and a boil water notice lasting 48 hours, were obtained via an econometric analysis of responses to the SP2 stated preference exercise using a random-effects panel interval regression modelling approach. A sensitivity analysis was conducted examining different approaches to sample exclusions, with some impact on the results. A segmentation analysis was further undertaken to explore how valuations for the pivot service issues varied across the population.

The results showed that, regardless of the sample (HH/NHH), company, and region (England/Wales), the median willingness to accept compensation for a boil water incident was substantially higher when compared with a planned water supply interruption lasting 6 hours. The confidence ranges around valuations were relatively narrow for households. For non-households, the confidence ranges were slightly wider, reflecting a substantially smaller sample size of the non-household survey in comparison to the household survey.

Service issue valuations

The valuation estimates for the service issues were obtained by combining the results from the SP2 compensation choice analysis and the SP1 impact choice analysis.

In comparisons to values for avoided service issues from PR19 studies, as reported in Accent-PJM (2018b), a common theme that emerged was that the household results appeared to be broadly consistent with those from PR19 in most cases, where comparable, and generally towards the low end of this range. A prominent exception to this pattern, however, is that the values for sewer flooding were found to be low in comparison to PR19.

A second theme arising from the comparison against PR19 results was that the non-household valuation estimates from the present study tended to lie above the top end of the range in most cases. These comparisons should give pause for consideration, particularly given that the non-household results have been less reliably measured than household results.

Conclusions

Overall, the study has delivered values with strong evidence of content/cognitive validity and, in most cases, construct validity. There were two key issues with the results, however, which suggest that an adjustment of the values reported herein may be warranted rather than applying them directly within ODI rates for PR24:

- First, for the reasons discussed in the report, we consider that the estimated values for internal sewer flooding may be understated in the present study. This suggests that Ofwat and/or companies would be prudent to consider triangulating the values for sewer flooding, in particular, against other evidence. The Green Book, for example, states that average flood damage costs £8,000 to £11,000 per event for a flood of less than 0.1 metres in depth. This, and other evidence, could be brought to bear when considering the value for sewer flooding.

- Additionally, a downward adjustment to the non-household results may be prudent given that they appear to be substantially higher than those found at PR19, while at the same time showing weaker reliability in comparison to household values. For example, the low end of the range could be justifiably used rather than the central values, or the overall scale of the valuations could be calibrated to the household values as a proportion/multiple of the average bill, whilst retaining the estimated non-household relative values.

Finally, although comparisons to PR19 values were not possible for environmental service issues, due to the need for a further mapping stage to be undertaken that was beyond the scope of the present report, our considerations at the design stage regarding the choice of valuation measure suggest that an alternative reasonable approach that relied on willingness to pay for environmental improvement, rather than the compensation required for environmental harms, would have returned values lower than those actually measured. This suggests that the environmental service issue values obtained are likely to be at the upper end of the justifiable range.

Notwithstanding these issues, the study has successfully implemented an innovative new approach to customer valuation that has obtained values on a comparable basis across the industry and the results are commended to Ofwat for the purposes of developing ODI rates for PR24.

Glossary

CATI	Computer Assisted Telephone Interview
HH	Household
NHH	Non-household
ODI	Outcome delivery incentive
PAF	Postcode Address File
PC	Performance commitment
PR14	The 2014 water price review
PR19	The 2019 water price review
PR24	The 2024 water price review
SEG	Socioeconomic grade
WTA	Willingness to accept
WTP	Willingness to pay

1. Introduction

1.1. Background and objectives

Valuation evidence has played a crucial role in business planning for the water industry, including for cost-benefit analysis of enhancement cases, and for setting outcome delivery incentive (ODI) rates. Ahead of the 2024 water price review (PR24), Ofwat and CCW instigated a programme of collaborative industry-wide research with the aim of ensuring a common basis for the setting of ODI rates for the common performance commitments (PC) anticipated to be in place for PR24. This research was proposed for PR24 to address the variability in results found at PR19, and previous reviews, which was thought to be caused by differences in design, quality and approach between water companies. Within this programme of collaborative work, companies and key stakeholders were consulted on the research through regular steering group meetings.[2]

Accent and PJM Economics were commissioned by Ofwat and CCW initially to design and develop the survey instrument for the collaborative research, and subsequently to deliver the fieldwork for the main survey on behalf of the companies. Separate reports from these stages have already been delivered to Ofwat, CCW and the water companies: the Stage 1 report covered the design of the methodology; the Stage 2 report covered the development and testing phase; and the Stage 3 report covered the main fieldwork phase.

PJM Economics was later commissioned to complete the analysis and modelling stage of the study, with the aim of deriving customer values and marginal benefit values for common PCs.

A leading academic expert in choice modelling, Prof. Stephane Hess, was separately appointed by Ofwat to provide assurance regarding the quality of the design, analysis and reporting of the study.

A note containing the customer valuation results, along with all the data, programs, and intermediate outputs used in the generation of these results, has been recently delivered to Ofwat, CCW and the water companies.

The present document is the final Stage 4 report on analysis and modelling. This stage has been focussed on obtaining evidence on household and non-household values for service issue failures. The report provides an explanation of the methodology used, and the findings generated, and provides an appraisal of the reliability and validity of these findings, including comparisons to estimates from PR19 where possible.

1.2. Structure of report

The remainder of this report is organized as follows:

- Section 2 describes the survey design, including the design of the core stated preference exercises.
- Section 3 describes the administration of the household and non-household surveys, including an overview of the data obtained and the approach to weighting.

[2] For further details regarding the context of this research, and the intended application of the results, see Ofwat, 2022, Creating tomorrow together: Our final methodology for PR24, December 2022.

- Section 4 presents findings on experience of service issues, usage of rivers, canals, beaches, hosepipes and sprinklers and attitudes towards environmental costs.
- Section 5 presents a description of the approach to analysis of the SP1 impact exercise and the findings from this analysis.
- Section 6 presents a description of the approach to analysis of the SP2 compensation exercise and the findings from this analysis.
- Section 7 presents the final customer valuation results for both households and non-households. In addition, we present a comparison of the customer values resulting from the present research with the PR19 customer values.
- Section 8 concludes.

Appendix A contains a description of the service issues tested in the research; Appendix B contains the main survey questionnaire; and Appendix C contains supplementary results from econometric analysis of the stated preference choice data.

2. Survey Design

This section describes the design of the survey, including the following parts:

- Overview (2.1)
- SP1 Impact exercise (2.2)
- SP2 Compensation exercise (2.3)
- Supporting questions (2.4)

The Stage 1 report contained further details on the survey design, including its rationale, while the Stage 2 report contained full details of the testing and development approaches and findings.

2.1. Overview

An extensive development journey was undertaken to create the survey design used in the present research. This consisted of:

- A desk review of academic literature on and relevant industry materials from PR19 and RIIO2.
- Consultation with companies, individually and via an industry workshop to review options.
- Several stages of qualitative testing via depth interviews, and two large-scale quantitative pilots.

Full reports from this development work have been produced, with the Stage 1 report covering design and the Stage 2 report covering testing and development respectively. The remainder of this section provides an overview of the final survey design only, with findings from the Stage 2 testing referred to where relevant.

As described in the Stage 1 report, a new approach to water service valuation was developed for the study, based in part on the review of the strengths and weaknesses of techniques previously used in the water and energy sectors. Crucially, this new approach avoided the need to present participants with service levels, which have often necessarily taken the form of small changes in the risk of experiencing different forms of service issue, or equivalently, as the number of properties experiencing the service issue within the company supply area. This type of approach has dominated water and wastewater service valuation since Willis et al. (2005) and Hensher et al. (2005), and was embedded into UKWIR (2011) guidance for the England and Wales water sector. (See Willis and Sheldon, 2022, for a history of valuation research approaches in UK water sector price reviews.)

Unfortunately for the validity and reliability of these past approaches, there has emerged strong evidence from the value of a statistical life (VSL) literature (see, e.g., Hammitt and Graham, 1999), as well as from the England and Wales water sector (Metcalfe and Sen, 2022), that survey participants are not adequately sensitive to small risk changes in stated preference surveys. This implies that WTP estimates obtained from studies based on the discrete choice experiment methods traditionally used in the water sector can be considered neither reliable, nor valid, in general despite within-study evidence consistently suggesting otherwise (Metcalfe and Sen, 2022).

The design developed for the present study avoided the presentation of company service levels and instead included the following two linked stated preference choice exercises:

- **SP1 Impact exercise**: A pairwise choice exercise in which customers saw a series of ten questions each asking which of the two service issues shown would have the most impact on them. The intention of this exercise was to obtain estimates of the relative impacts of 26 service issue scenarios included in the design.

- **SP2 Compensation exercise**: A contingent valuation exercise in which customers were asked to choose between experiencing a service issue and being compensated for it, or not experiencing the issue and not receiving any compensation. Two service issues were included in this exercise: a short, planned supply interruption, and a boil water notice. The intention of this exercise was to obtain valuations for all service issues by pivoting off the values obtained for the two pivot service issues, using the relative impacts derived from the impact exercise.

This design builds on the approach taken by Chalak and Metcalfe (2022), which also valued water and wastewater service improvements using an impact exercise. However, rather than using a compensation exercise to link impact to monetary value, that study included a 'package' exercise to measure the total value of a package of service improvements and then apportioned this to individual service levels via impact-weighted numbers of service failures. As noted by the authors, a key limitation of that approach was that the package value could itself be expected to be insufficiently sensitive to the scope of improvement offered. Thus, whilst the relative values established by the impact exercise were not themselves affected by insensitivity to service levels, the overall scale of the monetary values could still be unreliable. The present approach instead calibrates values using simple and direct choices that do not challenge the survey participant to make sense of a complicated profile of abstract service levels. Consequently, they have addressed this key limitation within Chalak and Metcalfe (2022).

In the remainder of this section, the SP1 impact exercise and the SP2 compensation exercise designs are described in more detail, with the final part of the section then describing the supplementary questions that were added to complete the survey questionnaire.

2.2. SP1 impact exercise

The first choice exercise focused on measuring the relative impacts of a wide range of service issues, covering issues at the participant's property as well as local environmental impacts influenced by water or wastewater operations. Figure 1 shows an example of a choice card from the survey, which illustrates the nature of the questions asked. Participants each saw ten questions such as the one shown in Figure 1.

Figure 1: Impact exercise: example choice card

Hover buttons, represented by ⓘ, were included on some options. Clicking on these showed more information on the scenario.

In total, 26 different scenarios were included in the design, with different pairs of service issues shown across the sequence of questions for each participant, and across the sample, according to an experimental design. (See below for details.)

The scenarios included in the design are shown in Table 1 below, while Appendix A contains the full descriptions and images shown. The list of service issues was developed based on the common PC measures for which valuations were required, and considering how these measures might impact upon customers.

The precise forms of the measures, including the descriptions and images used to convey them, were consulted on with companies and tested extensively with household and non-household customers throughout Stage 2 of the study. In each case, the service issue attempted to convey the average severity of a broad class of issues, where only one was included, e.g. internal sewer flooding; or to show different severities/durations where there were expected to be particularly important segmentations needed, e.g. in the case of supply interruptions, discoloured water and water taste and smell issues.

In the case of many of the environmental service issues, separate versions were developed for 'nearby' and 'elsewhere in your region'. These was intended to allow for stepped distance decay functions to be developed to allow for the summing of values over the appropriate population, bearing in mind that those living closer to an area suffering an environmental harm would be expected to experience a higher impact than those living further away.

For all of the service issues, the descriptions were developed to convey: what impact the issue would have, how long it would last, when it would happen, and what it was caused by. These features were understood to be the key pieces of information participants would need to be able to assess how impactful each of the service issues would be on them.

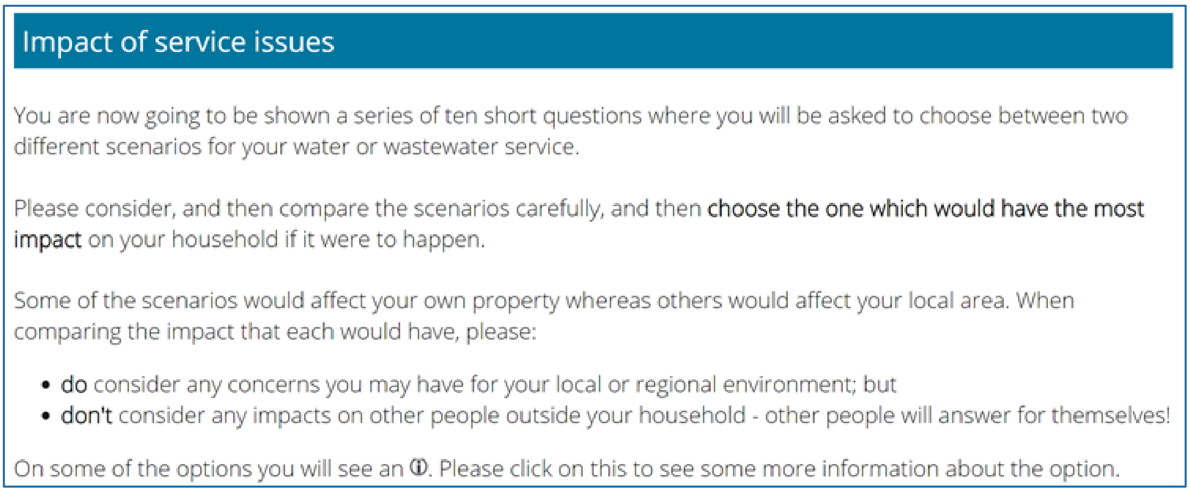
Table 1: Service issue scenarios included in the impact exercise

Label[a]	Scenario
UnexpInt6	Unexpected water supply interruption (6h)
UnexpInt24	Unexpected water supply interruption (24h)
PlannedInt6	Planned water supply interruption (6h)
LowPressure	Unexpected low water pressure (6h)
Boil	Boil water notice (48h)
DND	Do not drink notice (48h)
Discolour24	Discoloured water (24h)
Discolour6	Discoloured water (6h)
TasteSmell24	Water taste and smell (24h)
TasteSmell6	Water taste and smell (6h)
InternalSF	Sewer flooding: inside your property (1 month)
ExternalSF	Sewer flooding: outside your property (1 week)
HoseBan	Hosepipe ban (5 months)
RotaCuts	Emergency drought restrictions (2 months)
LowFlowNearby	Low flows in rivers nearby (2 months)
LowFlowElse	Low flows in rivers elsewhere (2 months)
StormFlowNearby	Storm overflow nearby (4 hours)
Pol3Nearby	Minor pollution incident nearby (1 day)[1]
Pol2Nearby	Significant pollution incident nearby (4 weeks) [2]
StormFlowElse	Storm overflow elsewhere (4 hours)
Pol3Else	Minor pollution incident elsewhere (1 day) [1]
Pol2Else	Significant pollution incident elsewhere (4 weeks) [2]
RWQNearby	River water nearby is not High quality[3]
RWQElse	River water elsewhere is not High quality[3]
BWQExc	Coastal bathing water is not Excellent quality
BWQGood	Coastal bathing water is neither Excellent nor Good quality

The labels shown here are those used within the analysis as an abbreviation for the full scenario. (1) Minor pollution incident descriptions were intended to reflect Category 3 incidents. (2) Significant pollution incident descriptions were intended to reflect Category 2 incidents. (3) The 'High quality' description of river water was based on the description of 'High quality' within the National Water Environment Benefits Survey (NWEBS), which was itself based on the level of Good Ecological Status, as defined by the Water Framework Directive (2000/60/EC). (See NERA-Accent, 2007, for further details on the water quality ladder used within NWEBS.)

The exercise was introduced to participants with the important instruction that they should consider all the impacts that they care about for themselves, including concerns for the environment, but should not consider impacts on other people when making their choices. (Figure 2 shows the introductory screen in full). This instruction was intended to ensure that Total Economic Value (TEV) would be captured for each participant, including non-use value as well as use value, and that impacts would be elicited in such a form as could be validly aggregated over the population affected by the service issue.

Figure 2: Impact exercise: introductory screen



A 'D-efficient' design approach was used to create the choice situations faced by each participant from the set of all possible combinations of scenarios. This approach attempts to maximise the precision of the preference parameter estimates, given some prior estimates of the true parameters. Priors were obtained from the pilot study to calibrate the main stage designs for households and non-households.

The main stage design comprised 30 blocks of 10 questions each (each participant being randomly allocated to one of the blocks), with the large number of blocks chosen to allow for a significant degree of variation with respect to the order with which attributes appeared, and the combinations in which they appeared. Prior to optimisation, the candidate set of choices was restricted to exclude dominant/dominated pairs of options, such as two unexpected water supply interruptions of different durations, to ensure that each choice required some meaningful trade-off. The full set of design restrictions implemented is shown in Table 2.

Table 2: Impact exercise design restrictions : Excluded pairs

	More impactful	Less impactful
1	Unexpected water supply interruption (6h)	Planned water supply interruption (6h)
2	Unexpected water supply interruption (24h)	Planned water supply interruption (6h)
3	Unexpected water supply interruption (24h)	Unexpected water supply interruption (6h)
4	Emergency drought restrictions (2 months)	Hosepipe ban (5 months)
5	Low flows in rivers nearby (2 months)	Low flows in rivers elsewhere (2 months)
6	Storm overflow nearby (4 hours)	Storm overflow elsewhere (4 hours)
7	Minor pollution incident nearby (1 day)	Minor pollution incident elsewhere (1 day)
8	Significant pollution incident nearby (4 weeks)	Significant pollution incident elsewhere (4 weeks)
9	River water nearby is not High quality	River water elsewhere is not High quality
10	Minor pollution incident nearby (1 day)	Storm overflow nearby (4 hours)
11	Significant pollution incident nearby (4 weeks)	Storm overflow nearby (4 hours)
12	Significant pollution incident nearby (4 weeks)	Minor pollution incident nearby (1 day)
13	Minor pollution incident nearby (1 day)	Storm overflow elsewhere (4 hours)
14	Significant pollution incident nearby (4 weeks)	Storm overflow elsewhere (4 hours)
15	Significant pollution incident nearby (4 weeks)	Minor pollution incident elsewhere (1 day)
16	Minor pollution incident elsewhere (1 day)	Storm overflow elsewhere (4 hours)
17	Significant pollution incident elsewhere (4 weeks)	Storm overflow elsewhere (4 hours)
18	Significant pollution incident elsewhere (4 weeks)	Minor pollution incident elsewhere (1 day)
19	Coastal bathing water is neither Excellent nor Good quality	Coastal bathing water is not Excellent quality
20	Discoloured water (24h)	Discoloured water (6h)
21	Taste and smell (24h)	Taste and smell (6h)

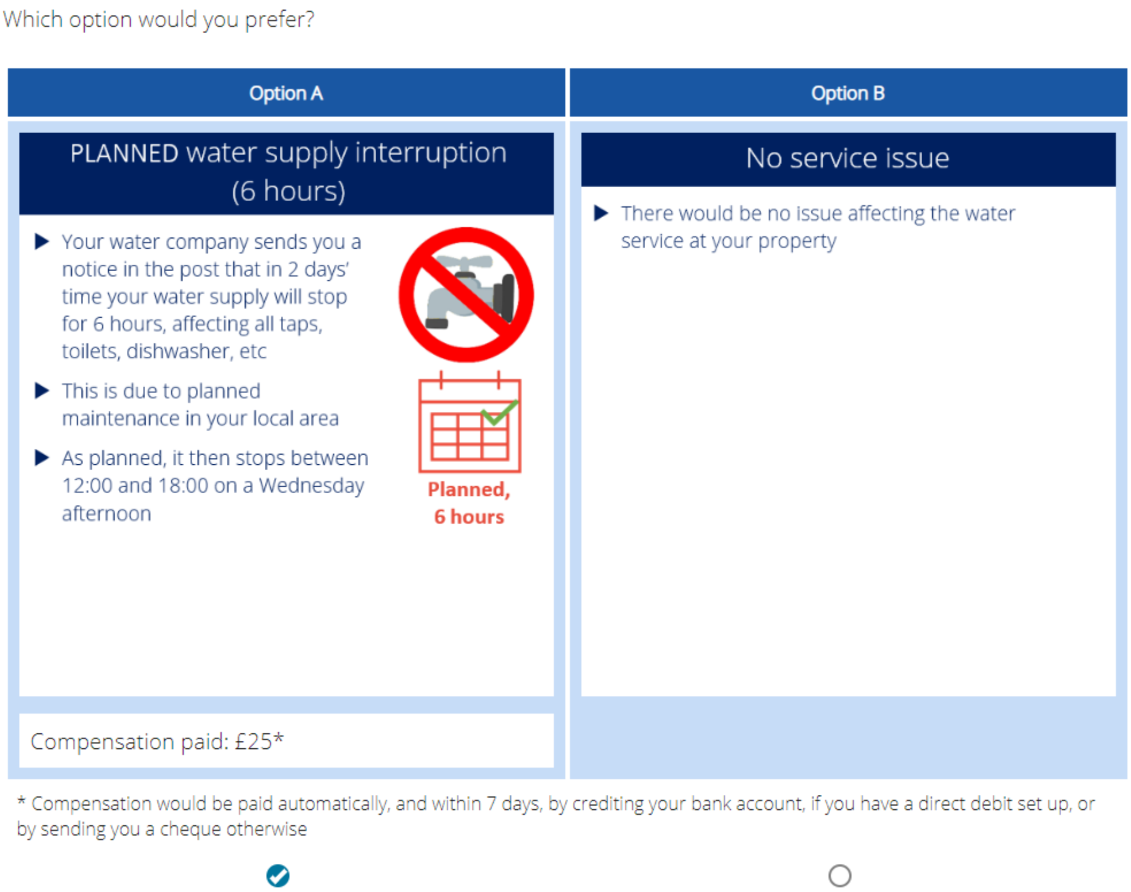
Note: The Impact exercise was designed to exclude any choice sets that included the pairs of scenarios shown in the table.

2.3. SP2 compensation exercise

The compensation exercise was designed to value two service issue scenarios: a planned water supply interruption lasting 6 hours, and a boil water incident lasting 48 hours. Whilst only one 'pivot' service issue was needed to obtain the values of all service issues when combined with the relative impacts, the decision to include two service issues was taken to allow for: an analysis of the sensitivity to choice of pivot, an ability to triangulate values as obtained via use of both pivots, and as a means of testing the validity of the key assumption that relative values should be proportional to relative impacts. The reasons for selecting these two service issues in particular are set out later in this subsection.

Figure 3 shows an example of a choice card from the survey. Each service issue was valued by asking participants to choose between experiencing the service issue and being compensated for it, or not experiencing the issue and not receiving any compensation. Participants were told that the compensation would be paid automatically and within 7 days, by crediting their bank account if they had a direct debit set up, or by sending them a cheque otherwise. Pre-testing had found this payment vehicle to be credible and meaningful.

Figure 3: Compensation exercise: example choice card



The method obtains values for service issues as a willingness-to-accept (WTA) measure, rather than the willingness to pay (WTP) measure more commonly associated with water service valuation. The use of this measure was not entirely new to the industry – a study by PJM Economics for Affinity Water at PR19 adopted a similar approach (Accent-PJM, 2018a). However, most water service valuation studies have focused on WTP values for service level improvements.

Where WTA values and WTP values have both been estimated, (e.g. Lanz et al. 2010), it has been found that WTA values exceed WTP values for the same service increment. This finding is consistent with the broader literature in which it has been very commonly observed that WTA exceeds WTP.

In choosing between a WTP and a WTA approach to measuring value, the two key factors for consideration were economic principles, notably the nature of the participant's reference condition and empirical/practical considerations (Kim et al., 2015; Johnstone et al., 2017; Atkinson et.al, 2018). In the case of traditional service level valuation experiments e.g. Willis et al. (2005), the participant's reference condition has been the current level of service, expressed in most cases as the current average risk of a service issue happening to a customer. However, in a choice between experiencing a service issue or not experiencing it, the natural reference condition that customers can expect, on a day-to-day basis, is one where nothing goes wrong, rather than one where they experience failure after failure and would need pay extra to prevent an otherwise certain service issue from occurring. It is hence correct to use a WTA measure in this context rather than a WTP measure.

A potential exception to this rule could be envisaged in the case of the environmental service issues, wherein the choice between a WTP and a WTA approach to measuring value is less clear cut. The natural reference condition for environmental service attributes could be understood to be less-than-perfect and it is hence not clear whether water customers should be asked to pay extra money for achieving perfect environmental status or if they should be entitled to compensation for the environmental impacts.

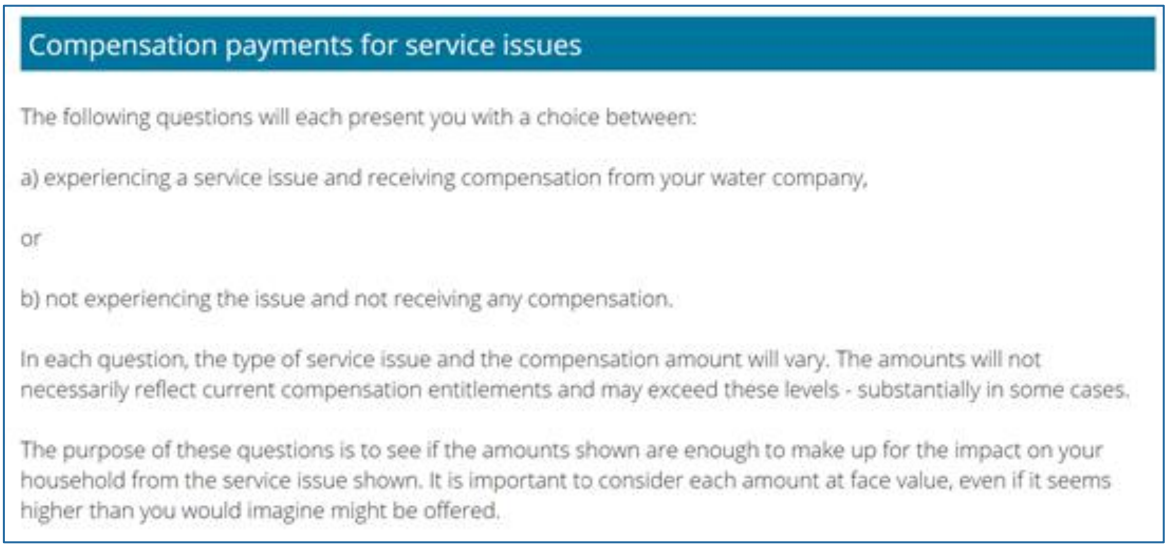
For practical reasons, a common approach was adopted for all service scenarios, including private and environmental impacts. This entailed use of a WTA measure rather than a WTP measure, on the basis that this approach was more appropriate overall.

Notwithstanding the merits of the approach taken, however, one can envisage a counterfactual set of results wherein WTP estimates were been obtained for the environmental service issues. In such a case, we would expect the values to be lower than the WTA values actually measured. This consideration is relevant to the interpretation of the environmental service values obtained from the present study as it suggests that an alternative, reasonable approach, involving WTP rather than WTA would result in lower values for environmental service issues.

Figure 4 shows the introductory screen to the exercise. This was kept deliberately brief as it was not considered necessary to provide detailed background material on, e.g. company performance, or the regulatory regime. In addition to introducing the type of questions that would be asked, text was included in order to prevent misunderstandings about current compensation levels, and to prime them to expect to see amounts that they may consider very large. This was needed because the amounts needed to encourage sufficient people to accept them as sufficient compensation were found in pre-testing to be higher than current compensation entitlements, and it was important for the performance of the payment vehicle that it should be considered credible even at these higher-than-expected levels.

With regard to the purpose of the exercise, the explanation was deliberately kept brief, and limited to only that information which would be needed to give participants sufficient cause to consider the exercise to be worthwhile. The wording was not misleading in any way but, importantly, it was considered that it would be unnecessary, and unhelpful, to provide details of how the results would actually be used within the regulatory regime to provide the basis for setting ODI rates. This was due to the excessive volume and complexity of education that would be required to set this out clearly, and in such a manner as to motivate the particular form of questions asked in the exercise.

Figure 4: Compensation exercise: introductory screen


Compensation payments for service issues

The following questions will each present you with a choice between:

a) experiencing a service issue and receiving compensation from your water company,

or

b) not experiencing the issue and not receiving any compensation.

In each question, the type of service issue and the compensation amount will vary. The amounts will not necessarily reflect current compensation entitlements and may exceed these levels - substantially in some cases.

The purpose of these questions is to see if the amounts shown are enough to make up for the impact on your household from the service issue shown. It is important to consider each amount at face value, even if it seems higher than you would imagine might be offered.

Related to this, the following text was included at the end of the questionnaire:

> Earlier in the questionnaire we asked you to make choices between experiencing a service issue and receiving compensation, or not experiencing the service issue. Different amounts were shown to different survey participants as part of this study to test how much money would be needed, in principle, to compensate for the impact that the service issue would have on customers.
>
> **We wish to reiterate that the amounts shown were not the same as those you would be currently entitled to expect if you were to experience the service issue at your property.**

The two service issues, Planned interruption (6h) and Boil notice (48h), were selected to serve as the key 'pivot' scenarios for the following reasons:

- Both were service issues at the customer's property rather than environmental impacts.
  - This was considered important because there is an established norm for compensating customers that are impacted by service failures at their property The Guaranteed Standards Scheme (GSS), for example, requires companies to compensate customers with specified amounts when they experience interruptions to supply, low pressure or sewer flooding. By contrast, there were no common societal norms for compensating the general public in the event of environmental harms to rivers or coastal bathing waters. This was considered to make it more likely that participants would reject the credibility of the payment vehicle in these cases.
- Both were relatively low-impact service issues
  - Required compensation was hence expected to be lower than, for example, sewer flooding, for which the amounts of money needed to adequately compensate the participant were expected to be too high to be considered credible by the participant. Perceptions that the amounts were not believable would weaken the motivation to give the questions careful consideration, and thereby weaken the validity of the results.
- Both could affect any property equally
  - Sewer flooding and low pressure are believed by some to be impossible at their property, due to the fact that they live at the top of a hill, or at the top of a block of flats. This is not, in fact, true as both service issues can occur in properties of this type. However, the belief by some was considered sufficient reason to exclude these as candidates for the pivot scenarios.
- Little room for ambiguity
  - Some of the service issues were potentially more ambiguous than others in terms of how they would impact the participant. For example, the external sewer flooding service issue was necessarily more ambiguously described than would be ideal due to the fact that the description needed to be relevant to all types of property, even though the actual impacts would vary substantially depending on, for example, whether the property had a garden. Ambiguity could potentially lead participants to infer something about the severity of the issue from the amount of money specified as being payable in compensation within the exercise.

- The company would definitely know of the service issues
    - Some of the service issues, including discoloured water, water taste and smell, and unexpected interruptions, were considered to have the potential for participants to question whether the company would even be aware of the issue, leading some to believe they may need to apply for compensation themselves rather than it be automatic. In the case of planned interruptions and boil notices, the fact that both involve a notice being sent by the water company implies, by definition, that the company must know about the issue. This thereby lent more credibility to the information presented to them stating that the compensation would be paid automatically.

The order in which each of the two pivot service issues appeared was randomised across the sample.

The compensation levels for the first question of each exercise were randomly chosen from the sets shown in Table 3. The compensation amounts were shown in pounds for households and as a percentage / multiple of the annual combined water and wastewater services bill for non-households. The reasons for presenting non-households with compensation amounts that were a percentage/multiple of their annual combined water and wastewater bill were three-fold:

- Non-households usually have a wide range of bills. This would require the survey to include many bill levels in order to cover the wide range of bills and also reliable means of deciding who gets what set of bill levels. Owing to these practicality issues, we presented compensation amounts as a percentage/multiple of the combined bill for non-households.
- Non-households often do not know the precise amounts of their bills. Further, evidence from previous research suggests that business customers prefer to respond in terms of percentages/multiples of their bills rather than in monetary terms [UKWIR, 2011].
- We considered the combined water and wastewater service bill rather than just the water service bill for planned water supply interruptions and boil water notice. This was to ensure consistency and comparability in the compensation measure shown to all business customers, regardless of whether they received separate bills or a combined bill for water and wastewater services. Further, we think that it is prudent to consider combined bills since previous research has shown that non-households when asked to provide separate estimates of their water and wastewater bill, generally always consider their combined bill.

Amounts for an initial question in each case were varied across the sample, and this compensation amount was either halved or doubled in a follow-up question, depending on the response to the first question. This is the so-called 'double-bounded contingent valuation' method (Hanemann et al., 1991).

In comparison with single-bounded contingent valuation questions, the addition of the follow-up question allows for more statistically precise estimates to be obtained (Hanemann et al., 1991). However, several papers in the non-market valuation literature have identified the potential for double-bounded contingent valuation estimates to be downward-biased, in comparison to the 'gold standard' of single-bounded formulations (e.g. Cameron and Quiggin, 1994). Several hypotheses have been offered to explain the bias, including cognitive anchoring, or 'starting point bias' (Herriges and Shogren, 1996) and incentive effects (Carson and Groves; 2007).

The addition of the follow-up question allows for the flexibility to estimate a wider variety of models, including those that ignore the follow-up question responses, and those that include mechanisms to avoid any potential bias that may be present. It was hence considered appropriate to include the follow-up questions within the compensation exercise design. This approach is consistent with the advice of Hanneman and Kanninen (1999), who note that 'even if it produces some bias compared to the single-bounded approach, the experience to date generally suggests that the bias is in a conservative direction and is greatly outweighed by the gain in efficiency in terms of minimizing overall mean squared error'. (Hanneman and Kanninen, 1999, p.388).

The bid levels themselves in Table 3 were chosen based on the findings from the pilot analysis, and based on the decision to focus on median WTA as the target measure for valuation, rather than mean WTA. Although mean WTA estimates are required to calculate the total benefits of a service improvement, and thereby apply the traditional Kaldor-Hicks test to appraisals; the median measure was considered to be practically and conceptually more appealing as the target measure of value for the present study.

On practical grounds, the mean was expected to be extremely difficult, if not impossible, to estimate reliably using the compensation exercise. This is because the pre-testing had found that the proportion choosing to reject the compensation tended to remain high (above 20%) even at extremely high levels of compensation. It also appeared in cognitive testing that there was a credibility limitation preventing the possibility of presenting scenarios that would encourage enough participants to accept the compensation (and the service issue) in order to robustly pin down the upper tail of the WTA distribution. This problem was particularly acute for non-households. (See Stage 2 report for further details of the pre-testing work and findings.)

The median measure is, by contrast, can much more reliably be estimated as it does not rely on capturing data on the shape of the distribution. It only requires knowledge of the price point at which 50% would accept and 50% would reject.

The median measure of value was also considered to be preferable on conceptual grounds. The median measures the value to the average household/non-household; the mean, by contrast, tends to be skewed towards a higher value than the majority would hold due to the influence of an upper tail with very high WTA values. A key advantage of the median is that it is not at all susceptible to influence from outliers with extremely high values.

Given this focus, the median WTA values from the pilot analysis were inputted as the middle price-point in each case (rounded to the nearest big number). Upper and lower levels were then chosen to capture a sufficiently broad range as to have a high confidence that the median would fall within the range for all sub-populations potentially of interest, whilst avoiding presenting numbers at the upper end that participants would consider too high to be credible.

Table 3: Compensation levels for the first valuation question

Household		Non-household	
Planned interruption (6h)	**Boil water notice (48h)**	**Planned interruption (6h)**	**Boil water notice (48h)**
£20	£40	40% of your annual water and wastewater services bill	80% of your annual water and wastewater services bill
£50	£100	100% of your annual water and wastewater services bill	2 times the amount of your annual water and wastewater services bill
£150	£300	3 times your annual water and wastewater services bill	6 times the amount of your annual water and wastewater services bill

The second, follow-up, question for each of the service issues in this exercise presented either double or half the compensation amount that they had been shown in the first question. Those that chose to accept the compensation were shown a follow-up with half the compensation offered; those that chose to reject the compensation were shown a follow-up with twice the compensation offered.

2.4. Supplementary questions

The full main survey questionnaire is included as Appendix B to this report. The remainder of the questionnaire included the following components in outline form:

- **Introduction and screening**
  - Participants had to: (i) agree to the privacy policy; (ii) not work for a market research company or a water company; (iii) be connected to the sewerage service, ie not have a septic tank or cesspit, (iv) be over 18 years old; and, in the case of non-households, (v) be solely or jointly responsible as the decision maker for their organisation's water and wastewater service at the property sampled.
- **Assignment to water and wastewater companies**
  - This depended on how the participant was recruited (see Section 3) for different modes used. All participants had to have an assigned water company and an assigned wastewater company to proceed.
- **Demographics**
  - Some demographic questions were placed early in the questionnaire including, for households: (i) Age; (ii) Sex; and (iii) Whether the participant was a bill payer or not; and, for both households and non-households: (iv) Bill size.
  - Further questions were included at the end of the questionnaire, including, for households: (i) Occupation; (ii) Ethnicity; (iii) Household size and composition; (iv) Vulnerability status; (v) Metered status; and, for non-households: (vi) How the organisation uses water; (vii) Number of sites; (viii) Number of Employees; (ix) Sector; (x) Metered status.
  - Finally, for those households completing the questionnaire by post, a question was included asking about their ability to access the internet.
- **Experience of service issues**
  - Questions were included to identify participants that had experienced any of the types of service issue included in the SP1 Impact exercise. These questions served three specific purposes within the present study:
    - They primed participants to be thinking about the service issues in advance of the SP1 questions about their relative impact.
    - They provided data, in the case of discolouration and water taste and smell issues, that could be used within the mapping stage of the study to measure the number of incidents of these kinds per contact. These data were needed to assign the service issue values derived in the present study to the common PC 'Customer contacts about water quality'.

- Finally, they provided the means for a validity test, based on the principle that, if the service issue descriptions were sufficiently accurate and unbiased then, provided experience of the service issue was not inherently conflated with other characteristics, the relative impacts should be approximately the same regardless of whether or not the participant had experienced the service issue in question. By contrast, if experience of a service issue was found to be significantly correlated with its relative impact, and there was no reason to expect this to be a consequence of difference participant characteristics, this could be an indicator that the service issue description had presented a biased picture of the impact of that service issue.

  An analysis of the impacts of experience on impacts is presented in Section 5.

- **Usage**
  - Questions were included on: Usage of rivers and canals in the UK; Usage of beaches and the sea in the UK; and Usage of a hosepipe or sprinkler. The principal purpose of these questions was to provide the means for a validity test, based on the principle that those that are particularly affected by a service issue should be found to assign a higher relative impact to that service issue than others. Service issues affecting rivers should therefore be correlated with usage of rivers in the UK; coastal bathing water quality impairment should be correlated with usage of beaches and the sea in the UK; and the impact of a hosepipe ban should be correlated with usage of a hosepipe or sprinkler.
  - An analysis of the impacts of usage on impacts is presented in Section 5.
- **Attitudes**
  - A single question was included to capture a measure of the participant's attitude to the importance of environmental protection and improvement:

> Please look at the following five statements about pollution control and the costs of pollution control. Which one do you agree with most? ***SINGLE CHOICE***
>
> - The environment should be protected from pollution and improved, **regardless of cost**
> - The environment should be protected from pollution and improved, **provided costs are not excessive**
> - The environment should be protected from pollution and improved, **but at no additional cost**
> - Further protection and improvements to the environment are not needed, and **the costs for this should fall**
> - Standards for protection and improvement to the environment are already too high and should be relaxed, **and costs should fall**
> - Don't know

  - The purpose of this question was to provide the basis for an additional validity test. This was based on the principle that those that have particularly strong pro-environment attitudes should be found to assign a higher relative impact to environmental service issues than others.
  - Again, Section 5 presents the analysis of the impacts of attitudes on impacts.
- **SP1 questions and feedback**
  - The SP1 exercise was included as described earlier in this section.

- Participant feedback following SP questions is a useful means of gauging the validity of the responses and can contribute to an analysis of the sensitivity of results to alternative approaches to whether participants are retained or excluded based on their responses. Certain questions also provide further insight into how the results should be interpreted.
- Following the first of the SP1 questions, participants were asked: 'Why did you choose this option?' Answers to this question were coded and are analysed in Section 5.
- Following completion of the SP1 exercise, participants were also asked a sequence of questions about: (i) Whether they were able to understand the choices, (ii) Whether they found the options believable; (iii) Whether the choices were based on how much impact they thought each option would have; and, in the case of non-households only (iv) Whether they found it easy to answer with the specific property in mind that they were being asked about. Answers to these questions are analysed in Section 5.1.

SP2 questions and feedback

- The SP2 exercise was also included as described earlier in this section.
- Following each pair of questions about one of the pivot service issues, if the participant had refused the compensation both times, the participant was asked why they had made the choice they had. This question was asked in order to identify whether they had a genuine high value for avoiding the service issue in question, or whether the refusals to accept compensation were driven by other potentially invalid reasons.

NHH: Applicability of results to other sites

- Finally, for non-households that were responsible for more than one sampled site, the following question was asked to assess whether their responses could validly be used to represent the preferences of all of these sampled sites, or just the one they were asked about specifically:

> Thinking about the choices you have just made about the impacts of different service issues and the compensation amounts shown, would you say that your responses would be similar across most other sites for which you manage the water and wastewater services?
>
> Yes
> No
> I am not responsible for any other sites
> Don't know

- Only those that answered 'Yes' to this question were treated as responding on behalf of multiple sites. All others were treated as responding with respect to a single site only.

3. Survey Administration and Data

This section gives a brief overview of the sample design, survey administration, and demographic-type characteristics of the data obtained. It also provides details of the survey weights generated. The section is split into the following two parts:

- Household survey (3.1)
- Non-household survey (3.2)

Further details on these areas can be found in the Stage 3 report.

3.1. Households

3.1.1. Sample design and administration

The household sample was designed to include a minimum of 500 participants per water company, and also 500 per wastewater company, except in the case of Hafren Dyfrdwy. For reasons of proportionality, and practicality, the Hafren sample was limited to 350 water customers and 147 wastewater customers. Some companies purchased boosts to this sample size, leading to a sample size of 12,567 households in total.

Households were recruited via one of two contact modes: via a letter send to their home address, as sampled from the national Postcode Address File (PAF); or via an invitation to members of an online commercial panel. Of the full sample, those recruited via the PAF method comprised 58% ; with Panel participants comprising the remainder (42%).

PAF participants were given the option of completing the survey online, by following a weblink or scanning a QR code, or by calling a telephone number to request a paper questionnaire. Overall, the vast majority of the survey, (99% including the Panel component), completed the survey online, with the remaining 1% completing a paper questionnaire and submitting by post.

All household interviews were completed between July and September 2022.

Following the survey completion, data were anonymised and weighted to be representative within company and between companies using Census data on numbers of households in water and wastewater company areas by age, sex and social grade (SEG)[3].

Table 4 presents the demographic profile of the household sample (segmented by survey mode), compared to Census statistics.

Both the PAF and Panel household samples were reasonably representative by Sex and Household size. However, both samples had an older profile than the Census, both had more SEG=AB than the population, with the Panel sample closer than the PAF, and both samples were skewed to White participants at the expense of ethnic minorities.

[3] A detailed explanation of the survey methodologies used for both household and non-household populations is contained in the "Outcome Delivery Incentive Research: Main Survey Fieldwork (Stage 3) Report" delivered to Ofwat, CCW and the water companies in December, 2022.

Urban/rural comparisons were only possible for the PAF sample as the Panel sample did not include the full postcode and so could not be reliably matched to urban/rural indicator data. In the case of this sample, however, the statistics matched the population very well.

Table 4: Household sample characteristics compared to population statistics

	Census(1) %	PAF(2) %	Panel(2) %
Sex			
Male	49%	48%	46%
Female	51%	52%	54%
Age			
18-29	19%	9%	8%
30-64	58%	64%	60%
65 or older	23%	27%	32%
SEG(3)			
AB	23%	46%	30%
C1C2	52%	41%	46%
DE	25%	12%	24%
Urban/Rural(4)			
Urban	82%	81%	
Rural	18%	19%	
Ethnicity			
White	82%	89%	93%
Mixed	3%	2%	1%
Asian or Asian British	9%	5%	4%
Black or Black British	4%	2%	1%
Other ethnic group	2%	3%	1%
Household size			
1 or 2	64%	63%	69%
3 or 4	29%	31%	27%
5 or more	7%	6%	4%

Notes:
(1) Population statistics for Sex, Age, Ethnicity and Household size were obtained from 2021 Census data. Population statistics for SEG and Urban/Rural were obtained from 2011 Census data as 2021 data had not yet been released.
(2) Base sample size :12,567 (PAF:7,229 and Panel:5,338). Sample sizes for individual demographics exclude those that did not answer the relevant question.
(3) Population and sample statistics shown for adults aged under 65.
(4) Panel sample statistics unavailable for Urban/Rural as the full postcode was not known for these participants and so could not be reliably matched to urban/rural indicator data.

3.1.2. Weighting

A weighting procedure was applied to ensure the household sample was representative of the target population within each water company and sewerage company area by key demographics, as well as representing the population of England and Wales geographically according to the proportions coming from each water and sewerage company area. The approach incorporated *design weights* to correct for deliberate non-proportional sampling of participants by water and sewerage company area, and *post-stratification* weights to correct for variable response rates across different demographics within each water company and sewerage company.

At the time of calculation, a first release of Census 2021 data had been made available by the Office for National Statistics (ONS). This included population totals by age and gender, but not by social grade. Although the social grade distribution was considered likely to have evolved since the previous census in 2011, the decision was taken to use Census 2011 data on social grade rather than restrict the post-stratification weighting only to age and gender.

A further issue with the Census 2021 first release was that data were only made available at the Local Authority area level, not the more granular Output Area level, which would have been better for matching to water and sewerage company area boundaries[4]. Accordingly, in order to obtain as accurate a set of population data as possible within water company and sewerage company boundaries, we calculated a 2011-to-2021 growth rate to population at the Local Authority level and applied that to Census 2011 data at the Output Area level, such that each Output Area population statistic was assumed to grow at the same rate within the same Local Authority. Output Areas were then matched via Geographical Information System (GIS) software to water company and sewerage company boundaries to calculate population statistics within each of these areas.

The design weights were calculated first by simply dividing the population and sample numbers for each combination of water and sewerage company. All participants were then assigned the design weight corresponding to their combination of water and sewerage company.

The post-stratification weights were calculated next, by matching the weighted sample proportions of each age, sex, and socio-economic group of each water and sewerage company to the respective populations. We used a raking procedure (also known as iterative proportional fitting), following Kott (2006) and Särndal (2007). These weights correct for non-response bias, i.e. lower response rates among some groups.

The weights were obtained by an iterative procedure. In a given iteration, a weight is calculated such that the total sample size of a given group, scaled to the population, and adjusted by the weight, equals the known population totals for that group. The weight is estimated as the ratio of the known population totals to the estimated totals. In the next iteration, a weight is calculated in the same way, for another group. The procedure continues for all groups until convergence is attained, i.e. the weighted totals of all groups are approximately equal to the respective population totals and the weights do not change much in each iteration.

The weights were trimmed to the interval [0.25-4] to ensure that they were not excessively small or large for any of the participants, following Théberge (2000).

The final weights were assigned to each participant based on their combination of water and sewerage companies, and their age, sex, and socio-economic group.

Table 5 and Table 6 below show the unweighted sample proportions, population proportions, and weighted sample proportions by water company and by wastewater company respectively. (The Stage 3 report contained further tables showing the breakdowns by sex, age group, and socio-economic group within each company.) As shown in these tables, the weighted sample proportions match those of the population well.

[4] The borders of each company were downloaded from the House of Commons Library webpage: https://commonslibrary.parliament.uk/constituency-information-water-companies/#datasources

Table 5: Proportions of household customers in population and sample, unweighted and weighted, by water company

		Sample	
	Population (%)	Unweighted (%)	Weighted (%)
Affinity Water	6	4	6
Anglian Water	8	4	8
Bristol Water	2	4	2
Hafren Dyfrdwy	0	3	0
Northumbrian Water	8	10	8
Portsmouth Water	1	4	1
Severn Trent Water	14	8	14
South East Water	4	4	4
Southern Water	4	6	4
South Staffordshire Water	3	5	3
South West Water	4	5	4
SES Water	1	4	1
Thames Water	16	8	16
United Utilities	12	16	12
Dŵr Cymru	5	6	5
Wessex Water	2	4	2
Yorkshire Water	9	4	9
ALL	**100**	**100**	**100**

Table 6: Proportions of household customers in population and sample, unweighted and weighted, by wastewater company

		Sample	
	Population (%)	Unweighted (%)	Weighted (%)
Anglian Water	11	9	11
Hafren Dyfrdwy	0	1	0
Northumbrian Water	5	4	4
Severn Trent Water	16	11	16
Southern Water	8	13	8
South West Water	3	4	3
Thames Water	25	20	25
United Utilities	12	16	12
Dŵr Cymru	6	8	5
Wessex Water	5	9	5
Yorkshire Water	9	4	9
ALL	**100**	**100**	**100**

3.2. Non-households

3.2.1. Sample design and administration

The non-household sample was designed to include a minimum of 200 per water company and per wastewater company, except Hafren Dyfrdwy. Again, for reasons of proportionality and practicality, the Hafren sample was limited to 140 water customers and 60 wastewater customers.

As for households, some companies purchased boosts for their own customer base, leading to a total sample size of 3,838 non-household sites/connections.

A unique sampling frame was developed for the non-household survey, based on combined MOSL-Retailer data for England, and company data for Wales. This ensured almost complete coverage of the full non-household customer base, and afforded multiple contact options for each customer.

For the sample as a whole, 55% were contacted via Email; 27% by Post; and 18% by Telephone (CATI).

All those contacted by Telephone also completed by Telephone (18%). The remainder all completed online (82%).

Non-household interviews took place over August to October 2022.

Following the survey completion, data were anonymised and weighted to be representative (by employment size) within company and between companies.

Table 7 presents a comparison of key non-household sample characteristics against population statistics where available, including data from MOSL on consumption band for customers in England, and data from BEIS Business Population Estimates 2022 for employment by size band and industry sector.

Table 7: Non-household sample characteristics compared to population statistics

Premises characteristic	Population %	Achieved sample %
Consumption band (l/day)(1)		
<100	3%	6%
100 to 500	8%	17%
> 500	89%	77%
Number of employees(2)		
0	16%	14%
1-49	31%	69%
50-249	13%	10%
250+	40%	6%
Industry sector(2)		
A: Agriculture, Forestry and Fishing	2%	3%
B,D,E: Mining and Quarrying; Electricity, Gas and Air Conditioning Supply; Water Supply; Sewerage, Waste Management and Remediation Activities	1%	1%
C: Manufacturing	9%	7%
F: Construction	8%	4%
G: Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	19%	11%
H: Transportation and Storage	6%	2%
I: Accommodation and Food Service Activities	9%	23%
J: Information and Communication	5%	1%
K: Financial and Insurance Activities	4%	1%
L: Real Estate Activities	2%	7%
M: Professional, Scientific and Technical Activities	10%	2%
N: Administrative and Support Service Activities	11%	2%
P: Education	2%	1%
Q: Human Health and Social Work Activities	7%	7%
R: Arts, Entertainment and Recreation	3%	9%
S: Other Service Activities	3%	11%

Notes:
(1) Both population and sample statistics are for England only for this measure. Population statistics are the revenue proportions in each consumption band rather than the numbers of premises. Sample base =2,621.
(2) Population data derived from BEIS Business Population Estimates for the UK and Regions 2022: Table 9 for No. employees and Table 10 for Business Sector. In both cases, a weighted average of England and Wales data for the distribution of employment are shown. Sample bases exclude 'don't know', 'not stated' and those that could not be coded. Sample bases=3,620 (Number of employees) and 3,596 (Industry sector).

In the case of the consumption data, the relevant population comparators were the same as the target sample sizes, which were based on total billing revenue within band rather than the number of customers.

For numbers of employees and industry sector, the relevant population data were drawn from BEIS business population estimates 2022. With respect to employment, the table shows that the achieved sample was overweighted to the 1-49 size band, and contained an underrepresentation of the largest premises (250+ employees) in comparison to the employment distribution in England and Wales. This was corrected at the level of individual water and wastewater companies via weighting.

With regard to industry sector, the data suggests a mixed result, with over-representation of some industries, including Accommodation and Food Service Activities most notably, at the expense of under-representation of others, including Construction, Wholesale and Retail Trade, Professional, Scientific and Technical Activities, and Administrative and Support Service Activities.

3.2.2. Weighting

A weighting procedure was applied to ensure that the non-household sample was representative of the target population within each water company and sewerage company area by business size (i.e., number of employees), as well as representing the population of businesses of England and Wales geographically according to the proportions coming from each water and sewerage company area. The weighting was applied to a version of the dataset where each record represented one site (after disaggregating the businesses that had more than one site).

The number of businesses by water and sewerage company area came from Annual Performance Report 2021-22 data, provided by Ofwat. The disaggregation of businesses into sizes (0, 1-5, 5-49, and 50+ employees) in the population used data published by the Department for Business, Energy & Industrial Strategy (*Business Population Estimates for the UK and Regions 2022*). This data is at the regional level. The number of businesses in each region was assigned to water and sewerage companies proportionally to the area that those companies represent in the region. This was estimated in a Geographic Information System (GIS).

The weighting approach incorporated *design weights* to correct for deliberate non-proportional sampling of businesses by water and sewerage company area, and *post-stratification* weights to correct for variable response rates across different business sizes within each water company and sewerage company.

The design weights were calculated first, by matching the weighted sample proportions of each water and sewerage company to the respective populations. The post-stratification weights were calculated next, by matching the weighted sample proportions of each business size of each water and sewerage company to the respective populations.

In both cases, we used a raking procedure (also known as iterative proportional fitting), following Kott (2006) and Särndal (2007). The weights were obtained by an iterative procedure. In a given iteration, a weight is calculated such that the total sample size of a given group, scaled to the population, and adjusted by the weight, equals the known population totals for that group. The weight is estimated as the ratio of the known population totals to the estimated totals. In the next iteration, a weight is calculated in the same way, for another group. The procedure continues for all groups until convergence is attained, i.e. the weighted totals of all groups are approximately equal to the respective population totals and the weights do not change much in each iteration.

The final weights were assigned to each business site based on their combination of water and sewerage companies, and their size.

The weights were not trimmed, as this would lead to substantial gaps between the weighted sample proportions and the population proportions.

Table 8 and Table 9 below shows the unweighted sample proportions, population proportions, and weighted sample proportions by water company and by wastewater company respectively. Appendix E contains further tables showing these proportions by employment size band within each company. As shown in these tables, the weighted sample proportions match those of the population well.

Table 8: Proportions of non-household customers in population and sample, unweighted and weighted, by water company

		Sample	
	Population (%)	Unweighted (%)	Weighted (%)
Affinity Water	5	6	5
Anglian Water	8	5	8
Bristol Water	2	6	2
Dŵr Cymru	8	11	6
Hafren Dyfrdwy	1	4	1
Northumbrian Water	7	7	7
Portsmouth Water	3	5	3
SES Water	1	5	1
Severn Trent Water	13	5	13
South East Water	1	5	1
South Staffs Water	3	5	4
South West Water	6	6	5
Southern Water	4	5	4
Thames Water	14	6	14
United Utilities	12	7	14
Wessex Water	3	6	3
Yorkshire Water	9	5	9
ALL	100	100	100

Base: 3,838

Table 9: Proportions of non-household customers in population and sample, unweighted and weighted, by wastewater company

		Sample	
	Population (%)	Unweighted (%)	Weighted (%)
Anglian Water	10	8	10
Dŵr Cymru	7	13	7
Hafren Dyfrdwy	0	2	0
Northumbrian Water	5	5	5
Severn Trent Water	16	10	16
South West Water	4	5	4
Southern Water	7	15	8
Thames Water	23	17	23
United Utilities	14	7	14
Wessex Water	5	12	5
Yorkshire Water	9	5	9
ALL	100	100	100

Base: 3,838

4. Experience, Usage and Attitudes

This section presents findings on the characteristics of the sample of customers in England and Wales with regard to:

- Experience of service issues (4.1)
- Use of rivers and canals in the UK for various activities (e.g. fishing, walking, cycling etc.) (4.2)
- Use of beaches and sea in the UK for various activities (e.g. fishing, walking, cycling etc.) (4.3)
- Use of hosepipe or sprinkler for any purpose (e.g. washing/cleaning or watering plants) (4.4)
- Attitudes about pollution control and the costs of pollution control (4.5)

In addition to providing insight in its own right, the descriptive analysis in this section provides context for interpreting the findings from analysis of the variability of the stated preference results with respect to the factors included here.

4.1. Experience of service issues

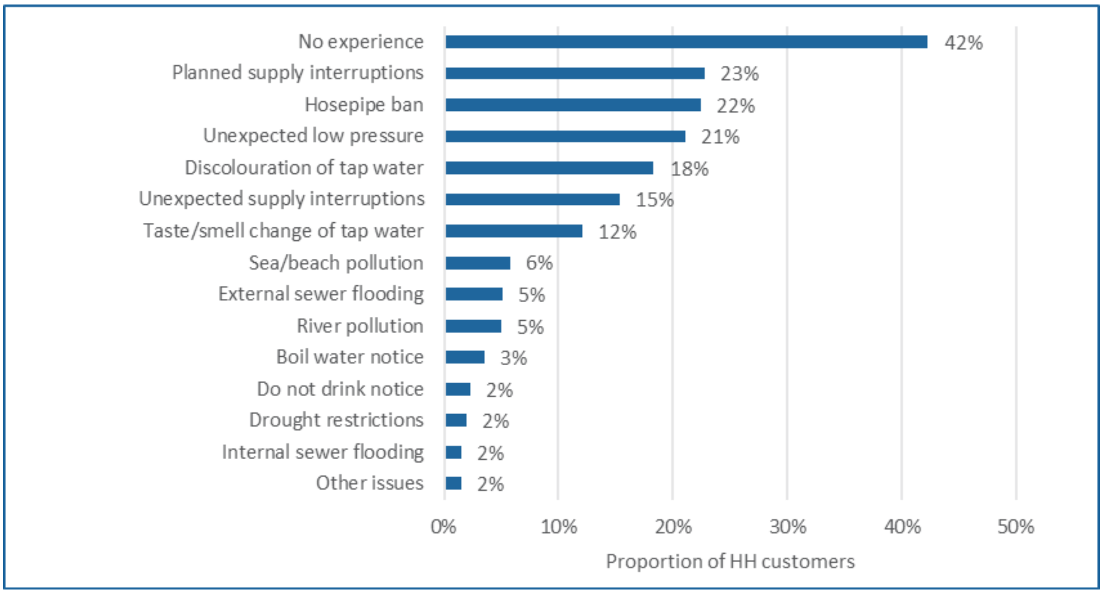
4.1.1. Households

Participants were asked if they had ever experienced one or more of the following service issues:

- Unexpected water supply interruption
- Planned water supply interruption
- Unexpected low pressure
- Boil water notice
- Do not drink notice
- Discolouration of water coming out of your tap
- A change to the taste and/or smell of your tap water
- Sewer flooding: inside your property
- Sewer flooding: outside your property
- Hosepipe ban
- Emergency drought restrictions (e.g. tap water being cut off on a rota basis to conserve supplies)
- Pollution in a river
- Pollution in the sea near a beach
- Other service issues
- No experience

Overall, around 42% of household customers reported not experiencing any of the service issues listed on the questionnaire. A little over 20% of household customers reported experiencing planned supply interruptions, hosepipe bans and unexpected low water pressure. The next most experienced service issues were discolouration of tap water, unexpected supply interruptions and taste/smell change of tap water. Less than 10% of household customers reported experiencing each of the remaining service issues. See Figure 5.

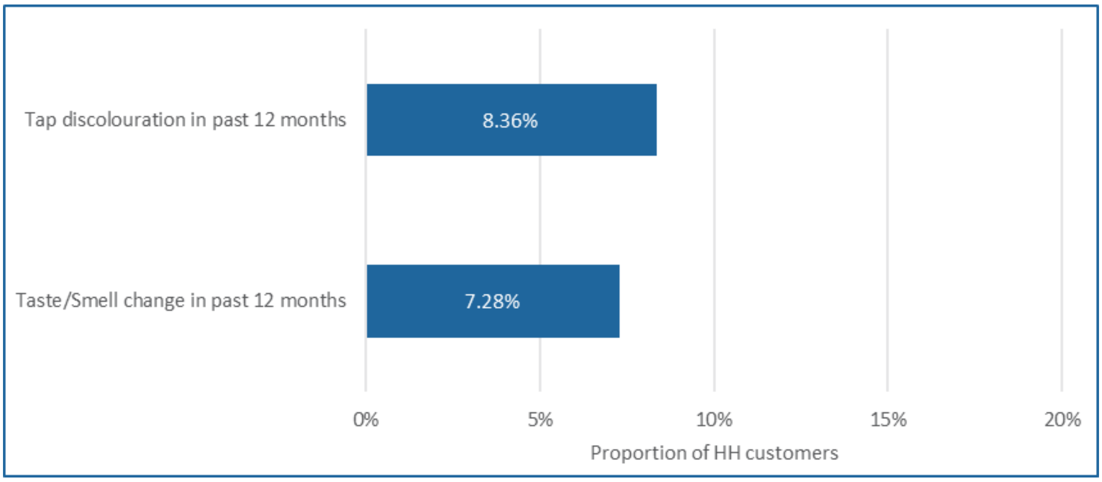
Figure 5: Experience of service issues by household customers



Base sample size: 12,567

Household customers who indicated that they had experienced discolouration of tap water and/or taste/smell change in tap water in the above question, were then asked if they had experienced these issues in the preceding 12 months. Of the total household sample, around 8.4% reported having experienced tap water discolouration and 7.3% reported having experienced taste/smell change in tap water in the previous 12 months. See Figure 6.

Figure 6: Experience of service issues by household customers in the last 12 months



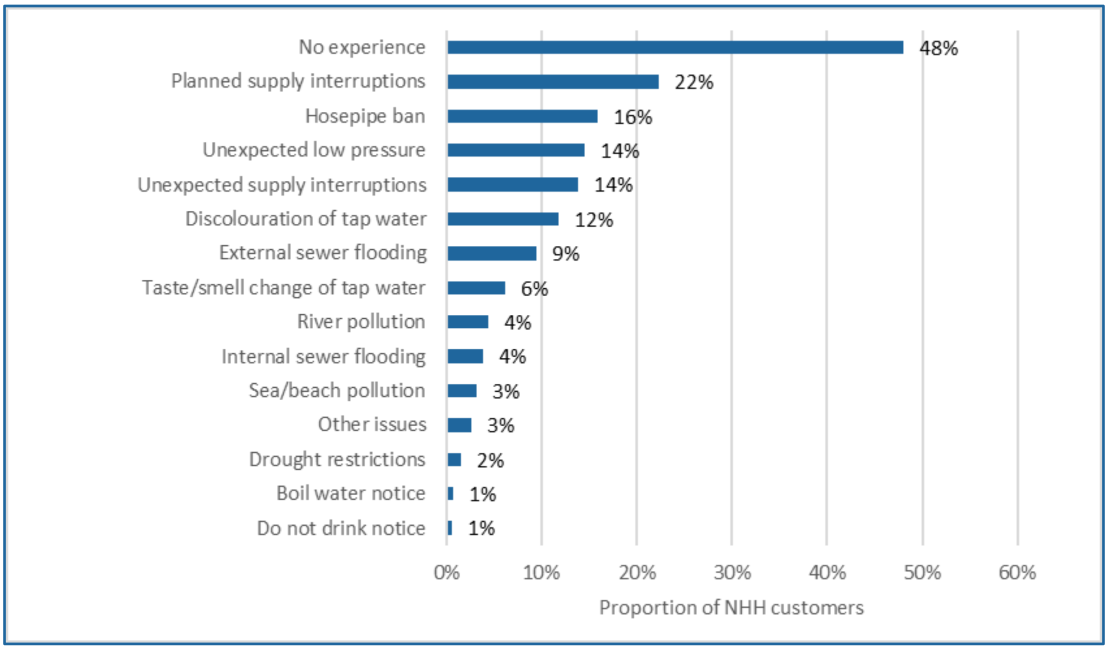
Base sample size: 12,567

4.1.2. Non-households

As in the case of households, non-household customers were asked if they had ever experienced one or more of various service issues presented to them in the questionnaire.

Around 48% of non-household customers reported not experiencing any of the service issues. Between 10% to just over 20% of non-household customers reported experiencing issues related to planned supply interruptions, hosepipe bans, unexpected low water pressure, unexpected supply interruptions and discolouration of tap water. Less than 10% of customers reported experiencing issues related to external sewer flooding, taste/smell change in tap water, river pollution, internal sewer flooding , sea/beach pollution, other issues and drought restrictions. Around 1% of the non-household sample reported experiencing issues related to boil water and do not drink notices. See Figure 7.

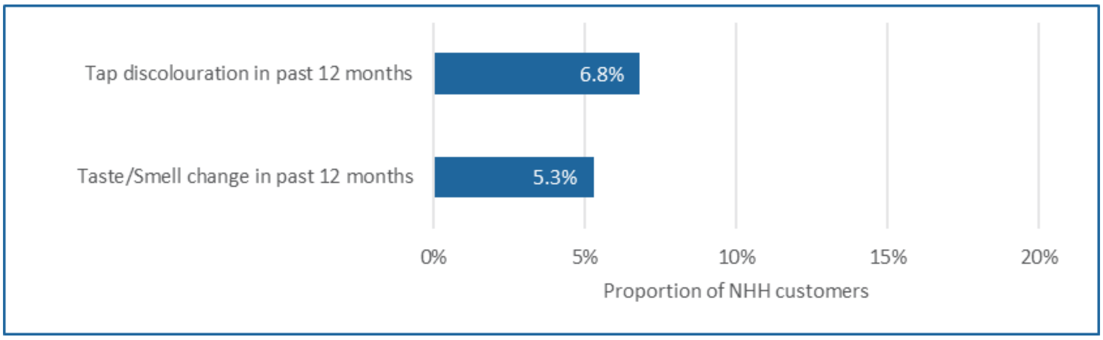
Figure 7: Experience of service issues by non-household customers



Base sample size: 3,838

Non-household customers who indicated that they had experienced discolouration of tap water and/or taste/smell change in tap water in the above question, were then asked if they had experienced these issues in the preceding 12 months. Of the total non-household sample, around 6.8% reported having experienced tap water discolouration and 5.3% reported having experienced taste/smell change in tap water in the previous 12 months. See Figure 8.

Figure 8: Experience of service issues by non-household customers in the last 12 months



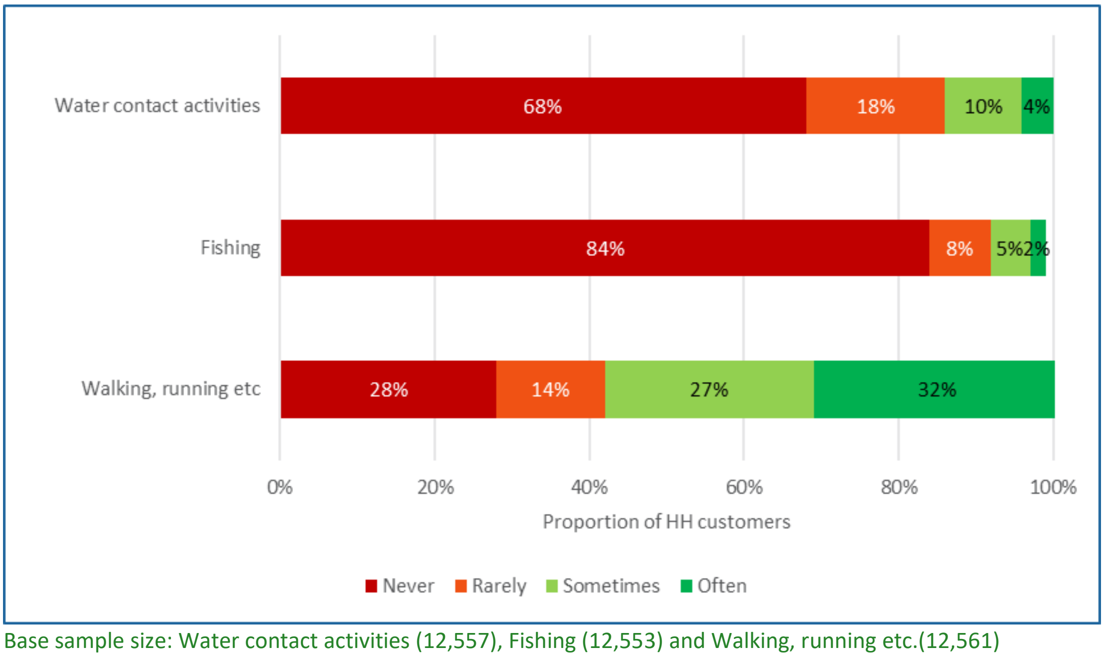
Base sample size: 3,838

4.2. Usage of rivers and canals in the UK

Next, household customers were asked how often they had used rivers and canals for various activities such as water contact activities (e.g. canoeing, rowing, rafting, paddleboarding, swimming, paddling), fishing and walking, running, cycling or sitting nearby or other activities on or around the water (e.g. narrow boating, other types of boating).

The majority of the household sample indicated that they never or rarely used rivers and canals for water contact activities and fishing. However, around 59% of the sample indicated that they often or sometimes used rivers and canals for walking, running, cycling etc. See Figure 9.

Figure 9: Use of rivers and canals in the UK by household customers



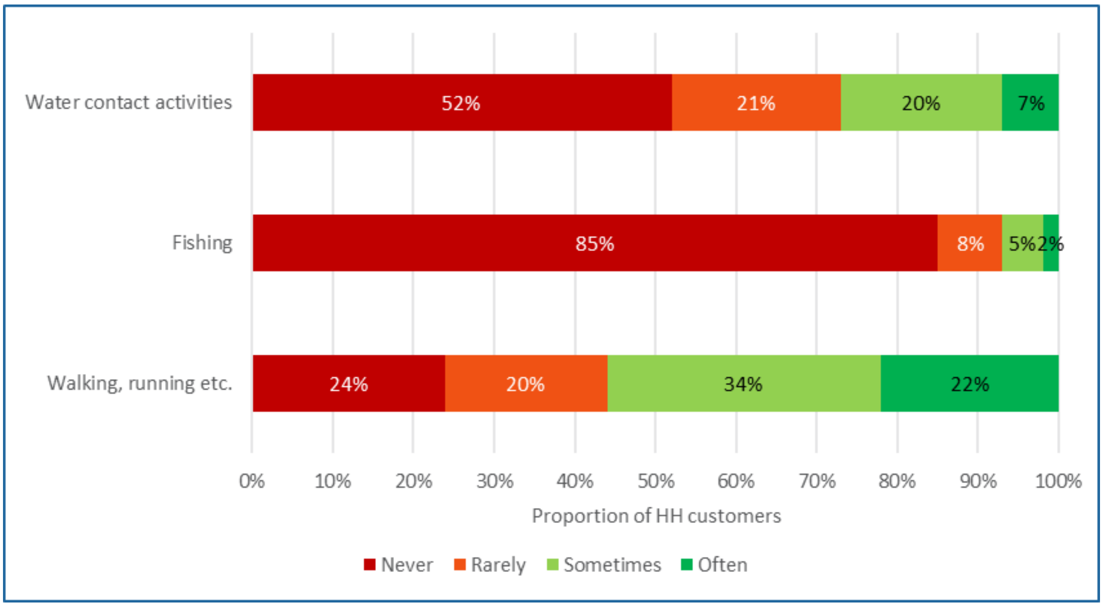
Base sample size: Water contact activities (12,557), Fishing (12,553) and Walking, running etc.(12,561)

4.3. Usage of beaches and the sea in the UK

Household customers were then asked how often they had used beaches and the sea for activities such as water contact activities (e.g. surfing, windsurfing, dinghy sailing, canoeing, paddleboarding, swimming and paddling); fishing; and walking, running, cycling or sitting or playing nearby or other activities on or around the water (e.g. other types of boating).

The majority of the household sample indicated that they never or rarely used beaches and the sea for water contact activities and fishing. However, around 56% of the sample indicated that they often or sometimes used beaches and the sea for walking, running, cycling etc. See Figure 10 below.

Figure 10: Use of beaches and the sea in the UK by household customers



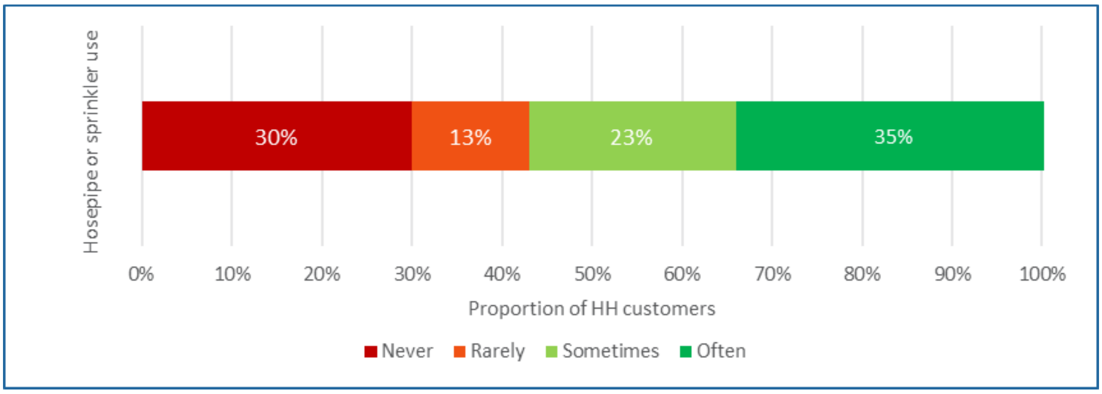
Base sample size: Water contact activities (12,558), Fishing (12,550) and Walking, running etc. (12,560)

4.4. Usage of hosepipe/sprinkler

4.4.1. Households

Household customers were also asked how often they had used a hosepipe or sprinklers for any purpose such as washing/cleaning or watering plants etc. 43% of the participants reported having never or rarely used hosepipes and sprinklers. The remaining participants indicated that they had often or sometimes used hosepipes and sprinklers for their household activities. See Figure 11.

Figure 11: Use of hosepipe and sprinklers by household customers

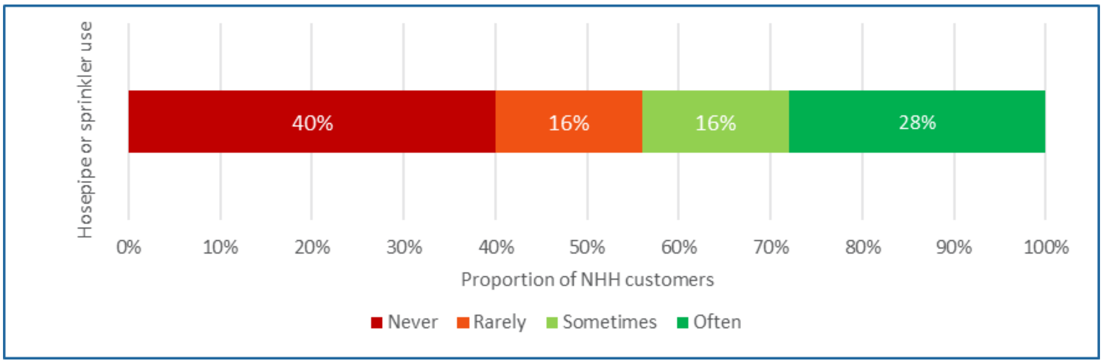


Base sample size: 12,565

4.4.2. Non-households

Non-household customers were also asked how often they had used a hosepipe or sprinklers for any purpose such as washing/cleaning or watering plants etc. 56% of the participants reported having never or rarely used hosepipes and sprinklers. The remaining 44% participants indicated that they had often or sometimes used hosepipes and sprinklers for their activities. See Figure 12.

Figure 12: Use of hosepipe and sprinklers by non-household customers



Base sample size: 3,836

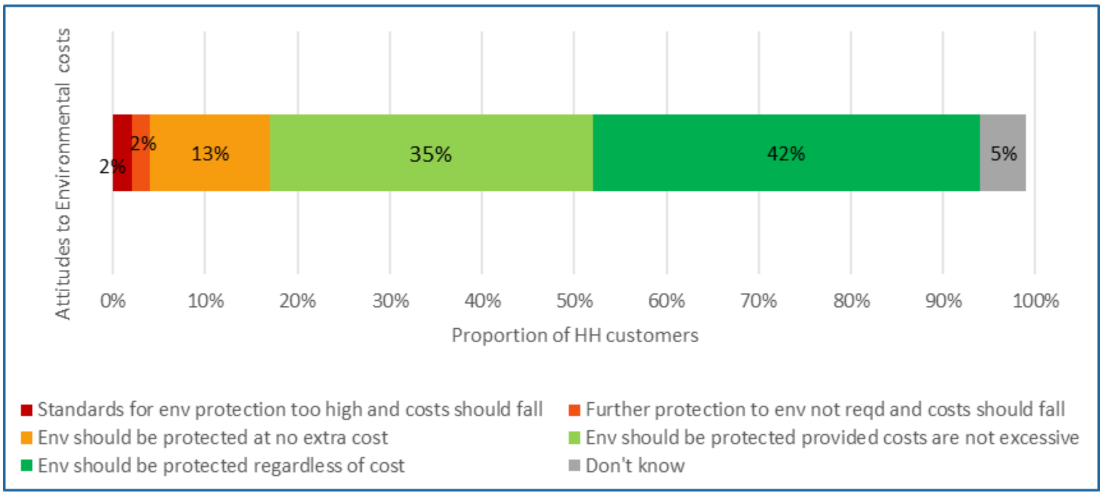
4.5. Attitudes to environmental costs

Finally, household customers were asked to indicate their attitudes towards pollution control and the costs of pollution control by choosing one of the following statements that they agreed with the most:

- The environment should be protected from pollution and improved, regardless of cost.
- The environment should be protected from pollution and improved, provided costs are not excessive.
- The environment should be protected from pollution and improved, but at no additional cost.
- Further protection and improvements to the environment are not needed, and the costs for this should fall.
- Standards for protection and improvement to the environment are already too high and should be relaxed and costs should fall.
- Don’t know.

90% of the household sample indicated that the environment should be protected with 42% supporting protection for the environment regardless of the cost, 35% supporting environmental protection provided costs are not excessive and 13% supporting environmental protection at no extra cost. The remaining participants were not in support of further environmental protection. See Figure 13.

Figure 13: Attitude of household customers to environmental costs



Base sample size: 12,561

5. SP1 Impact Analysis and Findings

This section describes the analysis undertaken on the SP1 impact exercise choice data and presents the findings from this analysis. It includes the following parts:

- Participant feedback and diagnostics from a descriptive analysis of the choice data and completion times (5.1)
- Econometric modelling, including sensitivity analysis, and details of how the impact scores were derived (5.2)
- Impact scores results, showing the relative impact /value of all the service issues (5.3)
- Sub-population impact scores (5.4)
- The influence of experience, usage and attitudes on impact scores (5.5)

The findings presented in this section represent a key input to the main service issue valuation results reported in Section 7.

5.1. Participant feedback and choice diagnostics

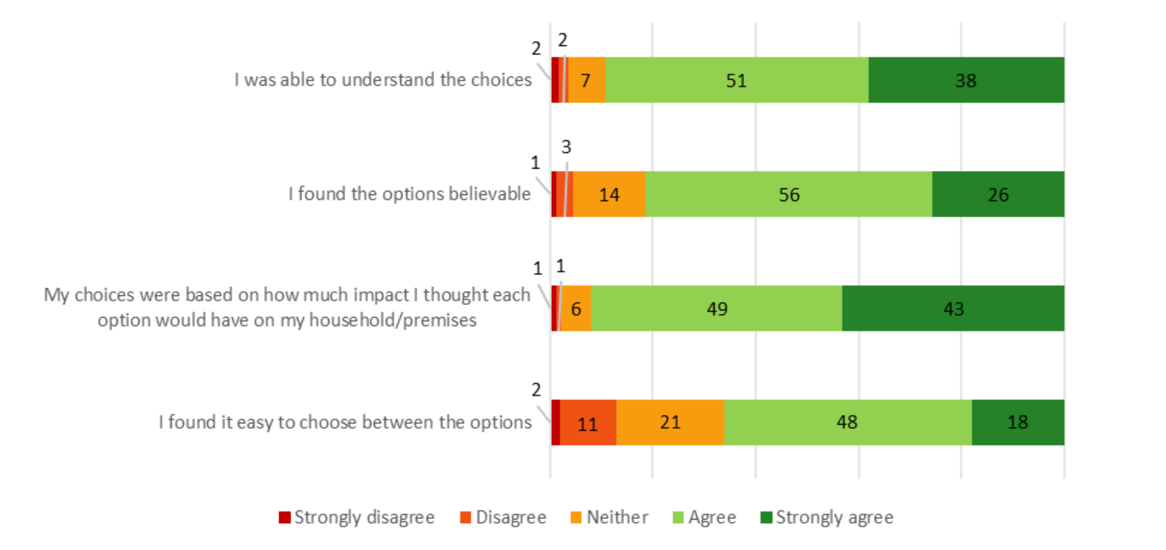
5.1.1. Participant feedback

Households

Feedback from household participants following the SP1 impact exercise was positive. Only small proportions of household participants disagreed a) that they were able to understand the choices, b) that they found the options believable, c) that their choices were based on how much impact each option would have on their household and d) that they found it easy to choose between the options. (See Figure 14.)

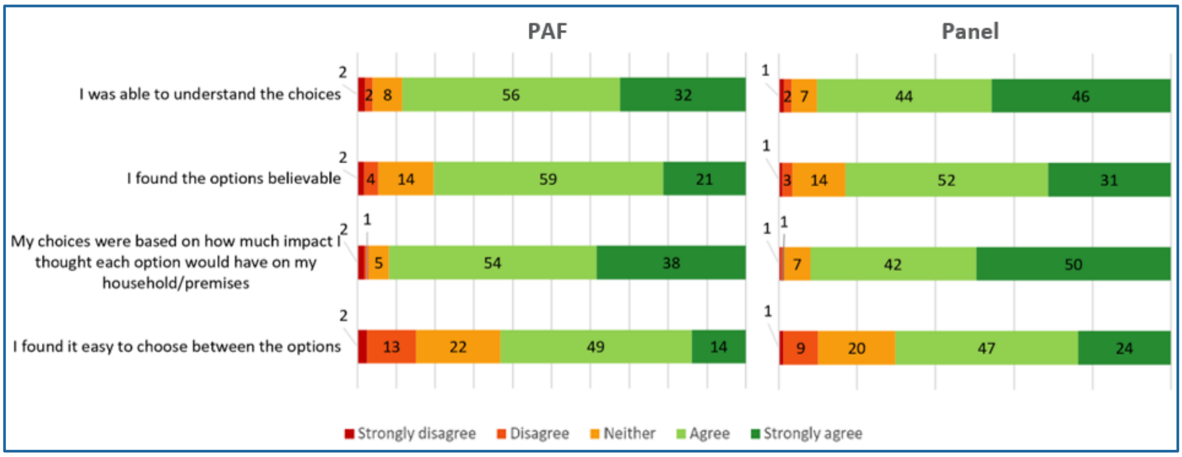
Comparing across samples, Figure 15 shows that there was slightly better feedback from Panel participants than from those recruited via the PAF. This is likely to be a result of the fact that Panel participants will generally have been more experienced in the completion of online surveys than PAF participants. However, feedback was strong across both samples, and supports the cognitive validity of the exercise.

Figure 14: SP1 household overall participant feedback



Note: Figures are in terms of proportion of participants. Base sample size: I was able to understand the choices (12,559); I found the options believable (12,558); My choices based on impact of option on household (12,561) and I found it easy to choose between options (12,562).

Figure 15: SP1 household participant feedback by survey mode (PAF vs. Panel)

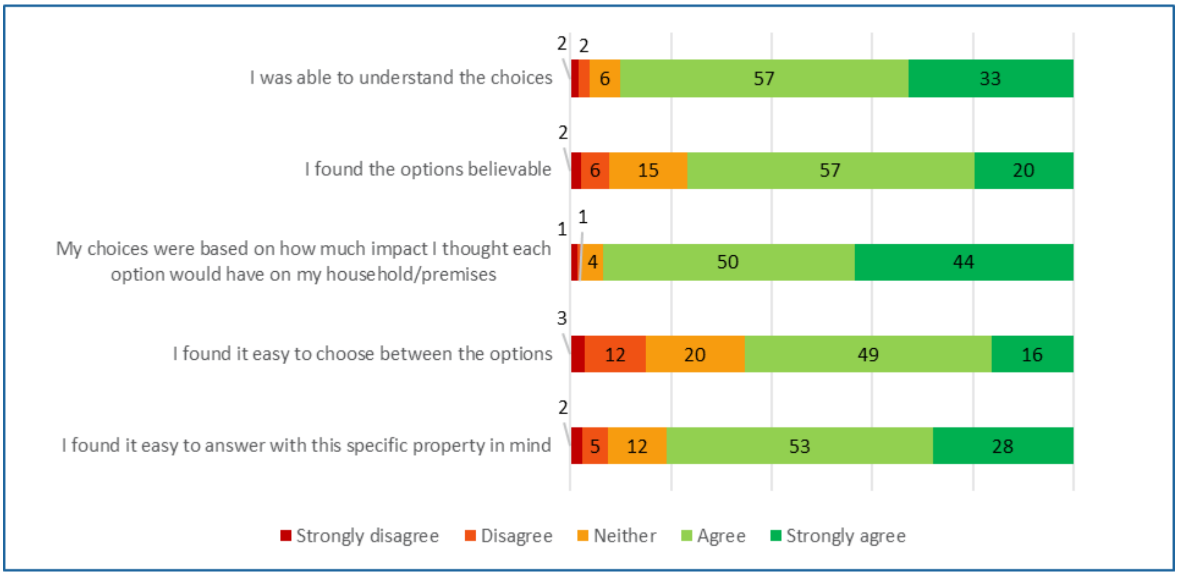


Note: Figures are in terms of proportion of participants. The bars on the left relates to PAF participants while the bars on the right relates to Panel participants. Base sample size: I was able to understand the choices (PAF: 7,221, Panel:5,338); I found the options believable (PAF:7,220, Panel:5,338); My choices based on impact of option on household (PAF:7,223, Panel:5,338) and I found it easy to choose between options (PAF:7,224, Panel:5,338).

Non-households

Feedback from non-household participants following the SP1 impact exercise was similarly positive. Figure 16 shows that only small proportions of non-household participants disagreed a) that they were able to understand the choices, b) that they found the options believable, c) that their choices were based on how much impact each option would have on their organisation, d) that they found it easy to choose between the options and e) that they found it easy to answer with the specific sampled property in mind about which they were asked.

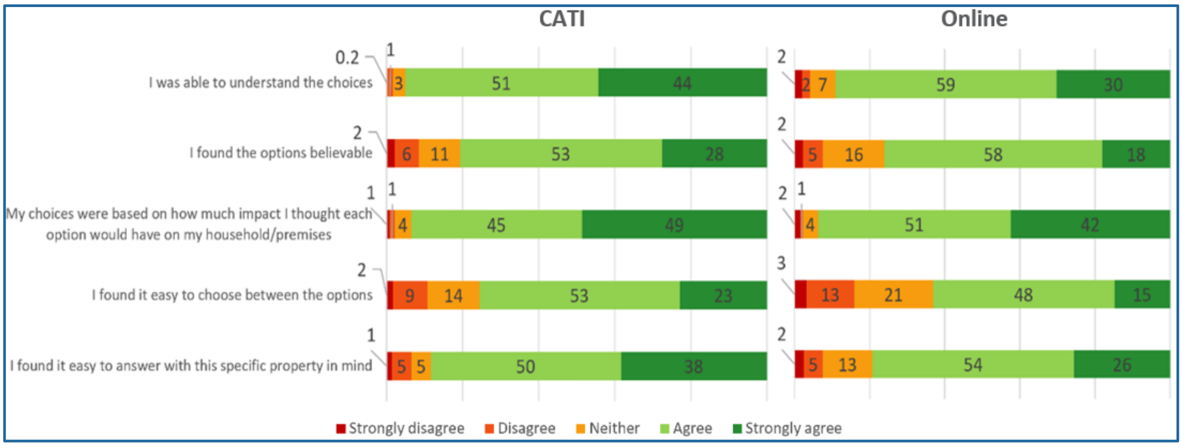
Figure 16: SP1 non-household overall participant feedback



Note: Figures are in terms of proportion of participants. Base sample size: I was able to understand the choices (3,838); I found the options believable (3,838); My choices based on impact of option on household (3,838), I found it easy to choose between options (3,838) and I found it easy to answer with this specific property in mind (3,836).

Figure 17 shows this feedback to the SP1 impact exercise split by survey mode. The bars on the left-hand side of the figure show feedback for the CATI participants while the bars on the right-hand side show feedback for the Online (Email/Post) participants. Overall, the feedback was stronger amongst CATI participants than amongst the Online sample, but the feedback was strong across both samples and, as in the case of households, supports the cognitive validity of the exercise.

Figure 17: SP1 non-household participant feedback by survey mode (CATI vs. Online)



Note: Figures are in terms of proportion of participants. The bars on the left relates to CATI participants while the bars on the right relates to Online (Email/Post) participants. Base sample size: I was able to understand the choices (CATI:679, Online:3,159); I found the options believable (CATI:679, Online:3,159); My choices based on impact of option on household (CATI:679, Online:3,159), I found it easy to choose between options (CATI:679, Online:3,159) and I found it easy to answer with this specific property in mind (CATI:679, Online:3,157).

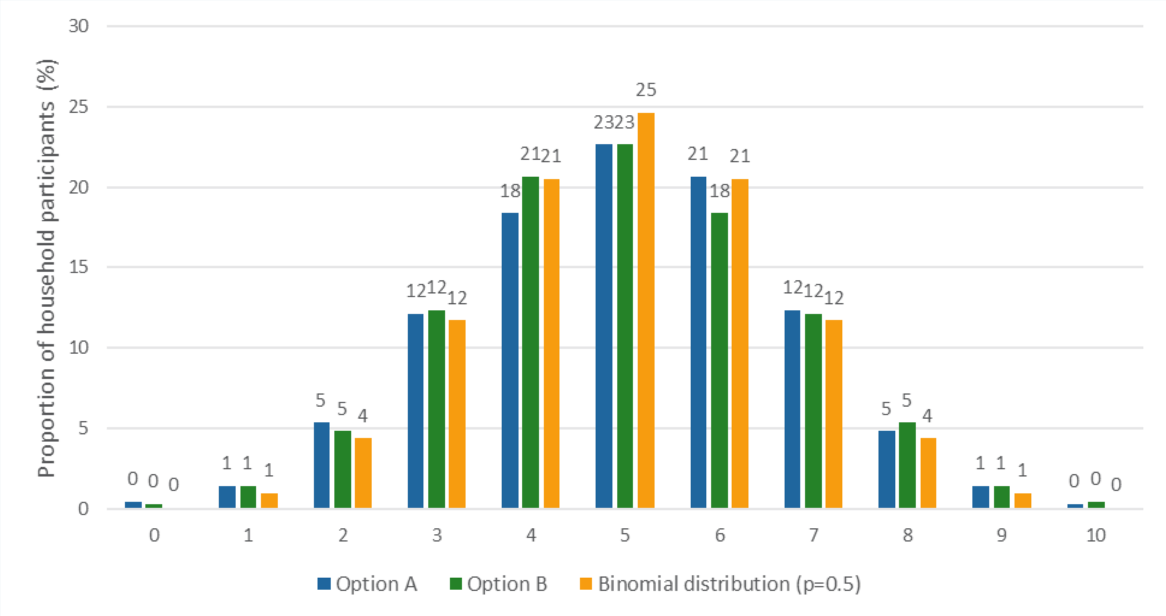
5.1.2. Non-trading behaviour

Households

Making the same choices repeatedly, e.g., Option A chosen ten times in a row, can be indicative of not engaging with the survey, and a large number of non-traders implies a poor-quality dataset for analysis. An analysis of non-trading behaviour is hence a useful diagnostic measure with respect to stated choice data. Figure 18 compares the household sample distribution of the number of Option A/B choices against the theoretical (binomial) distribution that is obtained when there are equal choice probabilities for Option A and Option B in each question. Figure 19 presents a similar comparison split by survey mode, i.e., PAF vs. Panel.

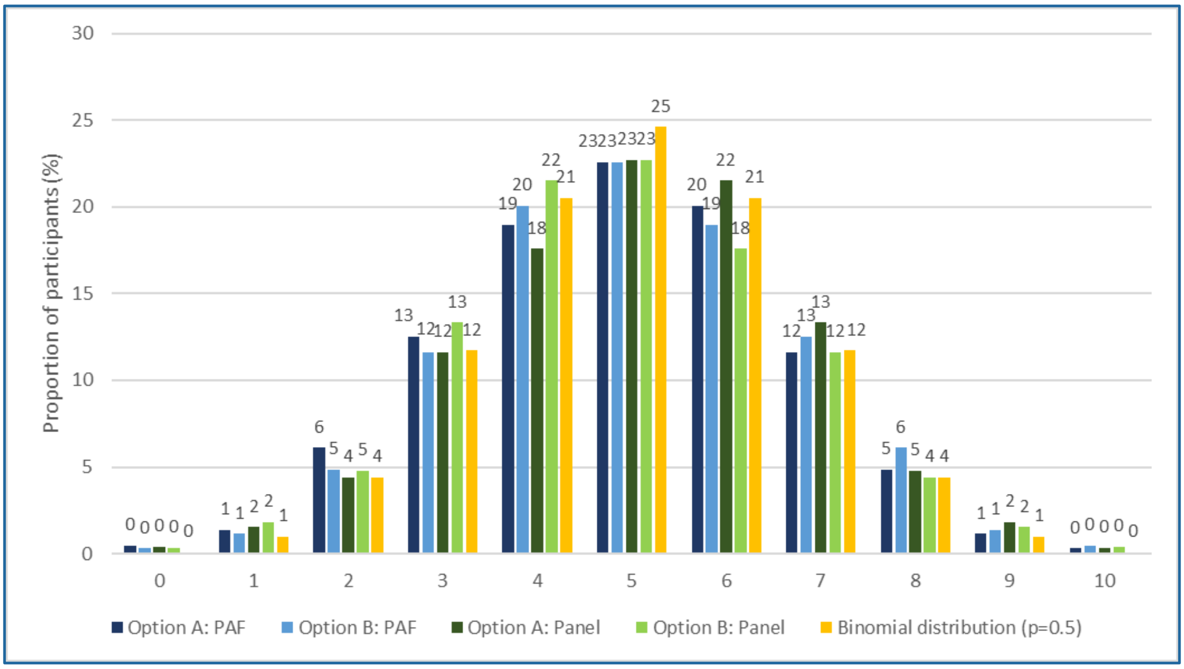
Figure 18 shows that the distributions of the number of Option A/B choices for households were in line with the expected theoretical distributions. Only a tiny proportion, i.e., 0.7% of households, chose the same option across all 10 choice occasions. Similarly, Figure 19 shows that the distributions of the number of Option A/B choices for both PAF and Panel households were in line with the expected theoretical distributions. Only a tiny proportion, i.e., 0.8% of PAF participants and 0.7% of Panel participants, chose the same option across all 10 choice occasions. Overall, this suggests that non-trading was not a cause for concern for the household sample.

Figure 18: Distribution of the number of Option A/B choices (out of 10) in the household sample



Sample size:12,545

Figure 19: Distribution of the no. of Option A/B choices in the household sample by survey mode



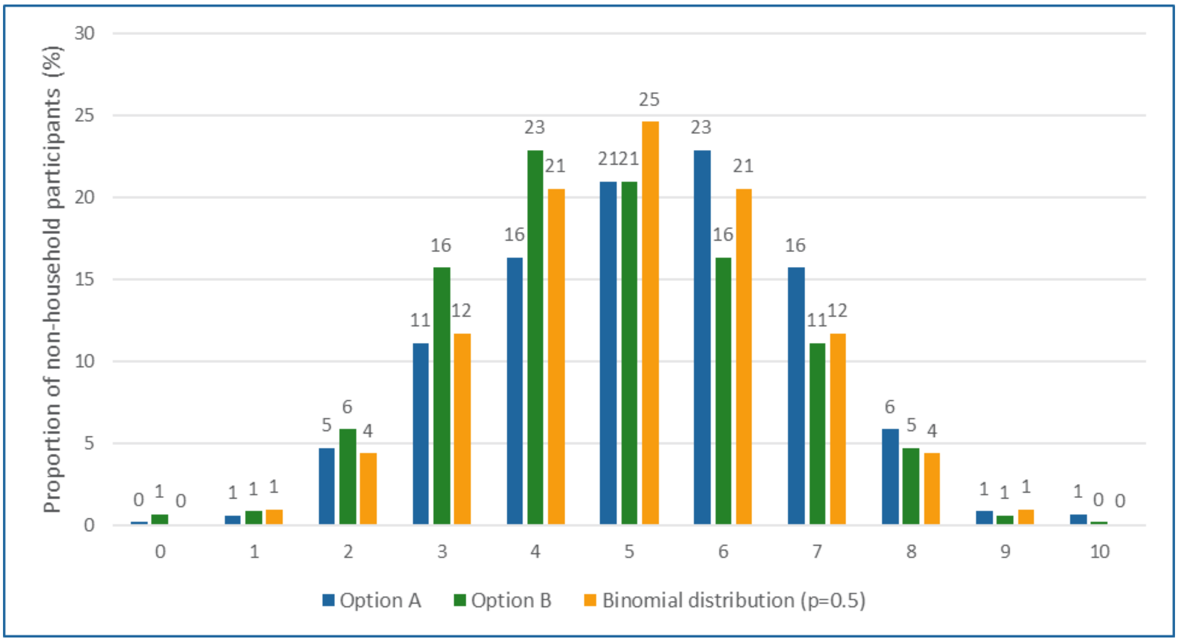
Sample size: PAF: 7,207 and Panel: 5,338

Non-households

Figure 20 compares the non-household sample distribution of the number of Option A/B choices against the theoretical (binomial) distribution that is obtained when there are equal choice probabilities for Option A and Option B in each question. Figure 21 presents a similar comparison split by survey mode (i.e. CATI vs. Online).

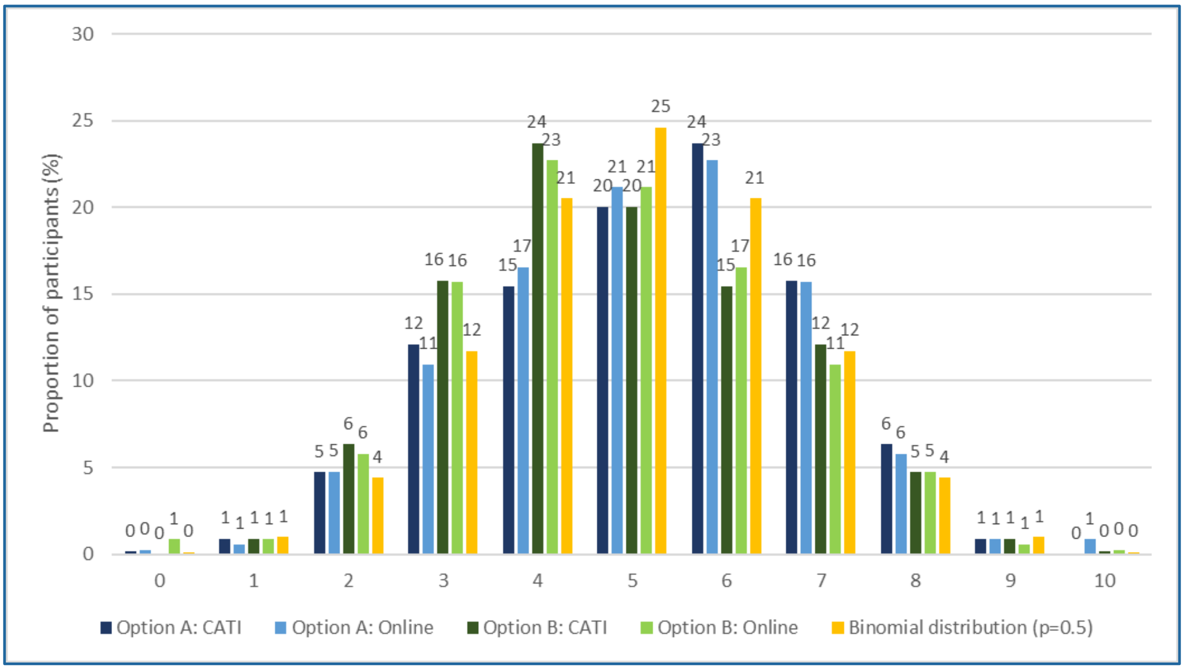
Figure 20 shows that the distributions of the number of Option A/B choices for non-households were in line with the expected theoretical distributions. Only a tiny proportion i.e. 0.9% of non-households chose the same option across all 10 choice occasions. Similarly, Figure 21 shows that the distributions of the number of Option A/B choices for both CATI and Online households were in line with the expected theoretical distributions. Only a tiny proportion i.e. 0.2% in case of CATI participants and 0.11% in the case of Online participants chose the same option across all 10 choice occasions. Overall, this suggests that non-trading was not a cause for concern for the non-household sample.

Figure 20: Distribution of the number of Option A/B choices (out of 10) in the non-household sample



Sample size:3,838

Figure 21: Distribution of no. of Option A/B choices in the non-household sample by survey mode



Sample size:3,838. CATI:679; Online:3159

5.1.3. SP1 Completion time

Another important aspect relating to SP1 performance was the time taken by participants to complete the choice exercise. There is a possibility that 'speeders' did not consider the options carefully enough or may have even responded randomly to complete quickly. We therefore test the sensitivities of key findings from the SP1 choice exercise to excluding participants whose completion time was less than the 10th percentile, and less than the 25^{th} percentile, of the distribution of completion times (see Section 5.2).

As shown in Table 10, the average times taken to complete the questionnaire by household and non-household participants were 5 minutes 11 seconds and 5 minutes 22 seconds respectively. Around 25% of both HH and NHH participants completed the SP1 exercise in around 2-3 minutes.

Table 10: Distribution of SP1 completion times

Proportion of participants	Households	Non-households
1%	57 seconds	82 seconds
5%	91 seconds	118 seconds
10%	114 seconds	139 seconds
25%	165 seconds	183 seconds
50%	250 seconds	265 seconds
75%	380 seconds	385 seconds
90%	554 seconds	560 seconds
95%	717 seconds	703 seconds
99%	1,254 seconds	1,240 seconds

Base sample size: HH:12,567 and NHH:3,270 (NHH base excludes 568 participants, mainly CATI, for whom SP1 time was not recorded in error.)

5.2. Econometric modelling

5.2.1. Core model development

The model specification to explain the SP1 impact choices was developed following a preliminary econometric analysis, which involved testing a number of initial models. These included:

- Models with different specifications of unobserved heterogeneity, including fixed coefficient (conditional logit) and several types of variable coefficient (mixed logit) models.
- Models with different approaches to application of sample weights, including models with weights entered into the log likelihood function, and models with demographic interaction effects the coefficients of which were used to derive population-weighted averages post-model.

Although it is common practice to include survey weights within the log likelihood function to correct for sample biases, our peer reviewer suggested that it was better in principle to include interaction terms in the choice models with post estimation weighting using the coefficients and the population weights for the various demographic / geographic characteristics explored within the present study. Our preliminary analysis showed negligible differences in results between approaches.

On the basis of the preliminary analysis, the final specification taken forward was a Bayesian mixed logit modelling approach, elaborated more fully in the following. Separate models were estimated for each water company and for each wastewater company, with an exception in the case of Hafren Dyfrdwy and Dŵr Cymru Welsh Water, which were combined into a single 'Wales' model due to the (proportionately) small sample size of Hafren Dyfrdwy customers. This approach allowed for a high degree of flexibility to model choices at the level of each company. Results for England, and for England and Wales were obtained by calculating the weighted averages over companies.

5.2.2. Core model specification

Let the utility that a participant *n* obtains from alternative *j* (one of the two service issues shown) in choice situation/scenario *t* (i.e., a question from the SP1 exercise) be:

(1) $$U_{njt}=\beta_n{}'x_j+\varepsilon_{njt}$$

where ε_{njt} is an independent identically distributed extreme value, x_j are the dummy variables indicating 25 of the 26 service issue scenarios included in the SP1 choice exercise and β_n are the individual-specific impact parameters for the service issues. The model is identified by omitting one of the service issues. In the present analysis, this was *BWQExc*. (See Table 1 for the labels used to represent each of the service issues throughout the econometric modelling.)

The coefficients, i.e., the βs were specified to vary across participants according to a joint-normal distribution with mean *b* and covariance matrix *W* over the population, allowing for correlations among the coefficients i.e. β_n ~ N(*b*,*W*).

Given a sample of N participants, let the chosen alternatives in all choice situations for person *n* be denoted as $y_n = (y_{n1},\ldots,y_{nT})$, and the choices of the entire sample as $Y = (y_1,\ldots,y_N)$. Then, the likelihood function of the observed choices of person *n* is defined as the product of the probabilities of observing person *n*'s sequence of choices, conditional on β and is given as:

(2) $$L\,(y_n|\beta) = \prod_t \frac{\exp\,(\beta' x_{ny_{nt}})}{\sum_{j=1}^{J} \exp\,(\beta' x_{njt})}$$

The above probability can be written as conditional on the distribution of parameters, ϕ(β|b,W), and integrated over the distribution of parameter values to obtain:

(3) $$L(y_n|\mathrm{b},\mathrm{W}) = \int L\,(y_n|\beta)\,\varphi(\beta|\mathrm{b},\mathrm{W})\,\mathrm{d}\beta$$

where ϕ(β|b,W) is the normal density with mean b and variance W.

Given the mixed logit probability, $L(y_n|\mathrm{b},\mathrm{W})$, and prior distributions for *b* and *W*, the posterior distribution of *b* and *W* is by definition:

(4) $$\mathrm{K}(\mathrm{b},\mathrm{W}|\mathrm{Y},\mathrm{X}) \propto \prod_n L(y_n|\mathrm{b},\mathrm{W})k(b,W)$$

where *k(b,W)* is the prior distribution on b and W i.e. normal for b times the inverted Wishart for W.

For the models presented here, the prior on *b* was assumed to be normal with an unboundedly large variance (i.e. it was assumed that the researcher had very little idea about the value of *b*) and the prior on *W* was assumed to be inverted Wishart with 25 degrees of freedom and scale matrix *I*, a 25-dimensional identity matrix.

Since it is difficult to draw directly from the posterior distribution in (4), simulation-based methods were used for estimation. As described by Train (2009), draws from $\mathrm{K}(\mathrm{b},\mathrm{W}|\mathrm{Y},\mathrm{X})$ become simpler if each set of individual-level coefficients β_n are assumed as additional parameters to be estimated and the Gibbs sampling method is used for the three parameters b, W and β_n.

Gibbs sampling is motivated by the idea that, given a joint distribution, iteratively sampling from the conditional density of each element given the values of the other elements will ultimately provide a sample from the joint density. Under this assumption, the posterior distribution of parameters b, W and β_n, given the data, becomes:

(5) $$K(b, W, \beta_n \ , n = 1,2,3 \ldots\ldots N|Y, X) \propto \prod_n L(y_n|\beta_n) \ \varphi(\beta_n|b, W)k(b, W)$$

Draws from the posterior distribution in (5) were obtained through Gibbs sampling which proceeded in three steps:

- First, *b* was drawn conditional on β_n and W i.e. a draw was obtained from the posterior distribution of b based on assumption that β_n and W were known.
- *W* was then drawn conditional on b and β_n i.e. a draw was obtained from the posterior distribution of W based on assumption that β_n and b were known.
- Finally, the values of β_n were drawn conditional on *b* and *W*.

These three steps repeated over many iterations eventually resulted in convergence to a set of draws from the joint posterior distribution of b, W and β_n. Once the converged draws from the posterior distribution were obtained, the mean and standard deviation of the draws could be calculated and interpreted classically as maximum likelihood estimates and standard errors of the parameters according to the Bernstein-von Mises theorem [Train, 2009][5].

Draws from Gibbs sampling are correlated over iterations due to the fact that each iteration builds on the previous one. It is therefore common to use only a portion of the draws after convergence in order to calculate the mean and standard deviation of the draws. For the models presented here, we used 15,000 draws, with a burn-in of 5,000 and a sampling rate of 1 in 10 for the remainder. An analysis of convergence was undertaken, including Geweke tests, (Geweke, 1992), to ensure that the number of burn-in draws was sufficient. Details of this analysis are reported in 5.2.4 below.

This process resulted in 1,000 draws of each of the parameters for each of the participants in the estimation sample. For each draw, a weighted mean was calculated using sampling weights, and the means and standard deviations across these weighted average draws were interpreted as estimates of the means, and the standard deviation of those estimates, for each of the model parameters.

It was not feasible, due to computation time, to run a joint model including interaction terms to capture differences between customer types and companies. Instead, separate models were estimated for each customer type (HH and NHH), for each water company, and for each wastewater company. However, due to the small sample sizes of Hafren Dyfrdwy customers, a slightly different approach was adopted in Wales than in England. For Wales, a single model was estimated, which combined Hafren Dyfrdwy and Dŵr Cymru data. From this combined model, separate estimates were obtained for each of the two companies using the individual-level posterior coefficients for each company's customers. This approach will have led to a closer alignment of the results between the two companies than would have been the case with separate models, as in England, but with smaller standard errors. The approach was deemed to be a sensible and proportionate solution to the problem caused by having a company included in the sample that was substantially smaller than the others. (Hafren Dyfrdwy household wastewater customers, for example, comprise less than 0.1% of the population of all household wastewater customers in England and Wales.)

[5] This interpretation, which is based on the Bernstein-von Mises theorem (see Train 2009), is only valid if the sample size is large enough. However, Huber and Train (2001) present an example in which this interpretation is approximately valid despite a relatively small sample of only a few hundred respondents.

The Stata software package (StataCorp, 2021) was used for the analysis, via the 'bayesmixedlogit' command (Baker, 2021).

5.2.3. Core model results

As an example, we present the core model results (means) for the household model for Wales in Table 11 below.[6] The posterior means of the service attribute parameters, are presented in the second column of the table. Following the Bernstein-von Mises theorem, these means can also be interpreted classically as maximum likelihood estimation coefficients (Train, 2009). The posterior means for the service attributes are sorted in descending order of size. Larger values on any of the variables imply a greater impact of the relevant scenario compared to scenarios that have smaller values. For example, Table 11 shows that Internal sewer flooding, External sewer flooding and Rota cuts had the highest impact on household customers in Wales. Minor pollution incident elsewhere (1 day), Storm overflow elsewhere (4 hours) and Coastal bathing water is neither excellent nor good quality had the lowest impact for Welsh household customers.

The posterior standard deviations for the service attributes are presented in the third column of the table. Again, following the Bernstein-von Mises theorem, these standard deviations can also be interpreted classically as the maximum likelihood estimation standard errors of the model coefficients. Accordingly, the standard deviations measure the precision of the mean estimates, i.e. the smaller the standard deviation, the more precise the estimate.

The standard deviations were used to form a confidence interval for the estimated means, as shown in the last two columns of the table below. The 95% confidence intervals for the estimated means are presented in the final two columns of the table. Adopting a classical perspective, the estimated means can be considered to be statistically insignificantly different from the base omitted service issue if the confidence interval includes 0. For example, Table 11 shows that the 95% confidence intervals for Storm overflow elsewhere (4 hours) and Coastal bathing water is neither excellent nor good quality contained zero, and hence these service issues all had an impact that was statistically insignificantly different from that of the omitted service issue (Coastal bathing water is not excellent quality). In contrast, the 95% confidence intervals for all other service issues strictly exceeded zero, indicating that the impacts were statistically higher, at the 5% level of significance, from that of the omitted service issue impact.

[6] The household and non-household model results for each water company and each wastewater company in England as well as the non-household model results for Wales is contained in Appendix B.

Table 11: SP1 household econometric model (means) for Wales

choice	Mean(1)	Std. dev(2)	[95% conf. interval]	
InternalSF	3.757	0.035	3.690	3.825
ExternalSF	2.828	0.031	2.768	2.888
RotaCuts	2.342	0.038	2.267	2.417
UnexpInt24	2.151	0.033	2.087	2.215
DND	2.055	0.029	1.999	2.111
Boil	1.611	0.030	1.551	1.671
UnexpInt6	1.540	0.038	1.465	1.614
Pol2Else	1.502	0.030	1.442	1.561
Pol2Nearby	1.341	0.033	1.276	1.405
Discolour24	1.182	0.034	1.116	1.248
TasteSmell24	1.147	0.035	1.079	1.215
Discolour6	1.069	0.036	0.999	1.138
TasteSmell6	0.913	0.031	0.851	0.974
LowFlowNearby	0.870	0.034	0.803	0.938
Pol3Nearby	0.816	0.033	0.751	0.881
LowPressure	0.783	0.033	0.718	0.849
PlannedInt6	0.683	0.035	0.614	0.752
LowFlowElse	0.575	0.038	0.501	0.650
RWQNearby	0.540	0.030	0.482	0.598
StormFlowNearby	0.479	0.035	0.411	0.548
RWQElse	0.314	0.030	0.254	0.373
HoseBan	0.309	0.038	0.235	0.384
Pol3Else	0.302	0.032	0.239	0.366
StormFlowElse	0.059	0.032	-0.004	0.122
BWQGood	0.054	0.033	-0.011	0.120

Note: (1) Values shown are the posterior means, across draws, of the log-impact parameters, where the values for each draw were themselves calculated as the weighted average across all participants of the individual level posterior parameters for that draw. (2) Values shown are the posterior standard deviations, across draws, of the log-impact parameters, where these were calculated for each draw in the same way as for the posterior means
Base: 1,156 participants. Total draws = 15,000; Burn-in draws = 5,000; Accept rate = 1/10. Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Multiple similar models to that of Table 11 were estimated, covering all water companies, and all wastewater companies, in England for households and non-households. The posterior means and standard deviations from these models are all included in Appendix C. The full sets of variance-covariance estimates are omitted from this report, but have been included within the outputs delivered to water companies.

5.2.4. Convergence diagnostics

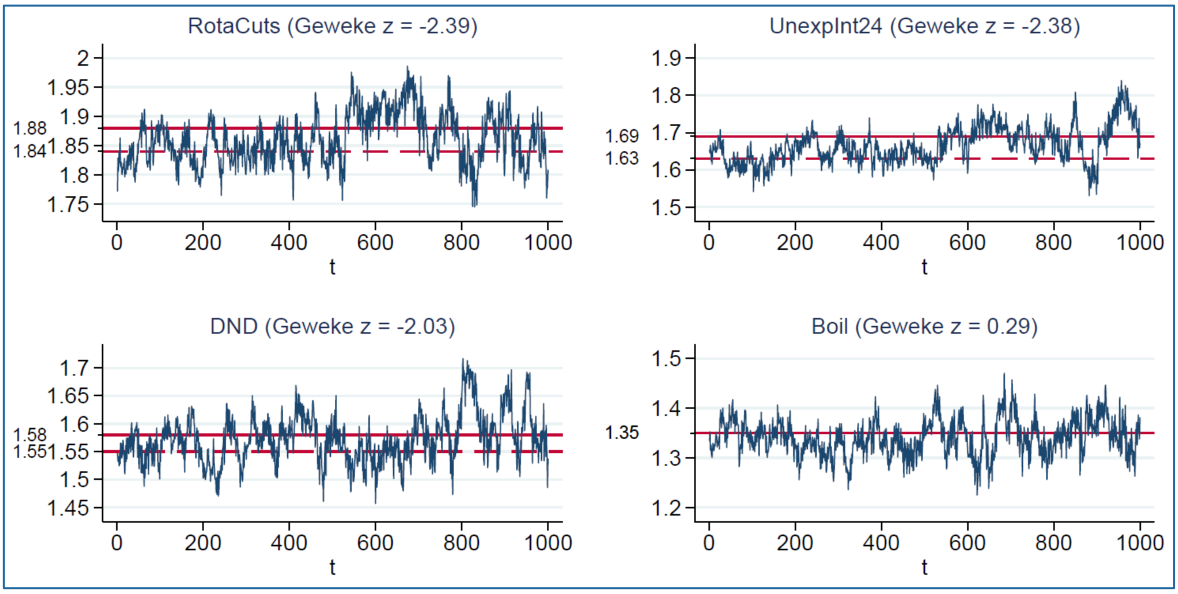
Inspection of charts of post burn-in draws showed that the draws tended to be stable rather than strongly trending. For each coefficient and each model, the mean of the first 10% of post-burn in draws was compared against the mean of the last 50% via Geweke tests[7]. The test rejected the null

[7] The CODA library (Plummer, Best, Cowles 2006) for the R software package was used for the analysis.

hypothesis of equality of means (p<.05) for some coefficients in all models, but these were a minority in every model. Furthermore, where the difference in means was statistically significant, the actual size of the difference tended to be very small. An illustrative example is shown in Figure 22.

These findings suggested that the draws were sufficiently stable to conclude that the process had reached convergence.

Figure 22: Example trace plots (Southern Water household model)



Note: The *z*-statistic of the Geweke test is given in each panel header. The dashed horizontal line indicates the mean of the first 10% of post burn-in draws, while the solid line shows the mean of the last 50%.

5.2.5. Derivation of impact scores

Estimates from the SP1 models were converted to impact scales for each customer type (HH/NHH) and Water/Wastewater company or the Wales region, by following the steps below:

- First, 'Pivot impact scores' were calculated for each of the two pivot service issues used in the SP2 choice exercise (i.e. a planned water supply interruption lasting 6 hours, and a boil water incident). These scores were calculated so that the pivot service issue in question would have a value of 1, and the score of every other service issue would represent the impact of that attribute as a multiple of the pivot service issue, e.g. a value of 2 would imply twice the size of the impact, etc.

  Thus, the pivot value of service issue A, relative to Planned supply interruptions (P6), was calculated as:

  (6) $PV_A^{P6} = \exp\left(\overline{\overline{\beta_A - \beta_{P6}}}\right)$, where:

  (7) $\overline{\overline{\beta_{A} - \beta_{P6}}} = \frac{1}{T}\sum_t \sum_n w_n(\beta_{Ant} - \beta_{P6nt})$;

  w_n is the survey weight for individual *n*, β_{Ant} is the tth parameter draw for service issue *A* for individual *n*.

  Likewise, the pivot value of service issue A, relative to a Boil notice (Boil) was calculated as:

(8) $PV_A^{P6} = \exp(\overline{\beta_A - \beta_{Boil}})$.

The purpose of this transformation was to provide the scales to multiply by the pivot service issue valuations from the SP2 choice exercise to obtain monetary values for each service issue.

- Next, in order to calibrate impacts to a common scale for the purposes of performing sub-population comparisons, impact scores IS_k were derived for each service issue A as follows:

(9) $IS_A = \exp\left(\frac{1}{T}\sum_t \sum_n w_n \frac{\beta_{Ant}}{\sum_k \beta_{knt}}\right)$

Confidence ranges around the pivot values and impact scores were derived using the delta method, assuming normality of the coefficients themselves, rather than of the pivot values. This leads to confidence intervals that are log-normally distributed. Whilst the exponentiated coefficients as well as the coefficients themselves will both be asymptotically normal (Cramer, 1986), meaning that the normality of either could be legitimately assumed for the purposes of calculating confidence intervals, the choice to treat the coefficients themselves as having normal sampling distributions carries the advantage that the confidence range will be bounded to lie above zero, which must always be true.

Results for England and Wales were calculated by taking a weighted average of the results for each water company, using population proportions of household and non-household water customers as weights. Population proportions were derived from 2021/22 Annual Performance Report data, provided by Ofwat.

The main results for impact scores are presented in 5.3.

5.2.6. Sensitivity analysis and findings

Sensitivity analysis was conducted to test alternative sample restrictions, including the dropping of participants who self-reported issues with respect to their understanding or ease of completing the stated preference exercise, and the dropping of participants who completed the survey very quickly.

Heteroscedastic conditional logit models were estimated to conduct the sensitivity analysis. Following Hole (2006) we provide an overview of this model below.

Let *N* be the sample of customers with the choice of *J* discrete alternatives (one of the two service issues shown). Let U_{nj} again be the utility that customer *n* derives from choosing alternative *j*. The utility is assumed to consist of a systematic component $\beta' X_j$ and a random component ε_{nj} i.e.

10) $U_{nj} = \beta' X_j + \varepsilon_{nj}$

where X_j is a vector of attributes related to alternative *j*, β is a vector of coefficients representing the impact of these attributes on the utility of a customer and ε_{nj} reflects the characteristics and attributes/measurement error/ variation in tastes among the sample of customers which is not known to the researcher.

The probability that a customer *n* chooses an alternative *i* is the probability that the utility from choosing *i* is higher than the utility from choosing any other alternative, i.e.:

11) $P_{ni} = P(\beta' X_i + \varepsilon_{ni} > \beta' X_j + \varepsilon_{nj}) = P\left((\varepsilon_{nj} - \varepsilon_{ni}) < (\beta' X_i - \beta' X_j)\right)$ for all $j \neq i$

Following McFadden (1974), we assume that the random error terms are IID extreme value type I distributed, so that we have the conditional logit model in which the probability that alternative *i* is chosen by customer *n* is given by:

12) $$P_{ni} = \frac{\exp(\mu\beta' X_i)}{\sum_j^J \exp(\mu\beta' X_j)}$$

where μ is a positive scale parameter which is inversely proportional to the error variance σ_ε^2 i.e. $\mu = \frac{\pi}{\sqrt{6\sigma_\varepsilon^2}}$

The scale parameter is usually normalised to 1 i.e. the standard conditional logit model assumes that the error variance is constant across all customers. This assumption has been challenged by several research papers (Hensher et al. 1999; Louviere, 2001; DeShazo and Fermo, 2002; Louviere et al., 2002).

DeShazo and Fermo (2002) and Hensher et al. (1999) provided the heteroscedastic conditional logit model as an alternative to the standard conditional logit model to allow for unequal variances across customers i.e.

13) $$P_{ni} = \frac{\exp(\mu_n\beta' X_i)}{\sum_j^J \exp(\mu_n\beta' X_j)}$$

where μ_n is assumed to be a function of individual characteristics that impact the magnitude of the scale parameter and therefore the error variance. Thus, the model assumes:

14) $$\mu_n = \exp(\gamma' Z_n)$$

where Z_n is a vector of individual characteristics and γ is a vector of parameters that represent the impact of those individual characteristics on the error variance.

The parameter vector θ= (β, γ) is estimated using maximum likelihood methods.

The log-likelihood function is given as:

15) $$\text{LL} = \sum_{n=1}^N \sum_{j=1}^J y_{nj}\ lnP_{nj}$$

where y_{nj} = 1 if alternative *j* is chosen by customer *n* and zero otherwise.

For the sensitivity analysis, we estimated heteroscedastic conditional logit models for household customers that allowed for differences in the scale parameter between: (1) those who gave non-negative (`Neither agree', 'Agree' or 'Strongly agree') feedback on SP1 choice questions and those who did not (2) those whose completion time of the SP questions was less than or equal to the 10th percentile of the distribution of completion times and all other participants (see Model 1 results in Table 12) and (3) those whose completion time of the SP questions was less than or equal to the 25th percentile of the distribution of completion times and all other participants (see Model 2 results in Table 12).

The scale parameter is inversely related to the variance of random component of the utility function. This means that the model essentially tests whether those that gave speedier responses or positive feedback answered the choice questions with less/more internal consistency, or equivalently, a higher/lower error variance.

Table 12 shows the heteroscedastic conditional logit models estimated for household customers. The results show that there was a lower scale/ greater variance i.e. greater response variability among those households who provided speedier responses. In contrast, we find a higher scale/lower variance i.e. lower response variability among those who gave a non-negative feedback, the difference in the scale parameter between those who did /did not give non-negative feedback was statistically significant (p>.05). However, no significant effects were estimated for Panel (vs PAF).

The sensitivity to completion times of the SP1 questions was analysed by estimating standard conditional logit models and excluding from the estimation samples:

- Participants whose completion time of the SP1 questions was higher than the 10th percentile of the distribution of completion times.
- Participants whose completion time of the SP1 questions was higher than the 25th percentile of the distribution of completion times.
- Participants who gave negative feedback following the SP1 choice questions.

Table 12 shows how sample exclusions based on completion time affected the impact scores for household customers. Looking across the last three columns of the table we find that the impact scores for household customers were not very sensitive to sample exclusions. Results show that a maximum impact of 25% on internal sewer flooding impacts is to be expected if the 25% speeders were removed from our estimation sample. However, the impact on internal sewer flooding was only 7% if negative feedback participants were removed from the analysis.

Table 12:SP1 sensitivity test results for households

	Heteroscedastic CL		Sub-sample CL impact scores			
	Model 1	Model 2	Overall	Speed > 10th percentile	Speed > 25th percentile	Non-negative feedback
Sewer flooding: inside your property (1 month)	3.294***	3.364***	28.1	32.6	35.1	30.1
Sewer flooding: outside your property (1 week)	2.389***	2.429***	10.2	11.3	11.7	10.2
Emergency drought restrictions (2 months)	2.080***	2.120***	7.3	7.8	8.2	7.0
Unexpected water supply interruption (24h)	1.927***	1.973***	6.4	6.1	5.8	6.5
Do not drink notice (48h)	1.824***	1.860***	5.8	5.4	4.9	5.7
Boil water notice (48h)	1.557***	1.590***	4.2	4.0	3.9	4.2
Unexpected water supply interruption (6h)	1.469***	1.499***	3.9	3.5	3.2	3.9
Significant pollution incident nearby (4 weeks)	1.253***	1.283***	3.0	2.8	2.7	2.9
Water taste and smell (24h)	1.200***	1.234***	3.0	2.5	2.2	2.9
Discoloured water (24h)	1.160***	1.184***	2.8	2.4	2.2	2.7
Significant pollution incident elsewhere (4 weeks)	1.083***	1.108***	2.5	2.3	2.2	2.3
Discoloured water (6h)	1.058***	1.078***	2.5	2.2	2.0	2.4
Water taste and smell (6h)	1.033***	1.053***	2.5	2.0	1.8	2.3
Planned water supply interruption (6h)	0.948***	0.970***	2.2	1.9	1.7	2.1
Unexpected low pressure (6h)	0.913***	0.936***	2.1	1.8	1.6	2.1
Low flows in rivers nearby (2 months)	0.786***	0.806***	1.8	1.6	1.6	1.7
Minor pollution incident nearby (1 day)	0.634***	0.641***	1.5	1.3	1.1	1.5
Low flows in rivers elsewhere (2 months)	0.628***	0.638***	1.5	1.3	1.3	1.4
River water nearby is not high quality	0.574***	0.589***	1.4	1.2	1.2	1.3
Storm overflow nearby (4 hours)	0.544***	0.557***	1.4	1.2	1.1	1.3
Hosepipe ban (5 months)	0.491***	0.502***	1.3	1.1	1.1	1.2
Minor pollution incident elsewhere (1 day)	0.405***	0.426***	1.2	1.0	0.9	1.1
River water elsewhere is not high quality	0.344***	0.359***	1.1	0.9	0.9	1.0
Storm overflow elsewhere (4 hours)	0.218***	0.217***	1.0	0.8	0.7	0.9
Coastal bathing water is neither excellent nor good quality	0.050	0.057	0.8	0.7	0.6	0.7
Coastal bathing water is not excellent quality	-	-	0.7	0.6	0.6	0.7
Heteroscedasticity coefficients						
Panel	-0.013	-0.025				
Speed ≤ 10th percentile	-0.700***					
Speed ≤ 25th percentile		-0.330***				
Non-negative feedback	0.234***	0.232***				

Base sample sizes: Speed <=10th percentile=1,826; Speed<=25th percentile= 4,086 and Non-negative feedback= 10,412. Conditional logit: Impact scores calculated as exponentiated coefficients, rescaled to sum to 100. Significance levels: *** (p<.01); ** (0.01<p<.05); * (0.05<p<.1)

5.2.7. Sub-population analysis

Sub-population impact scores were derived using conditional logit models rather than the Bayesian mixed logit models used to derive the main results. The reason for the difference in approach was due to the computation time that would have been required to estimate Bayesian models for every segment analysed. The set-up of the models took the following form:

16) $$U_{nj} = \beta_0' X_j + \beta_1' X_j^s + \varepsilon_{nj}$$

Where U_{nj}, X_j and ε_{nj} were defined as in previous models, but a new vector of variables X_j^s was added equal to X_j if n was in segment s, and equal to 0 otherwise. One such model was estimated for each segment examined and, in each case, impact scores were derived for any segment and its complement segment for each of the 26 service issues. Impact scores were straightforwardly derived from the β_0 and β_1 coefficient vectors based on the fact that the sum of these could be treated as the β coefficient vector for segment s, and equation **Error! Reference source not found.** could then be applied as in the derivation of the main impact score results. The delta method was used to test for significant differences in (the log of the) impact scores between any segment and the complement segment for each of the 26 service issue impact scores.

The results of the sub-population analysis are presented in Section 5.4 below.

5.2.8. Analysis of the influence of experience, usage and attitudes

The models used to examine the influence of usage and attitudes on impacts took exactly the same form as in the sub-population analysis, and impact scores were accordingly derived in the same manner. For the analysis of the influence of experience on impacts, the models took a slightly different form. As in 5.2.7, the set-up of the models was as follows:

17) $$U_{nj} = \beta_0' X_j + \beta_1' X_j^s + \varepsilon_{nj}$$

In this case, however, the vector of dummy variables, X_j^s, was equal to X_j only if *n* was in segment *s* and *j* was one of the service issues under examination for being potentially influenced by *s*. X_j^s was equal to 0 otherwise.

For the analysis of the influence of experience on impacts, only the service issues relevant to the experience were treated as segmentations. For example, when examining the influence of experiencing discoloured water on the impact assigned to discoloured water, only the variables *Discolour24* and *Discolour6* were estimated with separate coefficients linked to experience. A single conditional logit model was used to analyse the influence of experience of all types of service issue jointly. The difference in approach adopted in this case was due to a desire to focus attention on the specific service issues relevant to the experience.

Impact scores for those who did/did not experience the service issues were calculated from the estimated conditional logit model. For example, for Internal sewer flooding (ISF), we calculated the following:

- The impact score for all those who did not experience ISF (see column "No" in Table 19) was calculated as:

$$=100* \frac{\exp(\beta_{ISF0})}{\sum_j \exp(\beta_{j0})}$$

where the numerator is the exponentiated coefficient estimate pertaining to all those who did not experience ISF and the denominator is the sum of the exponentiated coefficient estimates pertaining to all those who did not experience any of the 26 service issues.

- The impact score for all those who did experience ISF (see column "Yes" in Table 19) was calculated as:

$$=100* \frac{\exp(\beta_{ISF1})}{[\sum_j \exp(\beta_{j0}) - \exp(\beta_{ISF0})] + \exp(\beta_{ISF1})}$$

where the numerator is the exponentiated coefficient estimate pertaining to all those who did experience ISF and the denominator is the sum of two quantities: (i) sum of the exponentiated coefficient estimates pertaining to all those who did not experience any of the remaining 25 service issues and (ii) exponentiated coefficient estimate pertaining to all those who did experience ISF.

The results of the analysis of the influence of experience, usage and attitudes on choices are presented in Section 5.5 below.

5.3. Impact scores

The main results from the SP1 study are the relative impacts of each service issue. Table 13 and Table 14 present these relative impacts for the 26 service attributes for England and Wales combined, and separately by country, with respect to households and non-households respectively. All impact scores are scaled to sum to 100 within each sub-population. Individual company impact scores were similarly obtained from the econometric models presented in Appendix C and were delivered to water companies along with the main valuation results.

As seen in the tables below, the impact scores were the highest for Internal sewer flooding and External sewer flooding across both HH and NHH samples. For example, Table 13 shows that household water customers regarded a one-off sewer flooding incident inside their property as being around 5 times more impactful than unexpected water supply interruptions (24h). The remaining impact scores can be interpreted in a similar manner.

While impact scores for household customers were relatively precisely estimated, as indicated by narrow confidence intervals, the confidence intervals around non-household impact scores were quite wide, indicating a relatively poor statistical fit. This lack of precision can be at least partly attributed to the substantially smaller sample size of the non-household survey in comparison to the household survey.

Table 13: Impact scores of service issues for households

	England & Wales			England			Wales		
	Impact score	95% Conf. interval		Impact score	95% Conf. interval		Impact score	95% Conf. interval	
Sewer flooding: inside your property (1 month)	**31.1**	29.8	32.4	**31.1**	29.8	32.5	**30.4**	26.8	34.5
Sewer flooding: outside your property (1 week)	**11.0**	10.6	11.5	**11.0**	10.5	11.5	**12.1**	11.0	13.5
Emergency drought restrictions (2 months)	**7.3**	7.0	7.6	**7.3**	7.0	7.6	**7.7**	6.7	8.8
Unexpected water supply interruption (24h)	**6.2**	5.9	6.5	**6.2**	5.9	6.5	**6.5**	5.8	7.2
Do not drink notice (48h)	**5.7**	5.5	5.9	**5.7**	5.5	5.9	**5.9**	5.3	6.5
Boil water notice (48h)	**4.1**	4.0	4.3	**4.2**	4.0	4.3	**3.7**	3.2	4.3
Unexpected water supply interruption (6h)	**3.8**	3.6	3.9	**3.8**	3.6	3.9	**3.3**	3.0	3.7
Significant pollution incident nearby (4 weeks)	**2.9**	2.8	3.0	**2.9**	2.8	3.0	**2.9**	2.5	3.2
Water taste and smell (24h)	**2.5**	2.4	2.6	**2.5**	2.4	2.6	**2.3**	2.1	2.6
Discoloured water (24h)	**2.4**	2.3	2.5	**2.4**	2.3	2.5	**2.5**	2.3	2.8
Significant pollution incident elsewhere (4 weeks)	**2.4**	2.3	2.5	**2.3**	2.3	2.4	**3.3**	3.0	3.7
Discoloured water (6h)	**2.2**	2.1	2.3	**2.2**	2.1	2.3	**2.1**	1.9	2.3
Water taste and smell (6h)	**2.2**	2.1	2.3	**2.2**	2.1	2.3	**1.8**	1.7	2.0
Planned water supply interruption (6h)	**2.0**	1.9	2.0	**2.0**	2.0	2.1	**1.5**	1.4	1.6
Unexpected low pressure (6h)	**1.9**	1.8	2.0	**1.9**	1.8	2.0	**1.6**	1.4	1.8
Low flows in rivers nearby (2 months)	**1.7**	1.6	1.7	**1.7**	1.6	1.7	**1.8**	1.6	2.0
Minor pollution incident nearby (1 day)	**1.4**	1.3	1.4	**1.4**	1.3	1.4	**1.7**	1.5	1.8
Low flows in rivers elsewhere (2 months)	**1.3**	1.3	1.4	**1.3**	1.3	1.4	**1.3**	1.2	1.4
River water nearby is not high quality	**1.3**	1.2	1.3	**1.3**	1.2	1.3	**1.2**	1.1	1.4
Storm overflow nearby	**1.2**	1.2	1.3	**1.2**	1.2	1.3	**1.2**	1.0	1.3
Hosepipe ban (5 months)	**1.2**	1.2	1.3	**1.2**	1.2	1.3	**1.0**	0.9	1.1
Minor pollution incident elsewhere (1 day)	**1.1**	1.0	1.1	**1.1**	1.0	1.1	**1.0**	0.9	1.2
River water elsewhere is not high quality	**1.0**	1.0	1.1	**1.0**	1.0	1.1	**1.0**	0.9	1.2
Storm overflow elsewhere in region	**0.9**	0.8	0.9	**0.9**	0.8	0.9	**0.8**	0.7	0.9
Coastal bathing water is neither excellent nor good quality	**0.7**	0.7	0.7	**0.7**	0.7	0.7	**0.8**	0.7	0.9
Coastal bathing water is not excellent quality	**0.7**	0.7	0.7	**0.7**	0.7	0.7	**0.7**	0.7	0.8

Note: Impact scores derived from econometric models estimated on SP1 choice data

Table 14: Impact scores of service issues for non-households

	England & Wales			England			Wales		
	Impact score	95% Conf. interval		Impact score	95% Conf. interval		Impact score	95% Conf. interval	
Sewer flooding: inside your property (1 month)	**35.7**	30.7	41.7	**36.1**	30.6	42.7	**31.0**	24.4	39.5
Sewer flooding: outside your property (1 week)	**14.3**	12.4	16.6	**14.2**	12.2	16.6	**15.1**	11.8	19.4
Unexpected water supply interruption (24h)	**8.4**	7.3	9.7	**8.5**	7.3	9.9	**7.6**	5.8	9.8
Emergency drought restrictions (2 months)	**7.5**	6.5	8.6	**7.6**	6.5	8.8	**6.3**	4.8	8.3
Unexpected water supply interruption (6h)	**5.9**	5.1	6.8	**6.0**	5.2	7.0	**4.6**	3.5	6.1
Do not drink notice (48h)	**4.5**	3.9	5.2	**4.4**	3.8	5.2	**5.0**	3.9	6.5
Planned water supply interruption (6h)	**3.3**	3.0	3.6	**3.3**	3.0	3.7	**2.8**	2.4	3.2
Boil water notice (48h)	**3.2**	2.8	3.8	**3.2**	2.8	3.8	**3.2**	2.5	4.1
Discoloured water (6h)	**2.0**	1.7	2.3	**2.0**	1.7	2.3	**2.0**	1.5	2.7
Water taste and smell (24h)	**1.8**	1.5	2.0	**1.7**	1.5	2.0	**2.2**	1.7	2.9
Discoloured water (24h)	**1.8**	1.5	2.0	**1.8**	1.5	2.0	**1.9**	1.5	2.5
Unexpected low pressure (6h)	**1.7**	1.5	2.0	**1.7**	1.5	2.0	**1.4**	1.1	1.7
Water taste and smell (6h)	**1.6**	1.4	1.9	**1.6**	1.4	1.9	**1.8**	1.4	2.2
Significant pollution incident nearby (4 weeks)	**1.2**	1.1	1.4	**1.1**	1.0	1.3	**2.8**	2.2	3.5
Significant pollution incident elsewhere (4 weeks)	**1.2**	1.0	1.3	**1.1**	0.9	1.3	**2.0**	1.6	2.5
Minor pollution incident nearby (1 day)	**0.9**	0.8	1.1	**0.9**	0.8	1.0	**1.3**	1.0	1.7
Storm overflow nearby	**0.8**	0.7	1.0	**0.8**	0.7	0.9	**1.6**	1.3	1.9
Low flows in rivers nearby (2 months)	**0.7**	0.6	0.8	**0.7**	0.6	0.8	**1.0**	0.8	1.3
Low flows in rivers elsewhere (2 months)	**0.6**	0.5	0.7	**0.6**	0.5	0.7	**1.1**	0.9	1.4
River water nearby is not high quality	**0.5**	0.5	0.6	**0.5**	0.4	0.6	**0.9**	0.7	1.2
Minor pollution incident elsewhere (1 day)	**0.5**	0.5	0.6	**0.5**	0.4	0.6	**1.0**	0.8	1.2
Storm overflow elsewhere in region	**0.5**	0.4	0.6	**0.5**	0.4	0.5	**1.1**	0.9	1.4
Hosepipe ban (5 months)	**0.5**	0.4	0.6	**0.5**	0.4	0.6	**0.7**	0.6	0.9
River water elsewhere is not high quality	**0.4**	0.3	0.4	**0.4**	0.3	0.4	**0.6**	0.5	0.8
Coastal bathing water is not excellent quality	**0.2**	0.2	0.3	**0.2**	0.2	0.2	**0.6**	0.5	0.7
Coastal bathing water is neither excellent nor good quality	**0.2**	0.2	0.3	**0.2**	0.2	0.2	**0.5**	0.4	0.7

Note: Impact scores derived from econometric models estimated on SP1 choice data

The results above show that relative values for the service issues were all in line with expectation for both households and non-households as below:

- Sewer flooding had the highest impact of all service issues.
- Longer interruptions were more impactful than shorter interruptions.
- Unexpected interruptions were more impactful than planned interruptions.
- Do not drink notices were more impactful than boil water notices of the same duration.
- Significant pollution incidents were more impactful than minor pollution incidents.
- Issues nearby were more impactful than issues elsewhere in the region.

There was one case only, across all household and non-household results, which appeared anomalous, which was that the non-household impact score for a 6-hour discoloured water incident slightly exceeded the non-household impact score for a 24-hour discoloured water incident. The size of the difference in this case was small, but was found in England, Wales and England and Wales results.

The relative impacts of the service issues were found to be somewhat smaller than expected in some cases. This is particularly relevant for the relative impacts at the upper end i.e. the internal sewer flooding vis-à-vis external sewer flooding and unexpected 24 hour water supply interruption vis-à-vis a two month emergency drought restriction. For example, Table 13 shows that household water customers regarded a one-off sewer flooding incident inside their property as being only around 2.8 times more impactful than a one-off sewer flooding incident outside their property. Similarly, household water customers regarded a two month emergency drought restriction as being only around 1.5 times more impactful than an unexpected 24 hour water supply interruption.

The reason for the lower-than-expected relative impacts of these service issues can be attributed to the fact that their impact scores are likely to be less reliably estimated in comparison with the other service issues, and quite possibly biased downwards. This is mainly due to the fact that the method used relied on the frequency with which service issues were chosen as the most impactful as the means of measuring the size of the relative impact and, in cases where everyone, or almost everyone, could be expected to consider a service issue to be the most impactful, e.g., for internal sewer flooding/emergency drought restrictions, the size of the relative impact estimated will be highly sensitive to errors in people's choices whereby they choose internal sewer flooding/emergency drought restrictions to be less impactful than the alternative option, whatever that might be. Such responses will have a disproportionately large, and downward, impact on the estimated impact for these service issues due to the fact that the errors will be exclusively one-way, i.e., they will not cancel each other out, and also because each error will have a relatively more substantial effect on the impact scores the closer one is to the extremes of the probability distribution. Similarly, the relative impacts of the service issues at the lower end can be expected to be quite possibly upward-biased. (This is due to the S-shape of the cumulative logistic distribution function).

5.4. Sub-population impact scores

A segmentation analysis was undertaken to explore how preferences varied across sub-populations. Table 15 shows the household and non-household customer segments that were examined.

Each segment's impact scores were compared against the impact scores of the complement segment 'Other' (for example, social grades A&B vs C&D&E combined) and t-tests were used to test for statistically significant differences. Significant differences in impact scores across household and non-household segments are shown in Table 16 and Table 17 below.

The light green/light red cells for any given segment indicate that the relevant service issue had a higher/lower impact on customers in that segment compared to customers in the complement segment 'Other', the difference in impact scores across segments being statistically significant at the 5% level. The cells in light yellow for any given segment indicate that the impact of the relevant service issue to that segment was insignificantly different from customers in the complement segment 'Other'.

In the case of households, for example, the Do not drink notice (48h) service issue had a significantly greater impact on male household customers compared to female household customers. Water taste and smell (24h) had a significantly higher impact for customers in the 18-29 age group than all other age groups. Similarly, Water taste and smell (24h) had a significantly lower impact for customers in the 65+ age group than all other age groups.

Many of the differences appear to have been driven by differences in internal sewer flooding impacts: those segments with a significantly higher impact for internal sewer flooding also tended to have lower impact scores for several other variables, due to the fact that internal sewer flooding comprises a substantial part of the overall impact. Moreover, it appears that the relative impact of sewer flooding was correlated with measures of wealth. For example, older people, higher SEGs and rural all had higher sewer flooding impacts, for example, and correspondingly lower impact scores for several other service issues. Those in SEG group D/E, and those in financial vulnerability had lower impact scores for sewer flooding and correspondingly higher impact scores for several other service issues.

In the case of non-households, Discoloured water (6h) had a significantly greater impact on those with 1-49 employees when compared to non-households with 0, 50-249 and 250+ employees. Sole-traders appeared to be relatively more concerned about environmental issues, and less concerned about a 6hr planned interruption. Non-households with 50-249 sites had the highest value for internal sewer flooding, which led to significantly lower values for many other issues. Manufacturers seemed to be relatively more concerned with water supply issues, and less concerned with sewer flooding incidents. The remaining differences can be interpreted in a similar manner.

Table 15: Customer segments

Characteristic	Segment	Segment size
Household segments		
Age	18-29	1,067
	30-64	7,776
	65+	3,630
Sex	Male	5,934
	Female	6,633
SEG	A&B	3,327
	C1 and C2	3,634
	D&E	1,466
Vulnerability	Medical	2,082
	Communications	1,713
	Life stage	1,877
	Financial	642
	Any	4,486
Urban/rural	Urban	5,780
	Rural	1,346
Non-household segments		
Employees	0 (sole trader)	524
	1-49	2,510
	50-249	374
	250+	212
Number of sites	1	2,604
	2-4	682
	5-50	305
	51+	132
Water use	In the manufacturing process	384
	Supply of services (e.g. cleaning services)	869
	Ingredient or part of product or service	1,054
	Normal domestic use for organisation	2,994

Base: HH: 12,567; NHH:3,838. Not stated/Prefer not to say were treated as missing.

Table 16: Household sub-population impact scores

	Age			Gender		SEG			Urban / Rural		Vulnerability				
Service issue	**18 to 29**	**30 to 64**	**65+**	**Female**	**Male**	**A / B**	**C1 / C2**	**D / E**	**Urban**	**Rural**	**Medical**	**Comms**	**Life**	**Financial**	**Any**
Sewer flooding: inside your property (1 month)	25.4	28.1	30.8	28.3	27.9	37.4	29.7	17.8	36.6	53.0	24.0	21.4	31.0	18.8	25.2
Sewer flooding: outside your property (1 week)	8.2	10.5	11.6	10.5	9.9	11.4	9.7	8.5	10.9	9.4	10.5	9.9	8.6	7.4	9.8
Emergency drought restrictions (2 months)	7.7	7.2	7.4	7.1	7.6	7.2	7.8	6.0	6.8	5.4	8.2	7.5	8.2	6.9	7.7
Unexpected water supply interruption (24h)	6.3	6.4	6.7	6.8	6.1	5.2	6.1	7.3	5.7	3.8	8.0	6.0	7.0	6.7	6.9
Do not drink notice (48h)	5.5	5.8	5.7	5.4	6.2	4.8	5.4	6.9	4.8	3.4	6.5	5.6	5.9	7.1	5.9
Boil water notice (48h)	4.0	4.1	4.6	4.2	4.2	3.2	4.1	4.4	3.5	2.6	4.4	4.5	4.7	4.4	4.5
Water taste and smell (24h)	3.8	3.0	2.2	2.9	3.0	2.0	3.1	4.8	2.6	1.4	3.0	3.4	2.5	5.3	3.0
Discoloured water (24h)	3.6	2.6	2.4	3.0	2.5	2.0	2.9	3.2	2.2	1.5	2.7	3.1	2.5	3.1	2.8
Unexpected water supply interruption (6h)	3.5	3.9	4.0	4.1	3.6	3.2	3.4	5.3	3.0	2.1	4.2	4.3	3.9	4.2	4.0
Significant pollution incident nearby (4 weeks)	3.4	3.0	2.7	3.0	3.0	2.8	2.9	3.5	3.0	2.1	2.5	3.4	2.4	3.8	2.9
Water taste and smell (6h)	3.1	2.4	2.0	2.5	2.4	1.8	2.6	3.2	2.0	1.2	2.5	3.1	2.6	3.8	2.8
Significant pollution incident elsewhere (4 weeks)	2.9	2.4	2.2	2.4	2.6	2.3	2.4	2.8	2.4	1.8	2.4	3.0	2.1	2.3	2.5
Discoloured water (6h)	2.8	2.5	2.1	2.4	2.5	1.8	2.5	3.3	2.1	1.2	2.8	2.5	2.2	4.2	2.6
Planned water supply interruption (6h)	2.5	2.2	1.9	2.1	2.3	1.8	2.1	3.3	1.6	1.0	2.3	2.7	1.9	2.7	2.3
Unexpected low pressure (6h)	2.4	2.1	2.0	2.1	2.1	1.5	2.0	2.8	1.5	1.1	2.5	2.6	2.0	2.8	2.4
Low flows in rivers nearby (2 months)	2.0	1.8	1.5	1.9	1.7	1.6	1.7	2.3	1.5	1.1	1.7	2.5	1.6	2.4	2.0
Minor pollution incident nearby (1 day)	1.7	1.5	1.3	1.5	1.5	1.3	1.5	1.8	1.2	0.9	1.5	2.0	1.4	2.0	1.7
Storm overflow nearby	1.7	1.4	1.1	1.3	1.5	1.1	1.4	1.7	1.2	0.9	1.5	1.8	1.2	1.7	1.6
Low flows in rivers elsewhere (2 months)	1.6	1.5	1.3	1.4	1.5	1.2	1.5	1.9	1.3	1.0	1.5	1.7	1.3	1.7	1.5
River water nearby is not high quality	1.5	1.5	1.2	1.3	1.5	1.2	1.3	1.8	1.2	0.9	1.5	1.8	1.3	1.5	1.5
Minor pollution incident elsewhere (1 day)	1.5	1.2	1.0	1.2	1.2	0.9	1.2	1.6	0.9	0.8	1.1	1.5	1.2	1.7	1.3
Hosepipe ban (5 months)	1.3	1.3	1.2	1.2	1.3	1.3	1.2	1.3	1.0	0.9	1.2	1.4	1.4	1.1	1.3
River water elsewhere is not high quality	1.1	1.1	1.1	1.0	1.1	0.9	1.0	1.2	1.0	0.8	1.0	1.3	1.0	1.2	1.1
Storm overflow elsewhere in region	1.1	1.0	0.8	0.9	1.0	0.7	0.9	1.3	0.8	0.6	0.9	1.2	0.9	1.2	1.0
Coastal bathing water is neither excellent nor good quality	0.9	0.8	0.5	0.8	0.8	0.7	0.8	1.0	0.7	0.5	0.8	1.0	0.6	1.2	0.8
Coastal bathing water is not excellent quality	0.7	0.8	0.6	0.7	0.7	0.7	0.7	0.9	0.7	0.5	0.7	0.9	0.5	1.0	0.7

Note: Cells in light green/light red indicate an estimate that is significantly larger/lower, than the rest of the sample at the 5% significance level. Cells in light yellow indicate that the estimate is insignificantly different from the rest. Figures shown are impact scores, which sum to 100 within each segment.

Base sample sizes: Age: 18 to 29= 1,068, 30-64= 7,777 and 65 and above= 3,630; Gender: Female=6,634, Male= 5,934; Seg: A/B=3,328, C1C2=3,635 and DE=1,466; Urban=5,780, Rural=1,346; Vulnerability: Medical= 2,082, Communication=1,713, Life=1,877, Financial=642 and Any=4,795;

Table 17: Non-household sub-population impact scores

Service issue	Nr. of employees				Nr. of sites				Water use			
	0	1 to 49	50 to 249	250+	1	2-4	5-50	50+	Manufacturing	Services	Ingredient	Domestic
Sewer flooding: inside your property (1 month)	33.2	31.4	46.1	27.3	33.0	34.7	25.3	42.2	12.2	33.6	32.9	37.9
Sewer flooding: outside your property (1 week)	13.0	13.3	11.0	17.5	14.6	13.0	16.9	7.6	11.3	11.1	11.5	13.9
Emergency drought restrictions (2 months)	8.6	7.9	7.5	5.5	8.7	7.9	5.3	2.6	6.6	8.9	9.5	7.2
Unexpected water supply interruption (24h)	6.9	8.6	7.9	13.1	8.2	9.1	13.8	12.2	16.9	13.5	10.8	8.6
Do not drink notice (48h)	5.9	4.3	4.3	6.9	5.3	4.2	4.8	11.0	5.8	4.5	5.8	5.5
Unexpected water supply interruption (6h)	3.8	6.3	6.8	6.0	5.3	7.8	3.8	5.9	10.4	4.5	4.8	5.1
Discoloured water (24h)	2.5	2.2	1.4	1.9	2.2	2.0	1.9	1.4	4.1	1.7	3.0	1.7
Water taste and smell (24h)	2.4	2.2	1.1	1.8	1.9	1.1	3.2	1.1	2.3	1.9	1.9	1.9
Boil water notice (48h)	2.2	3.4	1.8	3.1	2.8	2.4	3.4	3.3	2.6	2.8	3.4	2.7
Significant pollution incident elsewhere (4 weeks)	2.2	1.4	0.9	0.7	1.4	1.2	1.2	0.4	1.2	1.2	0.9	1.2
Unexpected low pressure (6h)	2.1	1.9	1.1	2.1	1.6	2.1	3.6	0.6	5.1	2.3	1.7	1.4
Discoloured water (6h)	1.9	2.5	1.1	1.2	2.0	1.7	1.3	1.6	1.6	1.8	2.3	1.6
Significant pollution incident nearby (4 weeks)	1.9	1.6	0.7	1.7	1.4	1.4	1.2	2.9	2.6	1.1	1.0	1.4
Planned water supply interruption (6h)	1.8	3.8	3.7	3.6	2.8	3.6	3.0	3.2	5.3	3.3	3.7	2.7
Water taste and smell (6h)	1.7	1.8	1.4	1.5	1.5	1.4	3.5	1.1	2.6	1.5	1.7	1.4
Minor pollution incident nearby (1 day)	1.7	1.1	0.4	0.8	1.1	1.0	1.4	0.2	1.1	1.1	0.8	0.9
Low flows in rivers elsewhere (2 months)	1.3	0.7	0.3	0.3	0.6	0.6	0.9	0.1	0.5	0.7	0.5	0.5
Low flows in rivers nearby (2 months)	1.2	0.9	0.3	0.7	0.8	0.7	0.9	0.5	0.9	0.8	0.6	0.7
Storm overflow nearby (4 hours)	1.0	1.0	0.6	1.9	1.1	1.4	1.2	0.3	2.2	0.8	0.7	0.9
Storm overflow elsewhere (4 hours)	1.0	0.7	0.2	0.3	0.6	0.4	0.4	0.2	0.5	0.5	0.4	0.5
Minor pollution incident elsewhere (1 day)	0.9	0.6	0.3	0.8	0.7	0.4	1.2	0.7	0.8	0.6	0.4	0.6
River water nearby is not high quality	0.8	0.7	0.4	0.4	0.7	0.5	0.4	0.1	0.8	0.4	0.4	0.5
Hosepipe ban (5 months)	0.7	0.7	0.3	0.5	0.5	0.6	0.6	0.7	1.7	0.7	0.6	0.5
River water elsewhere is not high quality	0.7	0.5	0.2	0.3	0.5	0.3	0.6	0.2	0.6	0.5	0.4	0.4
Coastal bathing water is not excellent quality	0.5	0.3	0.1	0.1	0.3	0.2	0.1	0.1	0.1	0.2	0.2	0.2
Coastal bathing water is neither excellent nor good quality	0.4	0.4	0.1	0.2	0.3	0.3	0.1	0.1	0.4	0.2	0.2	0.2

Note: Cells in light green/light red indicate an estimate that is significantly larger/lower, than the rest of the sample at the 5% significance level. Cells in light yellow indicate that the estimate is insignificantly different from the rest. Figures shown are impact scores, which sum to 100 within each segment.
Base sample sizes: Number of employees: 0= 522; 1 to 49=2,477,50-249= 337 and 250+=126; Number of sites: 1= 2,596,2-4=650,5-50=245,50+=69; Water use: Manufacturing=377,Supply of services=820,Ingredient of good/service provided=1,031 and Domestic use=2,847.

5.5. The influence of experience, usage and attitudes on impact scores

5.5.1. Experience

As discussed in Section 2, an analysis of the impact of experience on impacts provides the basis of a validity test, based on the principle that, if the service issue descriptions were sufficiently accurate and unbiased then, provided experience of the service issue was not inherently conflated with other characteristics, the relative impacts should be approximately the same regardless of whether or not the participant had experienced the service issue in question. By contrast, if experience of a service issue was found to be significantly correlated with its relative impact, and there was no reason to expect this to be a consequence of difference in participant characteristics, this could be an indicator that the service issue description had presented a biased picture of the impact of that service issue.

In the following section, we compare the impact scores of customers who experienced service issues with those who did not experience them. These impact scores were derived as described in Section 5.2.

First, Table 18 shows the numbers of participants having experienced each of the service issues asked about, and maps these to the service issues in the SP exercise to which they were associated. In most cases, the wording was very similar except for the durations being added in the case of the SP1 service issues. For 'Pollution in a river', however, there were many SP1 service issues associated; whilst in the case of 'Emergency drought restrictions', a decision was taken to include low flows in rivers as associated service issues on the basis that these were not picked up elsewhere by any of the other experience questions, and were related.

Table 18 shows that the impact scores for ten attributes i.e. Unexpected water supply interruption (6h), Significant pollution incident nearby (4 weeks), Significant pollution incident elsewhere (4 weeks), Unexpected low water pressure (6 hours), River water nearby is not high quality, Storm overflow nearby (4 hours), Minor pollution incident elsewhere (1 day), Hosepipe ban (5 months), River water elsewhere is not high quality and Coastal bathing water is neither excellent nor good quality, that had significantly different estimates, were higher for household customers who had experienced the service issues vis-à-vis those who did not experience any of the service issues. The difference in impact scores for Internal sewer flooding and Do not drink notice was large (although insignificant) for household customers who had experienced the service issues vis-à-vis those who did not experience any of the service issues. The reason for these attributes having insignificantly different estimates might be attributed to the fact that not many of the households had experienced these service issues in the first place.

In general, experience of a service issue should not lead to that issue showing a higher relative impact, all else equal, if the descriptions fairly and accurately represent the impacts. However, for environmental issues, experience of a service issue is correlated with visits to/use of rivers and beaches, hence we would expect a difference. Similarly for a hosepipe ban, one can only experience a ban if a hosepipe would have been used in the absence of the ban. Hence, we would also expect an impact here. The results in Table 18 therefore broadly conform to expectation with no significant differences for the majority of non-environmental service issues but significant differences, in the expected direction, for hosepipe ban and most environmental issues.

Table 18: Experience interactions with service issues

Type of service issue experienced	N	SP1 service issues interacted with
Unexpected water supply interruption	2,017	Unexpected water supply interruption (24h)
		Unexpected water supply interruption (6h)
Planned water supply interruption	3,078	Planned water supply interruption (6h)
Unexpected low pressure	2,592	Unexpected low pressure (6h)
Boil water notice	487	Boil water notice (48h)
Do not drink notice	305	Do not drink notice (48h)
Discolouration of water coming out of your tap	2,493	Discoloured water (24h)
		Discoloured water (6h)
A change to the taste and/or smell of your tap water	1,576	Water taste and smell (24h)
		Water taste and smell (6h)
Sewer flooding: inside your property	174	Sewer flooding: inside your property (1 month)
Sewer flooding: outside your property	682	Sewer flooding: outside your property (1 week)
Hosepipe ban	3,112	Hosepipe ban (5 months)
Emergency drought restrictions	251	Emergency drought restrictions (2 months)
		Low flows in rivers nearby (2 months)
		Low flows in rivers elsewhere (2 months)
Pollution in a river	678	Significant pollution incident nearby (4 weeks)
		Significant pollution incident elsewhere (4 weeks)
		Minor pollution incident nearby (1 day)
		River water nearby is not high quality
		Storm overflow nearby
		Minor pollution incident elsewhere (1 day)
		River water elsewhere is not high quality
		Storm overflow elsewhere in region
Pollution in the sea near a beach	912	Coastal bathing water is neither Excellent nor Good quality

Table 19: Household impact scores by whether service issue had been experienced

	Experienced service issue	
	No	Yes
Sewer flooding: Inside your property (1 month)	28.4	19.9
Sewer flooding: Outside your property (1 week)	10.1	12.1
Emergency drought restrictions (2 months)	7.4	7.7
Unexpected water supply interruption (24 hours)	6.4	6.8
Do not drink notice (48hours)	5.8	8.2
Boil water notice (48 hours)	4.2	4.5
Unexpected water supply interruption (6 hours)	3.8	4.9
Water taste and smell (24 hours)	3.0	2.7
Significant pollution incident nearby (4 weeks)	3.0	4.0
Discoloured water (24 hours)	2.9	2.4
Discoloured water (6 hours)	2.5	2.2
Water taste and smell (6 hours)	2.5	2.3
Significant pollution incident elsewhere (4 weeks)	2.5	3.4
Planned water supply interruption (6 hours)	2.3	2.0
Unexpected low water pressure (6 hours)	2.1	2.4
Low flows in rivers nearby (2 months)	1.8	2.2
Minor pollution incident nearby (1 day)	1.5	1.7
Low flows in rivers elsewhere (2 months)	1.5	1.7
River water nearby is not high quality	1.4	2.2
Storm overflow nearby (4 hours)	1.4	2.0
Minor pollution incident elsewhere (1 day)	1.2	1.6
Hosepipe ban (5 months)	1.1	1.9
River water elsewhere is not high quality	1.1	1.6
Storm overflow elsewhere (4 hours)	0.9	1.2
Coastal bathing water is neither excellent nor good quality	0.7	1.7
Coastal bathing water is not excellent quality	0.7	0.7

Cells in light green/light red indicate an estimate that is significantly larger/lower, than the rest of the sample at the 5% significance level. Cells in light yellow indicate that the estimate is insignificantly different from the rest.

5.5.2. Usage

Examining the correlation of impact scores with usage of rivers, beaches and hosepipes/sprinklers also provides the means for a validity test, based on the principle that those that are particularly affected by a service issue should be found to assign a higher relative impact to that service issue than others. Service issues affecting rivers should therefore be correlated with usage of rivers in the UK; coastal bathing water quality impairment should be correlated with usage of beaches and the sea in the UK; and the impact of a hosepipe ban should be correlated with usage of a hosepipe or sprinkler.

First, Table 20 presents the impact scores among households by frequency of use of rivers and canals in the UK. As expected, the results show that service issues related to pollution incidents near a river (e.g. Significant pollution incident nearby (4 weeks), Significant pollution incident elsewhere (4 weeks), River water nearby is not high quality and River water elsewhere is not high quality) had a significantly greater impact on households who ‘Sometimes or often’ used rivers and canals in the UK for any type of activity than on households who ‘Rarely or never’ used rivers and canals in the UK.

Moreover, the size of the difference, and the number of significant issues, varied depending on how households used rivers or canals. As expected, the impact of river water-related issues was substantially more differentiated by whether or not the participant used rivers or canals for water contact activities or fishing than by whether or not they used rivers or canals for other, non-contact, activities.

Table 20: Household impact scores by frequency of using rivers or canals in the UK

	River or canal use							
	Overall		Water contact activities		Fishing		Other activities	
	Sometimes or often	Rarely, never or not stated	Sometimes or often	Rarely, never or not stated	Sometimes or often	Rarely, never or not stated	Sometimes or often	Rarely, never or not stated
Sewer flooding: Inside your property (1 month)	30.0	27.2	14.4	29.0	14.7	28.6	31.8	26.5
Sewer flooding: Outside your property (1 week)	11.0	9.8	8.7	10.3	6.5	10.3	11.0	9.8
Emergency drought restrictions (2 months)	8.1	7.0	7.3	7.3	8.7	7.3	8.1	7.0
Do not drink notice (48hours)	5.4	6.0	5.3	5.8	6.2	5.8	5.3	6.0
Unexpected water supply interruption (24 hours)	5.2	7.2	4.0	6.6	7.0	6.4	5.1	7.1
Boil water notice (48 hours)	3.9	4.4	4.3	4.2	3.9	4.2	3.8	4.4
Unexpected water supply interruption (6 hours)	3.6	4.0	3.7	3.9	4.0	3.9	3.4	4.1
Significant pollution incident nearby (4 weeks)	3.5	2.8	4.3	2.9	3.6	3.0	3.4	2.8
Significant pollution incident elsewhere (4 weeks)	2.8	2.3	3.7	2.4	2.8	2.5	2.7	2.4
Water taste and smell (24 hours)	2.5	3.2	4.7	2.9	4.4	2.9	2.3	3.3
Discoloured water (24 hours)	2.4	3.0	3.0	2.7	3.7	2.7	2.3	3.0
Discoloured water (6 hours)	2.0	2.7	2.7	2.4	2.4	2.4	2.0	2.7
Water taste and smell (6 hours)	2.0	2.7	2.8	2.4	3.9	2.4	1.9	2.8
Planned water supply interruption (6 hours)	1.8	2.5	2.1	2.2	1.9	2.2	1.7	2.5
Unexpected low water pressure (6 hours)	1.8	2.3	2.9	2.1	2.5	2.1	1.6	2.4
Low flows in rivers nearby (2 months)	1.8	1.7	2.6	1.7	2.6	1.7	1.7	1.8
River water nearby is not high quality	1.8	1.2	3.1	1.3	2.6	1.4	1.7	1.3
Low flows in rivers elsewhere (2 months)	1.6	1.4	2.8	1.4	2.6	1.5	1.6	1.4
Minor pollution incident nearby (1 day)	1.5	1.5	2.6	1.5	1.7	1.5	1.4	1.6
Storm overflow nearby (4 hours)	1.4	1.4	2.6	1.3	2.4	1.4	1.3	1.4
Hosepipe ban (5 months)	1.2	1.3	2.2	1.2	2.4	1.2	1.2	1.3
River water elsewhere is not high quality	1.2	1.0	2.6	1.0	2.7	1.0	1.2	1.0
Minor pollution incident elsewhere (1 day)	1.1	1.2	2.1	1.2	2.2	1.2	1.1	1.3
Storm overflow elsewhere (4 hours)	0.9	1.0	1.6	0.9	1.3	0.9	0.9	1.0
Coastal bathing water is neither excellent nor good	0.9	0.7	1.9	0.7	1.5	0.8	0.8	0.8
Coastal bathing water is not excellent quality	0.8	0.7	2.0	0.7	1.9	0.7	0.8	0.7

Note: Cells in light green/light red indicate an estimate that is significantly larger/lower, than the rest of the sample at the 5% significance level. Figures shown are impact scores, which sum to 100 within each segment
Base sample sizes: River or canal use: Sometimes/Often= 4,252, Rarely/never/not stated= 8,317.

Similarly, as Table 21 shows, service issues related to beaches e.g. 'Coastal bathing water is neither excellent nor good quality' and 'Coastal bathing water is not excellent quality', had a significantly higher impact on households who used beaches and the sea in the UK for any type of activity 'Sometimes or often' vis-vis those who used the beaches and the sea 'Rarely or never'. Further, these impacts were significantly higher irrespective of how households used beaches/ sea i.e. for water contact activities, fishing or other activities on or around the water. The size of the impact was correlated with type of usage, however, with usage for water contact activities driving the highest difference in impact scores for these service issues, followed by usage for fishing.

Table 21: Household impact scores by frequency of using beaches or the sea in the UK

	Beach or sea use							
	Overall		Water contact activities		Fishing		Other activities	
	Sometimes or often	Rarely, never or not stated	Sometimes or often	Rarely, never or not stated	Sometimes or often	Rarely, never or not stated	Sometimes or often	Rarely, never or not stated
Sewer flooding: Inside your property (1 month)	27.9	28.2	21.9	28.6	9.8	28.7	29.9	27.6
Sewer flooding: Outside your property (1 week)	9.7	10.4	9.9	10.2	5.9	10.3	9.8	10.3
Emergency drought restrictions (2 months)	6.8	7.5	6.9	7.3	8.7	7.3	7.2	7.4
Do not drink notice (48hours)	5.6	5.9	5.3	5.8	8.4	5.7	5.5	5.9
Unexpected water supply interruption (24 hours)	5.4	6.8	4.2	6.7	5.0	6.4	5.3	6.8
Boil water notice (48 hours)	4.4	4.1	4.7	4.2	4.3	4.2	4.3	4.2
Unexpected water supply interruption (6 hours)	3.5	4.0	3.2	3.9	3.7	3.9	3.3	4.1
Significant pollution incident nearby (4 weeks)	3.7	2.8	4.1	2.9	4.0	3.0	3.5	2.9
Significant pollution incident elsewhere (4 weeks)	3.0	2.3	3.4	2.4	2.2	2.5	2.9	2.4
Water taste and smell (24 hours)	2.7	3.0	3.3	2.9	5.1	2.9	2.5	3.1
Discoloured water (24 hours)	2.5	2.8	2.6	2.8	3.3	2.7	2.5	2.8
Discoloured water (6 hours)	2.2	2.5	2.2	2.5	2.5	2.4	2.2	2.5
Water taste and smell (6 hours)	2.1	2.5	1.9	2.5	5.2	2.4	2.0	2.6
Planned water supply interruption (6 hours)	1.8	2.4	1.8	2.3	1.7	2.2	1.8	2.4
Unexpected low water pressure (6 hours)	2.0	2.2	2.2	2.1	3.6	2.1	1.9	2.2
Low flows in rivers nearby (2 months)	2.1	1.7	2.4	1.7	2.3	1.7	2.0	1.7
River water nearby is not high quality	1.7	1.3	2.0	1.4	2.7	1.4	1.6	1.4
Low flows in rivers elsewhere (2 months)	1.7	1.4	2.0	1.4	2.4	1.5	1.6	1.4
Minor pollution incident nearby (1 day)	1.6	1.5	1.8	1.5	1.9	1.5	1.5	1.5
Storm overflow nearby (4 hours)	1.4	1.4	1.7	1.4	2.4	1.4	1.3	1.4
Hosepipe ban (5 months)	1.4	1.2	1.9	1.2	2.6	1.2	1.4	1.2
River water elsewhere is not high quality	1.4	1.0	2.0	1.0	3.6	1.0	1.3	1.0
Minor pollution incident elsewhere (1 day)	1.4	1.1	1.8	1.2	2.9	1.2	1.3	1.2
Storm overflow elsewhere (4 hours)	1.0	0.9	1.2	0.9	1.8	0.9	0.9	0.9
Coastal bathing water is neither excellent nor good	1.6	0.6	2.6	0.7	1.9	0.8	1.4	0.6
Coastal bathing water is not excellent quality	1.4	0.6	3.0	0.6	2.2	0.7	1.3	0.6

Note: Cells in light green/light red indicate an estimate that is significantly larger/lower, than the rest of the sample at the 5% significance level. Figures shown are impact scores, which sum to 100 within each segment
Base sample sizes: Beach or sea use: Sometimes/Often=3,494, Rarely/never/not stated=9,075.

Table 22 shows the impact scores among households by frequency of use of a hosepipe or sprinkler. As expected, the results show that households who used hosepipes or sprinklers ‘Often’ were significantly more impacted by a Hosepipe ban (5 months).

Table 22: Household impact scores by frequency of use of a hosepipe or sprinkler

	Hosepipe or sprinkler use	
	Often	Sometimes, rarely, never, or not stated
Sewer flooding: Inside your property (1 month)	35.3	25.0
Sewer flooding: Outside your property (1 week)	11.4	9.5
Emergency drought restrictions (2 months)	7.1	7.3
Do not drink notice (48hours)	5.1	6.0
Unexpected water supply interruption (24 hours)	5.6	6.7
Boil water notice (48 hours)	3.6	4.4
Unexpected water supply interruption (6 hours)	3.0	4.4
Significant pollution incident nearby (4 weeks)	2.8	3.1
Significant pollution incident elsewhere (4 weeks)	2.0	2.7
Water taste and smell (24 hours)	2.2	3.4
Discoloured water (24 hours)	2.1	3.1
Discoloured water (6 hours)	2.0	2.7
Water taste and smell (6 hours)	1.8	2.8
Planned water supply interruption (6 hours)	1.6	2.6
Unexpected low water pressure (6 hours)	1.6	2.4
Low flows in rivers nearby (2 months)	1.4	1.9
River water nearby is not high quality	1.1	1.5
Low flows in rivers elsewhere (2 months)	1.2	1.6
Minor pollution incident nearby (1 day)	1.2	1.7
Storm overflow nearby (4 hours)	1.1	1.5
Hosepipe ban (5 months)	2.7	0.8
River water elsewhere is not high quality	0.9	1.2
Minor pollution incident elsewhere (1 day)	0.9	1.4
Storm overflow elsewhere (4 hours)	0.7	1.1
Coastal bathing water is neither excellent nor good	0.7	0.8
Coastal bathing water is not excellent quality	0.6	0.8

Note: Cells in light green/light red indicate an estimate that is significantly larger/lower, than the rest of the sample at the 5% significance level. Cells in light yellow indicate that the estimate is insignificantly different from the rest. Figures shown are impact scores, which sum to 100 within each segment
Base sample sizes: Hosepipe use: Often=4,966, Sometimes/rarely/never/not stated=7,603.

5.5.3. Attitudes

A single question was included to capture a measure of the participant's attitude to the importance of environmental protection and improvement, as described in Section 2. The purpose of this question was to provide the basis for an additional validity test based on the principle that those that have particularly strong pro-environment attitudes should be found to assign a higher relative impact to environmental service issues than others.

As shown in Table 23, the strength of differentiation of environmental impacts by this measure of environmental attitudes was not as strong as one might have expected. However, the weakness appears to have been driven by the fact that 'Sewer flooding: Inside your property (1 month)' had a very substantially higher impact score amongst those with the most positive environmental attitudes and this has caused the impact scores of all the other service issues to be lower than they otherwise would have been.

Nonetheless, households who did not support environmental protection and improvement 'Regardless of cost' had significantly higher impact scores for service issues that were private in nature; e.g. the set of service issues ranging from Unexpected water supply interruptions through to unexpected low pressure (6h). In contrast to this, service issues which were essentially public in nature, such as Low flows in nearby rivers (2 months), Significant pollution incident nearby (4 weeks) and Significant pollution incident elsewhere (4 weeks) had a higher impact on households who supported environmental protection 'Regardless of cost' vis-à-vis those who didn't.

Table 23: Household impact scores by attitude to paying for environmental protection and improvement

	Env. protection & improvement regardless of cost	
	Yes	No
Sewer flooding: Inside your property (1 month)	35.1	24.4
Sewer flooding: Outside your property (1 week)	10.3	9.9
Emergency drought restrictions (2 months)	6.7	7.6
Do not drink notice (48hours)	4.8	6.4
Unexpected water supply interruption (24 hours)	5.0	7.5
Boil water notice (48 hours)	3.6	4.6
Unexpected water supply interruption (6 hours)	3.0	4.6
Significant pollution incident nearby (4 weeks)	3.2	2.8
Significant pollution incident elsewhere (4 weeks)	2.7	2.2
Water taste and smell (24 hours)	2.5	3.3
Discoloured water (24 hours)	2.2	3.2
Discoloured water (6 hours)	2.0	2.7
Water taste and smell (6 hours)	2.1	2.7
Planned water supply interruption (6 hours)	1.7	2.6
Unexpected low water pressure (6 hours)	1.8	2.3
Low flows in rivers nearby (2 months)	1.9	1.6
River water nearby is not high quality	1.5	1.3
Low flows in rivers elsewhere (2 months)	1.5	1.4
Minor pollution incident nearby (1 day)	1.5	1.5
Storm overflow nearby (4 hours)	1.3	1.4
Hosepipe ban (5 months)	1.0	1.4
River water elsewhere is not high quality	1.1	1.0
Minor pollution incident elsewhere (1 day)	1.2	1.2
Storm overflow elsewhere (4 hours)	0.9	1.0
Coastal bathing water is neither excellent nor good	0.8	0.8
Coastal bathing water is not excellent quality	0.7	0.7

Note: Cells in light green/light red indicate an estimate that is significantly larger/lower, than the rest of the sample at the 5% significance level. Figures shown are impact scores, which sum to 100 within each segment
Base sample sizes: Environmental protection regardless of cost: Yes=5,331, No=7,238.

5.5.4. Summary

Overall, we find that the results were consistent with expectations:

- River or canal users had higher values for river-related service issues.
- Beach or sea users had higher values for coastal bathing water quality.
- Hosepipe or sprinkler users had higher values for hosepipe ban.
- Those with most pro-environment attitude had higher values for some of the environmental service issues.

6. SP2 Compensation Analysis and Findings

This section describes the analysis undertaken on the SP2 compensation exercise choice data and presents the findings from this analysis. It includes the following parts:

- Participant feedback and diagnostics from a descriptive analysis of the choice data and completion times (6.1)
- Econometric modelling, including details of how the core pivot service issue values were derived (6.2)
- Pivot service issue value estimates (6.3)
- Sensitivity analysis (6.4)
- Sub-population pivot value estimates (6.5)

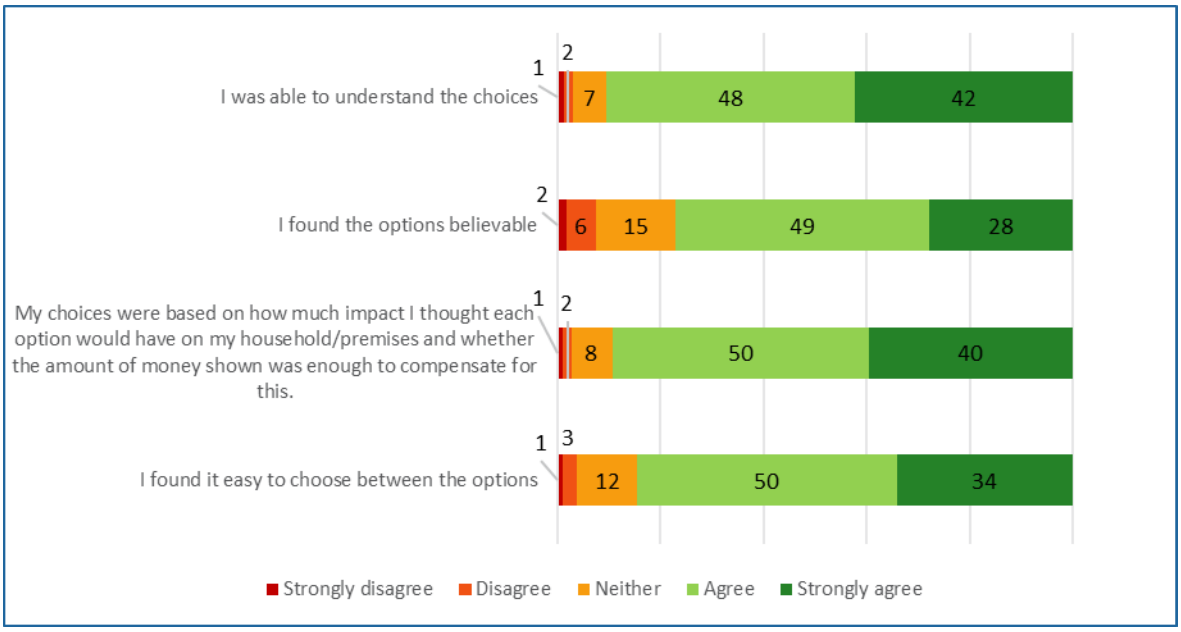
The findings presented in this section combine with the impact scores presented in the previous section to derive the main service issue valuation results reported in Section 7.

6.1. Participant feedback and choice diagnostics

6.1.1. Participant feedback

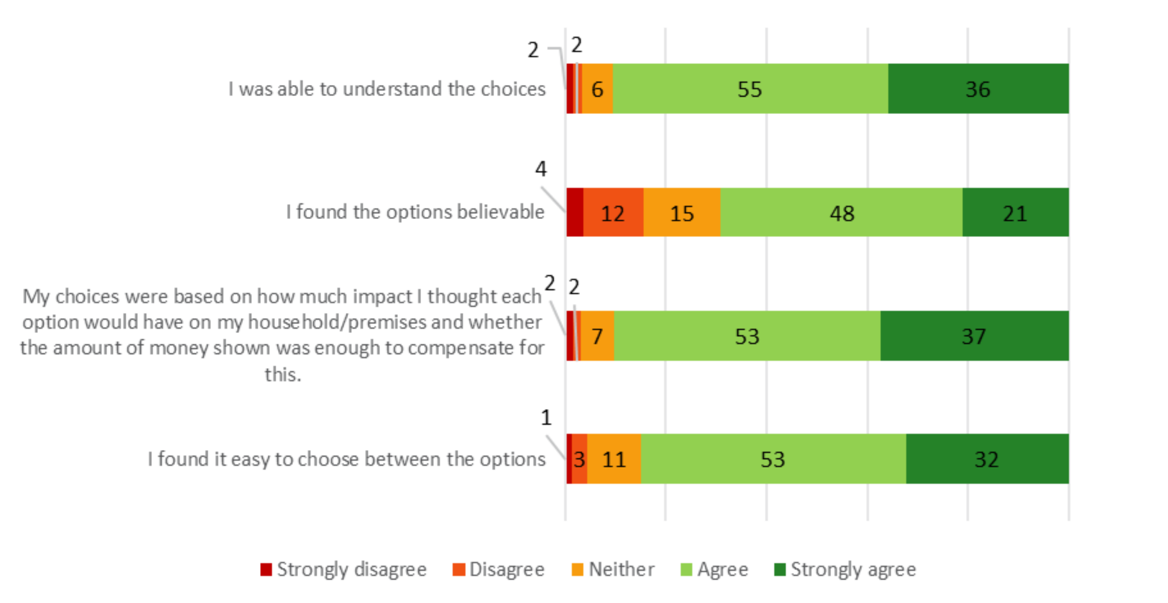
Feedback following the SP2 compensation exercise was positive from households as well as non-households. As shown in Figure 23 and Figure 24, only small proportions of participants disagreed a) that they were able to understand the choices; b) that they found the options believable; c) that their choices were based on how much impact each option would have on their household/premises and whether the amount of money shown was enough to compensate for this; and, d) that they found it easy to choose between the options.

Figure 23: SP2 household participant feedback



Note: Figures are in terms of proportion of participants. Base sample size: I was able to understand the choices (12,559); I found the options believable (12,557); My choices based on impact of option on household (12,552) and I found it easy to choose between options (12,560).

Figure 24: SP2 non-household participant feedback



Note: Figures are in terms of proportion of participants. Base sample size: 3,837

Overall, feedback from household participants for the SP2 exercise was slightly better than when compared to the SP1 exercise, with higher proportions of participants in the top 'strongly agree' and `agree' categories.

These findings provide support for considering the responses to the choice questions to be valid and meaningful in most cases.

6.1.2. Potentially invalid responses

In line with most CV surveys, some of the reasons given for choosing in a certain way could be considered to be invalid, in the sense of them not being based on the impact of the service issue in question and/or the sufficiency of the amount of compensation offered to them. This may be because they objected to the principle of accepting compensation, or they may have considered broader impacts on investment or service levels that were not intended to be considered within the valuation framework. Whether or not such responses should be excluded from analysis is a matter of debate amongst practitioners. However, it is considered best practice to identify such responses, and test the sensitivity to their exclusion within the analysis. [Johnstone et al, 2017]

In the survey, participants were given the opportunity after each CV question to enter the reasons for their choices verbatim. These responses were then coded. Table 24 and Table 25 present a frequency analysis of the coded reasons for not choosing to accept compensation offered for the Planned interruption and the Boil notice CV questions respectively. The frequencies, which are presented in terms of percentages, have been sorted in descending order of magnitude by the household category. For example, Table 24 shows that for the Planned interruption questions, 9.5% of the total household sample and 7.8% of the total non-household sample said that they did not accept the compensation since they preferred not to have any issues with their service. The results in Table 25 can be interpreted in a similar manner in case of the Boil notice questions.

Based on this analysis, we focussed on the following response categories as containing possibly invalid responses:

- Against idea/principle of compensation

- Cost to company-funds needed for investment
- Maintenance is necessary
- Pay for service to work
- Other reasons

The verbatim responses within each of the above categories were then examined to identify which of them could be considered potentially invalid. The responses that were categorised as potentially invalid cited one of the following reasons for not accepting compensation (see Table 26).

In total, based on this analysis, the following proportions of participants were identified as potentially invalid:

- **HH:** 4.6% of responses.
- **NHH:** 7.2% of responses.

These responses were used to identify sensitivity samples where the potentially invalid responses were removed. The results from this analysis are presented in Section 6.4.

Table 24: Coded reasons for not choosing to accept compensation offered: Planned interruption (6h)

Reasons for choosing not to accept compensation	Household (%)	Non-household (%)
No issues/prefer no issues	9.5	7.8
Prefer no disruption or interruption	8.3	8.8
Not interested in compensation/not a priority	7.4	7.9
Prefer/need good constant and reliable water supply	7.1	10.4
Direct impact on household/business	2.1	17.4
Good/better option-most appealing	2.0	0.6
Compensation is insufficient	2.0	1.6
No or little impact on household/business etc.	1.9	2.3
Ease/convenience	1.9	0.1
Prefer good service	1.7	4.3
Inconvenience	1.4	1.4
Notification should be given so can be planned	1.2	1.2
Against idea/principle of compensation	1.1	0.3
Maintenance is necessary	1.0	0.8
Prefer good safe and clean water quality	1.0	0.9
No particular reason	0.9	0.1
Because of time frame	0.9	1.1
Other	0.8	5.7
Don’t know	0.8	0.2
Pay for service to work	0.7	0.8
In favour of compensation	0.6	0.7
Cost to company-funds needed for investment	0.6	1.8
Compensation issues	0.5	0.4
Makes sense/most relevant	0.3	0.0
Prefer not to say	0.2	0.0
Compensation should be more substantial	0.2	0.2
Had to choose	0.1	0.1

Base: Households:12,567 and Non-households: 3,838. Not stated and not applicable observations are not included in the table.

Table 25: Coded reasons for not choosing to accept compensation offered: Boil notice (48h)

Reasons for choosing not to accept compensation	Household (%)	Non-household (%)
No issues/prefer no issues	13.9	10.1
Health implications	6.5	4.9
Prefer good safe and clean water quality	6.2	4.8
Prefer no disruption or interruption	6.2	7.0
Not interested in compensation/not a priority	5.6	8.1
Prefer/need good constant and reliable water supply	3.9	7.2
Compensation is insufficient	3.3	2.1
Good/better option-most appealing	3.3	1.4
Worried about cost of gas and electric	3.1	3.7
Prefer good service	2.3	3.1
No or little impact on household etc.	2.2	2.7
Ease/convenience	2.1	0.9
Direct impact on household/business	2.0	14.3
Against idea/principle of compensation	1.7	0.7
Pay for level of service	1.5	1.2
Inconvenience	1.1	2.4
In favour of compensation	1.0	0.9
Cost to company-funds needed for investment	0.9	0.8
Compensation issues	0.8	0.7
Maintenance is necessary	0.8	1.0
No/less worry	0.7	0.4
Makes sense/obvious	0.7	0.5
Issue too small -no compensation required	0.6	0.7
No particular reason	0.6	0.3
Other	0.6	2.9
No trust regarding water safety	0.5	0.2
Don’t know	0.5	0.2
Because of time frame	0.5	0.9
Haven’t had these issues before	0.5	0.4
Compensation should be more substantial	0.2	0.1
48 hours without safe water too long	0.2	0.2
Notification should be given to plan	0.2	0.8

Base: Households:12,567 and Non-households: 3,838. Not stated and not applicable observations are not included in the table.

Table 26: Invalid coded reasons for responses

Reason	Why treated as invalid?
Right to a good level of service	Suggests a rejection of the idea that compensation is appropriate
It would mean higher future costs for consumers	Considers the impact on others, hence not individual-specific value
In favour of using the money for investment purposes instead	Conflicts with value framework which holds other water and wastewater services fixed
Repair and maintenance are to be expected	Suggests a rejection of the idea that compensation is appropriate
Do not believe that water companies will actually pay them the compensation	Disbelief in the maintained payment vehicle
If service interruptions are planned or of short duration	Suggests that interruptions are not sufficiently impactful to warrant compensation
For ethical reasons for e.g. compensation seems like bribery	Suggests a rejection of the idea that compensation is appropriate

6.1.3. SP2 Completion time

The average time taken to complete the SP2 exercise by household and non-household participants were around 1 minute 52 seconds and 2 minutes 12 seconds respectively. The quickest 25% of the household sample completed the exercise in 54 seconds or less, while the quickest 25% of non-household participants completed the exercise in 68 seconds or less. (See Table 27 below).

Table 27: Distribution of SP2 completion times

Proportion of participants	Households	Non-households
1%	15 seconds	25 seconds
5%	27 seconds	38 seconds
10%	36 seconds	47 seconds
25%	54 seconds	68 seconds
50%	87 seconds	102 seconds
75%	136 seconds	154 seconds
90%	210 seconds	234 seconds
95%	273 seconds	313 seconds
99%	507 seconds	620 seconds

Base sample size: HH:12,567 and NHH:3,269 (NHH base excludes 569 participants, mainly CATI, for whom SP2 time was not recorded in error.)

As in the case of SP1, we test the sensitivities of the key findings from the SP2 choice exercise to excluding participants whose completion time was less than the 10th percentile; and to excluding those whose completion time was less than the 25th percentile. Section 6.4 presents the results from this analysis).

6.2. Econometric modelling

6.2.1. Core model development

A preliminary econometric analysis was undertaken to explore a number of key issues and alternatives with respect to model specification. These issues, and the approach adopted to model specification are briefly discussed in the following:

- **Non-parametric vs parametric**

  Parametric models impose a smooth value distribution on top of the choice data, with a small number of parameters, e.g. mean and standard deviation, being estimated. Non-parametric models, by contrast, involve estimating the proportions of the population willing to accept each level of compensation shown in the survey. Non-parametric models are less restrictive, but are also less smooth than parametric models and less statistically efficient.

  Following an initial exploration of the non-parametric model as above, it was decided to proceed with parametric models.

- **Analysis of Q2 effects**

  A number of studies within the contingent valuation literature have found evidence that answers to the second question (Q2) in a double-bounded contingent valuation exercise are different from answers to the first question (Q1) in the exercise. This is in the sense that they have appeared not to have been drawn from the same value distribution. (See, e.g., Cameron and Quiggin, 1994; De Shazo, 2002). In a preliminary econometric analysis, this issue was explored via a series of models that allowed for such differences. These models were compared to interval-censored regression models that combined the Q1 and Q2 responses into a single dependent variable that took the form of an interval between minimum and maximum willingness to accept, as revealed by the responses to these two questions. On the basis of this initial analysis, it was decided that Q1 and Q2 data should be combined within the interval modelling framework, estimated via maximum likelihood estimation (MLE). This was principally on the basis that there appeared to be no significant 'Q2 effect' on estimated values, and the interval models were the most statistically efficient.

- **Choice of estimator and value distribution in parametric models**

  On the basis of a preliminary econometric analysis, it was decided to proceed with a panel-data version of the interval regression model, that included the responses to questions on both pivot service issues within a single model. This allowed for within-participant correlation of values across pivot choices, which was to be expected. Details of this model specification are given below.

6.2.2. Core model specification

The interval censored framework is straightforward to implement in a maximum likelihood context. Let WTA_n be our interval-censored WTA variable for participant *n*. If we model this as a linear function of explanatory variables x_n plus an i.i.d. error term ε_n with mean zero and variance σ^2, then we have:

(18) $$Prob(y_n) = F\left(\frac{y_n^U - \beta' x_n}{\sigma}\right) - F\left(\frac{y_n^L - \beta' x_n}{\sigma}\right),$$

which implies the following log-likelihood:

(19) $$LL = \sum_n \log[Prob(y_n)]$$

A distributional assumption is required for *F*(.) to implement the estimation. We chose the log-normal because it ensures that WTP is non-negative (a problem with the normal) and it is straightforward to implement.

In the panel context, where we had two responses per person, indexed by *k*, we thus let y_{nk} = log(WTA_{nk}) and defined lower and upper bounds accordingly, where WTA_{nk} is the willingness to accept by respondent *n* for pivot service issue k. *F*(.) is then simply the standard normal cumulative distribution.

Let t_1 be the compensation amount offered in the first question and t_2 be the compensation amount offered in the follow-up question. The dependent variable was then coded into one of the following categories:

- **YY** - The participant answered *yes* to the first question (accepts the compensation offered) and *yes* to the second question i.e. $t_2 < t_1$. In this case, $0 < WTA < t_2$
- **YN** - The participant answered *yes* to the first question and *no* to the second question i.e. $t_2 < t_1$. In this case, $t_2 < WTA < t_1$
- **NY** - The participant answered *no* to the first question and *yes* to the second question i.e. $t_2 > t_1$. In this case, $t_1 < WTA < t_2$
- NN - The participant answered *no* to the first question and *no* to the second question i.e. $t_2 > t_1$. In this case, $t_2 < WTA < \infty$

In the second and third cases, we had well-defined intervals for the log of WTA for each participant. The intervals for the log of WTA in the first and fourth cases, however, were left-censored and right-censored respectively.

The above log likelihood is based on the assumption that error terms are independent of one another. Independence is unlikely, however, when responses to both CV questions are combined. To take account of within-person correlation between responses, our core model estimates are based on a random effects panel version of the above model which involves decomposing the error term into an individual specific effect, u_n, assumed to be normally distributed with mean zero and variance σ^2_u and an i.i.d. normal variate with mean zero and variance σ^2_e.

The Stata software package (StataCorp, 2021) was used for the analysis. The models were estimated using the 'xtintreg' command.

Based on the preliminary econometric analysis, it was decided to combine all household data within a single household model, and all non-household data within a single non-household model, rather than proceed with separate models for each company. This allowed for separate value estimates to be obtained for each company via the use of company dummy variables.

Weighting to company populations was achieved via the inclusion of demographic and socio-economic dummy variables, rather than via the inclusion of weights directly within the log likelihood function. Under this approach, separate values were obtained for each segment within each company, and aggregated to population-level values for each company using within-company population proportions as obtained from external data (Census for households; BEIS business population estimates for non-households).

6.2.3. Core model estimation results

Table 28 and Table 29 present the panel-data interval regression results for estimation of ln(WTA) for household and non-household water companies respectively.[8]. The explanatory variables in

---

[8] Household and non-household econometric models for wastewater companies as well as company-specific WTA values were contained in the 3524 Collaborative ODI Research SP Results Workbook ("3524m_SPResults.xlsx") shared with Ofwat and the water companies in January, 2023.

both the models consist of interaction terms of the two pivot service attribute dummy variables i.e. a planned water supply interruption lasting 6 hours (PlannedInt6), and a Boil notice (Boil) with the company dummy variables and demographic and socio-economic dummy variables.

Table 28 shows that the amounts of money needed to compensate household customers were higher across all water companies for a boil water incident than for a planned water supply interruption (6h). In the case of a planned water supply interruption (6h), the required compensation amounts were significantly higher amongst female household customers ($p<.05$). A strong age effect was also observed with higher required compensation amongst older age groups than younger ones. Household customers in the AB and DE socioeconomic grades had higher required compensation than the C1C2 group, however, the differences were not statistically significant ($p>.05$). In the case of a boil water incident, a strong statistically significant age effect was again observed with higher required compensation amongst older age groups than younger ones. Household customers in the AB socioeconomic grades also required significantly higher compensation than those in the C1C2 group.

Table 29 presents the non-household model results. The results show that, overall, the required compensation amongst non-household customers for a boil water incident was again higher when compared to a planned water supply interruption (6h).

In the case of planned water supply interruptions, the values associated with Bristol Water and Welsh Water were lower when compared to customers of all the other water companies. This is indicated by the negative coefficient estimates for the interaction terms between planned water supply interruptions and the indicator variables for Bristol Water and Welsh Water (i.e. PlannedInt6_WatBRL and PlannedInt6_WatWSH).

For both a planned water supply interruption (6h) and a boil water incident, values for non-household water customers with a large number of employees i.e. 50-249, 250+ were higher when compared to the base group of non-households with 1-49 employees. The negative coefficient estimates for the interaction terms between planned water supply interruption and non-household water customers with zero employees/ sole traders as well as boil water incident and sole traders (i.e. PlannedInt6_NrEmp_0 and Boil_NrEmp_0) indicates that the willingness of these sole traders to accept compensation was lower when compared to the base group of non-households with 1-49 employees. However, while the interaction term between planned water supply interruption and sole traders (i.e. PlannedInt6_NrEmp_0) was statistically significant ($p<.05$), the interaction term between boil water incident and sole traders (i.e. Boil_NrEmp_0) was not statistically significant ($p>.05$). Thus while the 95% confidence intervals for the coefficient estimate of PlannedInt6_NrEmp_0 does not contain zero, the corresponding confidence interval for the coefficient estimate of Boil_NrEmp_0 overlaps zero.

The model results also include the overall and panel-level variance components (*/sigma_u and /sigma_e*) along with *rho* which is the proportion of the total variance contributed by the panel-level variance component. If the value of *rho* is zero, then the panel-level variance component is not important so that the panel estimator is similar to the pooled estimator. The likelihood-ratio test of this is included at the bottom of the model estimation results. This test compares the pooled estimator (interval regression) with the panel estimator. In both cases, we reject the null hypothesis that there are no panel-level effects.

Table 28:SP2 household econometric model for all water companies in England and Wales

	Coefficient	Std. err.	z	P>z	[95% conf.	interval]
PlannedInt6_WatAFW	4.289	0.152	28.17	0.000	3.991	4.588
PlannedInt6_WatANH	3.690	0.149	24.75	0.000	3.398	3.982
PlannedInt6_WatBRL	3.922	0.151	26.01	0.000	3.627	4.218
PlannedInt6_WatHDD	4.003	0.175	22.85	0.000	3.660	4.346
PlannedInt6_WatNES	4.055	0.105	38.76	0.000	3.850	4.260
PlannedInt6_WatPRT	3.945	0.150	26.35	0.000	3.652	4.238
PlannedInt6_WatSVE	3.854	0.113	34.07	0.000	3.632	4.075
PlannedInt6_WatSEW	3.574	0.149	23.93	0.000	3.282	3.867
PlannedInt6_WatSRN	3.801	0.123	30.87	0.000	3.559	4.042
PlannedInt6_WatSSC	4.092	0.141	29.05	0.000	3.816	4.368
PlannedInt6_WatSWB	3.889	0.140	27.84	0.000	3.615	4.163
PlannedInt6_WatSES	4.047	0.152	26.68	0.000	3.750	4.345
PlannedInt6_WatTMS	3.732	0.113	32.91	0.000	3.509	3.954
PlannedInt6_WatUUW	3.771	0.089	42.24	0.000	3.596	3.946
PlannedInt6_WatWSH	3.897	0.125	31.09	0.000	3.652	4.143
PlannedInt6_WatWSX	3.844	0.151	25.53	0.000	3.549	4.139
PlannedInt6_WatYKY	3.754	0.151	24.91	0.000	3.458	4.049
PlannedInt6_Female	0.153	0.057	2.69	0.007	0.041	0.264
PlannedInt6_SEG_AB	0.067	0.075	0.90	0.370	-0.080	0.215
PlannedInt6_SEG_DE	0.026	0.097	0.27	0.791	-0.165	0.217
PlannedInt6_SEG_Mis	0.358	0.150	2.38	0.017	0.063	0.652
PlannedInt6_Age18_29	-0.523	0.101	-5.17	0.000	-0.721	-0.325
PlannedInt6_Age65plus	0.773	0.076	10.10	0.000	0.623	0.922
PlannedInt6_AgeMis	0.169	0.332	0.51	0.610	-0.481	0.819
Boil_WatAFW	5.348	0.153	34.93	0.000	5.048	5.648
Boil_WatANH	4.965	0.149	33.30	0.000	4.673	5.258
Boil_WatBRL	5.085	0.153	33.23	0.000	4.785	5.385
Boil_WatHDD	5.122	0.177	28.91	0.000	4.775	5.470
Boil_WatNES	5.385	0.106	50.98	0.000	5.178	5.592
Boil_WatPRT	5.300	0.151	35.11	0.000	5.004	5.596
Boil_WatSVE	5.078	0.114	44.60	0.000	4.855	5.301
Boil_WatSEW	5.185	0.151	34.30	0.000	4.889	5.482
Boil_WatSRN	5.150	0.124	41.67	0.000	4.907	5.392
Boil_WatSSC	5.454	0.142	38.34	0.000	5.175	5.733
Boil_WatSWB	5.265	0.141	37.37	0.000	4.989	5.541
Boil_WatSES	5.237	0.153	34.28	0.000	4.938	5.537
Boil_WatTMS	5.149	0.114	45.14	0.000	4.925	5.372
Boil_WatUUW	4.927	0.090	54.94	0.000	4.751	5.102
Boil_WatWSH	5.125	0.125	40.85	0.000	4.879	5.371
Boil_WatWSX	5.114	0.152	33.67	0.000	4.816	5.412
Boil_WatYKY	4.760	0.151	31.44	0.000	4.463	5.057
Boil_Female	0.050	0.057	0.87	0.384	-0.062	0.162
Boil_SEG_AB	0.181	0.075	2.40	0.016	0.033	0.329
Boil_SEG_DE	-0.100	0.097	-1.03	0.302	-0.290	0.090
Boil_SEG_Mis	0.261	0.152	1.72	0.085	-0.036	0.558
Boil_Age18_29	-0.673	0.101	-6.70	0.000	-0.871	-0.476
Boil_Age65plus	0.684	0.077	8.86	0.000	0.533	0.835
Boil_AgeMis	0.419	0.340	1.23	0.217	-0.247	1.085
/sigma_u	2.226	0.032	69.15	0.000	2.163	2.289
/sigma_e	1.531	0.018	87.29	0.000	1.496	1.565
rho	0.679	0.007			0.665	0.693

Number of households=12,557; Number of observations=25,114. The omitted categories for sex, SEG and age are Male, Seg C1C2 and Age 30-64 respectively.

Table 29: SP2 non-household econometric model for all water companies in England and Wales

	Coefficient	Std. err.	z	P>z	[95% conf.	interval]
PlannedInt6_WatAFW	0.752	0.347	2.17	0.030	0.072	1.433
PlannedInt6_WatANH	0.453	0.362	1.25	0.210	-0.255	1.162
PlannedInt6_WatBRL	-0.426	0.344	-1.24	0.215	-1.100	0.247
PlannedInt6_WatHDD	0.939	0.436	2.16	0.031	0.085	1.792
PlannedInt6_WatNES	0.930	0.317	2.93	0.003	0.308	1.553
PlannedInt6_WatPRT	0.470	0.357	1.31	0.189	-0.231	1.170
PlannedInt6_WatSVE	1.098	0.359	3.06	0.002	0.394	1.803
PlannedInt6_WatSEW	0.921	0.363	2.54	0.011	0.210	1.633
PlannedInt6_WatSRN	0.375	0.358	1.05	0.295	-0.326	1.076
PlannedInt6_WatSSC	0.623	0.361	1.73	0.085	-0.085	1.332
PlannedInt6_WatSWB	0.264	0.336	0.79	0.432	-0.394	0.921
PlannedInt6_WatSES	1.555	0.369	4.21	0.000	0.831	2.279
PlannedInt6_WatTMS	0.659	0.361	1.83	0.068	-0.048	1.366
PlannedInt6_WatUUW	0.299	0.316	0.95	0.344	-0.320	0.918
PlannedInt6_WatWSH	-0.050	0.260	-0.19	0.847	-0.561	0.460
PlannedInt6_WatWSX	0.104	0.349	0.30	0.766	-0.580	0.787
PlannedInt6_WatYKY	0.708	0.360	1.97	0.049	0.002	1.415
PlannedInt6_NrEmp_0	-0.731	0.246	-2.97	0.003	-1.213	-0.249
PlannedInt6_NrEmp_50_249	0.992	0.289	3.43	0.001	0.425	1.559
PlannedInt6_NrEmp_250plus	2.235	0.387	5.77	0.000	1.476	2.994
PlannedInt6_NrEmp_Miss	0.130	0.359	0.36	0.717	-0.573	0.833
Boil_WatAFW	1.835	0.351	5.23	0.000	1.147	2.522
Boil_WatANH	1.850	0.366	5.06	0.000	1.134	2.567
Boil_WatBRL	0.607	0.349	1.74	0.082	-0.077	1.291
Boil_WatHDD	1.956	0.443	4.41	0.000	1.087	2.824
Boil_WatNES	1.939	0.321	6.04	0.000	1.310	2.568
Boil_WatPRT	2.404	0.370	6.49	0.000	1.678	3.130
Boil_WatSVE	1.759	0.363	4.85	0.000	1.049	2.470
Boil_WatSEW	2.179	0.370	5.89	0.000	1.454	2.903
Boil_WatSRN	1.944	0.361	5.38	0.000	1.237	2.652
Boil_WatSSC	1.768	0.365	4.84	0.000	1.053	2.484
Boil_WatSWB	1.468	0.338	4.34	0.000	0.805	2.131
Boil_WatSES	1.864	0.370	5.04	0.000	1.139	2.589
Boil_WatTMS	1.791	0.368	4.87	0.000	1.070	2.513
Boil_WatUUW	1.252	0.313	4.00	0.000	0.638	1.866
Boil_WatWSH	1.476	0.261	5.66	0.000	0.965	1.986
Boil_WatWSX	1.331	0.355	3.75	0.000	0.636	2.026
Boil_WatYKY	1.358	0.359	3.78	0.000	0.654	2.062
Boil_NrEmp_0	-0.097	0.246	-0.40	0.692	-0.580	0.385
Boil_NrEmp_50_249	1.069	0.297	3.60	0.000	0.488	1.650
Boil_NrEmp_250plus	2.431	0.410	5.93	0.000	1.627	3.235
Boil_NrEmp_Miss	0.104	0.361	0.29	0.774	-0.604	0.811
/sigma_u	3.662	0.110	33.20	0.000	3.446	3.878
/sigma_e	2.246	0.050	45.00	0.000	2.148	2.344
rho	0.727	0.012			0.702	0.750

Number of non-households= 3,837; Number of observations= 7,674. The omitted category for number of employees is 1-49.

Overall, no issues were identified with respect to the core econometric model estimates, and they were therefore taken forward as the basis for deriving WTA values for the two pivot service issues.

6.2.4. Derivation of pivot service issue values

The approach to generating weighted WTA estimates for PlannedInt6 and Boil for each customer type and company consisted of the following steps:

- We computed the sum of *Attribute_Covariate* coefficients for each combination of covariates. For example, the combined *PlannedInt6* coefficient for Female, AB, 18-29 households in the Affinity Water area was calculated as the sum of the coefficients of *PlannedInt6_WatAFW*, *PlannedInt6_Female*, *PlannedInt6_SEG_AB* and *PlannedInt6_Age18_29*.
- Next, we computed the sum of weights for that combination, aggregating over the sample.
- We then derived a weighted mean, standard error, and lower/upper bounds for the 95% confidence interval for ln(WTA), based directly on the weighted combined coefficients
- Next, we derived the weighted mean, standard error, and lower/upper bounds for the 95% confidence interval for median WTA by simply calculating the exponential of ln(WTA).

Following the discussion in Section 2.3, the median WTA rather than the mean WTA measure was considered to be practically and conceptually more appealing as the target measure of value for the present study. On practical grounds, the mean was expected to be extremely difficult, if not impossible, to estimate reliably using the compensation exercise. This is because the pre-testing and cognitive testing work had found that a significant proportion of participants chose to reject the compensation even at extremely high levels of compensation. This made it difficult to robustly pin down the upper tail of the WTA distribution. The median measure, by contrast, could be more reliably estimated as it does not rely on capturing data on the shape of the distribution. It only requires knowledge of the price point at which 50% would accept and 50% would reject. The median measure of value was also considered to be preferable on conceptual grounds. The median measures the value to the average household/non-household; the mean, by contrast, tends to be skewed towards a higher value than the majority would hold due to the influence of an upper tail with very high WTA values. A key advantage of the median is that it is not at all susceptible to influence from outliers with extremely high values.

Notwithstanding the merits of the approach taken, one can envisage a counterfactual set of results wherein estimates of mean WTA values are considered for the pivot service issues. In such a case, however, we would expect the WTA values to be much higher than the estimated values. This is due to the properties of the log-normal distribution, wherein the mean of the distribution is related to the median of the distribution as follows:

$\text{Mean}=\text{Median}*\exp(0.5*\text{sigma\_u}^2)$

Considering the estimation results in Table 28 as an example, this would imply that the mean WTA values for households would be computed as:

$\text{Mean WTA}=\text{Median WTA}*\exp[0.5*(2.226^2)]=\text{Median WTA}*11.8 \approx 12*\text{Median WTA}$

However, due to the aforementioned conceptual and practical considerations, the median WTA is adopted as the target measure of value for the compensation exercise.

6.2.5. Sub-population analysis

For the sub-population analysis, a simplified version of the model was adopted, which focused directly on testing the difference in values for each pivot service issue between each segment and its complement. Essentially, one model was estimated for each segment examined containing one dummy variable for each of the two pivot service issues, and an additional variable for each pivot service issues interacted with a dummy variables indicating the segment in question. In each case, t-tests were performed on the coefficients of the interaction variables to identify the statistical significance of differences between the segment *s* and its complement for each of the two pivot service issues. Median WTA values were then straightforwardly derived from the coefficients for both segment s, and its complement.

Because of a slightly different approach was applied to generate the sub-population results from the main results, the sub-population results should not be expected to combine to return the main results for the full population.

6.3. Pivot service issue values

6.3.1. Main values from core model

A set of weighted WTA estimates for PlannedInt6 and Boil for England & Wales, England, and Wales as well as all the water/wastewater companies were generated from the SP2 econometric analysis described above. Table 30 presents the median WTA values for the two pivot service issues included in the SP2 choice exercise i.e. both a planned water supply interruption (6h) (PlannedInt6) and a boil water incident (Boil) for household and non-household customers. For the HH sample, results are in GBP per avoided service issue, while for the NHH sample they are (initially) in multiples of the current annual water and sewerage bill per avoided service issue.

These tables of results show that:

- Regardless of the sample (HH/NHH), and region (England/Wales), the median willingness to accept compensation for a boil water notice (48 hours) was substantially higher when compared with a planned water supply interruption lasting 6 hours. For households in England & Wales, the median WTA value estimate for avoiding a planned water supply interruption lasting 6 hours was £55.93; while for a boil notice it was £177.46.
- The household WTA values for both service issues were somewhat higher in Wales than in England, although the confidence intervals overlapped.
- The WTA values for a planned water supply interruption were slightly higher in case of the English non-household customers, when compared with their Welsh counterpart.

Table 30: Median WTA values for pivot service issues

	England and Wales			England			Wales		
	WTA	95% Conf. int.		WTA	95% Conf. int.		WTA	95% Conf. int.	
Households									
PlannedInt6	**55.93**	54.64	57.25	**55.63**	54.30	57.00	**61.31**	56.78	66.20
Boil	**177.46**	173.35	181.66	**177.00**	172.74	181.37	**185.40**	171.68	200.21
Non-households									
PlannedInt6	**3.32**	2.93	3.75	**3.42**	3.00	3.90	**2.33**	1.69	3.21
Boil	**11.52**	10.15	13.06	**11.49**	10.05	13.13	**11.84**	8.51	16.49

(1) Median HH WTA values and confidence intervals are shown in GBP per avoided service issue.
(2) Median NHH WTA values and confidence intervals are shown in multiples of the water and wastewater bill per avoided service issue.

6.3.2. Non-parametric results for comparison

Non-parametric methods were used to obtain estimates of the proportions of customers accepting compensation at each level. This analysis was undertaken to complement the core model estimation as a benchmark comparison.

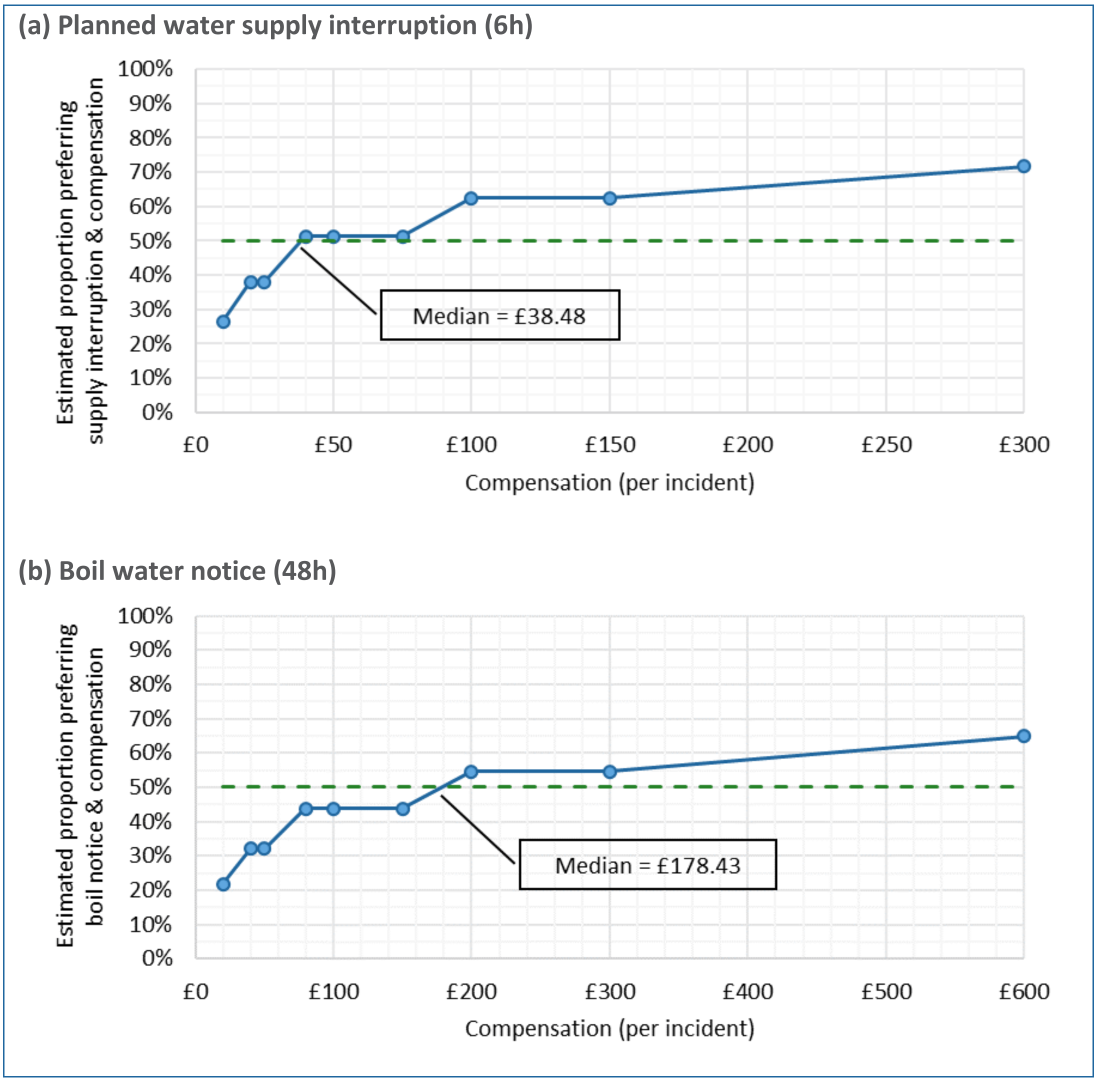
The estimated proportions of customers preferring to experience the service issues and receive compensation are shown in Figure 25 for households and in Figure 26 for non-households[9]. The results in panel (b) of Figure 26 show, for example, that around 35% of non-household customers were willing to accept (WTA) a compensation amount of double their annual water and wastewater bill in the event of a boil water notice lasting 48 hours. Thus, the curves show a section of the estimated cumulative WTA distribution.

The median WTA values shown on the figures were calculated by linearly interpolating between the relevant probability estimates. For households, the median of £178 for 'Boil water notice' is nearly identical to the estimate obtained using a parametric model (see Table 30). By contrast, the median of £38 for 'Planned water supply interruption (6h)' is around 30% lower than the parametric estimate. This divergence is explained by the fact that the region of the cumulative distribution around the 50th percentile is extremely flat, which corresponds to an imprecise estimate of the non-parametric estimate of median WTA.

For non-households, the interpolated medians of 5.3 times the bill (supply interruption) and 9.2 times the bill (boil notice) are around 60% higher and 20% lower, respectively, than the parametric estimates. Medians derived by interpolation can be quite sensitive to assumptions about the shape of the distribution function (linear vs non-linear), especially in cases where the interpolation range between the relevant compensation amounts is relatively wide, as happens to be the case for non-households. The region of the cumulative distribution around the 50th percentile is also quite flat for the Planned water supply interruption (6h' service issue for non-households, which corresponds to an imprecise estimate of the non-parametric estimate of median WTA.

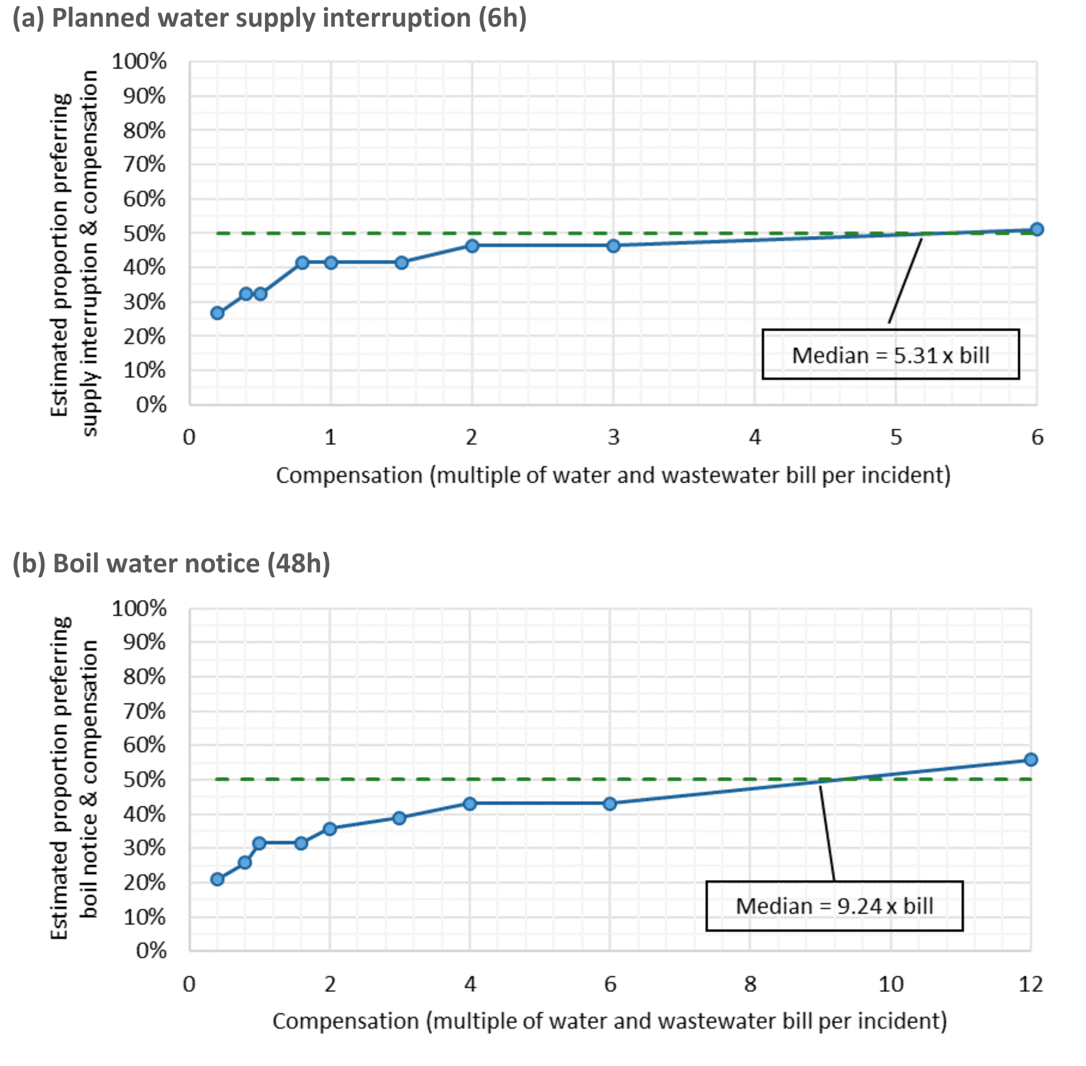
[9] The proportions are weighted non-parametric maximum-likelihood estimates obtained from the *icenReg* package for the R environment (R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/). See Anderson-Bergman, C. (2017). *icenReg*: Regression Models for Interval Censored Data in R. Journal of Statistical Software, 81(12), 1-23. See Day (2007) for a discussion of non-parametric maximum-likelihood estimation for interval-censored data.

Figure 25: Proportions of households preferring compensation



Non-parametric maximum-likelihood estimates (weighted); Number of households=12,557.

Figure 26: Proportions of non-households preferring compensation



Non-parametric maximum-likelihood estimates (weighted); Number of non-households=3,837.

6.4. Sensitivity analysis

The sensitivity of the WTA values to exclusion of potentially invalid responses was examined. (See Section 6.1 for details of how these were identified.) The results in Table 31 show that, for households, WTA values were 12% and 14% lower for planned water supply interruptions (6h) and boil water notice (48h) respectively, when potentially invalid responses were excluded from the analysis. For non-households, WTA values were 29% and 30% lower for planned water supply interruptions (6h) and boil water notice (48h) respectively, when potentially invalid responses were excluded from the sample.

Table 31: SP2 sensitivity test results

	Median WTA (E&W)(1)		Difference (%)
	Full sample	Excluding potentially invalid	
Households			
Planned water supply interruption (6h)	55.93	49.19	**-12%**
Boil water notice (48h)	177.46	152.81	**-14%**
Non-households			
Planned water supply interruption (6h)	3.32	2.34	**-29%**
Boil water notice (48h)	11.52	8.10	**-30%**

Base sample sizes: HH=12,557; NHH=3,606.
(1) Median HH WTA values and confidence intervals are shown in GBP per avoided service issue.
(2) Median NHH WTA values and confidence intervals are shown in multiples of the water and wastewater bill per avoided service issue.

Whether or not these invalid responses should be excluded from the main analysis is a matter of debate amongst practitioners. Following best practice guidelines for stated preference research [Johnstone et al, 2017] we included all responses to generate the main results and tested the sensitivity to their exclusion within the analysis as described above.

6.5. Sub-population results

As in the case of SP1, a segmentation analysis was undertaken to explore how preferences varied across the population. Each segment's WTA values were compared against the WTA values of the complement segment 'Other' and t-tests were used to test for statistically significant differences. Significant differences in WTA values for the two pivot service attributes across household and non-household segments are shown in Table 32 and Table 33 respectively.

Because of a slightly different approach was applied to generate the sub-population results from the main results, the sub-population results should not be expected to combine to return the main results for the full population.

The light green/light red cells for any given segment indicate that the WTA values for that segment is higher/lower compared to customers in the complement segment 'Other', the difference in WTA values across segments being statistically significant at the 5% level. The cells in light yellow for any given segment indicate that the WTA values were insignificantly different from those of other customers.

In the case of households, Table 32 shows the following findings:

- Customers aged 65 and above had significantly higher WTA values for both planned water supply interruptions (6h) and boil notice (48h) when compared to customers in all other age groups.
- Rural households had significantly higher WTA values for both planned interruptions (6h) and boil water notice (48h) when compared to urban households.
- Household customers belonging to the AB SEG category had higher required compensation and DE's had lower required compensation for a boil water notice, but no significant differences were estimated for a planned interruption.

- Household customers in financial vulnerability were willing to accept lower compensation amounts, as expected.
- Those with life stage vulnerability (mainly due to having one or more over 75 year old in the household) had higher required compensation., consistent with the age effect.

For non-households, Table 33 shows the following findings:

- WTA values were significantly greater for both the pivot service issues for those with 50-249 and 250+ employees, when compared to their respective complement groups.
- Non-households which used water for supply of services had significantly higher WTA values for both the pivot service issues, when compared to non-households which used water for all other purposes.
- Non-households using water for manufacturing had a higher value for planned supply interruption but had no significant difference from others for a boil notice.

Table 32: Significant differences in WTA values for the pivot service issues across household segments (£/HH)

Service issue	Age			Gender		SEG			Urban vs. Rural		Vulnerability				
	18 to 29	30 to 64	65+	Female	Male	A / B	C1 / C2	D / E	Urban	Rural	Medical	Communication	Life	Financial	Any
Planned water supply interruption (6h)	27.5	51.2	101.2	55.2	50.7	47.5	42.0	45.9	44.7	68.0	61.4	55.4	89.3	38.3	59.2
Boil water notice (48h)	85.4	167.4	299.6	167.0	167.5	166.6	137.0	119.9	173.8	267.6	163.3	173.2	257.3	88.8	168.2

Note: Cells in light green/light red indicate an estimate that is significantly larger/lower, than the rest of the sample at the 5% significance level. Cells in light yellow indicate that the estimate is insignificantly different from the rest.

Base sample sizes: Age: 18 to 29= 1,068, 30-64= 7,777 and 65 and above= 3,630; Gender: Female=6,634, Male= 5,934; Seg: A/B=3,328, C1C2=3,635 and DE=1,466; Urban=5,780, Rural=1,346; Vulnerability: Medical= 2,082, Communication=1,713, Life=1,877, Financial=642 and Any=4,795

Table 33: Significant differences in WTA for the pivot service issues across non-household segments (Multiples of bill/NHH)

Service issue	Nr. of employees				Nr. of sites				Water use			
	0	1 to 49	50 to 249	250+	1	2-4	5-50	50+	Manufacturing	Supply of services	Ingredient of good/service provided	Domestic use
Planned water supply interruption (6h)	0.75	1.63	7.14	3.59	1.67	5.88	1.54	2.50	5.51	3.75	2.64	2.14
Boil water notice (48h)	3.18	4.88	21.36	10.67	4.92	11.83	8.22	14.86	6.18	10.23	6.79	7.15

Note: Base sample sizes: Number of employees: 0= 522; 1 to 49=2,477,50-249= 337 and 250+=126; Number of sites: 1= 2,596,2-4=650,5-50=245,50+=69; Water use: Manufacturing=377,Supply of services=820,Ingredient of good/service provided=1,031 and Domestic use=2,847.

7. Valuations of Service Issues

This section presents the main results from the study. It includes the following parts:

- A description of how the main results were derived from the SP1 and SP2 results already presented (7.1)
- A presentation of the core service issue valuation results for England and Wales (7.2)
- A discussion of how the values compare to those from PR19 valuation studies (7.3)

7.1. Derivation of values

Table 34 presents a worked example of how the core values were derived from the estimates from the SP2 compensation choice analysis and the SP1 impact choice analysis. In this table, there are two Impact index columns, one for each of the two pivot service issues. In each case, the relative impacts are the same, but the numbers in the 'Base=PlannedInt6' column are scaled so that the impact value of Planned Interruption (6h) equals 1; and the numbers in the 'Base=Boil' column are scaled so that the impact value of Boil water notice (48h) equals 1.

The table shows two Value columns, one for each pivot. In the PlannedInt6=£50 column, the SP2-derived value of the PlannedInt6 pivot, assumed to be equal to £50, has been multiplied by the Impact index, Base=PlannedInt6 data. In the Value, Boil=£120 column, the SP2-derived value of the Boil pivot, assumed to be equal to £120, has been multiplied by the Impact index, Base=Boil data. This results in two sets of values.

Table 34: Combining estimates: worked example

	Impact index		Value	
Service issue	Base=PlannedInt6	Base=Boil	PlannedInt6=£50	Boil=£120
Planned interruption (6h)	**1**	0.5	**£50**	£60
Boil water notice (48h)	2	**1**	£100	**£120**
Unexpected interruption (24h)	4	2	£200	£240
Internal sewer flooding	20	10	£1,000	£1,200

For the purpose of deriving a single central value, the two sets of values were combined as an inverse variance-weighted average. This used the inverses of the variances of the SP2-derived pivot value estimates as weights, which had the effect of giving greater weight to the values derived from the SP2-derived pivot values that were more precisely estimated.

The confidence ranges reported around these central estimates are not the statistical confidence interval around the inverse-variance weighted averages, assuming independence of estimates. Rather, the lower bound of the central estimate's confidence range is set to be the smaller of the lower bounds of the two sets of estimates, and the upper bound the larger of the upper bounds. This confidence range thereby captures uncertainty around the true value attributable to the choice of pivot. The reason for using this confidence range was to capture two sources of error: the sampling error which is purely statistical in nature and a conceptual error resulting from the sensitivity of the measured values to the choice of the pivot. The use of a statistical confidence interval that captures only the sampling error would have led to a false impression of the precision of the core estimates.

In the case of non-households, an additional final step was required, which was to convert the values originally derived in the form of multiples of the average water and wastewater bill into monetary values. This was achieved by calculating the average combined water and wastewater bill for each water company and each wastewater company and using this to scale the original units.

This calculation of average non-household water and wastewater bills was achieved by taking the following steps:

- Calculate average non-household water revenue for all water companies and average non-household wastewater revenue for all wastewater companies. APR 2022 data provided by Ofwat was used for this step.
- For each water company, calculate the proportion of non-household customers served by each wastewater company; and, for each wastewater company, calculate the proportion of non-household customers served by each water company. This step was achieved using the full population of postcodes held for non-household customers in England and Wales obtained for the purposes of sampling, and using GIS to assign each postcode to a water-wastewater stratum.
- Using these proportions, calculate the average wastewater revenue for each water company and the average water revenue for each wastewater company.
- Uprate average revenue to average bills using a gross retail margin of 8% for water and 10% for wastewater, where these margins were obtained from Ofwat (2022)[10]

This process obtained average bills that could be multiplied by the value estimates in their original units to obtain the final monetary value estimates.

7.2. Core valuation results

7.2.1. Households

Figure 27 shows the central value (median) and confidence range for all service issues, for England and Wales households[11]. These are directly proportional to the impact scores in Section 5.3 . Accordingly, the results show that the relative values are all in line with expectation, e.g.:

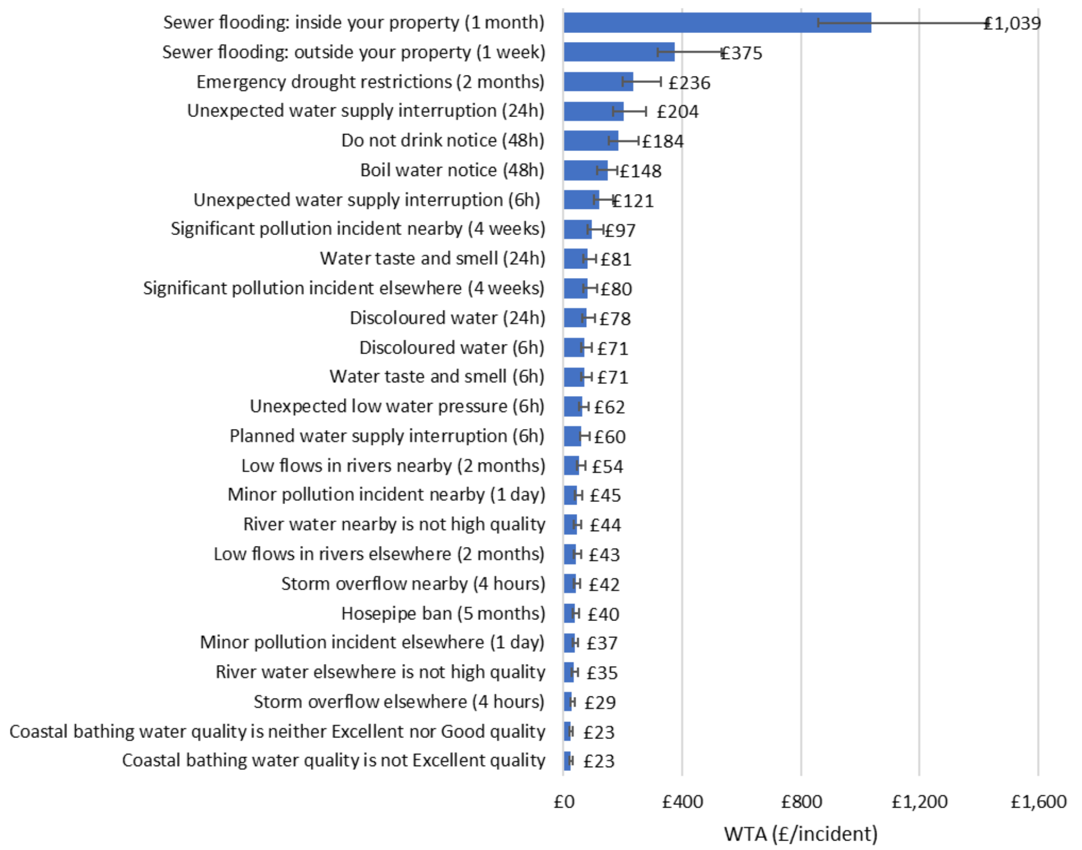
- Sewer flooding had the highest value of all service issues.
- Longer interruptions were more valued than shorter interruptions.
- Unexpected interruptions were more valued than planned interruptions.
- Do not drink notices were more valued than boil water notices of the same duration.
- Significant pollution incidents were more valued than minor pollution incidents.
- Environmental issues nearby were more valued than issues elsewhere in the region.

[10] Ofwat (2022) Business retail market: 2021-22 review of the Retail Exit Code - Consultation on proposals, Sep 2022, Table 1.
[11] Further results, including results for all companies individually, can be found in the accompanying Excel workbook.

The reasons for the values for sewer flooding being less reliably estimated in comparison with the values of other service issues, and being possibly biased downwards have been discussed in Section 5.3. Furthermore, it is possible that customers had in mind that they could claim compensation for damages in the event of sewer flooding. This would also result in the true additional value required, which is what we measure in our study, to be biased downwards. However, it also means that the true value of the sewer flooding incident should include these possible claimable damages. This could be calculated in principle for the purposes of an ODI.

Notwithstanding the fact that the estimated values for sewer flooding may have been understated in the present study, we note that the current compensation payments from wastewater companies to customers in the event of sewer flooding are limited to the maximum of £1,000 or the annual wastewater bill. This is in line with the internal sewer flooding values derived from our study.

Figure 27: Core E&W valuation results: Households



7.2.2. Non-households

Figure 28 shows comparable results for non-households in England and Wales. As for households, the relative values are broadly in line with expectation, e.g.,

- Sewer flooding had the highest value of all service issues.
- Longer interruptions were more valued than shorter interruptions.
- Unexpected interruptions were more valued than planned interruptions.
- Do not drink notices were more valued than boil water notices of the same duration.

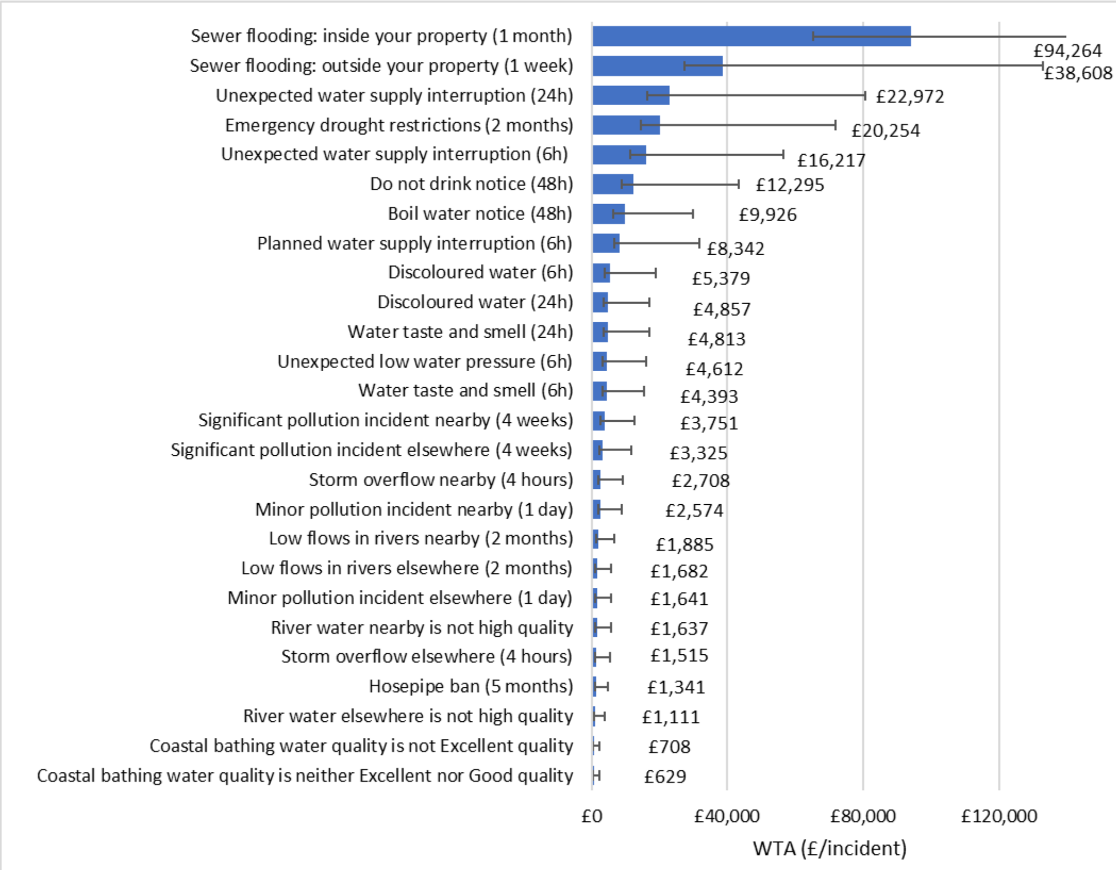
- Significant pollution incidents were more valued than minor pollution incidents.
- Environmental issues nearby were more valued than issues elsewhere in the region.

However, the results are much less precisely estimated than for households. This is driven by three factors: firstly, the sample sizes for non-households were smaller; secondly, there was more heterogeneity in the non-household population than in the household population; and thirdly, the choices made by non-households were less internally consistent than those made by households.

This latter point is evidenced by the fact that the relative impact of the two pivot service issues, Boil notice (48h) to Planned interruption (6h), was 3.8 when estimated from the SP2 compensation choice responses, whereas it was 1.0 when estimated via the SP1 Impact choice questions. By contrast, for households the relative values were much closer in alignment from the two exercises: 3.2 from the SP2 compensation choice responses, and 2.1 when estimated via the SP1 Impact choice questions.

Overall, the non-household results appear to be less reliable than the household results. This is borne out in the larger size of the confidence intervals for non-households in comparison to households.

Figure 28: Core E&W valuation results: Non-households



7.3. Comparison to PR19 values

The following presents a comparison of the core valuation results with values obtained from PR19 valuation studies. The list of comparable service measures is shown in Table 35 below. Service measures related to the environment were not directly comparable at this stage due to the fact that mapping is needed to determine the average sizes of the populations affected by environmental issues.

Table 35: PR19 vs. PR24: Comparable service measures

PR19 service measures	Service measures included in PR24 Collaborative ODI research
Discoloured water	Discoloured water (24h) Discoloured water (6h)
Non-Ideal taste and smell	Water taste and smell (24h) Water taste and smell (6h)
Water not safe to drink	Boil water notice (48h) Do not drink notice (48h)
Low water pressure	Unexpected low water pressure (6h)
Supply interruptions	Unexpected water supply interruption (6h) Unexpected water supply interruption (24h) Planned water supply interruptions (6h)
Drought restrictions	Emergency drought restrictions (2 months) Hosepipe ban (5 months)
Sewer flooding	Sewer flooding: inside your property (1 month) Sewer flooding: outside your property (1 week)

7.3.1. Discoloured water

Table 36 presents the core valuation results for discoloured water based on the present study. Table 37 shows unit values per avoided case of, or complaint about, discoloured water based on the PR19 valuation studies.

Table 37 shows that PR19 household unit values for discoloured water varied from £71 per property affected in the case of Study L to £9,881 per property affected for Study U. However, these values are not directly comparable to the values obtained from the present study because of variations in the definitions of discoloured water incidents (by frequency / persistence / duration) across studies.

The studies that valued complaints (E, I and T) had higher values than almost all the studies that valued discoloured water per property affected. This is consistent with the fact that only a portion of those affected by an incident will complain.

Studies that valued discoloured water incidents lasting for a long duration (J and U) had higher values compared to studies that valued discoloured water per property affected for shorter durations. Similarly, studies that valued discoloured water incidents lasting for 24 hours (C and D) but in which water was not safe to drink had higher values compared to the other studies. None of these values, however, were directly comparable to values obtained from the present study.

Studies that valued discoloured water incidents per property affected, lasting from a few hours up to 24 hours and in which water was safe to drink (L, Q and M) were somewhat comparable to values obtained from the present study. These values ranged from £71 per property affected to £165 per property affected for households. Comparison with these studies show that the values obtained from the present study (i.e. £71 for 6 hours and £78 for 24 hours; see Table 36) were within the PR19 range of values.

For non-households, the values reported by these comparable studies (L, Q and M) ranged from £419 per property affected to £1,132 per property affected. Comparison with these studies show that the values obtained from the present study for both incidents of discoloured water (i.e. £5,379 for 6 hours and £4,857 for 24 hours) were substantially higher than the PR19 values.

Table 36: Core E&W valuation results for Discoloured water

	Households			Non-households		
	Median value	95% Conf. int.		Median value	95% Conf. int.	
Discoloured water (24h)	**£78**	£65	£107	**£4,857**	£3,463	£16,876
Discoloured water (6h)	**£71**	£58	£97	**£5,379**	£3,832	£18,954

Note: Service measure unit is £ per incident

Table 37: PR19 customer valuation results for Discoloured water

		Value/incident	
Study	Unit	HH	NHH
L	1 property affected by discoloured water (few hours-up to 24 hours)	£71	£419
C	1 property affected by 1 discoloured water incident (24 hours)	£89	£1,144
D	1 property affected by 1 discoloured water incident (24 hours)	£274	£11,447
Q	1 property affected by discoloured water (few hours)	£107	---
M	1 property affected by discoloured water (few hours)	£165	£1,132
A	1 property affected by 1 tap water discolouration incident	£373	£1,036
J	1 property affected by discoloured water (a week)	£1,291	£2,775
U	1 property affected by persistent unpleasant colour of tap water	£9,881	£11,857
E	1 complaint about the appearance of tap water	£1,452	£4,779
I	1 complaint about discoloured water	£1,542	£1,120
T	1 complaint about discoloured water	£9,270	£1,607

Source: PJM-Accent (2018) report: Comparative Review of PR19 WTP results. All WTP values have been adjusted for inflation and are expressed in September 2022 prices. WTP values expressed as Unit value (£/incident)

7.3.2. Water taste and smell

Table 38 presents the core valuation results for non-ideal water taste and smell based on the present study. Table 39 shows unit values per avoided case of, or complaint about, non-ideal taste and smell based on the PR19 valuation studies.

Table 38: Core E&W valuation results for water taste and smell

	Households			Non-households		
	Median value	95% Conf. int.		Median value	95% Conf. int.	
Water taste and smell (24h)	**£81**	£67	£111	**£4,813**	£3,450	£17,021
Water taste and smell (6h)	**£71**	£58	£96	**£4,393**	£3,133	£15,448

Note: Service measure unit is £ per incident

Table 39: PR19 customer valuation results for water taste and smell

Study	Unit	HH	NHH
L	1 property affected by non-ideal taste and smell (few days)	£175	£955
C	1 property affected by 1 taste and smell incident for a period of 3 days	£274	£3,341
D	1 property affected by 1 taste and smell incident for a period of 3 days	£303	£17,765
M	1 property affected by non-ideal taste and smell (few days)	£316	£1,952
J	1 property affected by non-ideal taste and smell (few days)	£1,729	£3,950
Q	1 property affected by non-ideal taste and smell (few days)	£2,533	
G	1 property affected by non-ideal taste and smell (few days)	£45,425	£278,878
I	1 complaint about taste and smell	£2,171	£1,628
E	1 complaint about the taste and smell of tap water	£28,403	£73,888
T	1 complaint about non-ideal taste and smell	£57,333	£981,333

Source: PJM-Accent (2018) report: Comparative Review of PR19 WTP results. All WTP values have been adjusted for inflation and are expressed in September 2022 prices. WTP values expressed as Unit value (£/unit/year)

Table 39 shows that the PR19 household unit values varied from £175 in the case of Study L to £57,333 in the case of Study T. However, as before, these values are not directly comparable to the values obtained from the present study because of variations in the definitions of taste and smell incidents (by frequency/duration) across studies.

Like in the case of discoloured water, the studies that valued complaints (E, I and T) tended to have higher values than studies that valued taste and smell per property affected, which is consistent with the fact that only a portion of those affected by an incident will have complained. Studies C and D valued taste and smell incidents lasting for a period of 3 days. None of these values were hence directly comparable to values obtained from the present study.

The remaining studies (L, M, J,Q and G) valued taste and smell incidents lasting for a few days and in which water was safe to drink. The values reported by these studies varied from £175 per property affected to £45,425 per property affected for households and from £955 per property affected to £278,878 per property affected for non-households. Comparison with these studies show that the household values obtained from the present study for both taste and smell incidents (i.e. £71 for 6 hours and £81 for 24 hours) were much lower than the PR19 range of values. This was as expected, since the values reported by this study were expressed in terms of the willingness to accept compensation for a one-off water taste and smell incident lasting for a much shorter period of time i.e. 6 hours or 24 hours and in which water was safe to drink. Comparison for non-households showed that the values obtained from the present study for both incidents of taste and smell (i.e. £4,393 for 6 hours and £4,813 for 24 hours) were within the PR19 range of values.

7.3.3. Water not safe to drink

Table 40 presents the core valuation results for water not safe to drink based on the present study. Table 41 presents unit values for cases where customers' tap water was not safe to drink for a period of time based on the PR19 valuation studies.

Table 41 shows that the PR19 household unit values varied from £512 in the case of Study D to £75,992 in the case of Study T while the non-household unit values varied from £7,988 in the case of Study C to £9,482,320 in the case of Study T. The values for Study T appear as an outlier with substantially higher values than for C and D. However, the PR19 values were not directly comparable to the values obtained from the present study because of variations in the duration of the incidents across studies.

The values reported by the present study were expressed in terms of the willingness to accept compensation for a one-off water not safe to drink incident lasting for 2 days. As expected, therefore, the household values reported by this study for both the water not safe to drink incidents were lower than those reported by the PR19 studies. The non-household values reported by this study, however, lay within the PR19 range of values despite the duration being substantially shorter.

Table 40: Core E&W valuation results for Water not safe to drink

	Households			Non-households		
	Median value	95% Conf. int.		Median value	95% Conf. int.	
Do not drink notice (48h)	**£184**	£154	£253	**£12,295**	£8,739	£43,434
Boil water notice (48h)	**£148**	£112	£182	**£9,926**	£6,322	£29,852

Note: Service measure unit is £ per incident

Table 41: PR19 customer valuation results for Water not safe to drink

		Value per incident	
Study	Unit	HH	NHH
D	1 property where water is not safe to drink for a period of 2 weeks	£512	£31,387
C	1 property where water is not safe to drink for a period of 2 weeks	£651	£7,988
T	1 property affected by an incident of water not safe to drink	£75,992	£9,482,320

Source: PJM-Accent (2018) report: Comparative Review of PR19 WTP results. All WTP values have been adjusted for inflation and are expressed in September 2022 prices. WTP values expressed as Unit value (£/unit/year)

7.3.4. Low water pressure

Table 42 presents the core valuation results for low water pressure incident based on the present study. Table 43 presents unit values for properties affected by low water pressure based on PR19 valuation studies.

Table 43 shows that the PR19 household unit values varied from £25 in the case of Study D to £188,649 in the case of Study E while the non-household unit values ranged from £402 in the case of Study L to £631,973 in the case of Study E. Study E appears to be an outlier in this list with much higher values than found for other companies. Studies M and J which valued persistent low water pressure incidents were not directly comparable to the present study.

The remaining studies (D,C and L) valued low water pressure incidents occurring a number of times throughout the day and night or lasting for 3-6 hours. The values reported by these studies varied from £25 per property affected to £95 per property affected for households and from £402 per property affected to £2,129 per property affected for non-households. Comparisons with these studies showed that the household value obtained from the present study for a one-off low water pressure incident (i.e. £62 for 6 hours) was within the PR19 range of values. Comparison with non-households showed that the value obtained from this study for a one-off low water pressure incident (i.e. £4,612 for 6 hours) was higher than the PR19 values.

Table 42: Core E&W valuation results for Low water pressure

	Households			Non-households		
	Median value	95% Conf. int.		Median value	95% Conf. int.	
Unexpected low water pressure (6h)	**£62**	£51	£85	**£4,612**	£3,300	£16,221

Note: Service measure unit is £ per incident

Table 43: PR19 customer valuation results for Low water pressure

Study	Unit	Value per incident	
		HH	NHH
D	1 property affected by low water pressure (no. of times through day & night)	£25	£811
C	1 property affected by low water pressure (no. of times through day & night)	£83	£2,129
L	1 property affected by occasional low water pressure (3-6 hours)	£95	£402
M	1 property affected by persistent low water pressure	£500	£1,942
J	1 property affected by persistent low water pressure	£1,264	£2,166
E	1 property affected by reduced pressure to taps, showers and boilers	£188,649	£631,973

Source: PJM-Accent (2018) report: Comparative Review of PR19 WTP results. All WTP values have been adjusted for inflation and are expressed in September 2022 prices. WTP values expressed as Unit value (£/unit/year)

7.3.5. Supply interruptions

Table 44 presents the core valuation results for both unexpected and planned water supply interruptions from the present study. Table 45 presents values for avoided supply interruptions of various kinds based on PR19 valuation studies.

The values in Table 45 are ordered first by duration band and then by household value within each band. The largest values were found for the longest durations, as expected.

The PR19 unit values for planned water supply interruptions, lasting for greater than 3 hours, and lower than 12 hours, varied from £27 to £1,559 per property affected in the case of households and £839 to £6,131 per property affected in the case of non-households. The value reported by the present study for planned water supply interruptions lay within the PR19 range of values for households (i.e. £60). In contrast, the non-household value for planned supply interruptions obtained from the present study (i.e. £8,342) was substantially higher than the PR19 values.

The PR19 unit values for unexpected water supply interruptions, lasting for greater than 3 hours and lower than 24 hours, varied from £107 to £4,541 per property affected in the case of households and £1,142 to £77,970 per property affected in the case of non-households. The PR19 value for Study T which reported the value of unexpected supply interruptions per property affected (typically lasting around 6 hours) could be directly compared to the values obtained from the present study. Comparison with the values reported by Study T (i.e. £379 for households and £12,878 for non-households) showed that the household value from the present study (£121) was lower than the corresponding PR19 value, while the non-household value (£16,217) was higher.

The PR19 unit values for unexpected water supply interruptions, lasting for greater than 3 hours and for up to 24 hours, varied from £107 to £751 per property affected in the case of households and £1,142 to £15,441 per property affected in the case of non-households. The household value obtained from the present study (£204) was within the range of PR19 values, while the non-household value (£22,972) was higher than the corresponding PR19 values in most, but not all, cases.

Table 44: Core E&W valuation results for Supply interruptions

	Households			Non-households		
	Median value	95% Conf. int.		Median value	95% Conf. int.	
Unexpected water supply interruptions (24h)	**£204**	£167	£277	**£22,972**	£16,499	£80,515
Unexpected water supply interruptions (6h)	**£121**	£102	£167	**£16,217**	£11,542	£56,581
Planned water supply interruptions (6h)	**£60**	£55	£89	**£8,342**	£6,707	£31,646

Note: Service measure unit is £ per incident

Table 45: PR19 customer valuation results for Supply interruptions

		Value (£/incident)	
Study	Unit	HH	NHH
Supply interruptions >3 hours			
Q	1 property affected by a planned supply interruption (> 3 hours)	£27	
G	1 property affected by unexpected interruptions to supply lasting 3 hours or longer	£157	£1,142
Q	1 property affected by an unexpected supply interruption (> 3 hours)	£751	
I	1 property affected by planned or unplanned interruptions (<12 hours)	£1,559	£6,131
Supply interruptions 3-6 hours			
L	1 property affected by a planned interruption (3-6 hours)	£108	£839
L	1 property affected by an unplanned interruption (3-6 hours)	£162	£1,859
M	1 property affected by a planned interruption (3-6 hours)	£187	£1,884
M	1 property affected by an unexpected interruption (3-6 hours)	£335	£5,018
E	1 property affected (3-6 hours)	£368	£833
T	1 property affected by unplanned service interruptions (typically around 6 hours)	£379	£12,878
J	1 property affected by a short-term interruption to supply (3-6 hours)	£612	£2,999
Supply interruptions (4-8 hours)			
B	1 property affected by unexpected interruption to water supply (4-8 hours)	£4,541	£77,970
Supply interruptions (6-12 hours)			
L	1 property affected by a planned interruption (6-12 hours)	£144	£1,196
E	1 property affected (6-12 hours)	£207	£441
M	1 property affected by a planned interruption (6-12 hours)	£268	£2,228
L	1 property affected by an unplanned interruption (6-12 hours)	£341	£2,306
M	1 property affected by an unexpected interruption (6-12 hours)	£612	£5,583
J	1 property affected by a short-term interruption to supply (6-12 hours)	£688	£3,113
A	1 property affected by unplanned interruption to water supply (6-12 hours)	£1,120	£2,591
U	1 property affected by unexpected interruptions to water supply (6-12 hours)	£2,964	£1,976
Supply interruptions (<24 hours)			
D	1 property affected by an unexpected interruption (up to 24 hours)	£107	£4,379
L	1 property affected by a planned interruption (12-24 hours)	£208	£1,352
L	1 property affected by an unplanned interruption (12-24 hours)	£348	£3,161
C	1 property affected by an unexpected interruption (up to 24 hours)	£350	£15,441

Source: PJM-Accent (2018) report: Comparative Review of PR19 WTP results. All WTP values have been adjusted for inflation and are expressed in September 2022 prices. WTP values expressed as Unit value (£/unit/year)

7.3.6. Drought restrictions

Table 46 presents the core valuation results for drought restrictions based on the present study. Table 47 presents unit values, per property affected, for three types of drought restriction: temporary use bans, non-essential use bans and rota cuts and/or standpipes, based on PR19 valuation studies. Values were higher, as expected, for rota cuts and/or standpipes than for temporary use bans.

Table 47 shows that, while the PR19 unit values for temporary use/hosepipe bans lasting for 5 months in the case of households varied from £0 to £386 per property affected, the corresponding values for non-households varied from £152 to £36,219 per property affected.

Comparison with these studies show that both household and non-household values obtained from the present study (i.e. £40 for households and £1,341 for non-households) were contained within the range of PR19 values.

With respect to emergency drought restrictions, comparison with PR19 studies show that the household value obtained from the present study (i.e. £236) was broadly in line with, albeit at the low end, of the corresponding PR19 value range. The non-household values obtained from the present study (i.e. £20,254) was, by contrast, substantially higher than the corresponding PR19 values.

Table 46: Core E&W valuation results for Drought restrictions

	Households			Non-households		
	Median value	95% Conf. int.		Median value	95% Conf. int.	
Emergency drought restrictions (2 months)	**£236**	£198	£328	**£20,254**	£14,676	£71,858
Hosepipe ban (5 months)	**£40**	£33	£54	**£1,341**	£965	£4,789

Note: Service measure unit is £ per incident

Table 47: PR19 customer valuation results for Drought restrictions

Study	Unit	Value per incident	
		HH	NHH
Temporary use ban			
I	1 property affected by a temporary use ban (May - Sep)	£0	
G	1 property affected by a temporary use ban (5 months)	£38	
P	1 property affected by a hosepipe ban (May - Sep)	£43	£152
L	1 property affected by a hosepipe ban (May-Sep)	£45	£251
Q	1 property affected by a temporary use ban (May-Sep)	£64	
M	1 property affected by a hosepipe ban (May-Sep)	£115	£406
B	1 property affected by temporary water use restrictions	£125	£36,219
C	1 property affected by a hosepipe ban for 5 months from May to September	£128	£3,679
D	1 property affected by a hosepipe ban for 5 months from May to September	£184	£5,353
J	1 property affected by a temporary use ban (May-Sep)	£386	
Non-essential use ban			
I	1 property affected by a non-essential use ban		£0
G	1 property affected by a non-essential use ban (5 months, May - Sep)		£411
J	1 property affected by a non-essential use ban (May-Sep)		£631
Rota cuts and/or standpipes			
C	1 property affected by water use restrictions (standpipe) for 2 to 4 weeks	£51	£2,103
A	1 property experiences severe water restrictions	£131	£535
D	1 property affected by water use restrictions (standpipe) for 2 to 4 weeks	£184	£4,758
E	1 property affected by use of standpipes	£204	£929
I	1 property affected by restricted essential use of water lasting two months	£583	£0
L	1 property affected by a restriction on essential use of water (2 months)	£706	£5,181
G	1 property affected by water supply restricted to 3 hours per day for 2 months during a dry summer	£822	£6,337
M	1 property affected by a restriction on essential use of water (2 months)	£867	£5,849

Source: PJM-Accent (2018) report: Comparative Review of PR19 WTP results. All WTP values have been adjusted for inflation and are expressed in September 2022 prices. WTP values expressed as Unit value (£/unit/year)

7.3.7. Sewer flooding

Table 48 presents the core valuation results for sewer flooding based on the present study. Table 49 presents values for avoided cases of sewer flooding based on PR19 valuation studies. These are split into two types: internal sewer flooding and external sewer flooding outside properties. The values are presented in ascending order of household value within each of these groups.

A wide range of values is observed in Table 49, particularly in the case of internal sewer flooding where values ranged from £2,105 to £146,696 for households and from £11,198 to £2,643,657 for non-households. Similarly, in the case of external sewer flooding, values ranged from £848 to £16,326 for households and from £1,736 to £125,843 for non-households.

A direct comparison of the values obtained from the present study with the PR19 internal and external sewer flooding values is problematic since none of the studies report any information regarding the duration of these incidents. Further, all of the PR19 studies describe external sewer flooding incidents as affecting areas immediately outside customers' properties as well as customers' gardens. This is in contrast to the description of an external sewer flooding incident presented in the present study which was described as affecting only the access to customers' front door or entrance. Nonetheless, the household values for both types of flooding obtained from the present study were substantially lower than their corresponding PR19 values. In contrast, the non-household values for both types of flooding obtained from the present study were contained within the range of PR19 values.

Table 48: Core E&W valuation results for Sewer flooding

	Households			Non-households		
	Median value	Conf. int.		Median value	Conf int.	
Sewer flooding: inside your property (1 month)	**£1,039**	£860	£1,431	**£94,264**	£65,140	£323,579
Sewer flooding: outside your property (1 week)	**£375**	£318	£531	**£38,608**	£27,371	£133,139

Note: Service measure unit is £ per incident

Table 49: PR19 customer valuation results for Sewer flooding

Study	Unit	Value per incident	
		HH	NHH
Internal sewer flooding			
N	1 property affected by internal sewer flooding	£2,105	£17,429
M	1 property affected by internal sewer flooding	£5,552	£21,002
J	1 property affected by minor internal flooding, causing no lasting damage	£12,973	£36,171
F	1 property affected by sewer flooding inside peoples' homes	£21,467	
J	1 property affected by extensive internal flooding, making it uninhabitable	£21,517	£47,848
K	1 property affected by minor internal flooding, causing no lasting damage	£24,968	
O	1 property affected by internal sewer flooding	£29,347	£128,261
K	1 property affected by extensive internal flooding, making it uninhabitable	£60,555	
E	1 property affected by sewer flooding inside peoples' homes	£62,573	£398,733
Q	1 property affected by internal sewer flooding	£66,178	
T	1 property affected by internal sewer flooding	£69,375	£11,198
G	1 property affected by sewer flooding inside customers' properties	£72,251	£651,185
H	1 property affected by sewer flooding inside customers' properties	£115,766	£684,069
A	1 property affected by internal sewage flooding	£117,042	£207,293
B	1 property affected by internal sewage flooding	£146,696	£2,643,657
External sewer flooding			
N	1 property affected by sewer flooding immediately outside	£848	£8,135
M	1 property affected by sewer flooding immediately outside	£2,358	£14,283
J	1 property affected by external sewer flooding	£3,205	£7,797
Q	1 property affected by sewer flooding in gardens/close to other properties	£4,229	
T	1 property affected by external sewer flooding	£4,437	£1,736
K	1 property affected by external sewer flooding	£5,254	
G	1 property affected by sewer flooding outside customers' properties	£5,757	£43,878
F	1 property affected by sewer flooding on peoples' land and in gardens	£6,137	
H	1 property affected by sewer flooding outside customers' properties	£7,507	£36,367
A	1 property affected by external sewage flooding	£8,342	£15,547
O	1 property affected by sewer flooding immediately outside	£9,755	£125,843
U	1 property affected by external sewer flooding	£9,881	£18,773
E	1 property affected by sewer flooding on peoples' land and in gardens	£16,326	£99,610

Source: PJM-Accent (2018) report: Comparative Review of PR19 WTP results. All WTP values have been adjusted for inflation and are expressed in September 2022 prices. WTP values expressed as Unit value (£/unit/year)

7.4. Discussion of results

For the valuation results that could be compared, a common theme that emerged in the above comparisons was that the household results appeared to be broadly consistent with those from PR19 in most cases, and generally towards the low end of this range. A prominent exception to this pattern, however, is that the values for sewer flooding were found to be low in comparison to PR19.

There are two strong candidate explanations for the divergence in values from PR19 for sewer flooding:

- Firstly, the methods most commonly used at PR19, i.e. those that involved trade-offs of service levels, can be considered likely to overstate the values for service issues that occur with very low frequency. This is because, as previously discussed, stated choice survey participants tend to be inadequately sensitive to the frequency levels shown [Metcalfe and Sen, 2022]. This leads to high values for service issues with small changes in frequency levels, and relatively low values where the change in frequency is larger (the so-called 'denominator effect'). Since sewer flooding cases tend to occur rarely, and proposed improvements in previous price reviews have been small in terms of the absolute numbers of customers impacted, this means that sewer flooding values are likely to have been biased upwards in many of the PR19 studies.

- The second reason for the discrepancy is that the results for sewer flooding within the present study are likely to be less reliably estimated in comparison with the values of other service issues, and quite possibly biased downwards. This is due to the fact that the method used relied on the frequency with which service issues were chosen as the most impactful as the means of measuring the size of the relative impact and, in cases where everyone, or almost everyone, could be expected to consider a service issue to be the most impactful, e.g., for internal sewer flooding, the size of the value estimated will be highly sensitive to errors in people's choices whereby they choose internal sewer flooding to be less impactful than the alternative option, whatever that might be. Such responses would have a disproportionately large, and downward, impact on the estimated value for internal sewer flooding due to the fact that the errors will be exclusively one-way, i.e., they will not cancel each other out, and also because each error will have a relatively more substantial effect on the impact scores the closer one is to the extremes of the probability distribution. (This is due to the S-shape of the cumulative logistic distribution function.)
- Finally, it is possible that participants with insurance that covered against damages due to sewer flooding considered this insurance when considering the relative impact of sewer flooding vis-à-vis other service issues that would not generate an insurance claim. If this were the case then the survey value estimated by the present study would capture only the additional compensation required, and not the full social value, which would also include the damages costs.

In combination, these considerations suggest that the estimated values for internal sewer flooding may be understated in the present study, but that the true values could be expected to be below those commonly found at PR19. This suggests that Ofwat and/or companies would be prudent to consider triangulating the values for sewer flooding against other evidence. The Green Book, for example, states that average flood damage costs £8,000 to £11,000 per event for a flood of less than 0.1 metres in depth. This, and other evidence, would be advisable to bring to bear when considering the value for sewer flooding.

A second consistent theme when comparing against PR19 results is that the non-household estimates from the present study appear to be above the top end of the range in most cases. These comparisons should give pause for consideration. As previously seen, the non-household results have been less reliably measured than household results, based on the size of the confidence intervals in Figure 28, and the relatively high degree of sensitivity to the exclusion of potentially invalid responses, as shown in Table 31. These findings, including the comparisons to PR19 set out above, suggest that some downward adjustment to the non-household results may be prudent rather than applying them as they are.

In considering a potential downward adjustment, a reasonable approach would be to use the low end of the reported value range for non-households, rather than the central values reported. Alternatively, one could calibrate the overall scale of the valuations to the household values as a proportion/multiple of the average bill. This would have the benefit of preserving the evidence on non-household relative impacts/values, whilst applying a more conservative approach to their overall scale. Applying this approach would result in a scaling factor of 0.3, i.e., a 70% reduction in values, where this number was calculated by taking the average of the household to non-household value ratios for Planned Interruption (6h) and Boil water (48h), with both expressed as a multiple of the average combined bill in each case.

8. Conclusions

The core objective of the present research was to provide customer impact estimates of 26 service issues/scenarios as well as willingness-to-accept (WTA) valuations of these scenarios not happening. This research formed part of a programme of collaborative industry-wide research which aimed to ensure a common basis for the setting of outcome delivery incentive (ODI) rates for the common performance commitments (PC) anticipated to be in place for PR24.

The following summarises the findings obtained:

- Participant feedback was very positive, and there were no signs of non-trading, suggesting good cognitive performance of both the choice exercises for both households and non-households.
- The impact ranking of the service issues was almost universally as expected for both households and non-households:
  - Sewer flooding had the highest impact of all service issues.
  - Longer interruptions were more impactful than shorter interruptions.
  - Unexpected interruptions were more impactful than planned interruptions.
  - Do not drink notices were more impactful than boil water notices of the same duration.
  - Significant pollution incidents were more impactful than minor pollution incidents.
  - Environmental issues nearby were more impactful than issues elsewhere in the region.
- While impact scores for household customers were relatively precisely estimated, the confidence intervals around non-household impact scores were wide, leading to wide confidence intervals around non-household customers' valuations.
- For household customers, the relative WTA valuations from the SP2 exercise for a boil water notice and a planned interruption lasting 6 hours were fairly close to the relative impacts of these two service issues from the SP1 exercise. This provides assurance as to the construct validity of the valuation framework. For non-household customers, however, the results from the SP1 and SP2 exercises were less well aligned. This is consistent, however, with a weaker degree of precision of the non-household results than the household results, and further suggests that the non-household results may be less reliable than those for households.
- Results from both the choice exercises were segmented to explore how preferences varied across the population. Results showed:
  - Correlations with experience, usage and attitudes, and financial vulnerability were in line with expectation/theoretical requirements.
  - Older people, higher SEGs and rural customers all had relatively higher sewer flooding impacts, which led to lower impact scores for several other service issues.
  - Median WTA was significantly higher for older households (65plus) than younger households.
  - Median WTA was significantly higher for larger non-household customers than smaller non-households.

- Sensitivity analysis was conducted to explore if and how key findings from both the choice exercises change as a result of different approaches to sample exclusions. Results showed the following:
    - Removal of 'speeders' from the SP1 sample – i.e. those that completed the survey especially quickly – would increase internal sewer flooding value by up to 25%, and reduce values for lower-impact service issues.
    - Removal of those giving negative feedback to the SP1 choice exercise would have a smaller impact, increasing the internal sewer flooding value by 7%, and reducing values for lower-impact service issues.
    - Results were somewhat sensitive to exclusion of potentially invalid responses to the SP2 compensation exercise, particularly for non-households. Removing these responses resulted in values that were lower by 12%-14% for households and by 29%-30% for non-households. Whether or not these invalid responses should be excluded from the main analysis is a matter of debate amongst practitioners. Within the present study they have been retained within the sample used to calculate the main results; however excluding them would also have been a justifiable approach.
- In comparisons to values for avoided service issues from PR19 valuation studies, as reported in Accent-PJM (2018b), a common theme that emerged was that the household results appeared to be broadly consistent with those from PR19 in most cases, where comparable, and generally towards the low end of this range. A prominent exception to this pattern, however, is that the values for sewer flooding were found to be low in comparison to PR19.

  For the reasons discussed in 7.4, we consider that the estimated values for internal sewer flooding may be understated in the present study, while the values commonly found at PR19 may have been overstated. This suggests that Ofwat and/or companies would be prudent to consider the values for sewer flooding, in particular, in conjunction with other evidence. The Green Book, for example, states that average flood damage costs £8,000 to £11,000 per event for a flood of less than 0.1 metres in depth. This, and other evidence, would be advisable to bring to bear when considering the value for sewer flooding.
- A second theme arising from the comparison against PR19 results was that the non-household valuation estimates from the present study tended to lie above the top end of the range in most cases. These comparisons should give pause for consideration, particularly given that the non-household results have, as discussed above, been less reliably measured than household results.

  These findings suggest that a downward adjustment to the non-household results may be prudent. For example, the low end of the range could be justifiably used rather than the central values, or the overall scale of the valuations could be calibrated to the household values as a proportion/multiple of the average bill, whilst retaining the estimated non-household relative values.
- Finally, although comparisons to PR19 values were not possible for environmental service issues, due to the need for a further mapping stage to be undertaken that was beyond the scope of the present report, our considerations at the design stage regarding the choice between a WTP and a WTA approach suggest that it would have been equally reasonable to adopt a WTP approach to valuation of environmental service issues. Notwithstanding the

merits of the approach taken, which were justified on practical grounds, if WTP estimates had been obtained for the environmental service issues, we would have expected the values to have been lower than the WTA values actually measured. This suggests that the environmental service issue values obtained are likely to be at the upper end of the justifiable range.

Overall, the study has delivered values with strong internal evidence of content/cognitive validity and, in most cases, construct validity. For the reasons set out above, some adjustment of the values reported herein may be warranted rather than applying them directly within ODI rates for PR24. Notwithstanding these issues, the study has successfully implemented an innovative approach to customer valuation that has obtained values on a comparable basis across the industry and the results are commended to Ofwat for the purposes of developing ODI rates for PR24.

References

Accent-PJM (2018a) *Exploration of Supply Outage Compensation Levels*. A Report for Affinity Water, UK.

Accent-PJM (2018b) *Comparative Review of PR19 WTP Results*. Report for a club of water companies, UK.

Accent-PJM (2022a) *Outcome Delivery Incentive Research: Design of Methodology. Stage 1 Report*. A Report for Ofwat and CCW.

Accent-PJM (2022b) *Outcome Delivery Incentive Research: Testing and Development. Stage 2 Report*. A Report for Ofwat and CCW.

Accent-PJM (2022c) *Outcome Delivery Incentive Research: Main Survey Fieldwork. Stage 3 Report*. A Report for Ofwat and CCW.

Anderson-Bergman, C. (2017) *icenReg*: Regression Models for Interval Censored Data in R. *Journal of Statistical Software* **81**(12), 1-23.

Atkinson, G., Braathen, N.-A., Groom, B. and Mourato, S. (2018) *Cost-Benefit Analysis and the Environment: Further Developments and Policy Uses*, Organisation for Economic Co-operation and Development (OECD), Paris.

Baker, M. J. (2021) Using *bayesmixedlogit* and *bayesmixedlogitwtp* in Stata. Working paper.

Cameron, T.A. and Quiggin, J. (1994) Estimation Using Contingent Valuation Data from a “Dichotomous Choice with Follow-Up” Questionnaire. *Journal of Environmental Economics and Management* **27**, 218-234.

Carson, R. T. and Groves, T. (2007) Incentive and informational properties of preference questions. *Environmental & Resource Economics* **37**(1), 181-210.

Chalak, A. and Metcalfe, P. (2022) Valuing water and wastewater service improvements via impact-weighted numbers of service failures. *Journal of Environmental Economics and Policy* **11**(1), 39-55.

Cramer (1986) *Econometric Applications of Maximum Likelihood Methods*. Cambridge University Press. UK.

Day, B. (2007) Distribution-free estimation with interval-censored contingent valuation data: troubles with Turnbull? *Environmental & Resource Economics* **37**(4), 777-795.

De Shazo, J. R., Fermo, G. (2002) Designing choice sets for stated preference methods: the effects of complexity on choice consistency. *Journal of Environmental Economics and Management* **44**, 123-143.

Geweke, J. (1992) Evaluating the Accuracy of Sampling-Based Approaches to the Calculation of Posterior Moments. In: Bernado, J.M., Berger, J.O., Dawid, A.P., and Smith A.F.M. eds., *Bayesian Statistics* Vol. 4. Clarendon Press, Oxford, UK.

Hammitt, J. K. and Graham, J. D. (1999) Willingness to pay for health protection: Inadequate sensitivity to probability? *Journal of Risk and Uncertainty* **18**(1), 33-62.

Hanemann, W.M., Loomis, J. and Kanninen, B. (1991) Statistical efficiency of double-bounded dichotomous choice contingent valuation. *American Journal of Agricultural Economics* **73**(4), 1255-1263.

Hanneman, W.M. and Kanninen, B. (1999) The statistical analysis of discrete response CV data. In Bateman, I. J. and Willis, K. G. eds. *Valuing Environmental Preferences: Theory and Practice of the Contingent Valuation Method in the US, EU and Developing Countries*. Oxford, UK.

Hensher, D., Louviere, J., Swait, J., (1999) Combining sources of preference data. *Journal of Econometrics* **89**, 197-221.

Hensher, D., Shore, N. and Train, K. (2005) Households' willingness to pay for water service attributes. *Environmental & Resource Economics* **32**(4), 509-531.

Herriges, J. A. and Shogren, J. F. (1996) Starting point bias in dichotomous choice valuation with follow-up questioning. *Journal of Environmental Economics and Management* **30**(1), 112-131.

Hole, A. (2006) Small-sample properties of tests for heteroscedasticity in the conditional logit model. *Economics Bulletin, AccessEcon* **3**(18), 1-14.

Huber, J. and Train, K. (2001) On the similarity of Classical and Bayesian estimates of individual mean partworths. *Marketing Letters*, **12**(3), 259-269.

Johnston, R. J., Boyle, K. J., Adamowicz, W., Bennett, J., Brouwer, R., Cameron, T., Hanemann, W.M., Hanley, N., Ryan, M., Scarpa, R., Tourangeau, R. and Vossler, C. A. (2017) Contemporary guidance for stated preference studies. *Journal of the Association of Environmental and Resource Economists* **4**(2), 319-405.

Kim, Y., Kling, C. and Zhao, J. (2015) Understanding Behavioral Explanations of the WTP-WTA Divergence Through a Neoclassical Lens: Implications for Environmental Policy. *Annual Review of Resource Economics* **7**(1), 169-187.

Kott, P S. (2006) Using calibration weighting to adjust for nonresponse and coverage errors. *Survey Methodology* **32**, 133-142.

Lanz, B., Provins, A., Bateman, I. J., Scarpa, R., Willis, K. 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.* Emerald Group Publishing Ltd. Bingley, UK.

Louviere, J. J., (2001) What if consumer experiments impact variances as well as means? Response variability as a behavioural phenomenon. *Journal of Consumer Research* **28**, 506-511.

Louviere, J., Street, D., Carson, R., Ainslie, A., DeShazo, J.R., Cameron, T., Hensher, D., Kohn, R., Marley, T., (2002) Dissecting the random component of utility. *Marketing Letters* **13**, 177-193.

McFadden, D. L. (1974) Conditional logit analysis of qualitative choice behaviour. In: Zarambeka, P. (ed.), *Frontiers in Econometrics*. Academic Press, New York.

Metcalfe, P. and Sen, A. (2022). Sensitivity to scope of water and wastewater service valuations: a meta-analysis of findings from water price reviews in Great Britain. *Journal of Environmental Economics and Policy*, **11**(1), 21-38.

NERA-Accent (2007) *The Benefits of Water Framework Directive Programmes of Measures in England and Wales*. A Final Report to DEFRA re CRP Project 4b/c. UK.

Ofwat (2017) *The guaranteed standards scheme (GSS): summary of standards and conditions*.

Ofwat (2022) *Creating tomorrow together: Our final methodology for PR24*, December 2022.

PJM Economics (2023) *Collaborative ODI Research: Guidance to accompany draft results outputs*. A note for Ofwat, CCW and the Water Companies. January 2023.

Plummer M., Best, N., Cowles, K. and Vines, K. (2006) CODA: Convergence Diagnosis and Output Analysis for MCMC. *R News*, **6**(1), 7–11.

R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/).

Särndal, C-E. (2007) The calibration approach in survey theory and practice. *Survey Methodology* **33**, 99-119.

StataCorp. (2021). Stata: Release 17. Statistical Software. College Station, TX: StataCorp LLC

Théberge, A. (2000) Calibration and restricted weights. *Survey Methodology* **26**, 99-107.

Train, K. (2009) *Discrete Choice Methods with Simulation*. Cambridge University Press. UK.

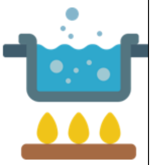
UKWIR (2011) Carrying Out Willingness to Pay Surveys. UK.

Willis, K., Scarpa, R. and Acutt, M. (2005). Assessing water company customer preferences and willingness to pay for service improvements: A stated choice analysis. *Water Resources Research* **41**(2).

Willis, K. and Sheldon, R. (2022) Research on customers' willingness-to-pay for service changes in UK water company price reviews 1994–2019. *Journal of Environmental Economics and Policy* **11**(1), 4-20.

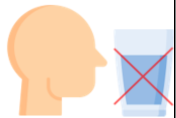
APPENDIX A Service Issue Descriptions

Boil water notice (48 hours)



- Your water company sends you a notice saying you need to boil tap water before drinking, cooking or preparing food to avoid the risk of becoming ill
- This is due to traces of e-coli being found in the water supply in your area
- You can still safely use tap water for washing and cleaning
- Bottled water would be delivered to vulnerable customers that need it
- You can still safely use tap water for washing and cleaning. The notice arrives on a Wednesday. After two days the water will be safe to drink again and your water company will notify you

Do not drink notice (48 hours)



- Your water company sends you a notice saying not to drink your tap water, or use it for cooking or preparing food, to avoid the risk of becoming ill
- This is due to traces of a harmful chemical being found in the water supply in your area
- You can still safely use tap water for washing and cleaning
- Water would be made available nearby to collect in your own buckets or bottles and vulnerable people would be delivered bottled water directly
- The notice arrives on a Wednesday. After two days the water will be safe to drink again and your water company will notify you

UNEXPECTED water supply interruption (24 hours)

- Your water supply stops working without warning, affecting all taps, toilets, dishwasher, etc
- This is due to a burst pipe in your local area
- Water would be made available nearby to collect in buckets or bottles and vulnerable people would be delivered water directly
- It stops for 24 hours, from a Wednesday morning to a Thursday morning

UNEXPECTED water supply interruption (6 hours)

- Your water supply stops working without warning, affecting taps, toilets, dishwasher, etc
- This is due to a burst pipe in your local area
- It stops for 6 hours, between 12:00 and 18:00 on a Wednesday afternoon

PLANNED water supply interruption (6 hours)

- Your water company sends you a notice in the post that in 2 days' time your water supply will stop for 6 hours, affecting all taps, toilets, dishwasher, etc
- This is due to planned maintenance in your local area
- As planned, it then stops between 12:00 and 18:00 on a Wednesday afternoon

Planned, 6 hours

UNEXPECTED low water pressure (6 hours)

- Your tap water supply starts running with a low pressure, without warning
- This is due to a burst pipe in your local area
- It takes longer to fill a kettle, sink or bath and a shower would be weak. Some appliances like dishwashers and washing machines may not work properly
- This happens for 6 hours, between 12:00 and 18:00 on a Wednesday afternoon

6 hours

Water taste and smell (24 hours)

- Your tap water starts tasting or smelling different, without warning
- This is due to chlorine, and the taste and smell is like a swimming pool
- The water is safe to drink, and for use in the dishwasher or washing machine
- This happens for 24 hours from a Wednesday morning

24 hours

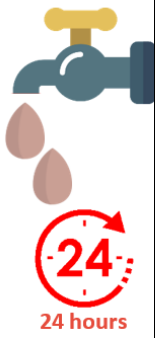
Water taste and smell (6 hours)

- Your tap water starts tasting or smelling different, without warning
- This is due to chlorine, and the taste and smell is like a swimming pool
- The water is safe to drink, and for use in the dishwasher or washing machine
- This happens for 6 hours, between 12:00 and 18:00 on a Wednesday afternoon

6 hours

Discoloured water (24 hours)

- Your tap water starts running light brown, without warning
- This is due to traces of sediment from pipes being disturbed
- The water is safe to drink, but you shouldn't use a dishwasher or washing machine until the water runs clear again
- This happens for 24 hours from a Wednesday morning

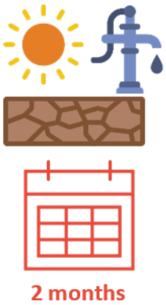


Discoloured water (6 hours)

- Your tap water starts running light brown, without warning
- This is due to traces of sediment from pipes being disturbed
- The water is safe to drink, but you shouldn't use a dishwasher or washing machine until the water runs clear again
- This happens for 6 hours, between 12:00 and 18:00 on a Wednesday afternoon

Emergency drought restrictions (2 months)

- Your water company cuts off the tap water supply from 2pm to 7am every day
- This is due to a severe drought leading to an extreme water shortage in your area
- Standpipes would be available nearby to collect water in your own buckets or bottles and vulnerable people would be delivered bottled water directly
- The restrictions begin in July and last for 2 months



Hosepipe ban (5 months)

- Your water company sends you a notice saying you must not use a hosepipe or sprinkler
- This is due to an extended period of dry weather leading to a water shortage
- The hosepipe ban begins in May and lasts for 5 months

Low flows in rivers NEARBY (2 months)

- The water level in a nearby stretch of river (less than 5 miles away) has a flow that is lower than the minimum it should be naturally
- This could affect habitats and harm the wildlife living in and by the river
- This is due to a combination of extended dry weather and water being taken for public water supply
- This happens from July and lasts for 2 months

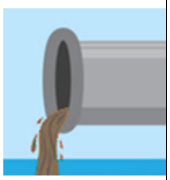
Nearby, 2 months

Low flows in rivers ELSEWHERE (2 months)

- The water level in a stretch of river somewhere in your region, but not nearby, has a flow that is lower than the minimum it should be naturally
- This could harm the wildlife living in and by the river
- This is due to a combination of extended dry weather and water being taken for public water supply
- This happens from July and lasts for 2 months

Elsewhere, 2 months

Significant pollution incident NEARBY (4 weeks)



- Untreated sewage spills into a nearby stretch of river (less than 5 miles away)
- This is due to sewerage equipment failure
- The damage to the river would be significant, including possible harm to wildlife and health risks to river users, plus visible sewage litter
- The spill begins on a Wednesday and lasts for 2 days. The river is then back to normal after 4 weeks

Nearby, 4 weeks

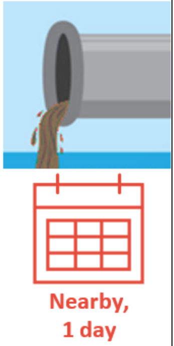
Significant pollution incident ELSEWHERE (4 weeks)

- Untreated sewage spills into a stretch of river somewhere in your region, but not nearby
- This is due to sewerage equipment failure
- The damage to the river would be significant, including possible harm to wildlife and health risks to river users, plus visible sewage litter
- The spill begins on a Wednesday and lasts for 2 days. The river is then back to normal after 4 weeks

Elsewhere, 4 weeks

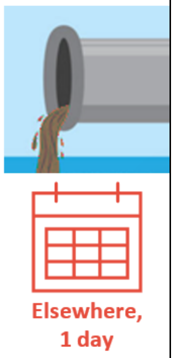
Minor pollution incident NEARBY (1 day)

- Untreated sewage spills into a nearby stretch of river (less than 5 miles away)
- This is due to sewerage equipment failure
- The damage to the river and visible pollution would be minor
- The spill begins on a Wednesday and lasts for 4 hours. The river is then back to normal after 1 day



Minor pollution incident ELSEWHERE (1 day)

- Untreated sewage spills into a stretch of river somewhere in your region, but not nearby
- This is due to sewerage equipment failure
- The damage to the river and visible pollution would be minor
- The spill begins on a Wednesday and lasts for 4 hours. The river is then back to normal after 1 day



River water NEARBY is not High quality

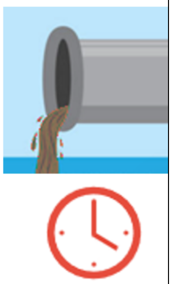
- A nearby stretch of river (less than 5 miles away) meets Medium rather than High quality standards, as defined by the government ⓘ
- This is due to a variety of factors, including the quality of treated wastewater, the river flow level, and the run-off from the surrounding area
- This has some effect on habitats for fish and wildlife, and can lead to algae (green slime) in the water

River water ELSEWHERE is not High quality

- A stretch of river **in your region, but** not nearby, meets Medium rather than High quality standards, as defined by the government ⓘ
- This is due to a variety of factors, including the quality of treated wastewater, the river flow level, and the run-off from the surrounding area
- This has some effect on habitats for fish and wildlife, and can lead to algae (green slime) in the water

Storm overflow NEARBY (4 hours)

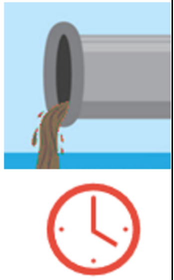
- Rainwater mixed with untreated sewage spills into a nearby stretch of river (less than 5 miles away)
- This is due to prolonged heavy rainfall and is allowed by the regulator to reduce the risk of sewer flooding
- There is no damage to the river and visible pollution is minor



Nearby, 4 hours

Storm overflow ELSEWHERE (4 hours)

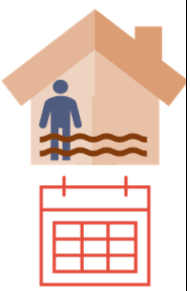
- Rainwater mixed with untreated sewage spills into a stretch of river somewhere in your region, but not nearby
- This is due to prolonged heavy rainfall and is allowed by the regulator to reduce the risk of sewer flooding
- There is no damage to the river and visible pollution is minor



Elsewhere, 4 hours

Sewer flooding: INSIDE your property (1 month)

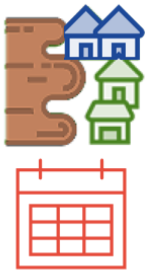
- Flooding from the sewer gets inside your property, affecting your living areas
- This results from prolonged heavy rainfall in your local area
- It gives off a foul smell, and damages floors, walls and furniture
- It takes 1 month for your property to get back to normal



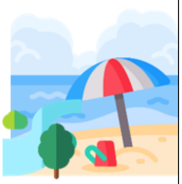
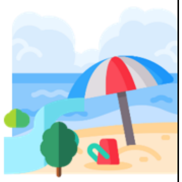
1 month

Sewer flooding: OUTSIDE your property (1 week)

- Flooding from the sewer affects access to your front door / entrance
- This results from prolonged heavy rainfall in your local area
- It gives off a foul smell, and could cause damage
- It takes 1 week for access to your property to get back to normal



1 week

Coastal bathing water is neither Excellent nor Good quality	Coastal bathing water is not Excellent quality
▶ The sea water at the beach you would be most likely to visit meets Sufficient rather than Good or Excellent quality standards, as defined by the government ⓘ ▶ This is due to the quality of treated wastewater entering the water nearby ▶ You could still swim in the sea, but there would be a small increase in the chance that you might get ill if you swallowed some water  **Water not Excellent**	▶ The sea water at the beach you would be most likely to visit meets Good rather than Excellent quality standards, as defined by the government ⓘ ▶ This is due to the quality of treated wastewater entering the water nearby ▶ You could still swim in the sea, but there would be a small increase in the chance that you might get ill if you swallowed some water  **Water not Excellent**

APPENDIX B Main Survey Questionnaire

Water Company Research

This survey is designed to get your views on water and sewerage services. It is being undertaken on behalf of Ofwat, the regulator, and Consumer Council for Water (CCW), the consumer organisation which represents the interests of water and sewerage customers in England and Wales.

The research will be used to help water companies plan investment in their service from 2025, and will influence your future water services and bills.

This research is being conducted by Accent, an independent research agency on behalf of Ofwat and CCW.

NOT PANEL: Anyone completing the survey will be eligible for a £10 voucher (either an Amazon voucher, an M&S voucher or a One4All voucher). Alternatively, we can donate your incentive to WaterAid. Details on how to claim your voucher are given at the end of the survey.

The questionnaire will take about 10 minutes to complete.

Any answer you give will be treated in confidence in accordance with the Code of Conduct of the Market Research Society and your data will be treated in accordance with the Data Protection Act 2018. If you would like to confirm Accent's credentials type Accent in the search box at: https://www.mrs.org.uk/researchbuyersguide.

You do not have to answer any question you do not wish to and you may terminate the interview at any point.

QA IF PAF: Please enter the **Unique ID** that is printed on the top right of your letter.

Please enter the **PIN** number that is printed on the top right of your letter.

Q1. Any data collected over the course of this interview that could be used to identify you, such as your name, address, or other contact details, will be held securely and will not be shared with any third party, including Ofwat, CCW and your water company, unless you give permission (or unless we are legally required to do so). Our privacy statement is available at https://www.accent-mr.com/privacy-policy/.

Do you agree to proceeding with the interview on this basis?

Yes
No THANK AND CLOSE IF ONLINE

Q2. ASK HH ONLY: Do you or any of your close family work in market research or for a water company?

Yes THANK & CLOSE
No

Q3. IF NHH ASK: We would like you to think about the site at #ADDRESS, POSTCODE# (SPID=#SPID#) when responding to this survey.

Are you solely or jointly responsible as the decision maker for your organisation's water and wastewater service at that property?

Yes
No THANK AND CLOSE

Q3b Does HH ONLY: your NHH ONLY: that property have a septic tank or cess pit? If you do have one, this would mean that your property is **not** connected to the main sewer and you would periodically arrange to have the septic tank emptied.

Yes THANK & CLOSE
No

Q4. IF PANEL ASK (OTHERWISE GO TO Q8): Please tell us the beginning of your postcode. So if your full postcode is ME14 3BN please just tell us ME14 3. (This will be used to check who supplies your water and wastewater services)

IF HH AND REFUSE GO TO Q6

Q5. IF PANEL AND DIFFERENT WATER AND WASTEWATER: Based on your postcode area, we believe your clean water service company should be #WATER COMPANY# and your wastewater service company should be #WASTEWATER COMPANY#. You may receive separate bills from each organisation or one combined bill. Is that correct?
IF PANEL AND SAME WATER AND WASTEWATER: Based on your postcode area, we believe your clean water service and wastewater service company should be #WATER COMPANY#. Is that correct?

Yes GO TO Q8
No GO TO Q6
Don't know GO TO Q8

Q6. IF HH: Which water company supplies clean water to your home?

Affinity Water
Anglian Water
Bournemouth Water
Bristol Water
Cambridge Water
Essex & Suffolk Water
Hafren Dyfrdwy
Hartlepool Water
Northumbrian Water
Portsmouth Water
Severn Trent Water
South East Water
Southern Water
South Staffs Water
South West Water
Sutton & East Surrey (SES) Water

Thames Water
United Utilities
Welsh Water/Dŵr Cymru
Wessex Water
Yorkshire Water
Other (Please specify) THEN THANK AND CLOSE
Don't know THANK AND CLOSE
None THANK AND CLOSE

Q7. IF HH: Which company provides wastewater (sewerage) services to your home?

Anglian Water
Hafren Dyfrdwy
Northumbrian Water
Severn Trent Water
Southern Water
South West Water
Thames Water
United Utilities
Welsh Water/Dŵr Cymru
Wessex Water
Yorkshire Water
Other (please specify) THEN THANK AND CLOSE
Don't know THANK AND CLOSE
None THANK AND CLOSE

Q8. IF HH: Are you the person in your household who is responsible, either solely or jointly, for paying for your water services bill?

I have complete responsibility for payment
I share responsibility for payment with others in my household
I have no responsibility
Don't know

BILLPAYER : = CODE 1 OR 2
NONBILLPAYER : = CODE 3-4

Q9. IF HH Which of the following age groups do you fall into?

Under 18 THANK AND CLOSE
18-29
30-64
65 or older
Prefer not to say
USE HH QUOTA IF PANEL

Q10. IF HH What is your sex? (A question about gender identity will follow)

Male
Female
USE HH QUOTA IF PANEL

Q10a IF HH: Is the gender you identify with the same as your sex registered at birth? **We would like to collect this to ensure that people of all backgrounds are represented in the study, but you do not have to answer if you do not wish to. This information will not be shared with any third party and will be destroyed within 12 months of project completion.**

Yes
No (type in gender identity)
Prefer not to say

Q11. **IF ONE SUPPLIER FOR WATER AND WASTEWATER DON'T ASK (BUT CODE AS ONE BILL FOR BOTH SERVICES) IF HH & BILLPAYER:** Do you receive separate bills for water and sewerage services or one bill for both services?

Separate bills
One bill for both services
Don't know

Q12b **IF HH & BILLPAYER:** How often do you make payment for water and sewerage services?

Annually
Every six months
Every month, over eight months of the year
Every month
Other (please specify)
Don't know **GO TO Q14**

Q13 **IF HH & BILLPAYER AND Q12B=1, 4-5 ASK:** How much, roughly, do you pay for water and sewerage services each month, or in total for a year? The month amounts assume that the bills are paid evenly over a 12-month period, but some customers pay over a different number of months.
IF HH & BILLPAYER AND Q12B=3 ASK: How much, roughly, do you pay for water and sewerage services for each of the eight months, or in total for a year?
IF HH & BILLPAYER AND Q12B=2 ASK: How much, roughly, do you pay for water and sewerage services every 6 months, or in total for a year?
IF NHH AND NO BILLING DATA FROM SAMPLE: Which of the following bands do you estimate that your organisation's annual total water bill at your premises falls into – that's the amount for both water and sewerage services.

IF HH and 12B=1, 4 or 5: Less than £10 per month/Less than £120 per year
IF HH and 12B=1, 4 or 5: £10 - £19.99 per month/£120 - £239.99 per year
IF HH and 12B=1, 4 or 5: £20 - £29.99 per month/£240 - £359.99 per year
IF HH and 12B=1, 4 or 5: £30 - £39.99 per month/£360 - £479.99 per year
IF HH and 12B=1, 4 or 5: £40 - £59.99 per month/£480 - £719.99 per year
IF HH and 12B=1, 4 or 5: £60 - £79.99 per month/£720 - £959.99 per year
IF HH and 12B=1, 4 or 5: £80 or more per month /£960 or more per year

IF HH and 12B=3: Less than £15 per month/Less than £120 per year
IF HH and 12B=3: £15 - £29.99 per month/£120 - £239.99 per year
IF HH and 12B=3: £30 - £39.99 per month/£240 - £319.99 per year
IF HH and 12B=3: £40 - £59.99 per month/£320 - £479.99 per year
IF HH and 12B=3: £60 - £89.99 per month/£480 - £719.99 per year
IF HH and 12B=3: £90 - £119.99 per month/£720 - £959.99 per year
IF HH and 12B=3: £120 or more per month /£960 or more per year
IF HH and 12B=2: Less than £60 every 6 months/Less than £120 per year
IF HH and 12B=2: £60 - £119.99 every 6 months /£120 - £239.99 per year
IF HH and 12B=2: £120 - £179.99 every 6 months /£240 - £359.99 per year
IF HH and 12B=2: £180 - £239.99 every 6 months /£360 - £479.99 per year
IF HH and 12B=2: £240 - £359.99 every 6 months /£480 - £719.99 per year
IF HH and 12B=2: £360- £479.99 every 6 months /£720 - £959.99 per year
IF HH and 12B=2: £480 or more every 6 months /£960 or more per year

IF NHH: Less than £1,000 per year
IF NHH: £1,000 to £5,000 per year
IF NHH: £5,000 to £25,000 per year
IF NHH: More than £25,000 per year
I'm not sure

TIMESTAMP

Service issues

Q14 Have you ever experienced any of the following **NHH ONLY:** at this property? *ROTATE* **Please tick one or more**

Unexpected water supply interruption
Planned water supply interruption
Unexpected low pressure
Boil water notice
Do not drink notice
Discolouration of water coming out of your tap
A change to the taste and/or smell of your tap water
Sewer flooding: inside your property
Sewer flooding: outside your property
Hosepipe ban
Emergency drought restrictions **(e.g. tap water being cut off on a rota basis to conserve supplies)**
Pollution in a river
Pollution in the sea near a beach
Other (please specify)
I haven't experienced any of these GO TO Q15

Q14b IF ONE BELOW IN Q14 ASK: Have you experienced the following in the last 12 months NHH ONLY: at this property?
IF BOTH BELOW IN Q14 ASK: Have you experienced any of the following in the last 12 months NHH ONLY: at this property?

IF TICKED IN Q14: Discolouration of water coming out of your tap
IF TICKED IN Q14: A change to the taste and/or smell of your tap water

Use of rivers and canals in the UK

IF HH: We would like to now find out a bit more about your use of rivers and canals in the UK.

Q15 IF HH: How often do you, or anyone in your household, use rivers or canals in the UK for any of the following activities?

	Often (more than six times a year)	**Sometimes** (between one and five times a year)	**Rarely** (less than once a year)	**Never**
Water contact activities (e.g. canoeing, rowing, rafting, paddleboarding, swimming, paddling)				
Fishing				
Walking, running, cycling or sitting nearby or other activities on or around the water (e.g. narrowboating, other types of boating)				

Use of beaches and the sea in the UK

Q16 IF HH: How often do you, or anyone in your household, use the beach or sea in the UK for any of the following activities?

	Often (more than six times a year)	**Sometimes** (between one and five times a year)	**Rarely** (less than once a year)	**Never**
Water contact activities (e.g. surfing, windsurfing, dinghy sailing, canoeing, paddleboarding, swimming, paddling)				
Fishing				
Walking, running, cycling or sitting or playing nearby or other activities on or around the water (e.g. other types of boating)				

Use of hosepipe or sprinkler

Q16a How often does [IF HH] your household [IF NHH] this property use a hosepipe or sprinkler for any purpose (e.g. washing/cleaning, or watering plants)?

Often (more than six times a year)
Sometimes (between one and five times a year)
Rarely (less than once a year)
Never

TIMESTAMP

Impact of service issues

You are now going to be shown a series of ten short questions where you will be asked to choose between two different scenarios for your water or wastewater service.

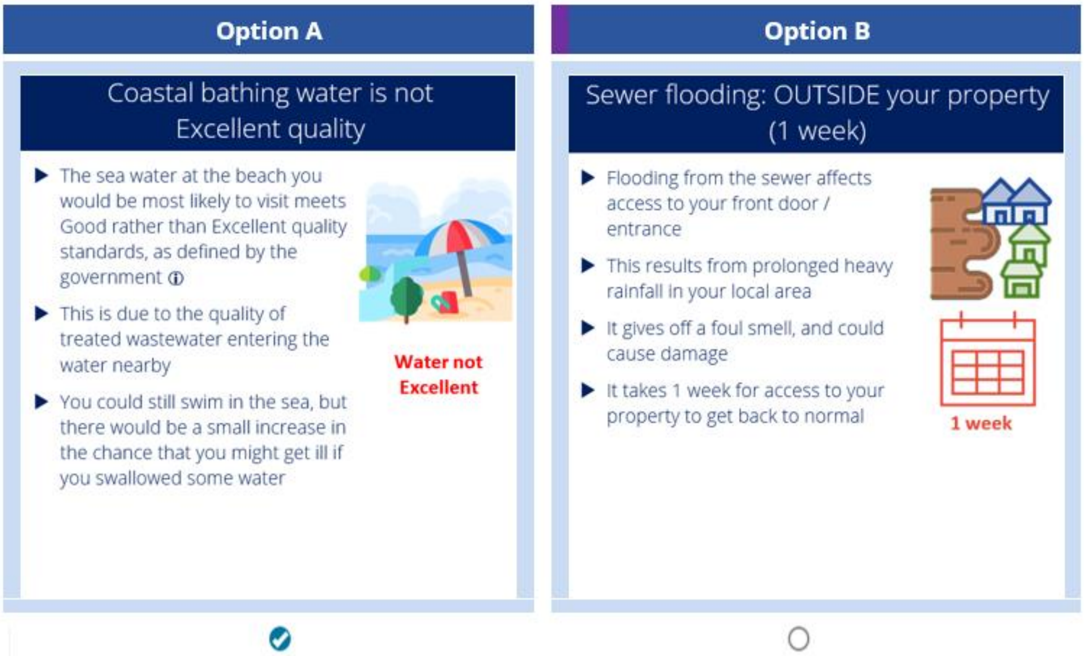
Please consider, and then compare the scenarios carefully, and then **choose the one which would have the most impact** on your IF HH: household IF NHH: organisation if it were to happen.

Some of the scenarios would affect your IF HH: own IF NHH: organisation's property whereas others would affect your local area. When comparing the impact that each would have, please:

- **do** consider any concerns you may have for your local or regional environment; but
- **don't** consider any impacts on other people outside your IF HH: household IF NHH: organisation - other people will answer for themselves!

On some of the options you will see an ⓘ. Please click on this to see some more information about the option.

Q17 Which of these would have the most impact on your IF HH: household IF NHH: organisation?



Q17b Why did you choose this option?

Q18 Which of these would have the most impact on your IF HH: household IF NHH: organisation?

Q19 Which of these would have the most impact on your IF HH: household IF NHH: organisation?

Q20 Which of these would have the most impact on your IF HH: household IF NHH: organisation?

Q21 Which of these would have the most impact on your IF HH: household IF NHH: organisation?

Q22 Which of these would have the most impact on your IF HH: household IF NHH: organisation?

Q23 Which of these would have the most impact on your IF HH: household IF NHH: organisation?

Q24 Which of these would have the most impact on your IF HH: household IF NHH: organisation?

Q24b Which of these would have the most impact on your IF HH: household IF NHH: organisation?

Q24c Which of these would have the most impact on your IF HH: household IF NHH: organisation?

TIMESTAMP

Q25 We would now like to ask you a few questions about the choices you have just made. How strongly do you agree or disagree with the following statements about the choices you have just made?

	Strongly disagree	Disagree	Neither	Agree	Strongly agree
I was able to understand the choices					
I found the options believable					
My choices were based on how much impact I thought each option would have on my [IF HH] household [IF NHH] organisation.					
I found it easy to choose between the options					
NHH ONLY: I found it easy to answer with this specific property in mind					

Q26 ASK IF Q25R1 = 1 OR 2. OTHERS GO TO Q27: Why were you unable to understand the choices?

Q27 ASK IF Q25R2 = 1 OR 2. OTHERS GO TO Q28: What was not believable about the options shown?

Q28 ASK IF Q25R3 = 1 OR 2. OTHERS GO TO Q29: What were the main factors driving your choices if not the impact that each would have on your [IF HH] household [IF NHH] organisation?

Q29 ASK IF Q25R4 = 1 OR 2. OTHERS GO TO NEXT SECTION: Why was it difficult choosing between the options?

Q29B ASK IF 0.5 = 1 OR 2. OTHERS GO TO NEXT SECTION: Why was it difficult to answer with this specific property in mind?

TIMESTAMP

Compensation for service issues

The following questions will each present you with a choice between:

a) experiencing a service issue and receiving compensation from your water company,

or

b) not experiencing the issue and not receiving any compensation.

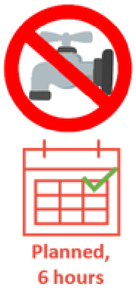
In each question, the type of service issue and the compensation amount will vary. The amounts will not necessarily reflect current compensation entitlements and may exceed these levels - substantially in some cases.

The purpose of these questions is to see if the amounts shown are enough to make up for the impact on your [IF HH] household [IF NHH] organisation from the service issue shown. It is important to consider each amount at face value, even if it seems higher than you would imagine might be offered.

RANDOMISE ORDER OF SERVICE ISSUES SHOWN IN Q30-Q31.

Q30 Which option would you prefer?

Option A	Option B
PLANNED water supply interruption (6 hours)	No service issue
▶ Your water company sends you a notice in the post that in 2 days' time your water supply will stop for 6 hours, affecting all taps, toilets, dishwasher, etc ▶ This is due to planned maintenance in your local area ▶ As planned, it then stops between 12:00 and 18:00 on a Wednesday afternoon	▶ There would be no issue affecting the water service at your property
Compensation amount: £50*	



IF BILLPAYER OR NHH: *Compensation would be paid automatically, and within 7 days, by crediting your bank account, if you have a direct debit set up, or by sending you a cheque otherwise
IF NON-BILLPAYER: *Compensation would be paid automatically, and within 7 days, by sending a cheque to your household.

If Option A Compensation level=50% of Q30 value
If Option B Compensation level =2*Q30 value
Then add in follow up question (Q30a) containing new compensation amounts.

Q30a Which option would you prefer?

Q30d [IF Q30=B AND Q30a=B] Why did you choose this option?

Q31 Which option would you prefer?

Option A

Boil water notice (48 hours)

- Your water company sends you a notice saying you need to boil tap water before drinking, cooking or preparing food to avoid the risk of becoming ill
- This is due to traces of e-coli being found in the water supply in your area
- You can still safely use tap water for washing and cleaning

- Bottled water would be delivered to vulnerable customers that need it
- You can still safely use tap water for washing and cleaning. The notice arrives on a Wednesday. After two days the water will be safe to drink again and your water company will notify you

Compensation amount: £100*

Option B

No service issue

- There would be no issue affecting the water service at your property

IF BILLPAYER OR NHH: *Compensation would be paid automatically, and within 7 days, by crediting your bank account, if you have a direct debit set up, or by sending you a cheque otherwise
IF NON-BILLPAYER: *Compensation would be paid automatically, and within 7 days, by sending a cheque to your household.

If Option A Compensation level=50% of Q31 value
If Option B Compensation level =2*Q31 value
Then add in follow up question (Q31B) containing new compensation amounts.

Q31B Which option would you prefer?

Q31C [IF Q31=B AND Q31B=B] Why did you choose this option?

TIMESTAMP

Q32 We would now like to ask you a few questions about the choices you have just made. How strongly do you agree or disagree with the following statements about the choices you have just made?

	Strongly disagree	Disagree	Neither	Agree	Strongly agree
I was able to understand the choices					
I found the options believable					
My choices were based on how much impact I thought each option would have on my [IF HH] household [IF NHH] organisation and whether the amount of money shown was enough to compensate for this					
I found it easy to choose between the options					

Q33 ASK IF Q32R1 = 1 OR 2. OTHERS GO TO Q34: Why were you unable to understand the choices?

Q34 ASK IF Q32R2 = 1 OR 2. OTHERS GO TO Q35: What was not believable about the options shown?

Q35 ASK IF Q32R3 = 1 OR 2. OTHERS GO TO Q36: What were the main factors driving your choices?

Q36 ASK IF Q32R4 = 1 OR 2. OTHERS GO TO NEXT SECTION: Why was it difficult choosing between the options?

Q36X IF NHH: Thinking about the choices you have just made about the impacts of different service issues and the compensation amounts shown, would you say that your responses would be similar across most other sites for which you manage the water and wastewater services?

Yes USE # IN 96 CELLS
No DO NOT USE # IN 96 CELLS
I am not responsible for any other sites
Don't know DO NOT USE # IN 96 CELLS

TIMESTAMP

Attitudes to environmental costs

Q37 IF HH: Please look at the following five statements about pollution control and the costs of pollution control. Which one do you agree with most? *SINGLE CHOICE*

The environment should be protected from pollution and improved, **regardless of cost**
The environment should be protected from pollution and improved, **provided costs are not excessive**
The environment should be protected from pollution and improved, **but at no additional cost**
Further protection and improvements to the environment are not needed, and **the costs for this should fall**
Standards for protection and improvement to the environment are already too high and should be relaxed, **and costs should fall**
Don't know

Q38 Please use this box to leave any further comments about this topic or this survey. Please note, your water company will be unable to respond to individuals.

TIMESTAMP

Classification Questions

We will now ask you a few questions about you and your IF HH household IF NHH organisation. These will only be used to ensure we have spoken to a wide range of customers. All responses you give will be kept strictly confidential.

Q39 IF HH: How would you describe the occupation type of the main income earner in your household?

Higher managerial/ professional/ administrative (e.g. Established doctor, Solicitor, Board Director in a large organisation (200+ employees), top level civil servant/public service employee)
Intermediate managerial/ professional/ administrative (e.g. Newly qualified (under 3 years) doctor, Solicitor, Board director small organisation, middle manager in large organisation, principle officer in civil service/local government)
Supervisory or clerical/ junior managerial/ professional/ administrative (e.g. Office worker, Student Doctor, Foreman with 25+ employees, salesperson, etc)
Skilled manual work (e.g. Skilled Bricklayer, Carpenter, Plumber, Painter, Bus/Ambulance Driver, HGV driver, AA patrolman, pub/bar worker, etc)
Semi or unskilled manual work (e.g. Manual worker, apprentice to skilled trade, Caretaker, Park keeper, non-HGV driver, shop assistant)

Unemployed
Retired
Student
Prefer not to say GO TO Q44

Q40 IF Q39=7 (RETIRED) ASK: Does the main income earner have a state pension, a private pension or both?

State only
Private only
Both
Prefer not to say GO TO Q44

Q41 IF Q40= PRIVATE OR BOTH ASK: How would you describe the main income earner's occupation type before retirement?

Higher managerial/ professional/ administrative (e.g. Established doctor, Solicitor, Board Director in a large organisation (200+ employees), top level civil servant/public service employee)
Intermediate managerial/ professional/ administrative (e.g. Newly qualified (under 3 years) doctor, Solicitor, Board director small organisation, middle manager in large organisation, principle officer in civil service/local government)
Supervisory or clerical/ junior managerial/ professional/ administrative (e.g. Office worker, Student Doctor, Foreman with 25+ employees, salesperson, etc)
Skilled manual work (e.g. Skilled Bricklayer, Carpenter, Plumber, Painter, Bus/ Ambulance Driver, HGV driver, AA patrolman, pub/bar worker, etc)
Semi or unskilled manual work. (e.g. Manual worker, apprentice to skilled trade, Caretaker, Park keeper, non-HGV driver, shop assistant)
None of these
Prefer not to say

Q44 IF HH: To which of these ethnic groups do you consider you belong to? **We would like to collect this to ensure that people of all backgrounds are represented in the study, but you do not have to answer if you do not wish to. This information will not be shared with any third party and will be destroyed within 12 months of project completion.**

WHITE
English, Welsh, Scottish, Northern Irish or British
Irish
Gypsy or Irish Traveller
Any other White background

MIXED
White and Black Caribbean
White and Black African
White and Asian
Any other Mixed background

ASIAN OR ASIAN BRITISH
Indian
Pakistani
Bangladeshi
Chinese
Any other Asian background

BLACK OR BLACK BRITISH
Caribbean
African
Any other Black background

OTHER ETHNIC GROUP
Arab
Any other ethnic group
Prefer not to say

Q45 IF HH: Thinking about all the people in your household, including yourself, how many people live here?

1 or 2
3 or 4
5 or more
Prefer not to say

Q46 IF HH: Please let us know if any of the following apply to you or a member of your household.
RANDOMISE ROWS
We would like to collect this to ensure that people with a variety of particular needs are represented in the study, but you do not have to answer if you do not wish to. This information will not be shared with any third party and will be destroyed within 12 months of project completion.

Disabled or suffers from a debilitating illness
Has a learning difficulty
Relies on water for medical reasons
Visually impaired (i.e. struggles to read even with glasses)
Over the age of 75 years old
Speaks English as a second language
Deaf or hard of hearing
A new parent
None of these statements apply
Prefer not to say

Q47 IF HH: Which of the following statements do you most agree with? ***Please remember, this research is entirely confidential and that it is only by understanding the views of people who are struggling to pay their household bills (eg gas, electricity, telephone etc) that change can be made.***

I can always afford to pay my household bills
I can usually afford to pay my household bills
I sometimes struggle to pay my household bills
I usually struggle to pay my household bills
I always struggle to pay my household bills
Prefer not to say

Q47a. IF HH: Thinking about your household finances, do you expect your household to be better off, worse off or about the same in 12 months' time?

Better off
The same
Worse off
Don't know

Q47b IF NHH: How does your organisation mainly use water at this property? **You can choose more than one answer**

The manufacturing process which is essential to the running of your organisation (e.g. to power machinery, agricultural production etc.)
The supply of services your organisation provides (e.g. cleaning services etc.)
An ingredient or part of the product or service your organisation provides (e.g. food or drink, chemical, cosmetics manufacturer etc.)
Normal domestic use for your organisation's customers and employees (e.g. customer toilets, supply of drinking water)
None of the above
Don't Know

Q48 IF NHH: How many sites in the UK does your organisation operate from?

1

2
3
4
5-10
11-50
51-250
250+
Prefer not to say

Q49 IF NHH: How many employees does your organisation have in the UK?

None, sole trader
Fewer than 4 employees
4 to 49 employees
50 to 249 employees
250+ employees
Prefer not to say

Q50 IF NHH: Which of the following best defines the core activity of your organisation?

Agriculture, forestry and fishing
Mining and quarrying
Energy or water service & supply
Manufacturing
Construction
Wholesale and retail trade (including motor vehicles repair)
Transport and storage
Hotels & catering
IT and Communication
Finance and insurance activities
Real estate activities
Professional, scientific and technical activities
Administrative and Support Service Activities
Public administration and defence
Education
Human health and social work activities
Arts, entertainment and recreation
Other service activities
Other (please specify)
Prefer not to say

Q52 IF HH: Do you have a water meter?
IF NHH: Does this property have a water meter?

Yes
No
Don't know
Prefer not to say

Q53 IF HH AND Q52=1 ASK: Did you ask to have a water meter fitted for your household?

Yes
No
Prefer not to say

Q54 IF HH AND POSTAL: Which of these best describes you?

I have never used the internet
I have used the internet but do not have regular access to it
I have regular access to the internet

Prefer not to say

Q54b Earlier in the questionnaire we asked you to make choices between experiencing a service issue and receiving compensation, or not experiencing the service issue. Different amounts were shown to different survey participants as part of this study to test how much money would be needed, in principle, to compensate for the impact that the service issue would have on customers.

We wish to reiterate that the amounts shown were not the same as those you would be currently entitled to expect if you were to experience the service issue at your property.

Q55 IF NON PANEL: We mentioned that there would be a £10 incentive for completing this survey. This incentive will be administered by Accent, within 4 weeks.

This can be sent as an Amazon, Marks & Spencer or One4All voucher by email [PAPER ONLY: or by post]. Alternatively, we can donate your incentive to WaterAid. Which would you prefer?

Amazon voucher by email COLLECT EMAIL ADDRESS
M&S Voucher by email COLLECT EMAIL ADDRESS
One4All by email COLLECT EMAIL ADDRESS
PAPER ONLY: Amazon voucher by post COLLECT ADDRESS
PAPER ONLY: M&S voucher by post COLLECT ADDRESS
PAPER ONLY: One4All voucher by post COLLECT ADDRESS
Donation to Water Aid

If you have any queries about your incentive, please contact us on 0131 220 8770.

Q56 Thank you. Would you be willing to be contacted again if we need to clarify any of the answers you have given today?

Yes
No

Thank you. This research was conducted under the terms of the MRS code of conduct and is completely confidential.

APPENDIX C SP1 Supplementary Results

Households: water companies

Table 50: SP1 household econometric model (means) for Affinity Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.921	0.062	62.79	0	3.799	4.044
ExternalSF	2.561	0.063	40.48	0	2.437	2.685
UnexpInt24	2.285	0.076	30.24	0	2.137	2.434
RotaCuts	2.129	0.090	23.78	0	1.953	2.304
DND	1.947	0.064	30.26	0	1.821	2.074
Boil	1.850	0.073	25.45	0	1.707	1.992
UnexpInt6	1.731	0.069	25.2	0	1.596	1.866
Pol2Nearby	1.321	0.069	19.26	0	1.186	1.455
TasteSmell24	1.219	0.073	16.63	0	1.076	1.363
Discolour24	1.215	0.065	18.7	0	1.087	1.342
Discolour6	1.116	0.062	18.07	0	0.995	1.237
TasteSmell6	1.086	0.062	17.39	0	0.964	1.209
PlannedInt6	1.049	0.073	14.29	0	0.905	1.194
LowPressure	1.021	0.065	15.63	0	0.893	1.150
Pol2Else	0.997	0.060	16.52	0	0.879	1.115
LowFlowElse	0.803	0.069	11.55	0	0.666	0.939
LowFlowNearby	0.767	0.059	13.03	0	0.651	0.882
Pol3Nearby	0.762	0.067	11.38	0	0.631	0.894
HoseBan	0.647	0.063	10.22	0	0.523	0.772
Pol3Else	0.607	0.062	9.75	0	0.484	0.729
RWQNearby	0.493	0.064	7.74	0	0.368	0.618
StormFlowNearby	0.478	0.070	6.79	0	0.340	0.616
RWQElse	0.470	0.063	7.49	0	0.347	0.593
StormFlowElse	0.033	0.069	0.49	0.626	-0.101	0.168
BWQGood	-0.215	0.072	-3	0.003	-0.356	-0.075

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 503 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 51: SP1 household econometric model (means) for Anglian Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.552	0.059	76.54	0	4.435	4.669
ExternalSF	2.950	0.064	46.28	0	2.825	3.076
RotaCuts	2.670	0.077	34.87	0	2.520	2.821
UnexpInt24	2.512	0.084	29.74	0	2.347	2.678
DND	2.429	0.063	38.84	0	2.306	2.551
Boil	2.054	0.064	31.84	0	1.927	2.180
Pol2Nearby	1.807	0.061	29.64	0	1.688	1.927
UnexpInt6	1.723	0.068	25.2	0	1.589	1.857
Discolour24	1.463	0.069	21.25	0	1.328	1.598
Pol2Else	1.385	0.058	23.85	0	1.271	1.499
PlannedInt6	1.338	0.057	23.68	0	1.227	1.449
TasteSmell6	1.308	0.061	21.53	0	1.189	1.428
Discolour6	1.301	0.075	17.27	0	1.153	1.449
TasteSmell24	1.224	0.056	21.86	0	1.114	1.333
LowFlowNearby	1.198	0.058	20.67	0	1.085	1.312
LowPressure	1.180	0.075	15.67	0	1.033	1.328
LowFlowElse	0.993	0.060	16.68	0	0.877	1.110
RWQNearby	0.864	0.062	13.93	0	0.743	0.986
HoseBan	0.803	0.060	13.39	0	0.685	0.920
StormFlowNearby	0.705	0.068	10.35	0	0.571	0.839
Pol3Nearby	0.657	0.067	9.79	0	0.525	0.789
Pol3Else	0.572	0.069	8.25	0	0.436	0.707
RWQElse	0.489	0.069	7.08	0	0.353	0.625
StormFlowElse	0.440	0.065	6.74	0	0.312	0.569
BWQGood	-0.077	0.072	-1.08	0.282	-0.218	0.064

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 513 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 52: SP1 household econometric model (means) for Bristol Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.009	0.057	70.52	0	3.898	4.121
ExternalSF	2.343	0.070	33.25	0	2.205	2.481
RotaCuts	2.017	0.066	30.68	0	1.888	2.146
UnexpInt24	1.617	0.073	22.22	0	1.474	1.759
DND	1.536	0.060	25.79	0	1.419	1.653
Boil	1.291	0.075	17.23	0	1.144	1.438
UnexpInt6	1.158	0.066	17.54	0	1.028	1.287
Pol2Nearby	1.007	0.059	16.95	0	0.890	1.124
Pol2Else	0.951	0.065	14.55	0	0.823	1.079
TasteSmell24	0.692	0.053	13.01	0	0.587	0.796
Discolour24	0.683	0.066	10.42	0	0.554	0.812
Discolour6	0.663	0.054	12.19	0	0.556	0.770
LowFlowNearby	0.597	0.058	10.27	0	0.483	0.711
PlannedInt6	0.479	0.071	6.75	0	0.340	0.618
TasteSmell6	0.473	0.066	7.21	0	0.344	0.602
LowFlowElse	0.438	0.062	7.03	0	0.316	0.561
LowPressure	0.374	0.065	5.73	0	0.246	0.503
StormFlowNearby	0.204	0.060	3.41	0.001	0.087	0.322
Pol3Nearby	0.149	0.066	2.25	0.025	0.019	0.280
RWQNearby	0.053	0.068	0.79	0.432	-0.079	0.186
HoseBan	0.045	0.063	0.7	0.481	-0.080	0.169
RWQElse	-0.156	0.068	-2.3	0.022	-0.288	-0.023
StormFlowElse	-0.265	0.064	-4.16	0	-0.390	-0.140
BWQGood	-0.294	0.068	-4.31	0	-0.428	-0.160
Pol3Else	-0.373	0.071	-5.24	0	-0.512	-0.233

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 511 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 53: SP1 household econometric model (means) for Northumbrian Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.582	0.025	143.780	0.000	3.534	3.631
ExternalSF	2.640	0.032	81.690	0.000	2.577	2.703
RotaCuts	2.170	0.033	65.140	0.000	2.104	2.235
UnexpInt24	2.116	0.028	75.270	0.000	2.061	2.171
DND	1.937	0.038	50.900	0.000	1.862	2.012
Boil	1.777	0.036	48.770	0.000	1.705	1.848
UnexpInt6	1.581	0.032	49.070	0.000	1.518	1.644
Pol2Nearby	1.335	0.038	35.070	0.000	1.261	1.410
TasteSmell24	1.307	0.029	45.750	0.000	1.251	1.363
Discolour6	1.205	0.027	43.820	0.000	1.151	1.259
Discolour24	1.176	0.030	39.160	0.000	1.117	1.235
TasteSmell6	1.150	0.033	35.300	0.000	1.086	1.214
Pol2Else	1.118	0.036	31.070	0.000	1.048	1.189
LowPressure	0.961	0.035	27.450	0.000	0.893	1.030
PlannedInt6	0.952	0.032	30.190	0.000	0.890	1.014
LowFlowNearby	0.724	0.028	25.960	0.000	0.670	0.779
StormFlowNearby	0.583	0.028	20.740	0.000	0.528	0.638
RWQNearby	0.569	0.035	16.060	0.000	0.500	0.639
Pol3Nearby	0.541	0.028	19.160	0.000	0.485	0.596
LowFlowElse	0.522	0.031	17.070	0.000	0.462	0.582
HoseBan	0.496	0.031	16.220	0.000	0.436	0.556
RWQElse	0.356	0.026	13.710	0.000	0.305	0.407
Pol3Else	0.293	0.038	7.770	0.000	0.219	0.366
StormFlowElse	0.133	0.031	4.31	0	0.072	0.193
BWQGood	0.048	0.034	1.42	0.155	-0.018	0.114

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 1263 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 54: SP1 household econometric model (means) for Portsmouth Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.239	0.073	44.260	0.000	3.096	3.383
ExternalSF	2.241	0.067	33.610	0.000	2.110	2.371
RotaCuts	1.756	0.058	30.110	0.000	1.641	1.870
DND	1.505	0.053	28.400	0.000	1.401	1.609
UnexpInt24	1.493	0.077	19.450	0.000	1.343	1.644
Boil	1.059	0.061	17.490	0.000	0.941	1.178
Pol2Nearby	0.797	0.063	12.68	0	0.674	0.921
UnexpInt6	0.716	0.067	10.680	0.000	0.584	0.847
TasteSmell24	0.508	0.063	8.060	0.000	0.385	0.632
Pol2Else	0.457	0.063	7.2	0	0.332	0.581
Discolour6	0.440	0.065	6.740	0.000	0.312	0.568
Discolour24	0.367	0.072	5.130	0.000	0.227	0.508
TasteSmell6	0.305	0.063	4.810	0.000	0.181	0.430
BWQGood	0.261	0.066	3.97	0	0.132	0.390
LowFlowNearby	0.194	0.053	3.670	0.000	0.090	0.298
LowPressure	0.136	0.064	2.130	0.034	0.010	0.262
StormFlowNearby	0.041	0.073	0.57	0.572	-0.102	0.184
PlannedInt6	0.038	0.075	0.510	0.609	-0.109	0.185
HoseBan	-0.014	0.071	-0.190	0.847	-0.153	0.126
LowFlowElse	-0.072	0.074	-0.970	0.331	-0.218	0.074
Pol3Else	-0.214	0.074	-2.91	0.004	-0.359	-0.070
Pol3Nearby	-0.303	0.059	-5.1	0	-0.420	-0.186
RWQNearby	-0.391	0.077	-5.11	0	-0.541	-0.241
RWQElse	-0.437	0.068	-6.46	0	-0.570	-0.304
StormFlowElse	-0.595	0.073	-8.11	0	-0.739	-0.451

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 507 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 55: SP1 household econometric model (means) for SES Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.296	0.073	59.020	0.000	4.153	4.439
ExternalSF	3.605	0.063	57.000	0.000	3.481	3.730
RotaCuts	3.219	0.078	41.380	0.000	3.066	3.372
DND	2.957	0.072	41.230	0.000	2.816	3.098
UnexpInt24	2.933	0.074	39.570	0.000	2.787	3.078
Boil	2.339	0.071	33.090	0.000	2.201	2.478
UnexpInt6	2.143	0.067	32.000	0.000	2.012	2.274
Pol2Nearby	1.826	0.070	26.06	0	1.688	1.963
Discolour24	1.778	0.062	28.490	0.000	1.655	1.900
Discolour6	1.747	0.065	26.860	0.000	1.619	1.875
TasteSmell24	1.606	0.065	24.650	0.000	1.478	1.734
Pol2Else	1.522	0.064	23.8	0	1.397	1.648
HoseBan	1.390	0.057	24.390	0.000	1.278	1.501
PlannedInt6	1.368	0.078	17.540	0.000	1.215	1.521
LowFlowNearby	1.248	0.081	15.500	0.000	1.090	1.406
TasteSmell6	1.186	0.056	21.020	0.000	1.075	1.297
LowPressure	1.141	0.067	17.150	0.000	1.010	1.271
RWQNearby	0.986	0.061	16.18	0	0.866	1.105
LowFlowElse	0.929	0.060	15.470	0.000	0.811	1.046
Pol3Nearby	0.867	0.061	14.240	0.000	0.747	0.986
StormFlowNearby	0.853	0.074	11.5	0	0.707	0.998
Pol3Else	0.604	0.075	8.04	0	0.456	0.751
StormFlowElse	0.522	0.066	7.97	0	0.394	0.651
RWQElse	0.415	0.056	7.37	0	0.304	0.525
BWQGood	0.136	0.058	2.33	0.02	0.021	0.250

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 505 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 56: SP1 household econometric model (means) for South East Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.476	0.076	58.87	0	4.326	4.625
ExternalSF	3.088	0.070	44.420	0.000	2.951	3.224
RotaCuts	2.745	0.071	38.650	0.000	2.606	2.884
UnexpInt24	2.313	0.067	34.550	0.000	2.182	2.444
DND	2.212	0.072	30.550	0.000	2.070	2.354
Boil	2.034	0.072	28.250	0.000	1.893	2.176
UnexpInt6	1.743	0.070	24.82	0	1.605	1.880
Pol2Nearby	1.469	0.061	24.200	0.000	1.350	1.588
Discolour24	1.252	0.066	18.850	0.000	1.122	1.383
Pol2Else	1.252	0.064	19.59	0	1.127	1.377
Discolour6	1.212	0.077	15.810	0.000	1.062	1.363
PlannedInt6	1.062	0.067	15.950	0.000	0.932	1.193
TasteSmell6	1.055	0.065	16.15	0	0.927	1.183
TasteSmell24	1.010	0.077	13.150	0.000	0.860	1.161
LowPressure	0.996	0.060	16.630	0.000	0.878	1.114
LowFlowNearby	0.918	0.072	12.680	0.000	0.776	1.060
StormFlowNearby	0.799	0.075	10.65	0	0.652	0.947
HoseBan	0.709	0.055	12.980	0.000	0.602	0.816
Pol3Nearby	0.672	0.075	8.96	0	0.525	0.819
RWQNearby	0.668	0.067	9.92	0	0.536	0.800
LowFlowElse	0.620	0.066	9.450	0.000	0.491	0.749
Pol3Else	0.468	0.063	7.44	0	0.344	0.591
RWQElse	0.376	0.064	5.88	0	0.251	0.501
StormFlowElse	0.362	0.092	3.94	0	0.181	0.542
BWQGood	0.283	0.065	4.35	0	0.155	0.410

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 508 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 57: SP1 household econometric model (means) for Southern Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.448	0.051	67.210	0.000	3.347	3.549
ExternalSF	2.301	0.051	44.92	0	2.201	2.402
RotaCuts	1.861	0.044	42.410	0.000	1.775	1.947
UnexpInt24	1.665	0.049	33.750	0.000	1.569	1.762
DND	1.573	0.044	35.810	0.000	1.486	1.659
Boil	1.341	0.038	35.5	0	1.267	1.415
UnexpInt6	1.029	0.045	22.650	0.000	0.940	1.118
Pol2Else	0.904	0.039	23.380	0.000	0.828	0.980
Pol2Nearby	0.869	0.039	22.31	0	0.793	0.946
Discolour24	0.727	0.040	18.17	0	0.649	0.806
Discolour6	0.688	0.049	14.020	0.000	0.592	0.784
TasteSmell24	0.570	0.046	12.270	0.000	0.479	0.661
TasteSmell6	0.567	0.042	13.660	0.000	0.486	0.649
PlannedInt6	0.530	0.043	12.24	0	0.445	0.615
LowPressure	0.520	0.043	12.020	0.000	0.435	0.605
LowFlowNearby	0.344	0.050	6.900	0.000	0.246	0.441
Pol3Nearby	0.249	0.045	5.5	0	0.160	0.338
LowFlowElse	0.244	0.046	5.330	0.000	0.154	0.333
HoseBan	0.164	0.049	3.37	0.001	0.068	0.259
StormFlowNearby	0.138	0.042	3.29	0.001	0.056	0.220
BWQGood	0.079	0.040	1.95	0.052	-0.001	0.158
Pol3Else	0.030	0.051	0.6	0.551	-0.069	0.130
RWQNearby	-0.127	0.041	-3.11	0.002	-0.208	-0.047
RWQElse	-0.153	0.043	-3.55	0	-0.238	-0.068
StormFlowElse	-0.356	0.052	-6.78	0	-0.459	-0.253

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 811 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 58: SP1 household econometric model (means) for South Staffs Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.713	0.059	62.610	0.000	3.596	3.829
ExternalSF	2.984	0.078	38.12	0	2.831	3.138
RotaCuts	2.582	0.063	40.740	0.000	2.458	2.706
UnexpInt24	2.505	0.048	52.540	0.000	2.412	2.599
DND	2.252	0.058	39.04	0	2.139	2.365
UnexpInt6	2.088	0.068	30.640	0.000	1.954	2.221
Boil	1.900	0.064	29.750	0.000	1.775	2.025
TasteSmell24	1.664	0.061	27.48	0	1.545	1.783
Discolour24	1.660	0.054	31.03	0	1.555	1.765
Pol2Nearby	1.655	0.050	32.8	0	1.556	1.754
Pol2Else	1.573	0.061	25.64	0	1.452	1.693
Discolour6	1.510	0.066	22.970	0.000	1.381	1.640
TasteSmell6	1.414	0.057	24.650	0.000	1.302	1.527
PlannedInt6	1.310	0.056	23.270	0.000	1.200	1.421
LowPressure	1.060	0.056	18.96	0	0.950	1.170
LowFlowElse	1.036	0.057	18.210	0.000	0.924	1.147
Pol3Else	0.953	0.059	16.26	0	0.838	1.069
LowFlowNearby	0.871	0.057	15.160	0.000	0.758	0.983
Pol3Nearby	0.852	0.061	13.95	0	0.732	0.972
HoseBan	0.823	0.062	13.35	0	0.702	0.944
StormFlowNearby	0.801	0.060	13.32	0	0.683	0.919
RWQNearby	0.776	0.058	13.3	0	0.662	0.891
RWQElse	0.670	0.058	11.56	0	0.556	0.783
StormFlowElse	0.514	0.053	9.61	0	0.409	0.619
BWQGood	-0.062	0.059	-1.06	0.288	-0.177	0.053

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 609 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 59: SP1 household econometric model (means) for Severn Trent Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.045	0.041	99.040	0.000	3.965	4.125
ExternalSF	3.020	0.033	92.57	0	2.956	3.084
RotaCuts	2.561	0.042	61.110	0.000	2.479	2.644
DND	2.432	0.043	56.730	0.000	2.348	2.516
UnexpInt24	2.335	0.040	58.99	0	2.257	2.412
UnexpInt6	2.090	0.036	58.24	0	2.019	2.160
Boil	1.967	0.043	46.180	0.000	1.883	2.050
TasteSmell24	1.741	0.038	46.11	0	1.667	1.815
Pol2Nearby	1.603	0.039	40.89	0	1.526	1.680
Discolour24	1.591	0.035	45.08	0	1.522	1.661
TasteSmell6	1.566	0.035	44.910	0.000	1.497	1.634
PlannedInt6	1.490	0.047	31.840	0.000	1.398	1.582
Pol2Else	1.473	0.041	35.81	0	1.392	1.554
Discolour6	1.465	0.043	33.91	0	1.381	1.550
LowPressure	1.449	0.031	46.340	0.000	1.388	1.511
LowFlowNearby	1.292	0.044	29.64	0	1.206	1.377
Pol3Nearby	1.093	0.033	33.47	0	1.029	1.157
RWQNearby	1.051	0.039	26.7	0	0.973	1.128
HoseBan	0.957	0.034	27.93	0	0.890	1.024
LowFlowElse	0.935	0.028	33.290	0.000	0.880	0.990
StormFlowNearby	0.928	0.034	27.65	0	0.862	0.994
Pol3Else	0.763	0.041	18.53	0	0.682	0.844
RWQElse	0.696	0.039	17.89	0	0.620	0.772
StormFlowElse	0.657	0.044	14.83	0	0.570	0.744
BWQGood	0.262	0.037	7.04	0	0.189	0.335

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 1014 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 60: SP1 household econometric model (means) for South West Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.310	0.056	59.2	0	3.200	3.419
ExternalSF	2.100	0.056	37.37	0	1.989	2.210
RotaCuts	1.884	0.072	25.990	0.000	1.742	2.026
UnexpInt24	1.528	0.054	28.36	0	1.422	1.634
DND	1.270	0.052	24.3	0	1.168	1.373
Boil	1.241	0.053	23.480	0.000	1.137	1.345
UnexpInt6	0.955	0.055	17.24	0	0.847	1.064
Pol2Nearby	0.938	0.055	17.170	0.000	0.831	1.045
Pol2Else	0.697	0.056	12.5	0	0.587	0.806
Discolour6	0.506	0.059	8.630	0.000	0.391	0.621
Discolour24	0.483	0.062	7.77	0	0.361	0.604
TasteSmell24	0.428	0.057	7.55	0	0.317	0.539
TasteSmell6	0.386	0.060	6.420	0.000	0.268	0.504
PlannedInt6	0.253	0.055	4.64	0	0.146	0.360
BWQGood	0.169	0.053	3.19	0.001	0.065	0.274
LowFlowNearby	0.161	0.056	2.900	0.004	0.052	0.270
LowPressure	0.153	0.056	2.75	0.006	0.044	0.263
Pol3Nearby	0.096	0.063	1.53	0.126	-0.027	0.220
RWQNearby	-0.017	0.050	-0.34	0.735	-0.116	0.082
Pol3Else	-0.018	0.053	-0.34	0.731	-0.123	0.086
HoseBan	-0.021	0.059	-0.36	0.717	-0.137	0.095
RWQElse	-0.124	0.063	-1.97	0.049	-0.248	-0.001
LowFlowElse	-0.152	0.052	-2.9	0.004	-0.255	-0.049
StormFlowNearby	-0.152	0.052	-2.91	0.004	-0.255	-0.050
StormFlowElse	-0.477	0.062	-7.7	0	-0.598	-0.355

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 612 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 61: SP1 household econometric model (means) for Thames Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.403	0.034	98.93	0	3.335	3.470
ExternalSF	2.417	0.047	51.6	0	2.325	2.509
RotaCuts	2.185	0.038	58.17	0	2.112	2.259
UnexpInt24	1.986	0.037	54.33	0	1.915	2.058
DND	1.896	0.035	54.880	0.000	1.828	1.964
Boil	1.604	0.036	45.19	0	1.535	1.674
UnexpInt6	1.570	0.045	34.650	0.000	1.481	1.659
Pol2Nearby	1.440	0.043	33.73	0	1.356	1.523
TasteSmell24	1.300	0.043	29.97	0	1.215	1.385
Pol2Else	1.209	0.037	32.93	0	1.137	1.281
Discolour24	1.131	0.040	28.150	0.000	1.052	1.209
TasteSmell6	1.067	0.038	27.82	0	0.991	1.142
LowPressure	1.008	0.040	25.21	0	0.930	1.087
Discolour6	0.994	0.037	27.22	0	0.922	1.066
PlannedInt6	0.970	0.034	28.850	0.000	0.904	1.036
LowFlowNearby	0.863	0.038	22.61	0	0.788	0.938
Pol3Nearby	0.752	0.042	17.95	0	0.670	0.835
StormFlowNearby	0.708	0.038	18.41	0	0.633	0.784
RWQNearby	0.595	0.049	12.1	0	0.499	0.692
LowFlowElse	0.566	0.033	17.060	0.000	0.501	0.631
RWQElse	0.448	0.044	10.24	0	0.363	0.534
Pol3Else	0.383	0.039	9.88	0	0.307	0.459
HoseBan	0.378	0.039	9.79	0	0.302	0.454
StormFlowElse	0.261	0.037	7.05	0	0.188	0.333
BWQGood	-0.101	0.034	-2.93	0.003	-0.169	-0.033

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 1011 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 62: SP1 household econometric model (means) for United Utilities

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.696	0.020	182.55	0	3.656	3.736
ExternalSF	2.999	0.023	130.32	0	2.954	3.044
RotaCuts	2.361	0.021	114.26	0	2.320	2.401
UnexpInt24	2.254	0.022	101.780	0.000	2.211	2.298
DND	2.113	0.019	110.71	0	2.076	2.151
Boil	1.821	0.022	81.700	0.000	1.777	1.865
UnexpInt6	1.743	0.019	91.11	0	1.706	1.781
Pol2Nearby	1.558	0.018	88.080	0.000	1.523	1.592
TasteSmell24	1.412	0.020	70.7	0	1.373	1.451
Discolour24	1.294	0.020	64.39	0	1.255	1.333
Pol2Else	1.251	0.021	58.65	0	1.209	1.293
TasteSmell6	1.203	0.021	56.2	0	1.161	1.245
Discolour6	1.153	0.024	47.980	0.000	1.106	1.201
PlannedInt6	1.149	0.020	56.96	0	1.109	1.189
LowPressure	1.029	0.020	52.74	0	0.991	1.067
LowFlowNearby	0.887	0.020	44.060	0.000	0.847	0.926
Pol3Nearby	0.737	0.020	37.44	0	0.698	0.775
LowFlowElse	0.662	0.022	30.73	0	0.619	0.704
RWQNearby	0.603	0.023	26.33	0	0.558	0.648
HoseBan	0.581	0.021	27.72	0	0.540	0.622
StormFlowNearby	0.538	0.019	27.77	0	0.500	0.576
Pol3Else	0.531	0.020	27.03	0	0.493	0.570
RWQElse	0.436	0.022	19.85	0	0.393	0.479
StormFlowElse	0.204	0.021	9.85	0	0.163	0.245
BWQGood	-0.072	0.022	-3.3	0.001	-0.115	-0.029

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 2028 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 63: SP1 household econometric model (means) for Wessex Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.968	0.069	57.570	0.000	3.832	4.103
ExternalSF	2.772	0.070	39.77	0	2.635	2.909
RotaCuts	2.275	0.062	36.75	0	2.153	2.396
UnexpInt24	1.966	0.072	27.370	0.000	1.825	2.107
DND	1.913	0.061	31.62	0	1.795	2.032
Boil	1.657	0.065	25.660	0.000	1.530	1.784
UnexpInt6	1.435	0.068	20.94	0	1.300	1.569
Pol2Else	1.344	0.072	18.69	0	1.203	1.485
Pol2Nearby	1.212	0.067	17.95	0	1.079	1.344
TasteSmell6	0.952	0.070	13.64	0	0.815	1.089
TasteSmell24	0.892	0.072	12.44	0	0.751	1.033
Discolour6	0.858	0.080	10.71	0	0.701	1.015
Discolour24	0.833	0.065	12.88	0	0.706	0.960
LowPressure	0.769	0.055	13.94	0	0.661	0.877
PlannedInt6	0.690	0.067	10.36	0	0.559	0.820
LowFlowNearby	0.627	0.066	9.55	0	0.498	0.756
StormFlowNearby	0.426	0.066	6.41	0	0.296	0.557
LowFlowElse	0.342	0.059	5.81	0	0.227	0.458
Pol3Else	0.332	0.061	5.43	0	0.212	0.453
Pol3Nearby	0.276	0.067	4.13	0	0.145	0.407
HoseBan	0.270	0.063	4.270	0.000	0.146	0.394
RWQNearby	0.212	0.075	2.84	0.005	0.065	0.358
RWQElse	0.133	0.070	1.89	0.059	-0.005	0.270
StormFlowElse	-0.012	0.081	-0.15	0.88	-0.170	0.146
BWQGood	-0.310	0.063	-4.92	0	-0.434	-0.186

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 508 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 64: SP1 household econometric model (means) for Yorkshire Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.940	0.074	53.16	0	3.795	4.086
ExternalSF	3.102	0.066	47.01	0	2.973	3.232
RotaCuts	2.646	0.068	39.190	0.000	2.514	2.779
DND	2.464	0.071	34.730	0.000	2.324	2.603
UnexpInt24	2.372	0.066	35.93	0	2.243	2.502
Boil	2.100	0.066	32.03	0	1.972	2.229
UnexpInt6	1.978	0.067	29.4	0	1.846	2.110
TasteSmell24	1.677	0.067	24.86	0	1.545	1.810
Discolour6	1.661	0.065	25.37	0	1.533	1.790
Discolour24	1.616	0.062	25.92	0	1.494	1.739
TasteSmell6	1.501	0.060	24.88	0	1.383	1.620
PlannedInt6	1.489	0.063	23.62	0	1.365	1.613
LowPressure	1.489	0.063	23.8	0	1.366	1.611
Pol2Nearby	1.482	0.071	20.81	0	1.342	1.622
Pol2Else	1.466	0.062	23.680	0.000	1.345	1.587
LowFlowNearby	1.059	0.059	17.89	0	0.943	1.175
RWQNearby	1.010	0.070	14.51	0	0.873	1.146
LowFlowElse	0.880	0.064	13.81	0	0.755	1.005
HoseBan	0.854	0.059	14.59	0	0.740	0.969
Pol3Nearby	0.800	0.060	13.45	0	0.684	0.917
StormFlowNearby	0.727	0.064	11.29	0	0.601	0.853
Pol3Else	0.605	0.065	9.29	0	0.477	0.733
RWQElse	0.510	0.062	8.21	0	0.388	0.632
StormFlowElse	0.432	0.059	7.27	0	0.315	0.549
BWQGood	-0.004	0.065	-0.05	0.957	-0.131	0.124

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 504 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Households: wastewater companies

Table 65: SP1 household econometric model (means) for Anglian Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.396	0.037	119.27	0	4.324	4.468
ExternalSF	2.988	0.028	108.03	0	2.934	3.043
RotaCuts	2.658	0.036	73.63	0	2.587	2.728
UnexpInt24	2.394	0.033	73.57	0	2.331	2.458
DND	2.239	0.030	74.18	0	2.179	2.298
Boil	1.841	0.035	52.51	0	1.772	1.910
UnexpInt6	1.738	0.031	56.01	0	1.677	1.799
Pol2Nearby	1.635	0.037	44.72	0	1.564	1.707
Pol2Else	1.416	0.036	39.27	0	1.345	1.487
Discolour24	1.378	0.029	47.07	0	1.320	1.435
Discolour6	1.251	0.037	33.77	0	1.178	1.324
TasteSmell24	1.152	0.031	36.7	0	1.090	1.213
PlannedInt6	1.098	0.038	28.6	0	1.022	1.173
TasteSmell6	1.095	0.030	37.08	0	1.037	1.153
LowFlowNearby	0.978	0.034	28.570	0.000	0.910	1.045
LowPressure	0.934	0.032	29	0	0.870	0.997
LowFlowElse	0.922	0.040	23.19	0	0.844	1.000
HoseBan	0.778	0.036	21.7	0	0.708	0.848
RWQNearby	0.777	0.034	22.96	0	0.711	0.844
StormFlowNearby	0.610	0.036	16.77	0	0.538	0.681
Pol3Nearby	0.587	0.036	16.13	0	0.516	0.659
Pol3Else	0.495	0.033	14.99	0	0.430	0.560
RWQElse	0.379	0.033	11.34	0	0.313	0.444
StormFlowElse	0.325	0.032	10.04	0	0.262	0.389
BWQGood	0.082	0.041	1.99	0.047	0.001	0.162

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 1125 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 66: SP1 household econometric model (means) for Northumbrian Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.493	0.075	46.79	0	3.347	3.640
ExternalSF	2.414	0.071	33.77	0	2.274	2.554
UnexpInt24	2.289	0.084	27.19	0	2.124	2.454
RotaCuts	1.852	0.064	28.84	0	1.726	1.978
DND	1.846	0.064	28.84	0	1.720	1.972
Boil	1.832	0.067	27.39	0	1.701	1.964
UnexpInt6	1.523	0.076	20.01	0	1.373	1.672
TasteSmell24	1.468	0.065	22.63	0	1.341	1.595
Pol2Nearby	1.101	0.064	17.29	0	0.976	1.226
Discolour6	1.076	0.062	17.290	0.000	0.954	1.198
TasteSmell6	1.070	0.064	16.82	0	0.945	1.195
Pol2Else	0.912	0.062	14.64	0	0.790	1.034
Discolour24	0.864	0.066	13.1	0	0.734	0.993
LowPressure	0.804	0.064	12.47	0	0.678	0.931
PlannedInt6	0.745	0.074	10.11	0	0.601	0.890
Pol3Nearby	0.630	0.064	9.85	0	0.505	0.756
LowFlowNearby	0.615	0.058	10.66	0	0.502	0.729
StormFlowNearby	0.461	0.056	8.19	0	0.350	0.571
RWQNearby	0.430	0.067	6.38	0	0.298	0.563
RWQElse	0.253	0.064	3.97	0	0.128	0.378
LowFlowElse	0.249	0.065	3.86	0	0.123	0.376
HoseBan	0.216	0.066	3.27	0.001	0.086	0.345
Pol3Else	0.109	0.069	1.58	0.114	-0.026	0.245
StormFlowElse	0.014	0.066	0.21	0.835	-0.117	0.144
BWQGood	-0.014	0.069	-0.21	0.835	-0.149	0.121

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 501 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 67: SP1 household econometric model (means) for Southern Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.520	0.030	118.11	0	3.461	3.578
ExternalSF	2.348	0.024	99.46	0	2.301	2.394
RotaCuts	1.942	0.024	81.48	0	1.895	1.989
UnexpInt24	1.700	0.023	74.8	0	1.655	1.744
DND	1.651	0.021	79.2	0	1.610	1.692
Boil	1.347	0.022	61.95	0	1.304	1.390
UnexpInt6	1.027	0.021	48.14	0	0.986	1.069
Pol2Nearby	0.879	0.024	36.98	0	0.832	0.925
Pol2Else	0.784	0.027	29.07	0	0.731	0.837
Discolour24	0.701	0.025	28.080	0.000	0.652	0.750
Discolour6	0.644	0.023	28.21	0	0.599	0.689
TasteSmell24	0.576	0.024	24.1	0	0.529	0.623
TasteSmell6	0.540	0.024	22.34	0	0.493	0.588
PlannedInt6	0.455	0.030	15.08	0	0.396	0.515
LowPressure	0.412	0.024	17	0	0.364	0.459
LowFlowNearby	0.384	0.023	16.77	0	0.339	0.429
LowFlowElse	0.234	0.023	10.34	0	0.189	0.278
StormFlowNearby	0.193	0.026	7.52	0	0.143	0.244
BWQGood	0.192	0.029	6.66	0	0.135	0.248
HoseBan	0.171	0.024	7.22	0	0.124	0.217
Pol3Nearby	0.143	0.029	5.01	0	0.087	0.199
Pol3Else	-0.009	0.024	-0.36	0.719	-0.056	0.039
RWQNearby	-0.090	0.027	-3.34	0.001	-0.143	-0.037
RWQElse	-0.234	0.025	-9.38	0	-0.283	-0.185
StormFlowElse	-0.327	0.026	-12.63	0	-0.378	-0.276

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 1679 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 68: SP1 household econometric model (means) for Severn Trent Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.817	0.030	128.6	0	3.759	3.876
ExternalSF	2.941	0.031	94.38	0	2.880	3.002
RotaCuts	2.504	0.027	94.14	0	2.452	2.557
DND	2.369	0.027	86.4	0	2.315	2.423
UnexpInt24	2.369	0.026	90.43	0	2.317	2.420
UnexpInt6	2.035	0.027	76.09	0	1.983	2.088
Boil	1.932	0.031	61.67	0	1.871	1.994
TasteSmell24	1.718	0.027	62.88	0	1.664	1.772
Discolour24	1.664	0.029	56.840	0.000	1.607	1.722
TasteSmell6	1.565	0.026	60.49	0	1.514	1.616
Pol2Nearby	1.557	0.026	59.89	0	1.506	1.608
Discolour6	1.506	0.024	63.32	0	1.460	1.553
PlannedInt6	1.450	0.026	56.3	0	1.399	1.500
LowPressure	1.428	0.024	59.74	0	1.381	1.475
Pol2Else	1.418	0.027	51.81	0	1.364	1.471
LowFlowNearby	1.120	0.030	37.89	0	1.062	1.178
Pol3Nearby	1.055	0.027	38.65	0	1.002	1.109
RWQNearby	1.002	0.027	37.17	0	0.949	1.055
LowFlowElse	0.938	0.030	31.72	0	0.880	0.996
StormFlowNearby	0.876	0.027	32.73	0	0.823	0.928
HoseBan	0.866	0.028	31.17	0	0.812	0.921
Pol3Else	0.824	0.027	30.32	0	0.770	0.877
RWQElse	0.693	0.026	26.66	0	0.642	0.744
StormFlowElse	0.615	0.031	19.82	0	0.554	0.676
BWQGood	0.153	0.029	5.38	0	0.097	0.209

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 1436 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 69: SP1 household econometric model (means) for South West Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.407	0.074	46.27	0	3.262	3.551
ExternalSF	2.138	0.068	31.33	0	2.004	2.272
RotaCuts	1.936	0.063	30.63	0	1.812	2.060
UnexpInt24	1.561	0.073	21.44	0	1.418	1.703
DND	1.250	0.070	17.93	0	1.113	1.387
Boil	1.175	0.063	18.52	0	1.050	1.299
Pol2Nearby	1.067	0.059	18	0	0.951	1.183
UnexpInt6	1.027	0.072	14.2	0	0.885	1.169
Pol2Else	0.816	0.063	13	0	0.693	0.940
Discolour6	0.598	0.064	9.36	0	0.473	0.723
Discolour24	0.584	0.057	10.22	0	0.472	0.696
TasteSmell6	0.492	0.066	7.51	0	0.364	0.621
TasteSmell24	0.475	0.067	7.040	0.000	0.343	0.607
PlannedInt6	0.279	0.063	4.42	0	0.155	0.403
LowFlowNearby	0.254	0.060	4.22	0	0.136	0.372
BWQGood	0.186	0.072	2.6	0.009	0.046	0.327
LowPressure	0.180	0.074	2.42	0.016	0.034	0.326
Pol3Nearby	0.083	0.061	1.35	0.178	-0.038	0.203
HoseBan	0.053	0.066	0.8	0.423	-0.077	0.183
RWQNearby	0.037	0.069	0.53	0.594	-0.099	0.173
Pol3Else	0.029	0.069	0.42	0.674	-0.106	0.164
LowFlowElse	-0.146	0.059	-2.48	0.013	-0.262	-0.031
StormFlowNearby	-0.150	0.063	-2.39	0.017	-0.274	-0.027
RWQElse	-0.171	0.070	-2.46	0.014	-0.308	-0.035
StormFlowElse	-0.329	0.060	-5.47	0	-0.447	-0.211

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 506 participants
Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 70: SP1 household econometric model (means) for Thames Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.715	0.016	231.02	0	3.684	3.747
ExternalSF	2.766	0.016	168.84	0	2.734	2.798
RotaCuts	2.395	0.016	148.03	0	2.363	2.426
UnexpInt24	2.210	0.017	128.13	0	2.177	2.244
DND	2.116	0.016	128.51	0	2.084	2.148
Boil	1.835	0.018	102.15	0	1.799	1.870
UnexpInt6	1.764	0.017	101.9	0	1.730	1.798
Pol2Nearby	1.540	0.017	89.53	0	1.506	1.574
TasteSmell24	1.359	0.017	80.69	0	1.326	1.392
Discolour24	1.335	0.020	68.01	0	1.297	1.374
Discolour6	1.293	0.016	79.5	0	1.261	1.325
Pol2Else	1.248	0.019	66.95	0	1.211	1.284
TasteSmell6	1.162	0.019	61.12	0	1.125	1.199
PlannedInt6	1.150	0.020	56.620	0.000	1.110	1.190
LowPressure	1.058	0.016	66.77	0	1.027	1.089
LowFlowNearby	0.964	0.015	63.78	0	0.935	0.994
Pol3Nearby	0.777	0.022	35.17	0	0.734	0.820
StormFlowNearby	0.737	0.016	45.38	0	0.705	0.769
HoseBan	0.726	0.018	39.85	0	0.690	0.761
LowFlowElse	0.720	0.017	42.23	0	0.687	0.754
RWQNearby	0.707	0.019	37.94	0	0.670	0.743
RWQElse	0.548	0.017	32.18	0	0.515	0.582
Pol3Else	0.495	0.016	31.26	0	0.464	0.526
StormFlowElse	0.320	0.016	19.82	0	0.289	0.352
BWQGood	-0.067	0.017	-4.04	0	-0.100	-0.035

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 2517 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 71: SP1 household econometric model (means) for United Utilities Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.696	0.020	182.55	0	3.656	3.736
ExternalSF	2.999	0.023	130.32	0	2.954	3.044
RotaCuts	2.361	0.021	114.26	0	2.320	2.401
UnexpInt24	2.254	0.022	101.78	0	2.211	2.298
DND	2.113	0.019	110.71	0	2.076	2.151
Boil	1.821	0.022	81.7	0	1.777	1.865
UnexpInt6	1.743	0.019	91.11	0	1.706	1.781
Pol2Nearby	1.558	0.018	88.08	0	1.523	1.592
TasteSmell24	1.412	0.020	70.7	0	1.373	1.451
Discolour24	1.294	0.020	64.39	0	1.255	1.333
Pol2Else	1.251	0.021	58.65	0	1.209	1.293
TasteSmell6	1.203	0.021	56.2	0	1.161	1.245
Discolour6	1.153	0.024	47.98	0	1.106	1.201
PlannedInt6	1.149	0.020	56.96	0	1.109	1.189
LowPressure	1.029	0.020	52.740	0.000	0.991	1.067
LowFlowNearby	0.887	0.020	44.06	0	0.847	0.926
Pol3Nearby	0.737	0.020	37.44	0	0.698	0.775
LowFlowElse	0.662	0.022	30.73	0	0.619	0.704
RWQNearby	0.603	0.023	26.33	0	0.558	0.648
HoseBan	0.581	0.021	27.72	0	0.540	0.622
StormFlowNearby	0.538	0.019	27.77	0	0.500	0.576
Pol3Else	0.531	0.020	27.03	0	0.493	0.570
RWQElse	0.436	0.022	19.85	0	0.393	0.479
StormFlowElse	0.204	0.021	9.85	0	0.163	0.245
BWQGood	-0.072	0.022	-3.3	0.001	-0.115	-0.029

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 2028 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 72: SP1 household econometric model (means) for Wessex Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.804	0.029	129.82	0	3.746	3.861
ExternalSF	2.420	0.037	64.98	0	2.347	2.493
RotaCuts	2.100	0.034	60.96	0	2.033	2.168
UnexpInt24	1.731	0.036	48.05	0	1.660	1.801
DND	1.638	0.036	44.94	0	1.566	1.709
Boil	1.443	0.033	43.84	0	1.379	1.508
UnexpInt6	1.171	0.032	36.8	0	1.108	1.233
Pol2Else	1.019	0.033	31	0	0.954	1.083
Pol2Nearby	0.982	0.041	23.78	0	0.901	1.063
TasteSmell24	0.712	0.033	21.29	0	0.647	0.778
Discolour6	0.673	0.034	19.77	0	0.606	0.739
Discolour24	0.660	0.029	22.48	0	0.603	0.718
TasteSmell6	0.592	0.035	16.95	0	0.524	0.661
PlannedInt6	0.514	0.037	13.97	0	0.442	0.586
LowPressure	0.499	0.032	15.470	0.000	0.436	0.562
LowFlowNearby	0.492	0.043	11.44	0	0.408	0.577
LowFlowElse	0.357	0.030	11.89	0	0.298	0.416
StormFlowNearby	0.245	0.034	7.32	0	0.180	0.311
Pol3Nearby	0.165	0.038	4.34	0	0.090	0.240
HoseBan	0.125	0.032	3.97	0	0.063	0.187
RWQNearby	0.059	0.039	1.5	0.134	-0.018	0.135
RWQElse	-0.022	0.031	-0.69	0.493	-0.083	0.040
Pol3Else	-0.057	0.033	-1.74	0.082	-0.121	0.007
StormFlowElse	-0.230	0.031	-7.52	0	-0.290	-0.170
BWQGood	-0.293	0.031	-9.57	0	-0.354	-0.233

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 1108 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 73: SP1 household econometric model (means) for Yorkshire Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.822	0.069	55.2	0	3.686	3.957
ExternalSF	3.134	0.071	43.98	0	2.994	3.274
RotaCuts	2.640	0.062	42.26	0	2.517	2.762
DND	2.469	0.051	48.38	0	2.369	2.569
UnexpInt24	2.433	0.068	35.95	0	2.300	2.566
Boil	2.056	0.068	30.31	0	1.923	2.189
UnexpInt6	2.004	0.065	30.74	0	1.876	2.132
TasteSmell24	1.765	0.060	29.41	0	1.647	1.882
Discolour6	1.571	0.061	25.93	0	1.452	1.689
Discolour24	1.555	0.057	27.35	0	1.443	1.666
Pol2Else	1.502	0.064	23.45	0	1.376	1.628
TasteSmell6	1.479	0.054	27.57	0	1.374	1.585
LowPressure	1.478	0.060	24.48	0	1.359	1.596
Pol2Nearby	1.477	0.056	26.57	0	1.368	1.586
PlannedInt6	1.463	0.072	20.38	0	1.323	1.604
LowFlowNearby	1.068	0.056	19.160	0.000	0.959	1.177
RWQNearby	1.008	0.072	13.92	0	0.866	1.150
HoseBan	0.893	0.064	13.99	0	0.768	1.019
LowFlowElse	0.878	0.064	13.71	0	0.753	1.004
StormFlowNearby	0.749	0.065	11.57	0	0.622	0.876
Pol3Nearby	0.725	0.062	11.72	0	0.604	0.847
Pol3Else	0.695	0.068	10.25	0	0.562	0.828
RWQElse	0.523	0.069	7.6	0	0.388	0.657
StormFlowElse	0.434	0.068	6.36	0	0.300	0.568
BWQGood	0.040	0.069	0.58	0.561	-0.095	0.175

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 507 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Non-households: water companies

Table 74: SP1 non-household econometric model (means) for Affinity Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.621	0.117	39.66	0	4.393	4.850
ExternalSF	4.022	0.132	30.42	0	3.762	4.281
RotaCuts	3.946	0.141	27.91	0	3.668	4.223
UnexpInt24	3.509	0.156	22.49	0	3.203	3.816
UnexpInt6	3.298	0.149	22.18	0	3.006	3.590
PlannedInt6	3.062	0.131	23.3	0	2.804	3.320
DND	2.882	0.118	24.48	0	2.651	3.114
Boil	2.620	0.161	16.25	0	2.304	2.937
Discolour6	2.375	0.124	19.2	0	2.133	2.618
TasteSmell24	2.196	0.132	16.68	0	1.938	2.454
LowPressure	2.116	0.154	13.76	0	1.814	2.418
TasteSmell6	2.035	0.118	17.3	0	1.804	2.266
Discolour24	1.962	0.124	15.86	0	1.719	2.205
Pol2Else	1.699	0.118	14.35	0	1.467	1.932
Pol3Nearby	1.598	0.135	11.81	0	1.332	1.863
LowFlowNearby	1.401	0.140	10	0	1.126	1.676
StormFlowNearby	1.366	0.147	9.3	0	1.078	1.654
Pol3Else	1.337	0.127	10.55	0	1.088	1.585
HoseBan	1.275	0.128	9.98	0	1.025	1.526
Pol2Nearby	1.269	0.143	8.91	0	0.990	1.549
LowFlowElse	1.252	0.129	9.720	0.000	0.999	1.505
RWQNearby	1.184	0.151	7.84	0	0.888	1.480
RWQElse	0.695	0.139	5.01	0	0.422	0.967
StormFlowElse	0.650	0.138	4.71	0	0.379	0.921
BWQGood	-0.149	0.140	-1.06	0.288	-0.425	0.126

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 201 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 75:SP1 non-household econometric model (means) for Anglian Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	5.441	0.124	43.78	0	5.197	5.685
ExternalSF	4.512	0.154	29.25	0	4.209	4.815
RotaCuts	3.917	0.122	32.14	0	3.678	4.157
UnexpInt24	3.228	0.138	23.45	0	2.958	3.498
DND	3.028	0.152	19.97	0	2.731	3.326
UnexpInt6	2.893	0.133	21.78	0	2.632	3.153
Boil	2.820	0.160	17.65	0	2.506	3.133
PlannedInt6	2.400	0.165	14.59	0	2.078	2.723
Discolour24	2.023	0.135	15.04	0	1.759	2.287
Discolour6	1.982	0.120	16.51	0	1.746	2.218
LowPressure	1.948	0.139	14.06	0	1.677	2.220
TasteSmell24	1.653	0.118	14.01	0	1.422	1.885
TasteSmell6	1.593	0.120	13.24	0	1.357	1.829
Pol2Else	1.564	0.122	12.770	0.000	1.324	1.805
Pol2Nearby	1.409	0.139	10.15	0	1.137	1.682
Pol3Nearby	1.406	0.125	11.23	0	1.160	1.651
StormFlowNearby	1.319	0.128	10.29	0	1.067	1.570
LowFlowNearby	1.156	0.121	9.59	0	0.920	1.393
LowFlowElse	1.043	0.126	8.26	0	0.795	1.290
HoseBan	0.948	0.132	7.17	0	0.688	1.207
RWQNearby	0.854	0.148	5.78	0	0.564	1.144
StormFlowElse	0.740	0.129	5.75	0	0.487	0.993
Pol3Else	0.489	0.129	3.79	0	0.236	0.742
RWQElse	0.300	0.142	2.12	0.035	0.022	0.578
BWQGood	-0.676	0.141	-4.79	0	-0.952	-0.399

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 200 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 76:SP1 non-household econometric model (means) for Bristol Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.528	0.144	31.51	0	4.246	4.810
ExternalSF	3.697	0.138	26.71	0	3.425	3.969
UnexpInt24	2.922	0.129	22.65	0	2.669	3.175
RotaCuts	2.862	0.147	19.43	0	2.573	3.151
UnexpInt6	2.528	0.129	19.62	0	2.275	2.781
DND	2.496	0.122	20.5	0	2.257	2.735
Boil	2.031	0.133	15.23	0	1.770	2.293
PlannedInt6	1.941	0.145	13.41	0	1.657	2.225
Discolour6	1.627	0.120	13.59	0	1.392	1.862
Pol2Nearby	1.609	0.136	11.8	0	1.341	1.876
Discolour24	1.603	0.116	13.85	0	1.376	1.830
TasteSmell24	1.494	0.126	11.88	0	1.247	1.741
StormFlowNearby	1.355	0.169	8.02	0	1.023	1.686
LowPressure	1.327	0.139	9.510	0.000	1.053	1.600
Pol2Else	1.231	0.148	8.3	0	0.940	1.521
TasteSmell6	1.217	0.119	10.2	0	0.983	1.451
LowFlowNearby	1.198	0.127	9.46	0	0.950	1.447
RWQNearby	1.012	0.129	7.84	0	0.758	1.265
Pol3Else	0.948	0.132	7.2	0	0.690	1.207
StormFlowElse	0.744	0.135	5.51	0	0.479	1.009
LowFlowElse	0.704	0.120	5.86	0	0.468	0.940
Pol3Nearby	0.608	0.131	4.64	0	0.351	0.865
HoseBan	0.471	0.137	3.44	0.001	0.202	0.740
RWQElse	0.437	0.133	3.3	0.001	0.177	0.697
BWQGood	-0.119	0.134	-0.88	0.377	-0.382	0.145

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 200 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 77:SP1 non-household econometric model (means) for Northumbrian Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.943	0.105	37.41	0	3.736	4.150
ExternalSF	2.997	0.084	35.56	0	2.831	3.162
UnexpInt24	2.182	0.083	26.22	0	2.019	2.345
RotaCuts	2.136	0.074	28.74	0	1.990	2.282
DND	2.018	0.075	26.93	0	1.871	2.165
UnexpInt6	1.758	0.074	23.74	0	1.613	1.904
Boil	1.464	0.078	18.71	0	1.310	1.617
Pol2Nearby	1.342	0.086	15.66	0	1.174	1.511
PlannedInt6	1.242	0.074	16.810	0.000	1.097	1.387
Discolour6	1.083	0.081	13.39	0	0.924	1.242
TasteSmell24	1.070	0.067	15.93	0	0.938	1.202
Discolour24	1.052	0.088	12.01	0	0.880	1.224
TasteSmell6	0.911	0.079	11.51	0	0.755	1.066
Pol2Else	0.891	0.078	11.38	0	0.737	1.045
LowPressure	0.701	0.076	9.17	0	0.551	0.851
StormFlowNearby	0.687	0.078	8.84	0	0.534	0.839
LowFlowElse	0.439	0.073	6.04	0	0.296	0.581
Pol3Nearby	0.405	0.088	4.59	0	0.232	0.579
StormFlowElse	0.404	0.098	4.1	0	0.211	0.597
Pol3Else	0.254	0.071	3.58	0	0.115	0.394
LowFlowNearby	0.245	0.074	3.32	0.001	0.100	0.390
RWQNearby	0.083	0.080	1.04	0.297	-0.073	0.240
HoseBan	-0.025	0.085	-0.29	0.773	-0.192	0.143
RWQElse	-0.052	0.081	-0.65	0.518	-0.210	0.106
BWQGood	-0.085	0.088	-0.97	0.332	-0.258	0.087

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 267 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 78:SP1 non-household econometric model (means) for Portsmouth Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.426	0.216	20.5	0	4.002	4.849
ExternalSF	4.281	0.177	24.23	0	3.934	4.627
UnexpInt24	3.902	0.215	18.16	0	3.480	4.323
UnexpInt6	3.134	0.164	19.07	0	2.812	3.457
RotaCuts	2.973	0.187	15.88	0	2.606	3.341
DND	2.632	0.176	14.98	0	2.287	2.977
Pol2Nearby	2.587	0.186	13.88	0	2.222	2.953
Pol2Else	2.523	0.163	15.51	0	2.204	2.842
PlannedInt6	2.384	0.213	11.2	0	1.967	2.802
Pol3Nearby	2.160	0.179	12.08	0	1.809	2.511
Boil	2.156	0.155	13.93	0	1.852	2.460
Discolour6	1.895	0.164	11.54	0	1.573	2.218
Discolour24	1.732	0.211	8.19	0	1.317	2.147
StormFlowNearby	1.717	0.174	9.86	0	1.375	2.058
TasteSmell24	1.694	0.184	9.190	0.000	1.332	2.056
LowPressure	1.678	0.167	10.02	0	1.349	2.006
TasteSmell6	1.566	0.145	10.83	0	1.282	1.849
LowFlowNearby	1.424	0.165	8.63	0	1.100	1.748
RWQNearby	1.371	0.185	7.4	0	1.008	1.735
StormFlowElse	1.371	0.176	7.78	0	1.025	1.717
LowFlowElse	1.258	0.172	7.33	0	0.921	1.595
Pol3Else	1.215	0.167	7.27	0	0.887	1.544
HoseBan	1.031	0.166	6.23	0	0.706	1.356
RWQElse	0.406	0.153	2.65	0.008	0.105	0.706
BWQGood	-0.267	0.205	-1.3	0.194	-0.669	0.136

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 196 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 79:SP1 non-household econometric model (means) for SES Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	5.418	0.124	43.72	0	5.174	5.661
ExternalSF	5.122	0.154	33.21	0	4.820	5.425
UnexpInt24	4.375	0.146	30.07	0	4.090	4.661
RotaCuts	4.106	0.128	32.05	0	3.854	4.357
DND	3.709	0.146	25.34	0	3.421	3.996
UnexpInt6	3.553	0.123	29	0	3.312	3.793
PlannedInt6	3.388	0.132	25.62	0	3.129	3.648
Boil	3.192	0.124	25.7	0	2.948	3.435
TasteSmell24	3.189	0.143	22.35	0	2.909	3.469
Discolour6	2.783	0.135	20.61	0	2.518	3.048
Discolour24	2.752	0.138	19.99	0	2.481	3.022
TasteSmell6	2.667	0.131	20.43	0	2.411	2.923
LowPressure	2.584	0.143	18.08	0	2.303	2.864
Pol2Nearby	2.497	0.120	20.73	0	2.261	2.734
StormFlowNearby	2.174	0.141	15.38	0	1.897	2.451
Pol2Else	2.141	0.151	14.19	0	1.845	2.437
Pol3Nearby	1.795	0.139	12.95	0	1.523	2.067
LowFlowNearby	1.680	0.126	13.360	0.000	1.433	1.926
LowFlowElse	1.657	0.128	12.99	0	1.407	1.907
StormFlowElse	1.532	0.147	10.46	0	1.245	1.820
RWQNearby	1.516	0.142	10.67	0	1.237	1.795
Pol3Else	1.392	0.131	10.59	0	1.134	1.650
HoseBan	1.331	0.138	9.65	0	1.061	1.602
RWQElse	0.599	0.147	4.07	0	0.310	0.889
BWQGood	0.179	0.138	1.29	0.196	-0.093	0.450

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 195 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 80:SP1 non-household econometric model (means) for South East Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.398	0.119	28.530	0.000	3.164	3.632
ExternalSF	2.813	0.120	23.34	0	2.576	3.049
RotaCuts	2.315	0.111	20.87	0	2.097	2.533
UnexpInt24	2.211	0.118	18.74	0	1.980	2.443
UnexpInt6	2.201	0.110	20.04	0	1.985	2.416
DND	1.779	0.120	14.87	0	1.544	2.014
Boil	1.317	0.124	10.64	0	1.074	1.561
PlannedInt6	1.119	0.118	9.47	0	0.887	1.351
Discolour24	1.009	0.120	8.38	0	0.773	1.245
TasteSmell24	0.847	0.109	7.75	0	0.633	1.062
Discolour6	0.791	0.101	7.8	0	0.592	0.990
LowPressure	0.598	0.120	4.98	0	0.362	0.833
Pol2Nearby	0.471	0.115	4.1	0	0.245	0.696
TasteSmell6	0.200	0.137	1.46	0.145	-0.069	0.468
BWQGood	0.181	0.124	1.46	0.144	-0.062	0.425
Pol2Else	0.150	0.116	1.29	0.196	-0.077	0.377
Pol3Nearby	0.004	0.124	0.03	0.975	-0.238	0.246
StormFlowNearby	-0.147	0.117	-1.25	0.211	-0.377	0.083
LowFlowElse	-0.235	0.108	-2.19	0.029	-0.447	-0.024
LowFlowNearby	-0.359	0.110	-3.26	0.001	-0.575	-0.143
HoseBan	-0.392	0.129	-3.04	0.002	-0.645	-0.139
StormFlowElse	-0.439	0.117	-3.74	0	-0.669	-0.209
RWQNearby	-0.581	0.117	-4.97	0	-0.810	-0.352
RWQElse	-0.683	0.129	-5.3	0	-0.936	-0.431
Pol3Else	-0.828	0.128	-6.46	0	-1.080	-0.577

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 198 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 81:SP1 non-household econometric model (means) for Southern Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.886	0.128	30.36	0	3.634	4.137
ExternalSF	3.092	0.153	20.16	0	2.791	3.393
UnexpInt24	2.364	0.161	14.64	0	2.048	2.681
RotaCuts	2.350	0.130	18.04	0	2.095	2.606
DND	1.772	0.126	14.05	0	1.524	2.019
Boil	1.705	0.173	9.86	0	1.366	2.044
UnexpInt6	1.682	0.155	10.85	0	1.378	1.987
PlannedInt6	1.501	0.154	9.74	0	1.198	1.803
TasteSmell24	1.313	0.129	10.16	0	1.059	1.566
Discolour24	1.170	0.123	9.54	0	0.930	1.411
TasteSmell6	1.147	0.115	10	0	0.922	1.372
Discolour6	0.940	0.130	7.21	0	0.684	1.196
Pol2Nearby	0.776	0.131	5.93	0	0.520	1.033
LowPressure	0.667	0.129	5.15	0	0.413	0.921
Pol2Else	0.642	0.142	4.53	0	0.364	0.921
Pol3Else	0.425	0.131	3.25	0.001	0.168	0.681
StormFlowNearby	0.259	0.131	1.98	0.049	0.002	0.517
Pol3Nearby	0.232	0.138	1.68	0.093	-0.039	0.503
LowFlowNearby	0.029	0.137	0.21	0.835	-0.240	0.297
StormFlowElse	-0.143	0.110	-1.29	0.196	-0.359	0.074
LowFlowElse	-0.146	0.158	-0.92	0.357	-0.456	0.165
RWQElse	-0.204	0.135	-1.51	0.132	-0.468	0.061
BWQGood	-0.204	0.153	-1.33	0.182	-0.505	0.096
RWQNearby	-0.352	0.147	-2.4	0.017	-0.640	-0.064
HoseBan	-0.431	0.140	-3.08	0.002	-0.706	-0.156

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 201 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 82:SP1 non-household econometric model (means) for South Staffs Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	5.273	0.122	43.17	0	5.033	5.513
ExternalSF	4.171	0.135	30.79	0	3.905	4.437
UnexpInt24	3.586	0.143	25.09	0	3.305	3.866
DND	3.501	0.130	26.84	0	3.245	3.758
UnexpInt6	3.494	0.145	24.08	0	3.209	3.778
RotaCuts	3.271	0.134	24.45	0	3.008	3.533
PlannedInt6	3.148	0.166	18.92	0	2.822	3.475
Boil	2.919	0.140	20.9	0	2.645	3.193
Discolour6	2.420	0.135	17.87	0	2.155	2.686
Discolour24	2.407	0.119	20.16	0	2.173	2.641
TasteSmell6	2.338	0.149	15.65	0	2.045	2.631
LowPressure	2.163	0.150	14.46	0	1.869	2.456
TasteSmell24	1.980	0.128	15.46	0	1.729	2.232
StormFlowNearby	1.887	0.122	15.41	0	1.647	2.128
Pol3Nearby	1.700	0.133	12.77	0	1.439	1.961
Pol2Else	1.682	0.145	11.61	0	1.398	1.966
Pol2Nearby	1.581	0.157	10.09	0	1.274	1.889
LowFlowNearby	1.448	0.137	10.6	0	1.180	1.716
LowFlowElse	1.403	0.129	10.92	0	1.151	1.655
HoseBan	1.316	0.119	11.08	0	1.083	1.549
StormFlowElse	1.284	0.144	8.92	0	1.002	1.567
RWQNearby	1.248	0.125	9.97	0	1.002	1.493
Pol3Else	1.128	0.133	8.5	0	0.868	1.389
RWQElse	0.870	0.112	7.78	0	0.651	1.089
BWQGood	-0.231	0.173	-1.34	0.182	-0.571	0.108

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 198 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 83:SP1 non-household econometric model (means) for Severn Trent Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.908	0.129	30.38	0	3.656	4.160
ExternalSF	3.524	0.111	31.72	0	3.306	3.742
RotaCuts	2.854	0.101	28.35	0	2.657	3.052
UnexpInt6	2.838	0.129	21.97	0	2.585	3.092
UnexpInt24	2.783	0.102	27.41	0	2.584	2.983
DND	2.349	0.113	20.85	0	2.128	2.570
PlannedInt6	2.039	0.113	18.12	0	1.818	2.260
Boil	1.943	0.127	15.31	0	1.694	2.193
Discolour24	1.697	0.104	16.38	0	1.494	1.900
Discolour6	1.660	0.111	15.01	0	1.443	1.877
TasteSmell24	1.609	0.100	16.06	0	1.412	1.806
TasteSmell6	1.589	0.103	15.45	0	1.387	1.791
LowPressure	1.580	0.121	13.08	0	1.343	1.817
Pol2Nearby	1.394	0.106	13.14	0	1.186	1.602
Pol3Nearby	1.256	0.103	12.22	0	1.054	1.458
StormFlowNearby	0.980	0.098	10.04	0	0.788	1.172
Pol2Else	0.961	0.095	10.08	0	0.774	1.148
LowFlowNearby	0.805	0.111	7.26	0	0.587	1.022
LowFlowElse	0.582	0.098	5.96	0	0.390	0.774
StormFlowElse	0.509	0.111	4.57	0	0.290	0.727
Pol3Else	0.297	0.101	2.96	0.003	0.100	0.495
RWQNearby	0.286	0.104	2.76	0.006	0.082	0.490
HoseBan	0.230	0.094	2.44	0.015	0.045	0.415
RWQElse	0.040	0.110	0.37	0.715	-0.176	0.257
BWQGood	-0.340	0.109	-3.1	0.002	-0.554	-0.125

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 201 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 84: SP1 non-household econometric model (means) for South West Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.654	0.161	28.88	0	4.338	4.970
ExternalSF	3.653	0.154	23.75	0	3.351	3.955
UnexpInt24	3.281	0.149	22.07	0	2.989	3.573
RotaCuts	3.009	0.150	20.05	0	2.714	3.303
DND	2.800	0.142	19.67	0	2.520	3.079
UnexpInt6	2.673	0.141	18.93	0	2.396	2.950
PlannedInt6	2.382	0.116	20.56	0	2.154	2.609
Boil	2.212	0.142	15.58	0	1.934	2.491
Discolour24	1.801	0.152	11.84	0	1.502	2.099
TasteSmell24	1.603	0.136	11.76	0	1.336	1.871
TasteSmell6	1.456	0.134	10.89	0	1.194	1.719
Discolour6	1.396	0.127	10.97	0	1.146	1.646
LowPressure	1.210	0.141	8.59	0	0.934	1.486
Pol2Nearby	1.177	0.139	8.49	0	0.905	1.449
Pol2Else	1.025	0.122	8.43	0	0.787	1.264
StormFlowNearby	0.932	0.133	7	0	0.671	1.194
Pol3Nearby	0.930	0.124	7.52	0	0.687	1.172
LowFlowNearby	0.540	0.149	3.62	0	0.247	0.833
Pol3Else	0.443	0.160	2.77	0.006	0.129	0.757
HoseBan	0.327	0.137	2.38	0.018	0.057	0.596
StormFlowElse	0.171	0.148	1.16	0.247	-0.119	0.462
LowFlowElse	0.138	0.120	1.15	0.251	-0.098	0.374
RWQNearby	0.010	0.164	0.06	0.952	-0.311	0.331
RWQElse	-0.290	0.131	-2.21	0.027	-0.547	-0.033
BWQGood	-0.461	0.134	-3.43	0.001	-0.724	-0.197

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 236 participants
Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 85: SP1 non-household econometric model (means) for Thames Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	5.539	0.134	41.43	0	5.277	5.801
ExternalSF	4.519	0.149	30.41	0	4.227	4.810
UnexpInt24	4.099	0.114	35.82	0	3.875	4.324
RotaCuts	3.896	0.133	29.25	0	3.635	4.158
UnexpInt6	3.771	0.159	23.64	0	3.458	4.084
DND	3.552	0.144	24.69	0	3.270	3.834
PlannedInt6	3.243	0.130	24.99	0	2.988	3.497
Boil	3.012	0.151	19.9	0	2.715	3.309
LowPressure	2.798	0.133	20.96	0	2.536	3.059
Discolour6	2.782	0.140	19.92	0	2.508	3.056
TasteSmell24	2.457	0.128	19.24	0	2.207	2.708
TasteSmell6	2.428	0.119	20.48	0	2.195	2.661
Discolour24	2.178	0.156	13.97	0	1.872	2.484
Pol2Else	1.919	0.136	14.1	0	1.652	2.186
Pol3Nearby	1.860	0.137	13.57	0	1.591	2.129
Pol2Nearby	1.772	0.147	12.05	0	1.484	2.061
StormFlowNearby	1.752	0.153	11.46	0	1.452	2.052
LowFlowNearby	1.430	0.129	11.09	0	1.177	1.683
LowFlowElse	1.393	0.114	12.27	0	1.170	1.616
RWQNearby	1.291	0.135	9.58	0	1.027	1.556
Pol3Else	1.189	0.124	9.62	0	0.946	1.431
RWQElse	1.113	0.156	7.15	0	0.807	1.418
HoseBan	1.073	0.163	6.59	0	0.753	1.392
StormFlowElse	0.975	0.139	7.02	0	0.703	1.248
BWQGood	0.236	0.142	1.66	0.097	-0.043	0.514

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 196 participants
Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 86: SP1 non-household econometric model (means) for United Utilities Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.740	0.139	26.95	0	3.468	4.013
RotaCuts	3.263	0.151	21.6	0	2.966	3.559
ExternalSF	2.954	0.119	24.91	0	2.721	3.187
UnexpInt24	2.770	0.127	21.83	0	2.521	3.019
UnexpInt6	2.279	0.151	15.09	0	1.982	2.575
Boil	2.159	0.157	13.74	0	1.851	2.467
DND	2.060	0.118	17.5	0	1.829	2.291
PlannedInt6	1.607	0.148	10.87	0	1.317	1.897
Discolour24	1.459	0.125	11.63	0	1.213	1.705
Discolour6	1.397	0.134	10.41	0	1.133	1.660
LowPressure	1.221	0.127	9.64	0	0.972	1.469
TasteSmell6	1.049	0.114	9.17	0	0.825	1.274
TasteSmell24	1.048	0.136	7.72	0	0.781	1.314
Pol2Nearby	0.958	0.116	8.24	0	0.730	1.186
Pol2Else	0.709	0.129	5.51	0	0.456	0.962
HoseBan	0.414	0.134	3.09	0.002	0.151	0.677
StormFlowNearby	0.357	0.143	2.49	0.013	0.075	0.638
StormFlowElse	0.337	0.133	2.53	0.012	0.075	0.599
LowFlowElse	0.179	0.136	1.31	0.19	-0.089	0.446
BWQGood	0.174	0.130	1.33	0.182	-0.082	0.430
Pol3Else	0.171	0.125	1.37	0.171	-0.074	0.416
Pol3Nearby	0.070	0.129	0.54	0.589	-0.183	0.322
LowFlowNearby	0.059	0.143	0.41	0.679	-0.222	0.341
RWQElse	0.048	0.155	0.31	0.756	-0.256	0.353
RWQNearby	-0.049	0.159	-0.31	0.755	-0.361	0.262

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 260 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 87: SP1 non-household econometric model (means) for Wessex Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	5.065	0.130	39.01	0	4.810	5.320
ExternalSF	3.672	0.148	24.74	0	3.381	3.963
UnexpInt24	3.369	0.148	22.75	0	3.079	3.660
RotaCuts	3.045	0.120	25.48	0	2.811	3.280
DND	2.826	0.135	20.87	0	2.560	3.092
UnexpInt6	2.712	0.155	17.48	0	2.408	3.017
PlannedInt6	2.180	0.148	14.68	0	1.888	2.471
Boil	2.097	0.143	14.7	0	1.817	2.377
Discolour24	2.026	0.109	18.63	0	1.812	2.239
TasteSmell24	1.808	0.169	10.73	0	1.477	2.138
Pol2Nearby	1.637	0.131	12.54	0	1.381	1.893
Discolour6	1.607	0.144	11.17	0	1.324	1.889
TasteSmell6	1.430	0.131	10.88	0	1.172	1.688
LowPressure	1.405	0.119	11.79	0	1.171	1.639
Pol2Else	1.345	0.131	10.27	0	1.088	1.601
Pol3Nearby	1.073	0.141	7.6	0	0.796	1.350
LowFlowNearby	1.050	0.119	8.83	0	0.817	1.283
StormFlowNearby	0.886	0.120	7.41	0	0.652	1.121
LowFlowElse	0.823	0.116	7.1	0	0.595	1.051
RWQNearby	0.806	0.146	5.51	0	0.519	1.093
HoseBan	0.743	0.128	5.79	0	0.491	0.995
StormFlowElse	0.546	0.132	4.14	0	0.287	0.806
Pol3Else	0.417	0.136	3.07	0.002	0.151	0.683
RWQElse	0.356	0.139	2.57	0.01	0.084	0.628
BWQGood	0.055	0.143	0.38	0.702	-0.226	0.335

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 206 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 88: SP1 non-household econometric model (means) for Yorkshire Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	5.369	0.172	31.31	0	5.033	5.706
ExternalSF	4.390	0.158	27.83	0	4.081	4.700
UnexpInt24	4.182	0.123	34.05	0	3.941	4.423
RotaCuts	3.809	0.148	25.65	0	3.517	4.100
UnexpInt6	3.219	0.123	26.13	0	2.977	3.461
DND	3.169	0.135	23.43	0	2.904	3.434
Boil	3.054	0.119	25.6	0	2.820	3.288
PlannedInt6	2.950	0.137	21.53	0	2.681	3.219
Discolour6	2.604	0.142	18.33	0	2.325	2.882
Discolour24	2.542	0.141	17.98	0	2.264	2.819
LowPressure	2.486	0.125	19.87	0	2.241	2.732
TasteSmell6	2.319	0.121	19.18	0	2.082	2.556
TasteSmell24	2.072	0.149	13.86	0	1.779	2.365
Pol2Nearby	1.837	0.119	15.5	0	1.604	2.070
Pol2Else	1.762	0.160	11	0	1.448	2.076
StormFlowNearby	1.613	0.135	11.96	0	1.348	1.878
Pol3Nearby	1.594	0.134	11.87	0	1.330	1.857
LowFlowNearby	1.581	0.130	12.17	0	1.326	1.835
LowFlowElse	0.950	0.130	7.33	0	0.696	1.205
Pol3Else	0.939	0.118	7.99	0	0.708	1.170
RWQNearby	0.933	0.132	7.06	0	0.674	1.192
HoseBan	0.885	0.166	5.32	0	0.558	1.211
RWQElse	0.667	0.130	5.14	0	0.412	0.921
StormFlowElse	0.604	0.135	4.47	0	0.339	0.870
BWQGood	-0.055	0.136	-0.41	0.683	-0.322	0.211

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 199 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 89: SP1 non-household econometric model (means) for Wales

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.960	0.067	59.15	0	3.828	4.091
ExternalSF	3.220	0.057	56.54	0	3.108	3.331
UnexpInt24	2.505	0.064	39.21	0	2.379	2.630
RotaCuts	2.375	0.061	38.64	0	2.255	2.496
UnexpInt6	2.090	0.073	28.51	0	1.946	2.234
DND	2.083	0.071	29.36	0	1.943	2.222
Boil	1.590	0.072	22.1	0	1.449	1.731
Pol2Nearby	1.541	0.060	25.8	0	1.424	1.658
PlannedInt6	1.503	0.064	23.61	0	1.378	1.628
Discolour6	1.295	0.065	19.96	0	1.167	1.422
TasteSmell24	1.243	0.060	20.76	0	1.126	1.361
Pol2Else	1.233	0.063	19.71	0	1.111	1.356
Discolour24	1.190	0.057	20.91	0	1.078	1.301
TasteSmell6	1.045	0.063	16.5	0	0.921	1.169
StormFlowNearby	0.920	0.056	16.44	0	0.810	1.030
LowPressure	0.884	0.067	13.1	0	0.752	1.017
Pol3Nearby	0.863	0.073	11.89	0	0.721	1.006
LowFlowElse	0.621	0.062	9.99	0	0.499	0.743
LowFlowNearby	0.573	0.053	10.86	0	0.470	0.677
StormFlowElse	0.573	0.064	8.98	0	0.448	0.698
Pol3Else	0.527	0.066	7.93	0	0.396	0.657
RWQNearby	0.435	0.052	8.42	0	0.334	0.537
HoseBan	0.276	0.063	4.36	0	0.152	0.400
RWQElse	0.072	0.065	1.1	0.271	-0.056	0.199
BWQGood	-0.048	0.076	-0.63	0.528	-0.198	0.102

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 555 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Non-households: wastewater companies

Table 90: SP1 non-household econometric model (means) for Anglian Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.813	0.131	36.7	0	4.555	5.070
ExternalSF	3.916	0.128	30.63	0	3.665	4.167
RotaCuts	3.730	0.127	29.39	0	3.481	3.979
UnexpInt24	3.096	0.100	31.11	0	2.901	3.292
DND	2.918	0.113	25.75	0	2.695	3.140
UnexpInt6	2.869	0.092	31.21	0	2.689	3.049
Boil	2.476	0.111	22.4	0	2.259	2.693
PlannedInt6	2.287	0.100	22.84	0	2.090	2.483
Discolour24	1.984	0.115	17.28	0	1.759	2.209
Discolour6	1.954	0.105	18.68	0	1.749	2.159
LowPressure	1.805	0.099	18.2	0	1.611	2.000
TasteSmell24	1.710	0.100	17.09	0	1.514	1.907
TasteSmell6	1.557	0.091	17.1	0	1.379	1.736
Pol2Nearby	1.471	0.090	16.34	0	1.294	1.648
Pol3Nearby	1.454	0.113	12.81	0	1.231	1.677
StormFlowNearby	1.323	0.126	10.51	0	1.076	1.570
Pol2Else	1.295	0.110	11.82	0	1.080	1.510
LowFlowNearby	1.088	0.091	11.92	0	0.909	1.267
LowFlowElse	0.937	0.089	10.47	0	0.761	1.113
HoseBan	0.899	0.112	8	0	0.678	1.119
StormFlowElse	0.651	0.096	6.8	0	0.463	0.838
RWQNearby	0.613	0.097	6.32	0	0.423	0.803
Pol3Else	0.400	0.099	4.03	0	0.205	0.595
RWQElse	0.114	0.125	0.91	0.362	-0.132	0.360
BWQGood	-0.444	0.110	-4.03	0	-0.660	-0.228

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 300 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 91: SP1 non-household econometric model (means) for Northumbrian Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.025	0.081	50	0	3.867	4.183
ExternalSF	3.137	0.064	49.29	0	3.013	3.262
UnexpInt24	2.333	0.086	27.15	0	2.164	2.502
RotaCuts	2.309	0.068	33.99	0	2.176	2.442
DND	2.101	0.064	32.69	0	1.975	2.227
UnexpInt6	1.886	0.073	25.85	0	1.743	2.029
Boil	1.500	0.066	22.77	0	1.370	1.629
Pol2Nearby	1.416	0.067	21.09	0	1.284	1.547
PlannedInt6	1.389	0.082	17.01	0	1.228	1.549
Discolour6	1.179	0.078	15.06	0	1.025	1.333
Discolour24	1.105	0.064	17.32	0	0.980	1.230
TasteSmell24	1.087	0.060	18.17	0	0.970	1.205
Pol2Else	1.051	0.062	16.97	0	0.930	1.173
TasteSmell6	0.899	0.073	12.33	0	0.756	1.042
StormFlowNearby	0.846	0.063	13.4	0	0.722	0.970
LowPressure	0.747	0.077	9.67	0	0.595	0.899
Pol3Nearby	0.597	0.069	8.66	0	0.462	0.733
LowFlowElse	0.563	0.069	8.19	0	0.428	0.698
StormFlowElse	0.491	0.067	7.3	0	0.359	0.623
Pol3Else	0.474	0.061	7.76	0	0.354	0.594
LowFlowNearby	0.367	0.076	4.84	0	0.218	0.516
RWQNearby	0.300	0.065	4.62	0	0.172	0.427
HoseBan	0.176	0.077	2.29	0.022	0.025	0.327
RWQElse	-0.015	0.058	-0.26	0.796	-0.128	0.098
BWQGood	-0.164	0.089	-1.83	0.067	-0.340	0.012

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 198 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 92: SP1 non-household econometric model (means) for Southern Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.246	0.161	26.34	0	3.930	4.563
ExternalSF	3.431	0.148	23.24	0	3.141	3.720
UnexpInt24	2.919	0.127	22.91	0	2.669	3.169
UnexpInt6	2.877	0.146	19.75	0	2.591	3.163
RotaCuts	2.788	0.137	20.31	0	2.519	3.058
DND	2.389	0.144	16.64	0	2.107	2.670
Boil	2.165	0.134	16.15	0	1.902	2.428
PlannedInt6	2.063	0.129	15.98	0	1.809	2.316
Discolour24	1.773	0.139	12.78	0	1.500	2.045
TasteSmell24	1.596	0.119	13.36	0	1.362	1.831
LowPressure	1.589	0.134	11.84	0	1.325	1.852
Discolour6	1.584	0.137	11.52	0	1.314	1.854
TasteSmell6	1.574	0.143	11.01	0	1.293	1.855
Pol2Nearby	1.484	0.145	10.2	0	1.199	1.770
Pol3Nearby	1.043	0.121	8.65	0	0.806	1.279
Pol2Else	0.932	0.135	6.92	0	0.668	1.197
LowFlowNearby	0.813	0.125	6.49	0	0.567	1.059
StormFlowNearby	0.742	0.139	5.34	0	0.470	1.015
StormFlowElse	0.494	0.142	3.48	0.001	0.216	0.773
LowFlowElse	0.479	0.135	3.54	0	0.214	0.745
HoseBan	0.255	0.129	1.98	0.049	0.002	0.509
Pol3Else	0.185	0.124	1.49	0.136	-0.058	0.429
RWQElse	0.155	0.115	1.36	0.176	-0.070	0.381
RWQNearby	0.131	0.161	0.82	0.413	-0.184	0.447
BWQGood	-0.402	0.134	-2.99	0.003	-0.665	-0.138

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 553 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 93: SP1 non-household econometric model (means) for Severn Trent Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
UnexpInt24	5.241	0.352	14.89	0	4.550	5.932
InternalSF	4.875	0.353	13.83	0	4.183	5.567
ExternalSF	4.860	0.343	14.16	0	4.187	5.534
UnexpInt6	4.191	0.329	12.73	0	3.545	4.837
RotaCuts	3.549	0.281	12.61	0	2.997	4.102
Pol3Nearby	3.313	0.345	9.59	0	2.635	3.990
Pol2Nearby	3.172	0.270	11.74	0	2.641	3.702
Pol2Else	2.949	0.300	9.82	0	2.360	3.539
Discolour24	2.825	0.306	9.24	0	2.225	3.425
Discolour6	2.743	0.327	8.39	0	2.102	3.384
TasteSmell24	2.725	0.304	8.96	0	2.128	3.322
Boil	2.672	0.280	9.55	0	2.123	3.221
PlannedInt6	2.640	0.314	8.42	0	2.025	3.255
DND	2.616	0.288	9.08	0	2.051	3.182
StormFlowNearby	2.453	0.324	7.57	0	1.817	3.089
LowFlowNearby	2.399	0.310	7.73	0	1.790	3.009
LowPressure	2.288	0.300	7.63	0	1.699	2.877
TasteSmell6	2.122	0.314	6.75	0	1.504	2.739
LowFlowElse	1.721	0.325	5.29	0	1.082	2.359
StormFlowElse	1.398	0.291	4.81	0	0.827	1.969
RWQNearby	1.338	0.360	3.72	0	0.632	2.044
HoseBan	1.248	0.287	4.35	0	0.685	1.811
Pol3Else	1.087	0.355	3.06	0.002	0.391	1.783
RWQElse	0.930	0.320	2.91	0.004	0.303	1.557
BWQGood	0.478	0.379	1.26	0.208	-0.267	1.222

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 364 participants
Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 94: SP1 non-household econometric model (means) for South West Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.674	0.161	22.76	0	3.357	3.991
ExternalSF	2.852	0.140	20.31	0	2.577	3.128
RotaCuts	2.558	0.127	20.2	0	2.310	2.807
UnexpInt6	2.423	0.138	17.55	0	2.152	2.694
UnexpInt24	2.311	0.157	14.71	0	2.003	2.619
DND	1.976	0.125	15.86	0	1.732	2.221
Boil	1.514	0.111	13.63	0	1.296	1.732
PlannedInt6	1.182	0.140	8.47	0	0.909	1.456
Discolour24	1.134	0.155	7.3	0	0.829	1.438
Discolour6	0.882	0.164	5.39	0	0.561	1.204
LowPressure	0.826	0.137	6.03	0	0.557	1.095
TasteSmell24	0.807	0.121	6.69	0	0.570	1.043
Pol2Nearby	0.504	0.144	3.51	0	0.222	0.786
TasteSmell6	0.352	0.158	2.23	0.026	0.042	0.662
Pol2Else	0.247	0.118	2.08	0.037	0.014	0.479
BWQGood	0.131	0.140	0.94	0.348	-0.143	0.406
StormFlowNearby	-0.076	0.126	-0.6	0.549	-0.324	0.172
LowFlowElse	-0.177	0.134	-1.32	0.188	-0.440	0.086
Pol3Nearby	-0.212	0.155	-1.37	0.17	-0.516	0.091
StormFlowElse	-0.295	0.129	-2.29	0.022	-0.549	-0.042
HoseBan	-0.408	0.142	-2.86	0.004	-0.687	-0.128
LowFlowNearby	-0.441	0.123	-3.58	0	-0.682	-0.199
RWQNearby	-0.550	0.133	-4.14	0	-0.811	-0.289
Pol3Else	-0.741	0.135	-5.49	0	-1.006	-0.476
RWQElse	-0.744	0.134	-5.55	0	-1.008	-0.481

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 199 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 95: SP1 non-household econometric model (means) for Thames Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	5.563	0.093	59.75	0	5.380	5.746
ExternalSF	4.851	0.091	53.55	0	4.673	5.029
UnexpInt24	4.241	0.098	43.47	0	4.049	4.432
RotaCuts	4.002	0.083	48.45	0	3.840	4.164
UnexpInt6	3.692	0.104	35.36	0	3.487	3.897
DND	3.589	0.090	39.76	0	3.412	3.766
PlannedInt6	3.353	0.086	38.77	0	3.183	3.523
Boil	3.057	0.093	32.83	0	2.874	3.240
Discolour6	2.883	0.077	37.3	0	2.731	3.034
TasteSmell24	2.839	0.073	38.99	0	2.696	2.981
LowPressure	2.732	0.099	27.7	0	2.538	2.925
TasteSmell6	2.616	0.081	32.3	0	2.457	2.775
Discolour24	2.553	0.088	29.11	0	2.380	2.725
Pol2Else	2.296	0.109	20.97	0	2.081	2.511
StormFlowNearby	2.148	0.084	25.56	0	1.983	2.313
Pol2Nearby	2.081	0.084	24.85	0	1.916	2.245
Pol3Nearby	1.880	0.099	19.08	0	1.687	2.074
RWQNearby	1.622	0.095	17.01	0	1.435	1.809
LowFlowNearby	1.555	0.098	15.87	0	1.362	1.747
Pol3Else	1.528	0.093	16.48	0	1.346	1.710
LowFlowElse	1.513	0.081	18.77	0	1.355	1.672
StormFlowElse	1.293	0.084	15.36	0	1.128	1.459
HoseBan	1.127	0.096	11.76	0	0.939	1.315
RWQElse	0.986	0.094	10.46	0	0.801	1.171
BWQGood	0.238	0.094	2.52	0.012	0.053	0.423

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 631 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 96: SP1 non-household econometric model (means) for United Utilities Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	3.682	0.073	50.14	0	3.538	3.826
ExternalSF	2.927	0.071	41.01	0	2.787	3.067
RotaCuts	2.677	0.059	45.58	0	2.561	2.792
UnexpInt24	2.607	0.065	39.84	0	2.478	2.735
UnexpInt6	2.000	0.064	31.26	0	1.874	2.125
DND	1.964	0.062	31.85	0	1.843	2.086
Boil	1.772	0.059	30.09	0	1.656	1.887
PlannedInt6	1.674	0.072	23.31	0	1.533	1.815
Discolour24	1.264	0.053	23.97	0	1.161	1.368
Discolour6	1.234	0.058	21.35	0	1.120	1.347
TasteSmell24	1.158	0.063	18.49	0	1.035	1.280
TasteSmell6	1.002	0.054	18.41	0	0.895	1.108
LowPressure	0.995	0.062	16.17	0	0.874	1.116
Pol2Nearby	0.892	0.069	12.88	0	0.756	1.028
Pol2Else	0.688	0.055	12.42	0	0.580	0.797
StormFlowNearby	0.486	0.058	8.32	0	0.371	0.601
Pol3Nearby	0.428	0.068	6.32	0	0.295	0.561
LowFlowNearby	0.257	0.063	4.07	0	0.133	0.381
Pol3Else	0.228	0.061	3.72	0	0.108	0.349
HoseBan	0.065	0.075	0.87	0.382	-0.081	0.212
LowFlowElse	0.049	0.059	0.82	0.412	-0.068	0.165
StormFlowElse	0.017	0.068	0.25	0.803	-0.116	0.150
BWQGood	-0.018	0.063	-0.28	0.777	-0.141	0.105
RWQNearby	-0.131	0.062	-2.1	0.036	-0.254	-0.009
RWQElse	-0.164	0.061	-2.67	0.008	-0.284	-0.043

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 260 participants
Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 97: SP1 non-household econometric model (means) for Wessex Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	4.590	0.073	62.88	0	4.447	4.733
ExternalSF	3.464	0.070	49.75	0	3.328	3.601
UnexpInt24	2.909	0.071	41.07	0	2.770	3.048
RotaCuts	2.826	0.082	34.27	0	2.664	2.987
DND	2.445	0.085	28.8	0	2.279	2.612
UnexpInt6	2.431	0.062	38.97	0	2.309	2.554
PlannedInt6	1.894	0.073	26.07	0	1.751	2.037
Boil	1.884	0.079	23.75	0	1.728	2.039
Discolour24	1.643	0.076	21.68	0	1.495	1.792
TasteSmell24	1.573	0.070	22.59	0	1.436	1.710
Pol2Nearby	1.528	0.078	19.61	0	1.375	1.681
Discolour6	1.479	0.073	20.13	0	1.335	1.623
TasteSmell6	1.202	0.077	15.7	0	1.052	1.352
LowPressure	1.202	0.071	16.88	0	1.062	1.341
Pol2Else	1.150	0.075	15.37	0	1.003	1.296
StormFlowNearby	1.017	0.071	14.3	0	0.878	1.157
LowFlowNearby	0.927	0.089	10.38	0	0.752	1.103
Pol3Nearby	0.837	0.065	12.83	0	0.709	0.965
RWQNearby	0.747	0.064	11.62	0	0.621	0.873
LowFlowElse	0.661	0.082	8.06	0	0.500	0.822
Pol3Else	0.587	0.071	8.28	0	0.448	0.727
StormFlowElse	0.510	0.076	6.71	0	0.361	0.659
HoseBan	0.494	0.076	6.49	0	0.344	0.643
RWQElse	0.299	0.086	3.48	0.001	0.130	0.467
BWQGood	0.005	0.063	0.07	0.942	-0.119	0.128

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 436 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)

Table 98: SP1 non-household econometric model (means) for Yorkshire Water

choice	Coefficient	Std. err.	t	P>t	[95% conf.	interval]
InternalSF	5.277	0.118	44.54	0	5.044	5.509
ExternalSF	4.355	0.162	26.92	0	4.037	4.672
UnexpInt24	4.111	0.134	30.66	0	3.848	4.375
RotaCuts	3.755	0.157	23.96	0	3.448	4.063
UnexpInt6	3.263	0.145	22.43	0	2.977	3.548
DND	3.147	0.126	24.96	0	2.900	3.395
Boil	3.017	0.165	18.33	0	2.694	3.340
PlannedInt6	2.930	0.131	22.4	0	2.673	3.187
Discolour6	2.573	0.144	17.84	0	2.290	2.856
LowPressure	2.500	0.139	17.96	0	2.227	2.773
Discolour24	2.481	0.127	19.46	0	2.231	2.731
TasteSmell6	2.370	0.127	18.65	0	2.121	2.620
TasteSmell24	2.048	0.144	14.21	0	1.765	2.330
Pol2Nearby	1.802	0.131	13.73	0	1.545	2.060
Pol2Else	1.737	0.120	14.47	0	1.501	1.972
LowFlowNearby	1.593	0.139	11.48	0	1.320	1.865
Pol3Nearby	1.560	0.135	11.53	0	1.295	1.826
StormFlowNearby	1.464	0.126	11.6	0	1.216	1.711
LowFlowElse	1.019	0.126	8.11	0	0.772	1.265
HoseBan	0.983	0.123	8.01	0	0.743	1.224
Pol3Else	0.946	0.137	6.91	0	0.678	1.215
RWQNearby	0.934	0.127	7.35	0	0.685	1.184
RWQElse	0.736	0.165	4.46	0	0.412	1.060
StormFlowElse	0.643	0.145	4.44	0	0.359	0.928
BWQGood	-0.134	0.161	-0.83	0.404	-0.449	0.181

Note: (1) Coefficients represent the mean of the impact parameters resulting from draws across all participants (2) Standard error represents standard deviation of the impact parameters resulting from draws across all participants.
Base: 201 participants. Total draws = 15000; Burn-in draws = 5000; Accept rate = 1/10
Base (omitted) service issue: *BWQExc* (Coastal bathing water is not excellent quality)