WRMP 24

Final debrief

djs research

United Utilities

Water for the North West

Contents

Background & objectives

Background

All water companies have a statutory obligation to produce a Water Resources Management Plan (WRMP) which sets out how they will meet demand for public water supplies over a minimum 25 year period.

Historically, WRMPs have focussed on minimising the cost of securing future water supplies by following a 'least cost' methodology. However, there is now formal recognition among water companies and regulators that factors other than cost (for example, carbon, impact on the environment, leakage levels, societal well-being, etc) are important and should be properly considered in the development of a WRMP. Consequently, the WRPG have been updated and companies are now required to follow a 'Best Value Planning' approach via an MCDA process/tool.

This involves the selection of decision metrics to characterise plan alternatives, and development of weights to determine how these metrics should be balanced against one another in decision making.

Additionally, water companies are now required to work collaboratively to develop a strategic Regional Plan for water resources. Company WRMPs need to reflect the Regional Plan. To this end, United Utilities and Severn Trent (members of the Water Resources West (WRW) group), commissioned a joint piece of customer research and South Staffs Water (another member group) shared the same metrics choice experiment design with the other two water companies.

The decision weights will be incorporated within the common Water Resources West MCDA tool.

This report outlines the findings for United Utilities only.

Objectives

The main objectives of this research were:

To measure customers' preferences for water resources, levels of service and the options or plans that United Utilities might create to address any changes to levels in service or to address a supply-demand deficit.

To develop a Best Value plan in line with Water Resource Planning Guidelines.

Specifically:

1. Measure at a high level, customers' attitudes and views regarding the natural environment and UU's approach to planning
2. Explore customers' ranking of UU's water supply options to meet demand over the next 25 years
3. Explore customers' preferences for WRP options to obtain weights for WRW MCDA decision metrics
4. Measure customer priorities in regards to levels of service concerning Temporary Use Bans (TUBs) and Extreme Events

Methodology

Two audiences

Household Customers

- An online approach was adopted to survey a representative sample of 671 household customers across the region using customer sample and customers via an online panel provider
- Customers had to have sole/joint responsibility of the water bill
- Quotas and weights were applied to age, gender, region, urban/rural, socio-economic grade and metering

Business Customers

- A similar online approach was adopted to survey a disproportionate sample of 184 business customers across the region using an online panel provider
- Business customers had to have complete responsibility or at least oversight of the water bill
- Quotas and weights were applied to reflect the profile of NW businesses as a whole in terms of business size

Household sample

671 completed interviews were conducted with United Utilities residential customers in the region.

The below quotas and weights were used to help reach a sample representative of residential bill payers.

Age	Weighted	Unweighted
Age 18 to 29	5%	3%
Age 30 to 44	22%	21%
Age 45 to 59	34%	28%
Age 60 to 74	25%	33%
Age 75 Plus	14%	15%

Gender	Weighted	Unweighted
Male	49%	58%
Female	51%	42%

Location	Weighted	Unweighted
Merseyside	20%	20%
Cumbria	7%	8%
Gr Manc	37%	31%
Lancashire	21%	23%
Cheshire	14%	18%

Location	Weighted	Unweighted
Urban	38%	44%
Rural	17%	19%
Suburban	46%	37%

SEG	Weighted	Unweighted
AB	22%	34%
C1	31%	28%
C2	21%	14%
DE	26%	24%

Metering	Weighted	Unweighted
Meter	46%	63%
Unmetered	54%	37%

Business sample

184 completed interviews were conducted with businesses in the United Utilities region.

Whilst a range of sectors were represented, quotas and weights were applied on business size. Medium and larger businesses were over represented allowing for subgroup analysis rather than being reflective of the business profile of the United Utilities region.

Business size	Weighted	Unweighted
Micro (0-9)	35%	20%
Small (10-49)	20%	23%
Medium (50-249)	24%	31%
Large(250+)	21%	26%

Cognitive interviews – Phase 1

To ensure the survey was effective in its design, a number of cognitive interviews were conducted. These revealed areas in need of adjustment – whilst there were elements that needed amending throughout the survey, the main issues related to the choice experiment simply due to the volume of information that needed communicating.

The initial cognitive pilots highlighted that the materials weren't working optimally. People were struggling with the wording and querying the scales used for the metrics and how to interpret the scales, in particular use of the word 'moderate'.

It was apparent that, whilst the survey couldn't accommodate fuller descriptions of the levels in the scales, the summarised wording was causing issues. To this end, symbols were used instead and the materials retested.

Catchment management

Option description	United Utilities can protect and enhance the water environment through managing the surrounding land through which water in any form (such as rain, melting snow or ice) drains into a body of water (i.e. a river, lake or reservoir).		
Relative cost	£	Human & social wellbeing	Moderate **positive** impact
Carbon	No significant impact	Habitats for native wildlife & plants	Moderate **positive** impact
Flood risk	Moderate **reduction**	River flows & water quality	Moderate improvement

	Catchment management	Recycle or re-use water indirectly	Take more water from under the ground	Increase the size of existing reservoirs	Surface water	Increase capacity of water treatment works	Transfer water from other regions	Reduce leakage	Install more water meters	Improve water efficiency
Relative cost	£	£ £	£ £	£ £	£ £ £	£ £	£ £ £	£ £ £	£ £ £	£ £ £
Carbon	No significant impact	Moderate **increase** equivalent to the emissions of around 75 households per year	Moderate **increase** equivalent to the emissions of around 75 households per year	No significant impact	Moderate **increase** equivalent to the emissions of around 75 households per year	Moderate **increase** equivalent to the emissions of around 75 households per year	Moderate **increase** equivalent to the emissions of around 75 households per year	Moderate **reduction** equivalent to the emissions of around 35 households per year	Moderate **reduction** equivalent to the emissions of around 35 households per year	Moderate **reduction** equivalent to the emissions of around 35 households per year
Flood risk	Moderate **reduction**	No significant impact	Moderate **reduction**	Moderate **reduction**	Moderate **reduction**	No significant impact	No significant impact	No significant impact	No significant impact	No significant impact
Human & social wellbeing	Moderate **positive** impact	Moderate **negative** impact	Moderate **negative** impact	No significant impact	No significant impact	No significant impact	Moderate **negative** impact	Moderate **positive** impact	Moderate **positive** impact	Moderate **positive** impact
Habitats for native wildlife and plants	Moderate **positive** impact	No significant impact	Moderate **negative** impact	Moderate **negative** impact	Major **negative** impact	No significant impact	Moderate **negative** impact	Moderate **positive** impact	Moderate **positive** impact	Moderate **positive** impact
River flows & water quality	Moderate improvement	Moderate improvement	Moderate deterioration	Moderate improvement	Major deterioration	No significant impact	Moderate improvement	Moderate improvement	Moderate improvement	Moderate improvement

Cognitive interviews – Phase 2

A significant minority failed to understand the proposed symbols, largely due to the key being ignored because it was at bottom of the slides.

Managing the land to improve water quality

Option description	United Utilities can protect and enhance the water environment through managing the surrounding land through which water in any form (such as rain, melting snow or ice) drains into a body of water (i.e. a river, lake or reservoir).

Relative cost: How much this option will cost relative to the other ones you'll be shown — £ £ £

Carbon emissions: The release of carbon into the atmosphere — No impact

Flood risk: likelihood this option will have a positive or negative impact on the risk of homes, businesses, gardens and public spaces flooding — − − + +

Human & social wellbeing - impact on the local area and environment e.g. job creation, economy, local green spaces for public health and wellbeing — − − + +

Habitats for native wildlife & plants - impact on natural ecosystems, biodiversity and wildlife habitats — − − + +

River flows & water quality - impact on the volume and cleanliness of water available to use in rivers and lakes — − − + +

£ This is the cost to United Utilities but will impact on customer bills further down the line. The more £ signs shown, the higher the cost and the greater the likelihood this will impact customer bills.

\+ The amount of increase in each measure this option will result in. The more green plus signs, the more the positive impact or reduction in negative effects!

− The amount of reduction in each measure this option will result in. The more red minus signs, the more the negative impact or increase in negative effects!

	Managing the land to improve water quality	Recycle or 're-use' water indirectly	Take more water from under the ground	Increase the size of existing reservoirs	Take more water from rivers and lakes	Increase capacity of water treatment works	Transfer water from other regions	Reduce leakage	Install more water meters	Improve water efficiency
Relative cost	£ £ £	£ £ £	£ £ £	£ £ £	£ £ £	£ £ £	£ £ £	£ £ £	£ £ £	£ £ £
Carbon	No impact	− − + +	− − + +	No impact	− − + +	− − + +	− − + +	− − + +	− − + +	− − + +
Flood risk	− − + +	No impact	− − + +	− − + +	− − + +	No impact	No impact	No impact	No impact	No impact
Human & social wellbeing	− − + +	− − + +	− − + +	No impact	No impact	No impact	− − + +	− − + +	− − + +	− − + +
Habitats for native wildlife and plants	− − + +	No impact	− − + +	− − + +	− − + +	No impact	− − + +	− − + +	− − + +	− − + +
River flows & water quality	− − + +	− − + +	− − + +	− − + +	− − + +	No impact	− − + +	− − + +	− − + +	− − + +

£ This is the cost to United Utilities but will impact on customer bills further down the line. The more £ signs shown, the higher the cost and the greater the likelihood this will impact customer bills.

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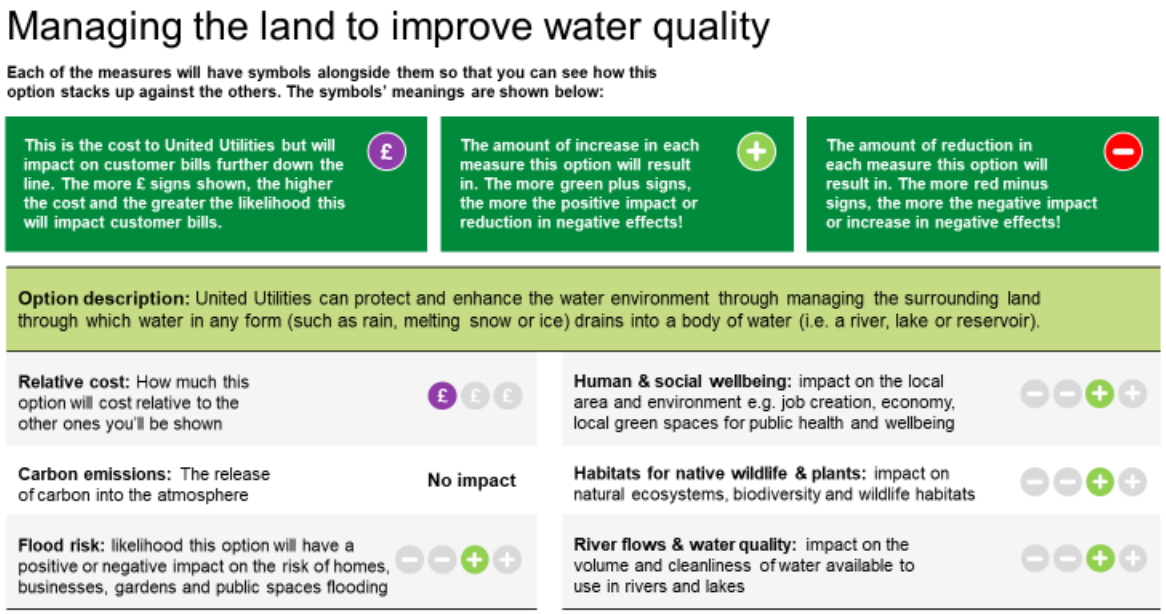
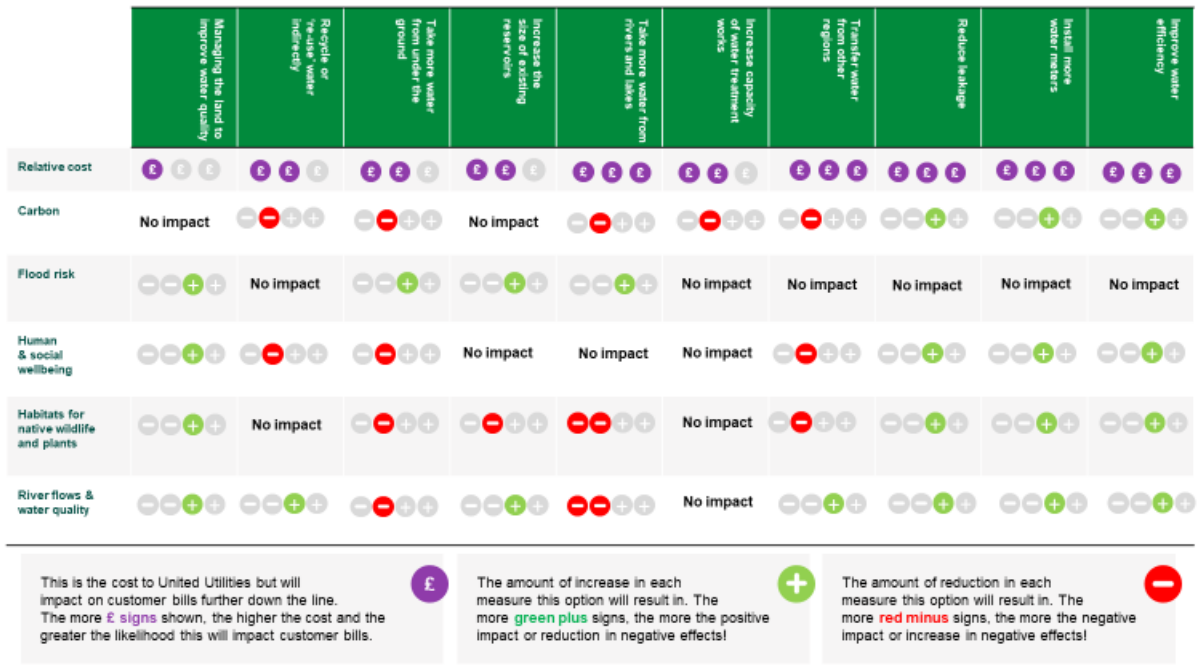
Cognitive interviews – Phase 3

The slides were redesigned with the key moved to the top of the charts. This made a big difference as respondents read the key first and thus understood the subsequent information.

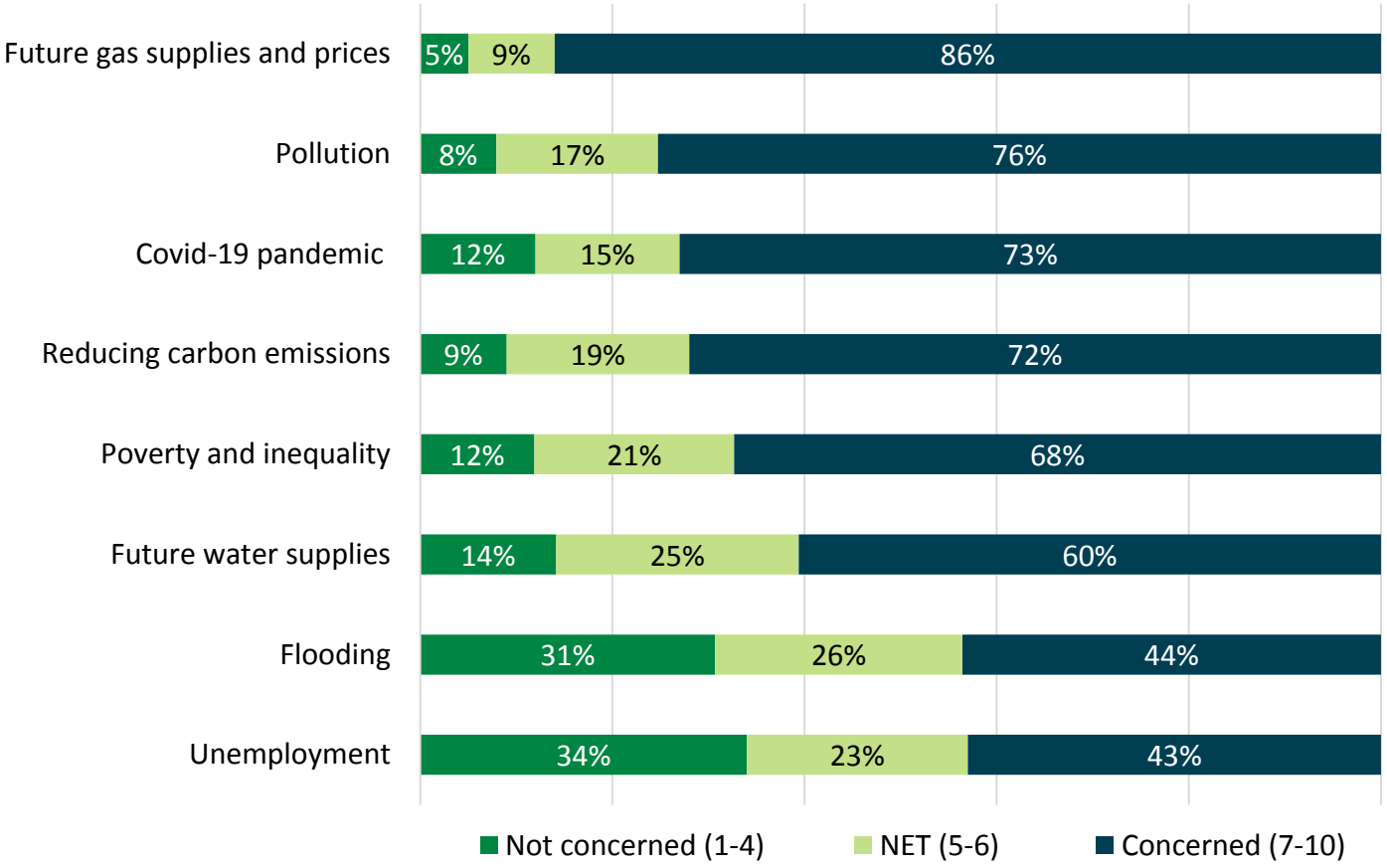




Attitudes & behaviours

Future water supplies ranks 6th in a list of current concerns

Level of concern about the following:



Perhaps not surprising given the time of fieldwork, concern around future gas supplies and prices is significantly higher

Those living in Lancashire were the most concerned about future water supplies (68%), significantly more than Cumbria (45%).

Households including someone with a disability were also significantly more likely to be concerned (67%) compared to those without (52%).

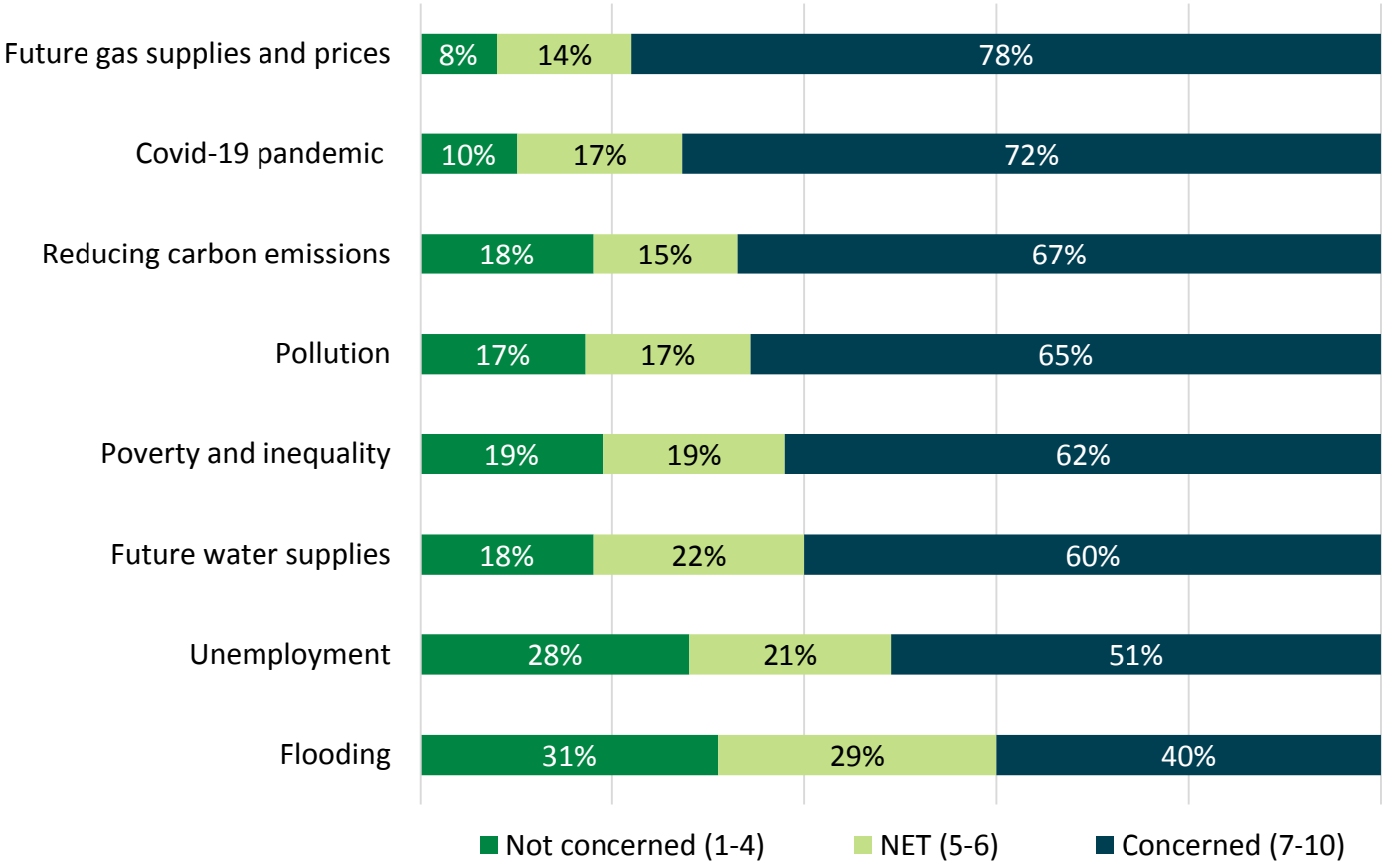
Those who say they sometimes struggle financially were significantly more likely to be concerned about future water supplies (63%) vs 54% who don't struggle.

Those with dependent children (53% vs 40%), and those with a disability in the household (48% vs 39%) were significantly more likely to say they are concerned about the risk of flooding.

Q01. On a scale of 1-10, where 1 is not at all concerned and 10 is extremely concerned, how concerned are you about the following? (All households excluding don't knows = Total: Above 471)

Amongst businesses, future water supplies and flooding are relatively low levels of concern

Level of concern about the following:



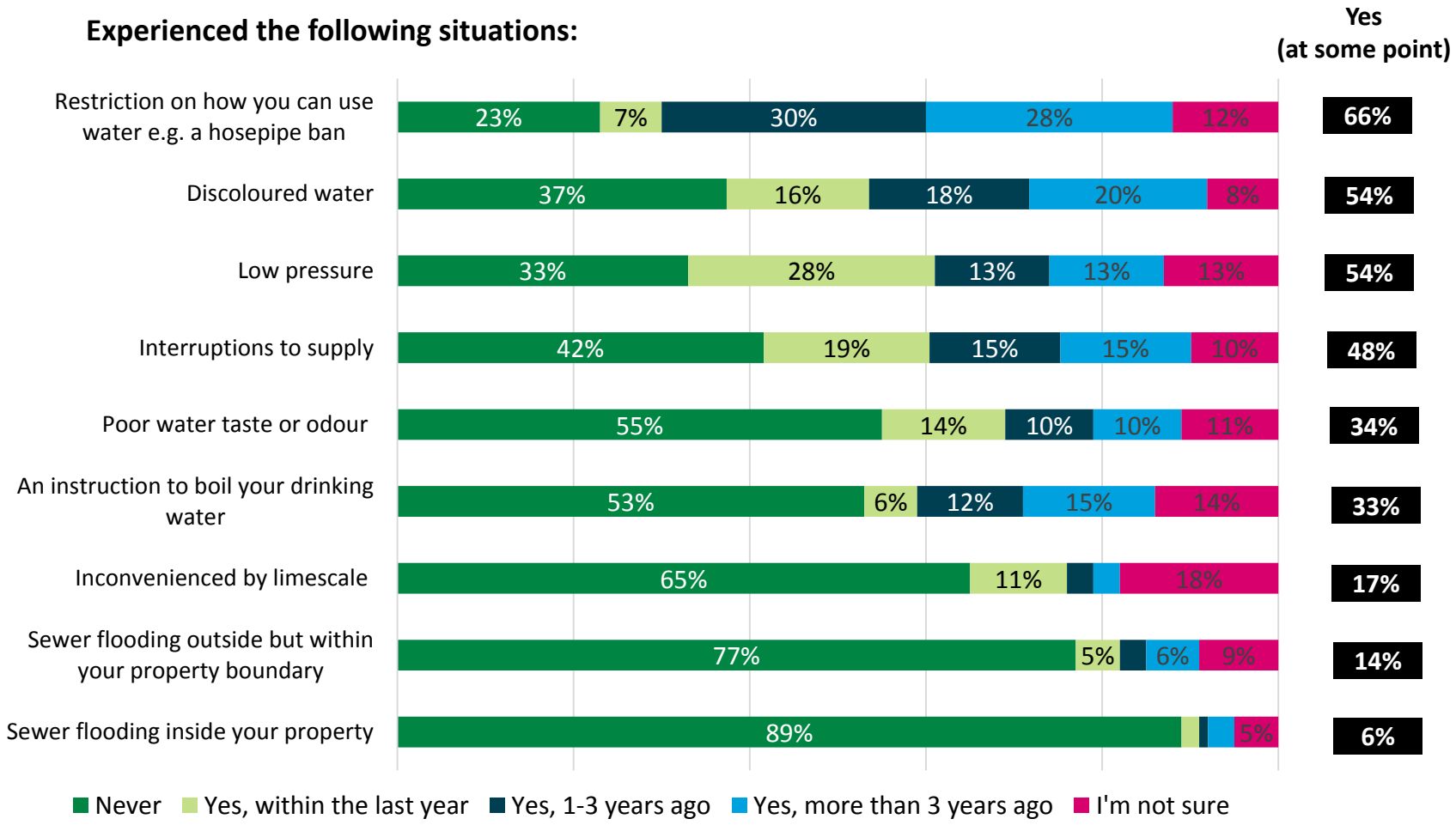
However, medium and large businesses are significantly more likely to be concerned about the risk of flooding (54% & 75%) compared to Small (24%) and Micros (19%).

Similarly, medium and large businesses are significantly more likely to be concerned about potential water shortages (74% & 77%) compared to Small (51%) and Micros (44%).

Those with self-described medium or high levels of water consumption are also significantly more likely to be concerned with potential water shortages (73% & 79%) compared to those with low consumption (44%).

Q01. On a scale of 1-10, where 1 is not at all concerned and 10 is extremely concerned, how concerned are you about the following? (All businesses excluding don't knows = Total: 182 or above)

Two-thirds (66%) of households recall, at some point in time, having a restriction on how they can use their water



Although only 7% claim this has happened in the last year whereas almost three in ten (28%) have had low pressure during this time.

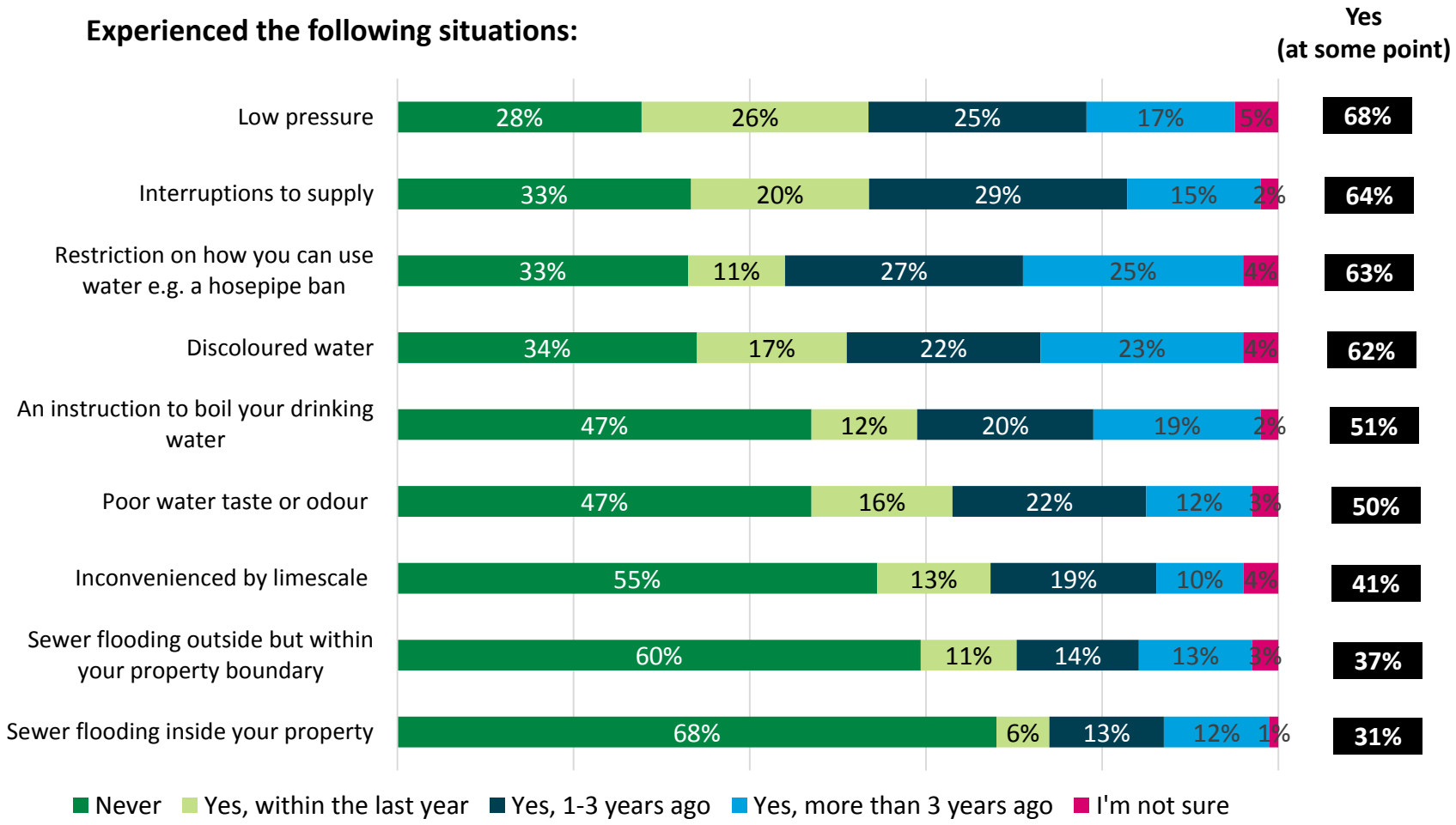
Households from higher socio-economic grades are significantly more likely to recall a restriction on how to use their water at some point (ABC1 – 77% v C2DE – 57%).

Households in rural and suburban areas are also significantly more likely to recall at some point having a restriction on how to use their water compared to those in urban areas (Urban – 58%, Suburban – 67%, Rural 76%).

The same is true of those with dependent children 51% vs 70% those who don't.

Q02. I'd now like you to say if you've ever experienced or noticed any of the following situations whilst living in the United Utilities region? (All households = Total:471)

Businesses are notably more likely to have come across a wider range of issues compared to households



Two-thirds (68%) of businesses recall experiencing low pressure and a quarter (26%) have experienced this in the last year.

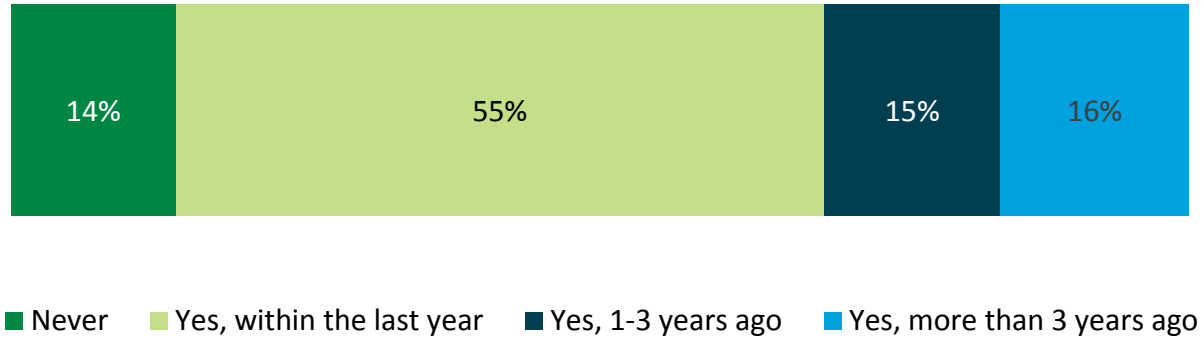
Experiences of sewer flooding are significantly lower than other issues, however, just under a third, still claim to have experienced this.

Medium and large sized businesses are significantly more likely to have experienced all these issues compared to small and micros.

Q02. I'd now like you to say if you've ever experienced or noticed any of the following situations whilst living in the United Utilities region? (All households = Total:471)

The majority of households have at some point visited water bodies for recreational purposes (86%) and over half have done so in the last year (55%)

Visited rivers, lakes, reservoirs, the sea in Northwest for recreation purposes:



Yes (at some point)

86%

Those from higher socio-economic grades are significantly more likely to have visited these sites than those from lower SEGs (93% ABC1 vs 80% C2DE)

Those living in Cumbria are significantly more likely to have visited water bodies for recreational purposes (98%).

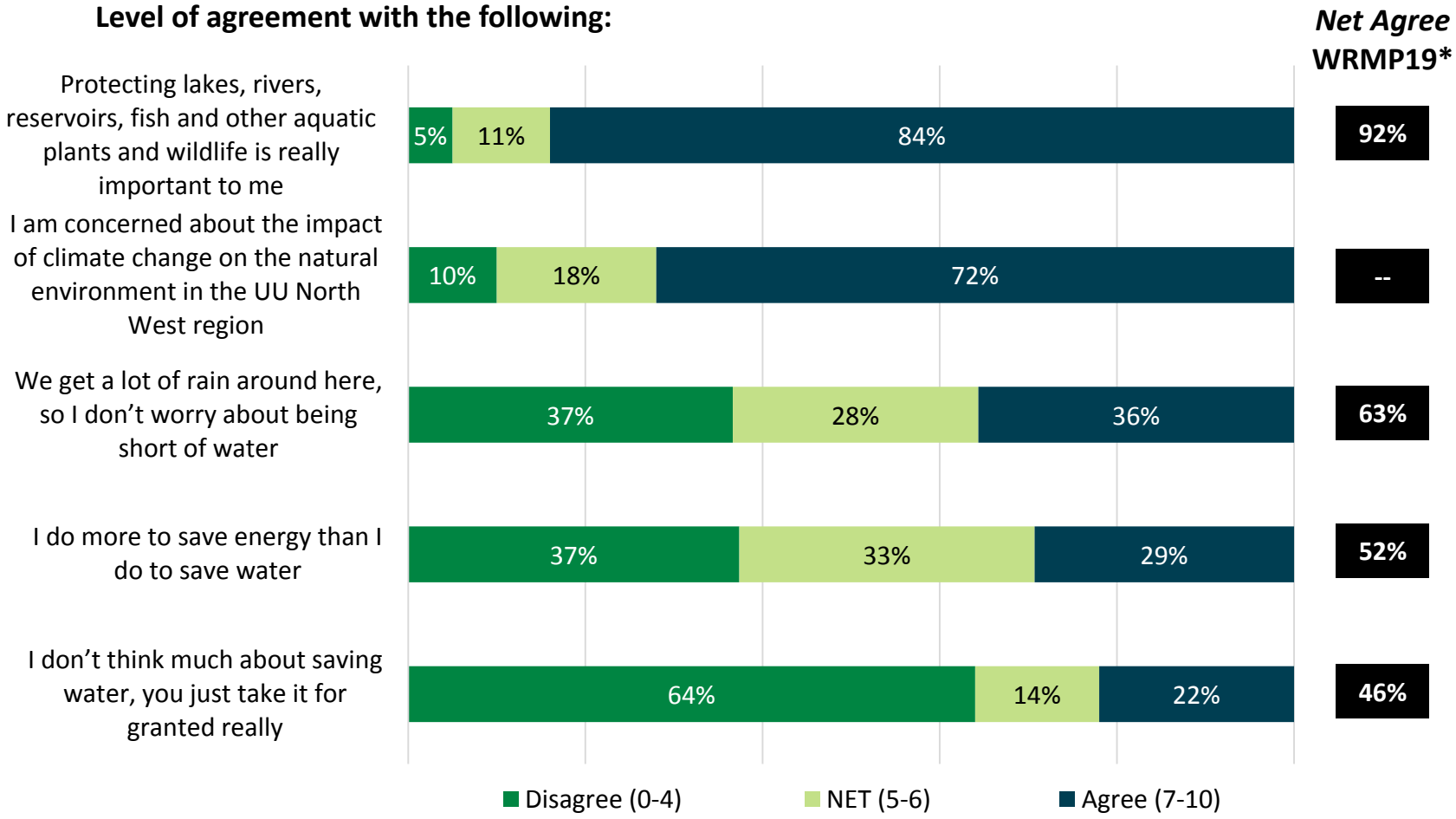
Whilst still a reasonable majority, those living in urban areas are significantly less likely to have visited water bodies (78%) compared to those from suburban (89%) or rural (92%) areas.

Those who live in households with incomes of less than £20,000 are significantly less likely to have visited them(78%).

Q03 Have you visited rivers, lakes, reservoirs, the sea in the North West of England for recreational purposes e.g. walking, fishing, swimming? (All households = Total households excluding don't knows:654)

Almost two thirds of households disagree with the idea that they take water saving for granted

Level of agreement with the following:



However, over a third (36%) are not worried about being short of water

Those in Cumbria are significantly more likely to agree with this statement (60%) compared to all the other areas in the NW.

Those living in Cheshire are significantly more likely to be concerned about the impact of climate change on the NW (83%).

Those from lower socio-economic grades are significantly more likely to disagree they 'do more to save energy than I do to save water (C2DE – 44% v ABC1 – 32%).

Q04. How much do you agree or disagree with the following statements? (All households = Total: excluding down knows : Above 656)

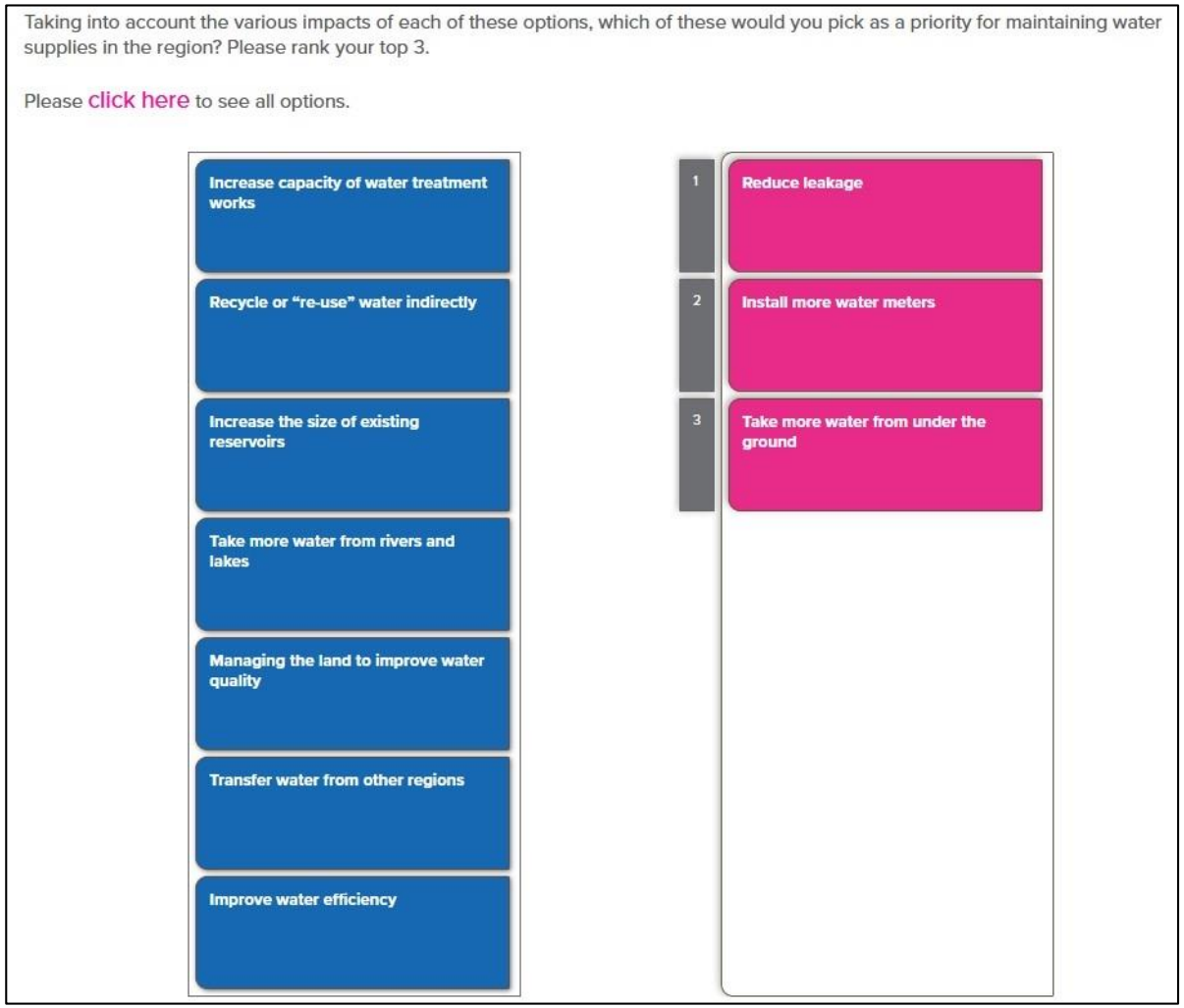
***Please note agree scale was a five-point scale for WRMP 19**

Ranking & Choice experiment

Supply-demand options ranking exercise

Supply-demand options ranking exercise

CHOICE FORMAT



Respondents were asked to pick their top 3 priorities from a set of 10 supply-demand options.

- The same set of 10 options was shown to household and business respondents.
- The order in which supply-demand options were shown varied randomly across respondents.
- Priority scores and rankings were obtained via a mixed logit modelling of respondents' choices, which allows for variation in preferences over the sample.
- Priority scores are a measure of preference intensity on a 0-100 scale.

Stimulus shown in ranking exercise

Managing the land to improve water quality
United Utilities can protect and enhance the water environment through managing the surrounding land through which water in any form (such as rain, melting snow or ice) drains into a body of water (i.e. a river, lake or reservoir).

Recycle or "re-use" water indirectly
Treated wastewater from sewage treatment works would be recycled into a river or reservoir before it is treated to tap water standard and used for drinking water supply

Take more water from under the ground
United Utilities could increase the amount of water taken from under the ground by finding new groundwater sources. This water is naturally replaced when it rains.

Increase the size of existing reservoirs
The size of reservoirs can be increased to store more water. This means that more water can be collected and stored when water is plentiful and used when it is not.

Take more water from rivers and lakes
United Utilities could increase the amount of water taken from rivers and lakes.

Stimulus shown in ranking exercise (continued)

Increase capacity of water treatment works
United Utilities could increase the capacity of existing water treatment works. This would allow more water to be abstracted from existing sources.

Transfer water from other regions
United Utilities could purchase water that is licensed to another water company. The bulk supply could originate from within our region but typically comes from outside our region, commonly via a pipeline from another water company.

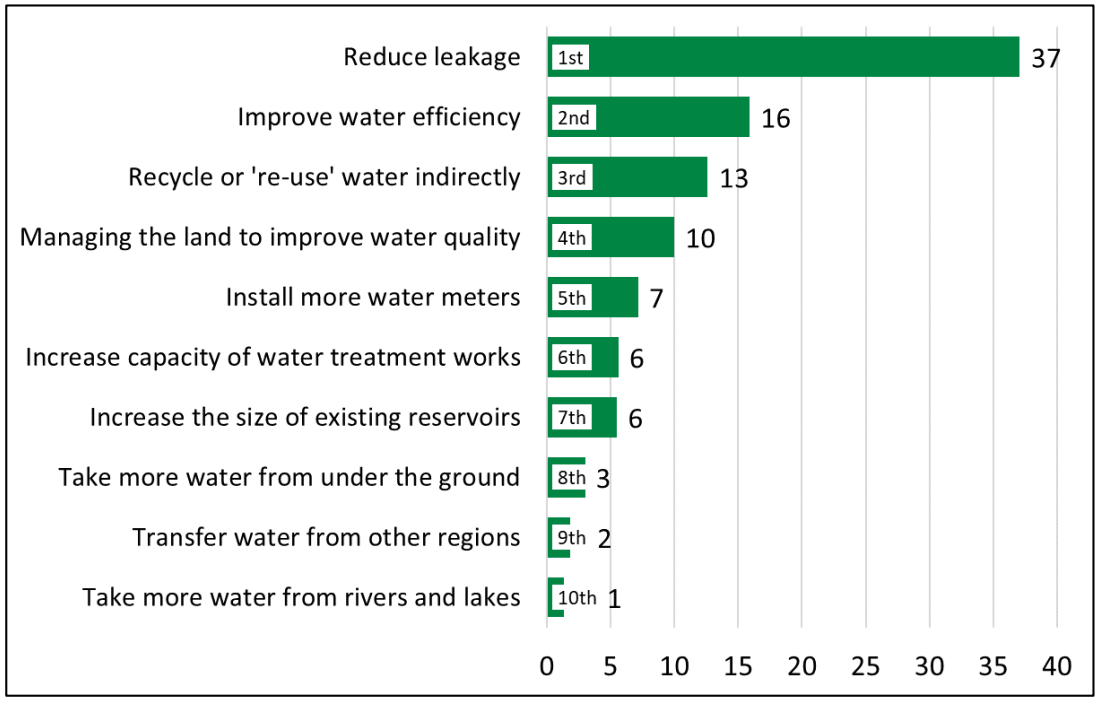
Reduce leakage
Leaks can occur from the water company's pipe network or in customers' homes. Methods used to reduce leakage include; Prevent (ability to stop leaks from occurring), Awareness (ability to identify a leak as it occurs), Locate (ability to find the exact location of the leak) and Mend (action to fix the leak).

Install more water meters
Water meters are installed at customer properties. They reduce supply pipe leaks and also help customers' conserve water by providing visibility of the amount of water they are using. These meters can also provide information that helps the water company find leaks on its network.

Improve water efficiency
Water efficiency is key to reducing customer water usage, which means that less water is used and therefore the water company doesn't need to produce as much. Water efficiency measures include, free water efficiency devices, subsidised water butts, free water efficiency home audits and educational programmes..

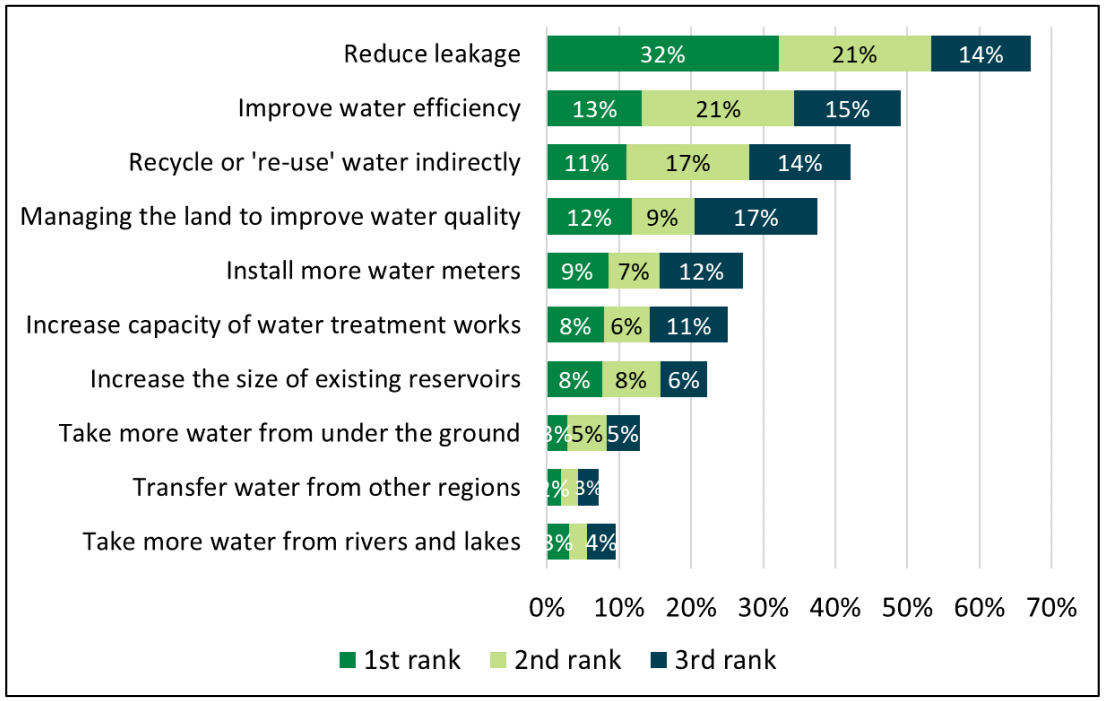
Priority Scores, Ranks, and Option Choices: Households

Priority scores and ranks



Base: 671 household respondents (weighted)

Option choice frequencies



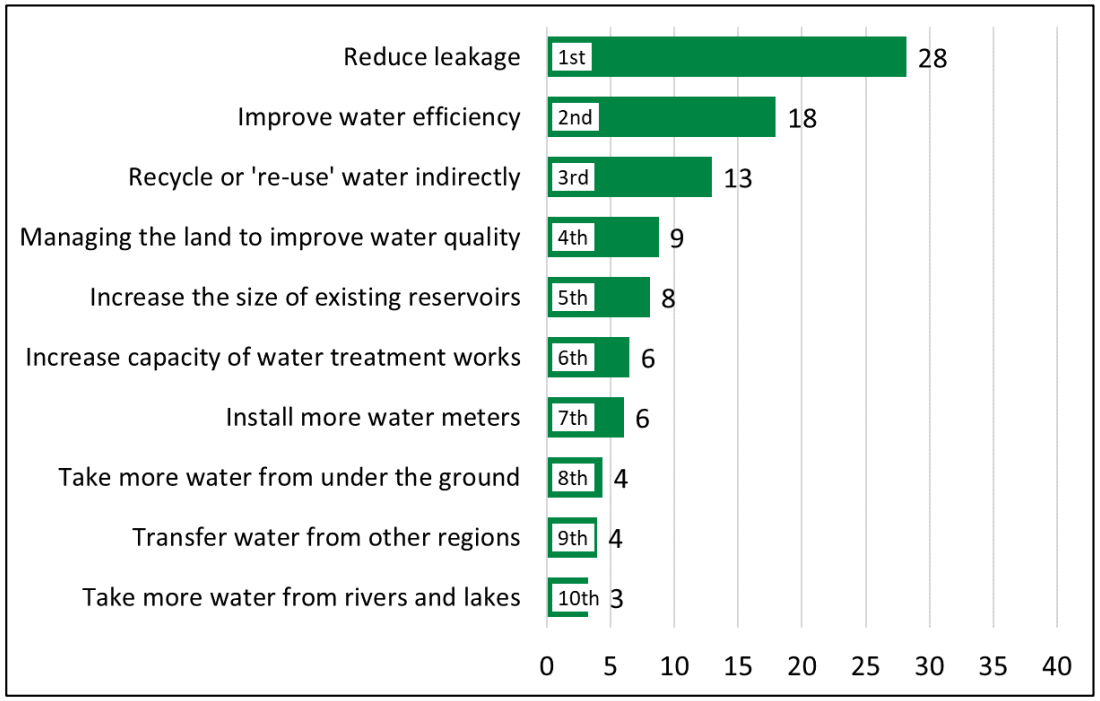
Base: 671 household respondents (weighted)

For household customers, on average,

- reducing leakage is by far the highest priority;
- reducing leakage is followed at a distance by Improving water efficiency and Recycling or ‘re-using’ water indirectly;
- the top three options account for around two thirds of the total ‘importance weight’.

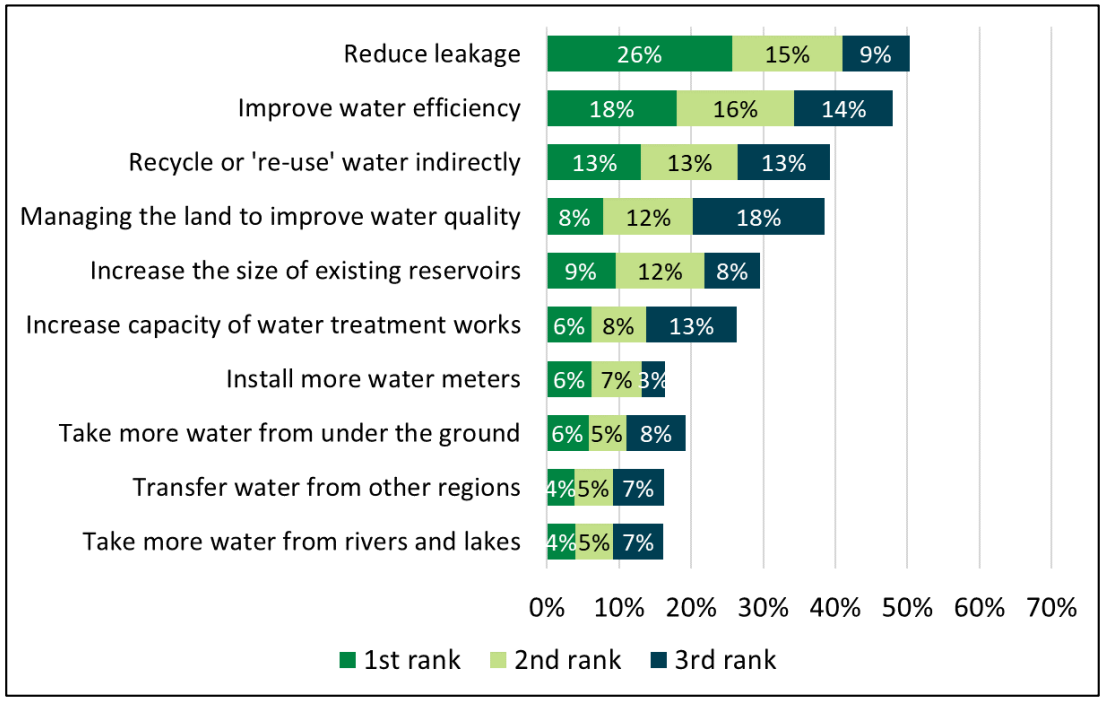
Priority Scores, Ranks, and Option Choices: Businesses

Priority scores and ranks



Base: 184 business respondents (weighted)

Option choice frequencies



Base: 184 business respondents (weighted)

Business customers, on average,

- have very similar priorities to households in terms of rankings (rank correlation = 0.95), but the preference for the top-ranked option of reducing leakage is somewhat weaker;
- tend to prefer options aimed at reducing water use/loss over options aimed at increasing the supply of water.

The most favoured choices appear to be prioritised in part due to the perceived comparative ease of delivering them

Why have you picked this item as your top choice? Please provide as much detail as possible

Customers most commonly placed **'Reducing leakage'** as the top priority as this is often a very visual issue that plays out in public. It's also viewed as being a simpler fix than some other choices.

"Leaking pipes / equipment because of bursts or breaks is of the main causes to water loss.."

Resident

"Need to renew some water piping network as quite a few of them are built-in the Victorian era. Experience burst pipes in my local area frequently."

Resident

The second-highest ranked choice was **'Improve water efficiency'**. To many customers this was an opportunity to improve on existing systems rather than doing something completely new.

"It feels like the easiest thing to achieve ... using what we have, better."

Resident

"More efficient use of water allows existing supplies to go further"

Resident

Similarly to 'improve water efficiency' **'Recycle or "re-use" water indirectly'** appealed to many as being a potentially more cost-effective thing to achieve. Some also liked this as a means of being more eco friendly.

"Much more eco friendly to re-use and recycle water that is already present. More cost effective to recycle and re use"

Resident

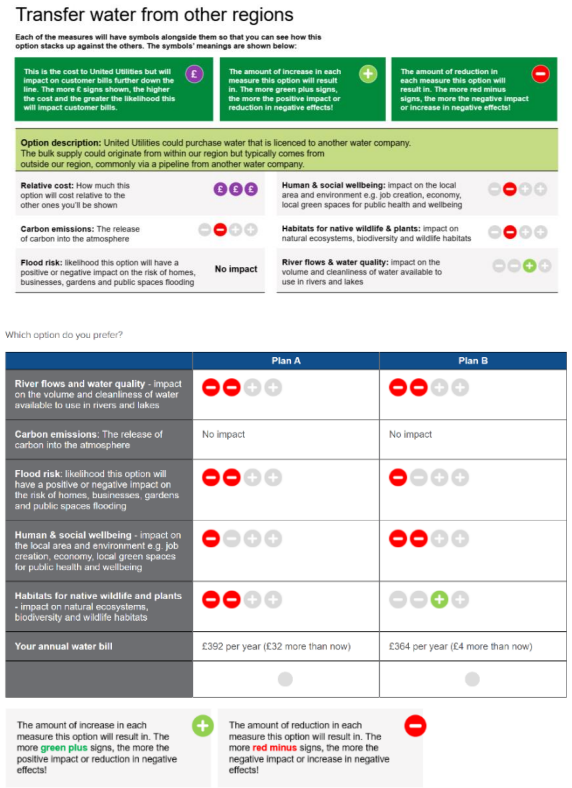
"No wastage is the best way of taking care of our environment. To re-use is a sustainable way to reduce waste"

Resident

DECISION METRIC WEIGHTS

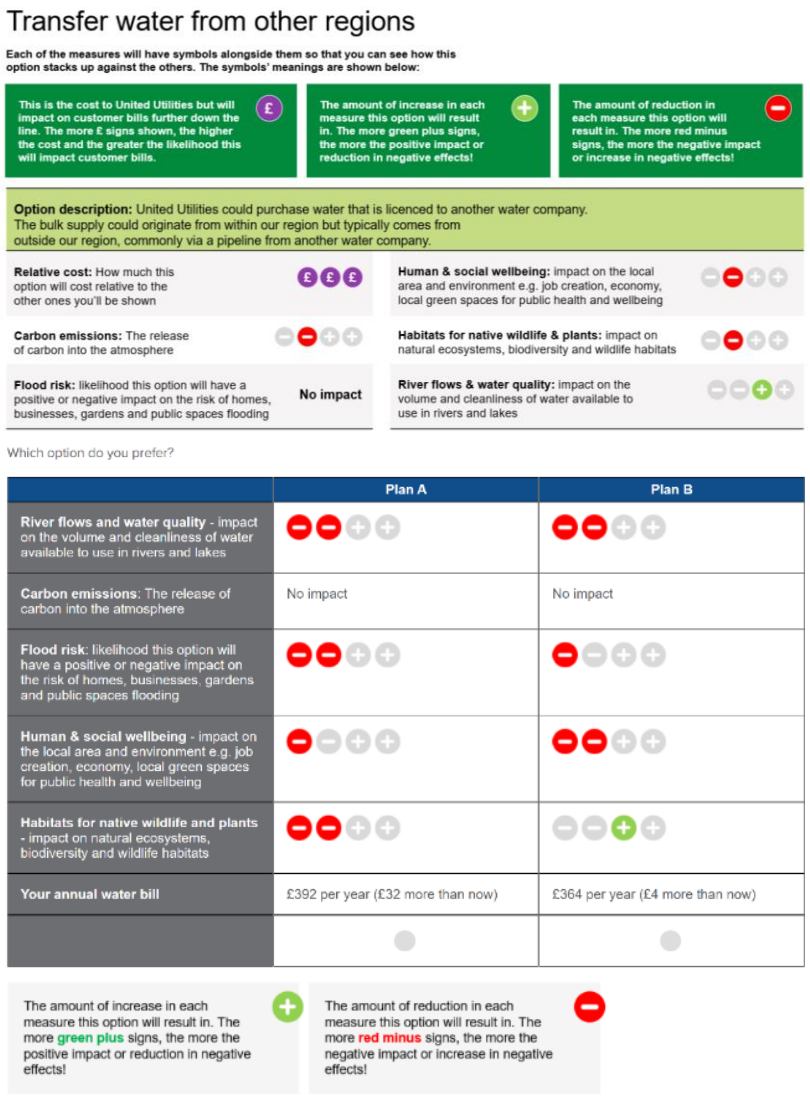
Stimulus shown in Stated Preference Choice Exercise

Respondents were shown more detail on the 10 different water resource options. Respondents were shown 10 individual slides for each option which included a description, the relative cost and whether the option would have a positive or negative impact on each of the metrics. This was then summarised so that respondents could compare the options.



- Survey participants saw 8 questions each.
- Attribute levels varied according to an experimental design.
- Household water bill impact shown in £s while Business water bill impact shown in %.
- Outcome for exercise is a measure of customer WTP for each attribute level.
- Customer WTP used to derive decision metric weights.

Stimulus shown in Stated Preference Choice Exercise



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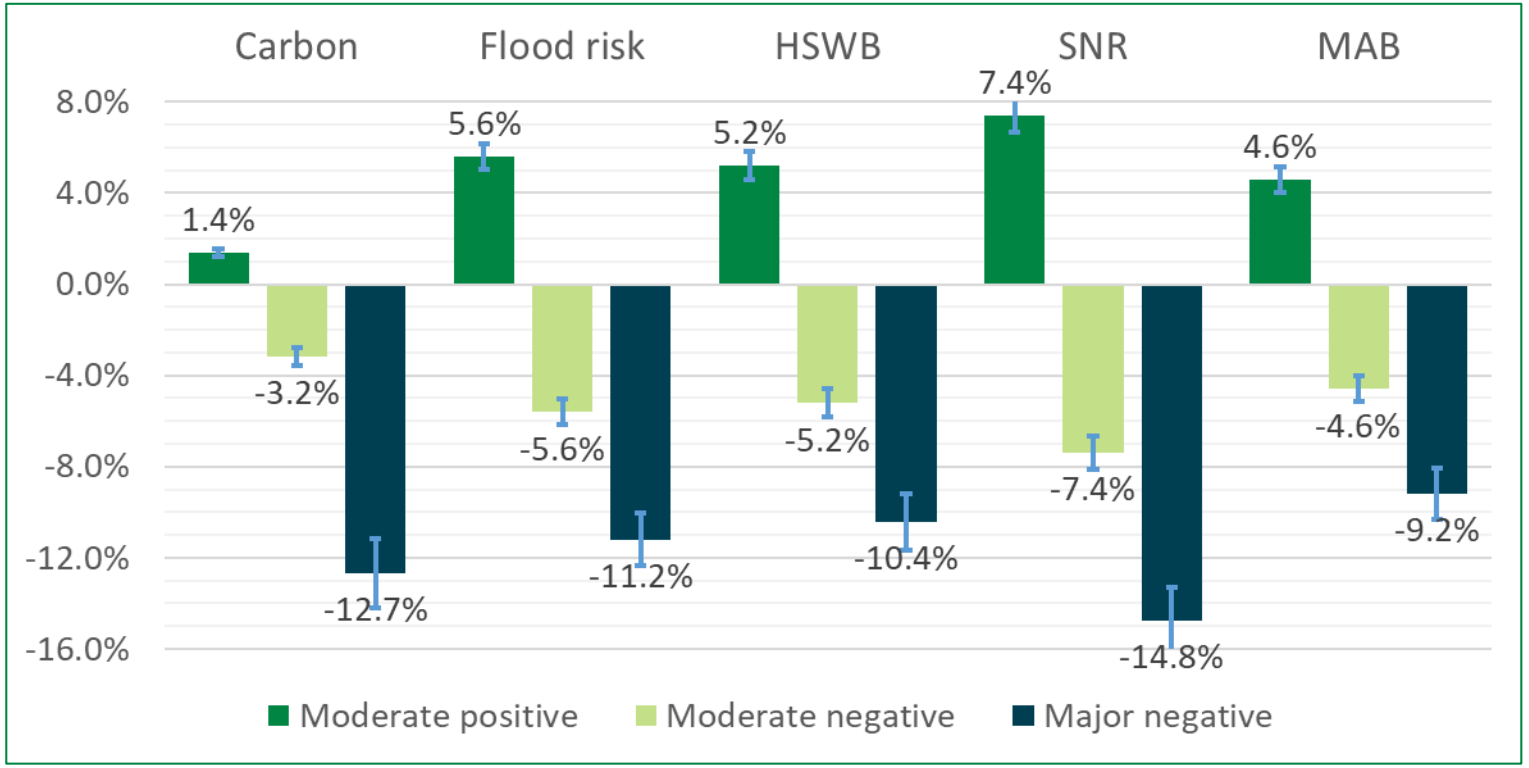
- Survey respondents saw 8 questions each.
- Attribute levels varied according to an experimental design.
- Household water bill impact shown in £s while Business water bill impact shown in %.
- Outcome for exercise is a measure of customer WTP for each attribute level.
- Customer WTP used to derive decision metric weights.
- Joint econometric model combining households and businesses from United Utilities, Southern Trent, and South Staffs Water to obtain more precise estimates while allowing for differences across companies.

SP Willingness to Pay: Households



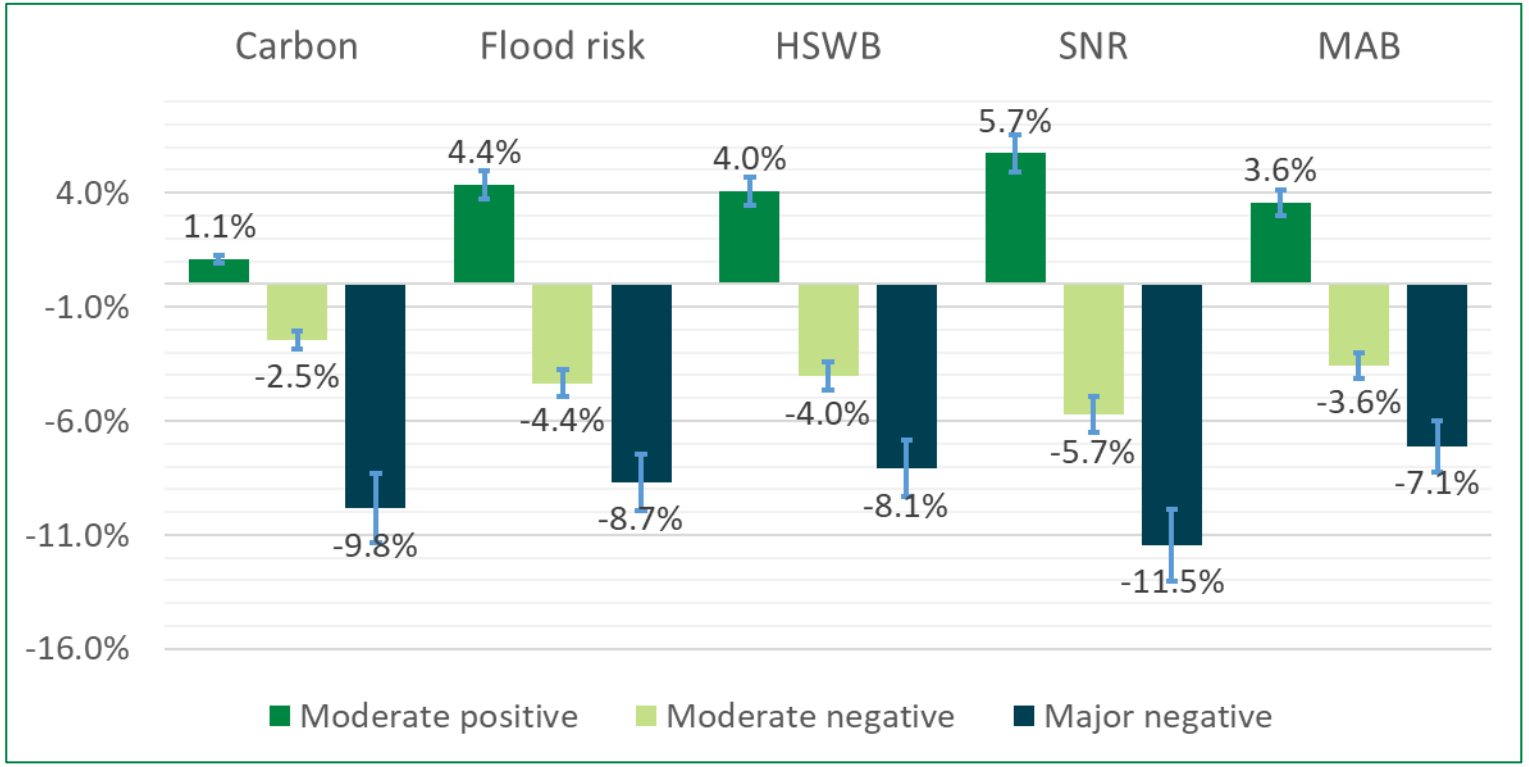
Note: The percentages indicate mean WTP referred to the annual water only bill. The vertical bars indicate 90% confidence intervals calculated using the Delta method. See Appendix for details on the calculation of WTP values.

HSWB Human & social wellbeing
SNR Habitats for native wildlife and plants
MAB River flows and water quality

Household customers on average:

- Are willing to pay the highest/lowest proportion of their annual water only bill for a moderate positive change in Ecosystem resilience (SNR)/Carbon emissions.
- Require the highest/lowest compensatory decrease in their annual water only bill for a moderate negative change in Ecosystem resilience (SNR)/Carbon emissions.
- Require the highest/lowest compensatory decrease in their annual water only bill for a major negative change in Ecosystem resilience (SNR)/River flows and water quality (MAB).

SP Willingness to Pay: Businesses



Note: The percentages indicate mean WTP referred to the annual water only bill. The vertical bars indicate 90% confidence intervals calculated using the Delta method. See Appendix for details on the calculation of WTP values.

HSWB Human & social wellbeing
SNR Habitats for native wildlife and plants
MAB River flows and water quality

Business customers on average:

- Are willing to pay the highest/lowest proportion of their annual water only bill for a moderate positive change in Ecosystem resilience (SNR)/Carbon emissions.
- Require the highest/lowest compensatory decrease in their annual water only bill for a moderate negative change in Ecosystem resilience (SNR)/Carbon emissions.
- Require the highest/lowest compensatory decrease in their annual water only bill for a major negative change in Ecosystem resilience (SNR)/River flows and water quality (MAB).

Measures of Content Validity

HIGH LEVEL OF VALIDITY

- Very few instances of non-trading behaviour i.e. where respondents always choose the same alternative throughout the exercise.
- Positive Participant feedback: people were able to make comparisons between the options presented to them.

SP NON-TRADERS

Measure	Household	Business	TOTAL
No. of respondents	653	184	837
%	78%	22%	100%
Always chose Option A	14	3	17
%	2%	1.6%	2%
Always chose Option B	7	2	9
%	1%	1.1%	1.1%

SP PARTICIPANT FEEDBACK

Measure	YES	NO	TOTAL
Household: Did you generally feel able to make comparisons between the choices presented to you?	619	34	653
%	95%	5%	100%
Business: Did you generally feel able to make comparisons between the choices presented to you?	174	10	184
%	95%	5%	100%

Construct Validity

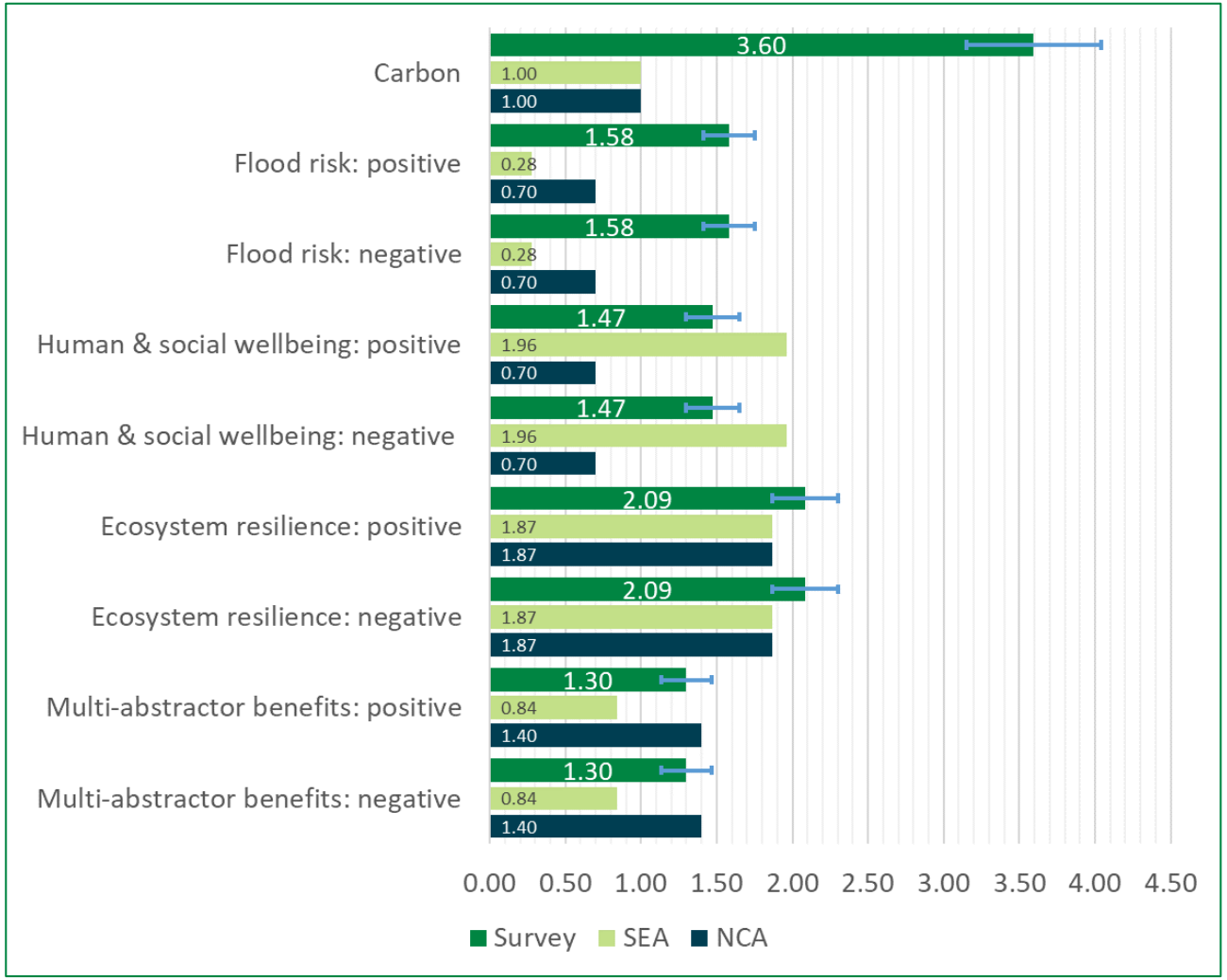
To test the construct validity of our analysis, we:

- **segment valuations for attribute levels (WTP) by customers' attitudes and concerns for the natural environment and water saving as well as several demographic characteristics**
- **compare each segment's WTP against the WTP of the complement segment ('Other') and assess statistical significance (at the 5% level) via t-tests based on the distributions of individual-level WTP values**

- We found relatively few statistically significant differences across segments defined based on attitudes and concerns.
- Improvements in carbon emissions are somewhat more highly valued by households who are very concerned about protecting water resources when compared with the less-concerned households, which is broadly in line with expectations.
- Customers from higher income households have, on average, higher valuations, of improvements in Flood risk and a somewhat higher valuation of improvements in Carbon emissions.
- Improvements in Carbon emissions are valued more highly by young customers (ages 18-29) than by older customers.
- Household customers in the Greater Manchester (Merseyside) region have, on average, a lower (higher) valuation of Habitats for native wildlife and plants, when compared to customers from other regions.

Overall, validity analysis shows that results are robust and reliable and hence there are good grounds for its use in UU's draft WRMP.

WRW ValueStream Tool: Decision Metric Weights Outputs



Note: See Appendix for details on the calculation of preference weights. The bars indicate 90% confidence intervals.

- The preference weights of Carbon emissions are substantially higher than the SEA and NCA weights.
- The preference weights of Flood risk are substantially higher than the SEA and NCA weights.
- The preference weights of Human & social wellbeing are in between the SEA and NCA weights.
- The preference weights of Ecosystem resilience/habitats are somewhat higher than the SEA and NCA weights.
- The preference weights of Multi-abstractor benefits (impacts on rivers) are somewhat lower than the NCA weights.
- Positive impacts were as highly weighted as the equivalent-sized negative impacts in line with the outcome from the stakeholder workshops.

TUBs & Extreme Events

Valuations of TUBs and Extreme Events

In order to calculate the customer preference for improved levels of service to avoid water restrictions (TUBs and Extreme Events) and the willingness to pay for improved service, we conducted a stated preference choice experiment.

- Both household and business customers were invited to choose which level of service was preferable when shown different options with the associated risk of water restrictions occurring and the impact on the customer's bill.
- The exercise was conducted on TUBs and Extreme Events independently in two separate choice experiments.
- Detailed information about the two types of water restrictions was shared with the respondent through a series of Show Cards.
- Respondents were shown three options in each iteration for TUBs and two options for Extreme Events. Option 1 was the status quo/no change option and was included in all sets shown to the respondent. Options 2 and 3 were improvements to the level of service that is currently received.

TUBs
Option 1 no change (1 in 22)
Option 2 improvement (1 in 40)
Option 3 major improvement (1 in 100)

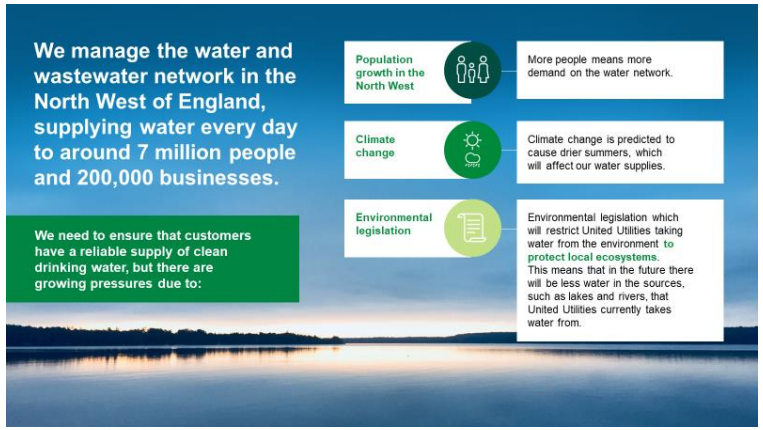
Extreme Events
Option 1 no change (wait until 2039)
Option 2 improvement (1 in 500 as soon as possible)

The bill impact shown on the first iteration was randomised to avoid a starting point bias.
A double-bounded dichotomous choice model was used (i.e. if the respondent rejected the first price shown for improvements the question was posed again with a lower price point but if the respondent accepted the first price point then the repetition included a greater bill impact).
household customers were shown a bill impact in £'s based on their bill and business customers were show a % bill increase.

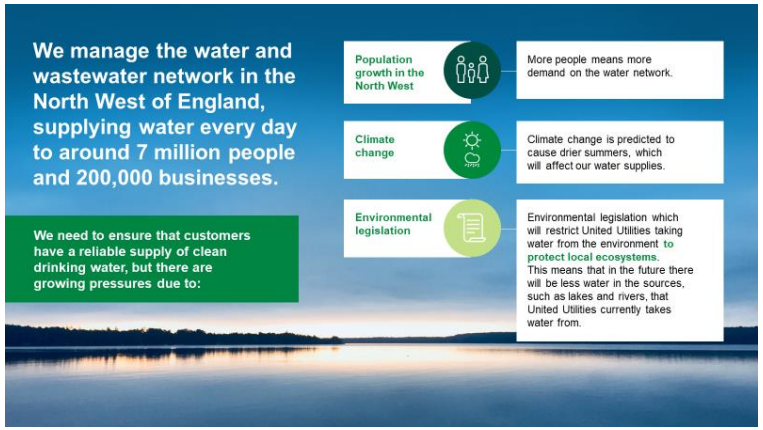
Stimulus shown for TUBS and Extreme Events

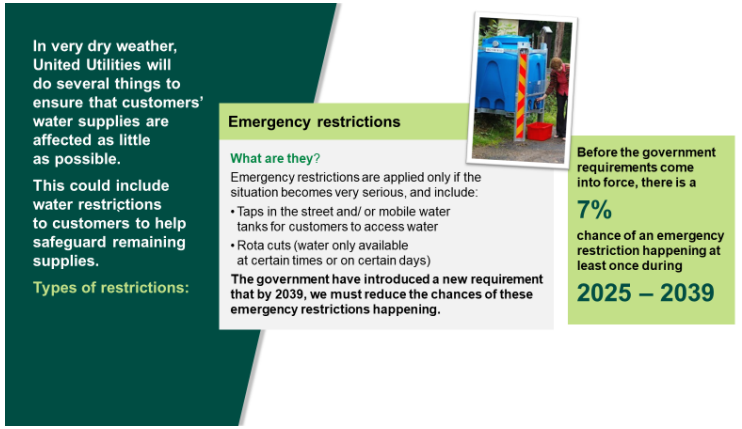
An inclusion criteria was set which ensured respondents had read the information about TUBs and extreme events that was shown to them during the survey and respondents who reported having difficulties in making preferences in the choice experiment were excluded from the survey.

Household



Businesses

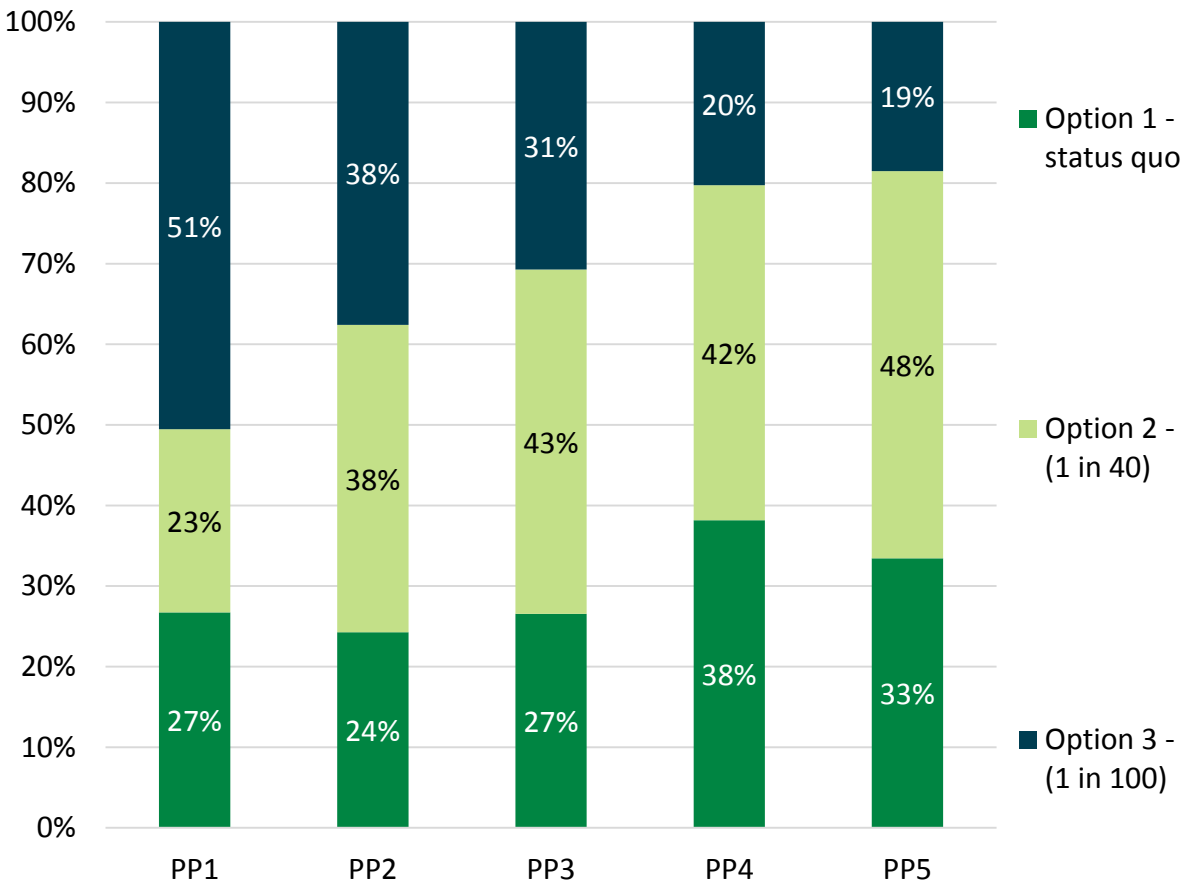




TUBs

TUBs – which options do household customers prefer?

Option choice (HH) by Bill impact



Analysis choices shows that as the bill impact increases, the preference for an improved level of service tend to decrease – the preference shifts from a willingness to pay for a major improvement to the more modest improvement of 1 in 40 which is preferred over the 'no improvement' status quo option.

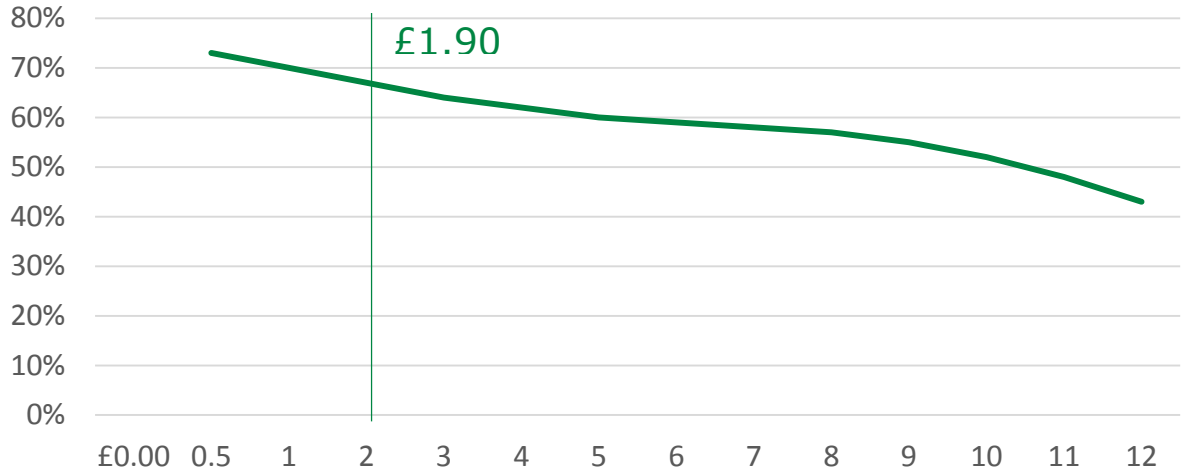
Few customers choose option 3 if the price >£12.

Overall, **26.5%** of customers said they preferred the status quo option from all options shown.

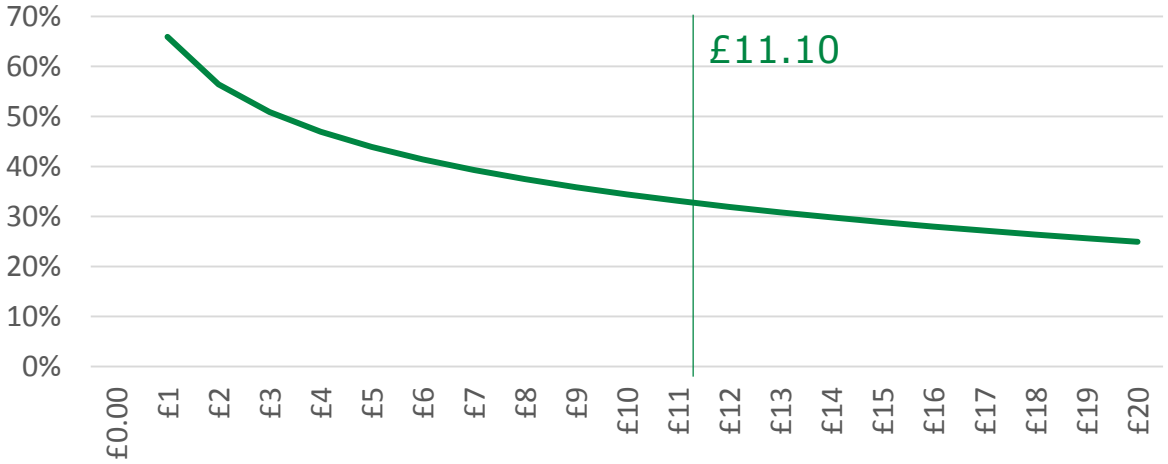
Price point	Option 1 – status quo	Option 2 - improvement	Option 3 – major improvement
PP1	£0	£0.50	£3.00
PP2	£0	£1.00	£6.00
PP3	£0	£2.00	£12.00
PP4	£0	£4.00	£24.00
PP5	£0	£8.00	£48.00

TUBs – which options do household customers prefer?

% HH customers willing to pay for improvement (1 in 40)



% HH customers willing to pay for improvement (1 in 100)



66.9% of household respondents preferred option 2 (1 in 40) over option 1 (status quo) **at £1.90**. 60% of customers would be willing to pay **£4.75**.

The average willingness to pay for the improved level of service (1 in 40) was **£6.04.**

Less than a third of customers (33.0%) would be willing to pay £11.10 for the major improvement. The average WtP for 1-in-100 is £8.38.

	Prefer Status Quo option	60% acceptance	% willing to pay at least £1.90	WtP (95% confidence interval)
TUBs (1 in 40)	26.5%	£4.75	66.9%	**£6.04** (£5.65, £6.43)
			% willing to pay at least £11.10	**WtP (95% confidence interval)**
TUBs (1 in 100)			33.0%	£8.48 (£7.13, £9.48)

Subgroup analysis

Willingness to pay for service improvements is higher in households with a more positive financial situation.

		TUBs		TUBS 1-in-40		TUBs 1-in-100	
	Subgroup	**Prefer status quo**	**60% acceptance**	**% willing to pay at least £1.90**	**WtP (95% confidence interval)**	**WtP (95% confidence interval)**	**% willing to pay at least £11.10**
Financial position	Sometimes/often/ always struggle	29%	£4.79	67%	**£5.75** (£5.24, £6.26)	**£6.50** ↓ (£4.89, £8.11)	27%↓
	Do not struggle	23%	£5.03	68%	**£6.39** (£5.77, £7.01)	**£10.91**↑ (£8.58, £13.24)	40%
Disability	Yes (self/other)	25%	£5.79	69%	**£6.27** (£5.66, £6.88)	**£7.89** (£5.94, £9.84)	34%
	No	27%	£4.02	65%	**£5.88** (£5.38, £6.38)	**£8.90** (£7.04, £10.76)	32%
Income	<£20,000	34%↑	£3.06↓	63%↓	**£5.13** ↓ (£4.53, £5.73)	**£4.93**↓ (£3.20, £6.66)	23%↓
	Above £20,000	23%	£5.70	69%	**£6.50** ↑ (£5.92, £7.08)	£11.15↑ (£8.98, £13.32)	40%
Metering	Metered	27%	£3.40	64%	**£5.57** (£5.01, £6.13)	**£9.87** (£7.59, £12.15)	36%
	Unmetered	26%	£5.78	69%	**£6.41** (£5.88, £6.94)	**£7.35** (£5.73, £8.97)	30%

↓ indicates a significantly lower result compared to the average
↑ indicates a significantly higher result compared to the average

Subgroup analysis

Willingness to pay for improvements in TUBs increases with age – Younger respondents reported higher levels of support for the modest increase but a low level of support for the major service increase.

		TUBs		TUBS 1-in-40		TUBs 1-in-100	
	Subgroup	**Prefer status quo**	**60% acceptance**	**% willing to pay at least £1.90**	**WtP (95% confidence interval)**	**WtP (95% confidence interval)**	**% willing to pay at least £11.10**
Age group	Age 18 to 29	21%	£8.71↑	81%↑	**£4.51** (£2.83, £6.19)	**£5.56** (£3.03, £8.09)	15%↓
	Age 30 to 44	32%↑	£2.10↓	60%↓	**£5.60** (£4.77, £6.43)	**£8.46** (£5.24, £11.68)	27%
	Age 45 to 59	33%↑	£2.79	62%	**£4.98** (£4.39, £5.57)	**£7.24** (£5.22, £9.26)	29%
	Age 60 to 74	18%↓	£6.90	72%	**£6.92** ↑ (£6.06, £7.78)	**£10.29** ↑ (£7.34, £13.24)	42%↑
	Age 75 Plus	19%↓	£8.07↑	75%↑	**£6.59**↑ (£5.23, £7.95)	**£10.49**↑ (£8.39, £12.59)	43%↑
Household size	One person household	29%	£3.88	65%	**£5.28** (£4.63, £5.93)	**£8.41** (£5.98, £10.84)	34%
	Couple	24%	£5.83	70%	**£6.75** (£6.11, £7.39)	**£8.23** (£5.99, £10.47)	31%
	3 or more	27%	£4.24	66%	**£5.90** (£5.18, £6.62)	**£8.95** (£6.49, £11.41)	35%

↓ indicates a significantly lower result compared to the average
↑ indicates a significantly higher result compared to the average

Subgroup analysis

Households in Cumbria reported a higher level of support for the service improvements with 83% choosing an improved level of TUBs.

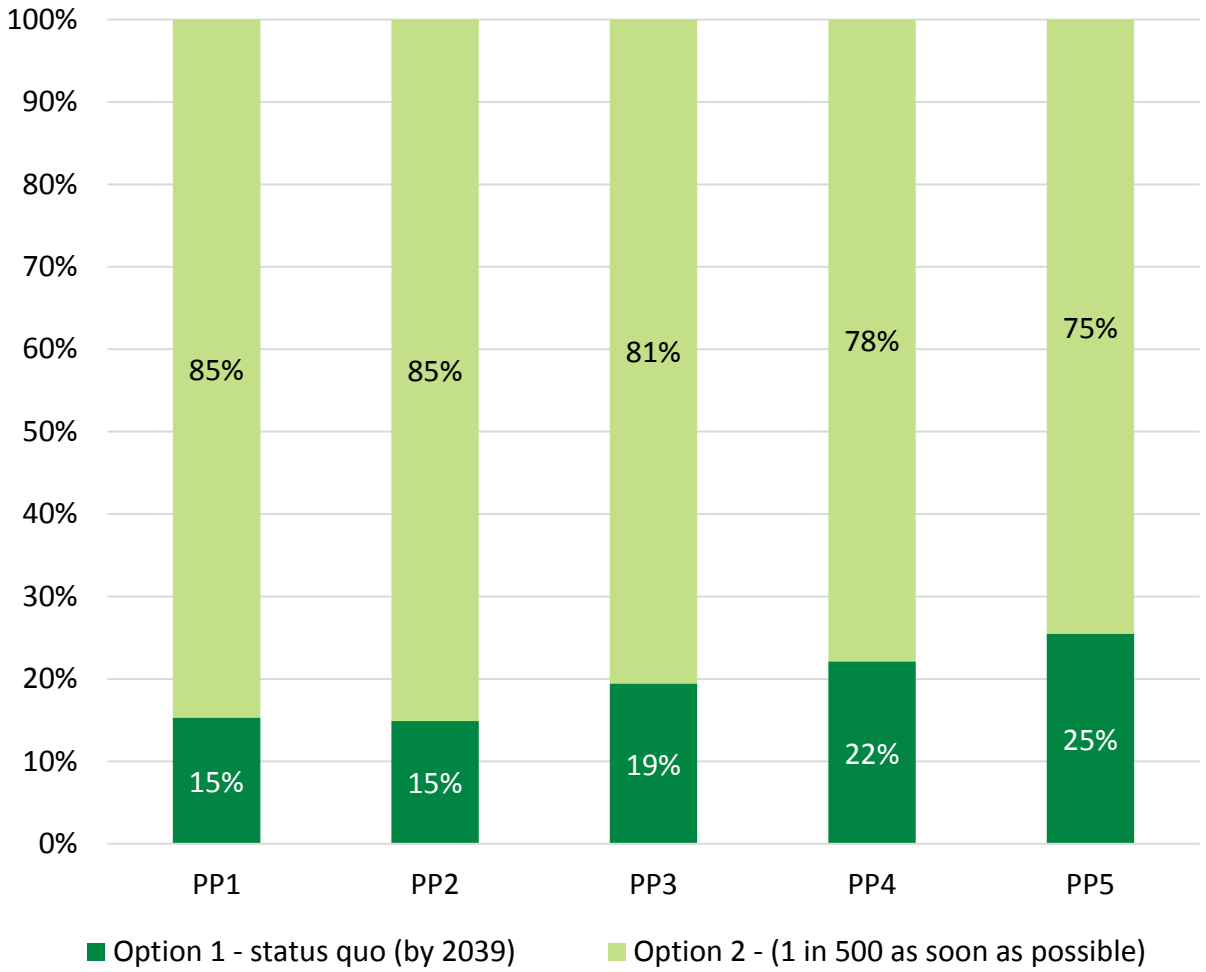
		TUBs		TUBS 1-in-40		TUBs 1-in-100	
	Subgroup	**Prefer status quo**	**60% acceptance**	**% willing to pay at least £1.90**	**WtP (95% confidence interval)**	**WtP (95% confidence interval)**	**% willing to pay at least £11.10**
Region	Merseyside	30%	£4.11↓	65%↓	**£5.16** (£4.44, £5.88)	**£7.55** (£4.61, £10.49)	30%
	Cumbria	17%↓	£8.80↑	82%↑	**£7.49** ↑ (£6.42, £8.56)	**£9.27** (£5.58, £12.96)	32%
	Gr Manc	27%	£5.13	68%	**£6.69** (£5.98, £7.4)	**£8.86** (£6.73, £10.99)	34%
	Lancashire	28%	£2.08↓	60%↓	**£5.39** (£4.61, £6.17)	**£8.50** (£5.21, £11.79)	30%
	Cheshire	22%	£5.33	68%	**£5.84** (£4.8, £6.88)	**£8.48** (£5.36, £11.6)	39%↑
Geography	Urban	30%	£3.20↓	63%↓	£5.78 (£4.82, £6.72)	£9.07 (£6.89, £11.24)	33%
	Rural	23%	£4.91	67%	£5.93 (£4.46, £7.38)	£8.22 (£5.59, £10.87)	36%
	Suburban	25%	£5.94↑	70%↑	£6.3 (£5.45, £7.16)	£8.14 (£6.29, £9.98)	31%

↓ indicates a significantly lower result compared to the average
↑ indicates a significantly higher result compared to the average

Extreme Events

Extreme Events – which options do household customers prefer?

Option choice (HH) by Bill impact



Analysis of the first choice set shows preference is firmly in favour of an improved level of service for Extreme Events. Even at the highest Bill Impact shown to respondents we see three quarters of customers preferring the improvement over the status quo.

As the Bill impact increases, the preference for an improved level of service decreases.

Overall, 14% of respondents preferred the Status Quo.

Price point	Option 1 – status quo	Option 2 - improvement
PP1	£0	£0.50
PP2	£0	£1.00
PP3	£0	£1.50
PP4	£0	£2.00
PP5	£0	£4.00

Extreme Events – which options do Household customers prefer?

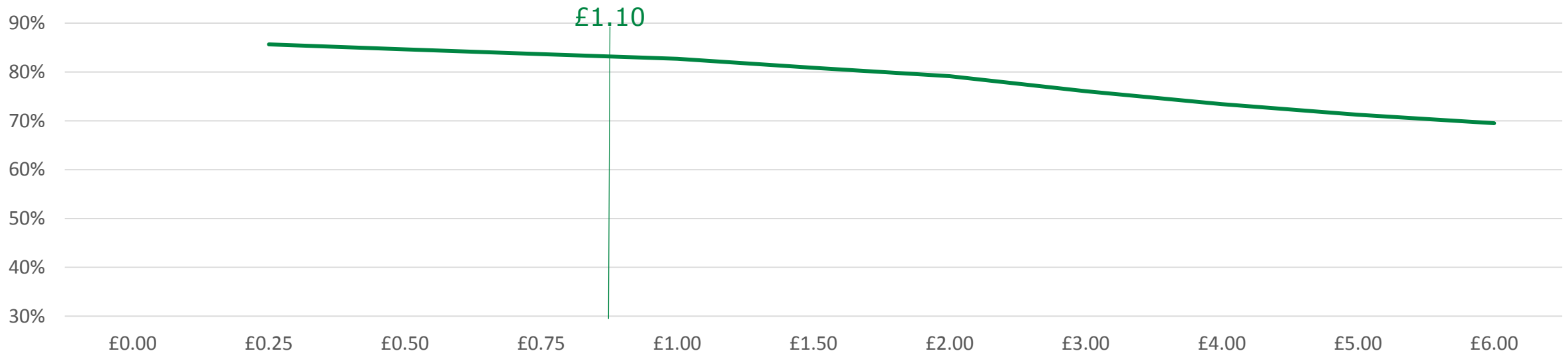
	Prefer Status Quo option	60% acceptance	70% acceptance	% willing to pay at least £1.10	WtP (95% confidence interval)
Extreme Events	14.0%	**£11.86**	**£5.90**	82.3%	**£4.56** (£4.38, £4.74)

82.3% of household customers preferred option 2 (moving to 1 in 500 as soon as possible) over option 1 (by 2039) at **£1.10.**

60% of UU household customers would accept a bill increase of **£11.86** to achieve the improved service level and 70% of customers would accept a bill increase of **£5.90**

The average willingness to pay for the improved level of service was **£4.56.**

% HH customers willing to pay for improvement (1 in 100)



Subgroup analysis

Willingness to pay for service improvements is higher in households with a more positive financial situation.

			Extreme Events			
	Subgroup	**Prefer status quo**	**60% acceptance**	**70% acceptance**	**% willing to pay at least £1.10**	**WtP (95% confidence interval)**
Financial position	Sometimes/often/ always struggle	16%	£11.40	£5.61	82%	**£4.62** (£4.35, £4.89)
	Do not struggle	10%	£13.69↑	£7.01↑	85%	**£4.44** (£4.19, £4.69)
Disability	Yes (self/other)	14%	£12.71	£6.42	84%	**£4.37** (£4.09, £4.65)
	No	14%	£11.30	£5.55	81%	**£4.66** (£4.42, £4.9)
Income	<£20,000	16%	£10.71↓	£5.17↓	80%↓	£4.64 (£4.31, £4.97)
	Above £20,000	13%	£12.47	£6.27	83%	**£4.35** (£4.11, £4.59)
Metering	Metered	17%	£10.74	£5.19	80%	**£4.51** (£4.23, £4.79)
	Unmetered	12%	£12.82	£6.49	84%	**£4.57** (£4.33, £4.81)

↓ indicates a significantly lower result compared to the average
↑ indicates a significantly higher result compared to the average

Subgroup analysis

Willingness to pay for improvements in TUBs increases with age – Younger respondents reported higher levels of support for the modest increase but a low level of support for the major service increase.

		Extreme Events				
	Subgroup	**Prefer status quo**	**60% acceptance**	**70% acceptance**	**% willing to pay at least £1.10**	**WtP (95% confidence interval)**
Age group	Age 18 to 29	22%	£9.42↓	£3.89↓	77%↓	**£4.30** (£3.41, £5.19)
	Age 30 to 44	19%	£8.95↓	£3.60↓	76%↓	**£4.71** (£4.31, £5.11)
	Age 45 to 59	12%	£12.51	£6.39	84%	**£4.35** (£4.06, £4.64)
	Age 60 to 74	11%↓	£12.91↑	£6.74↑	84%	**£4.45** (£4.10, £4.8)
	Age 75 Plus	11%↓	£13.66↑	£7.49↑	86%	**£4.96** (£4.43, £5.49)
Household size	One person household	17%	£10.66	£5.14	80%	**£4.69** (£4.35, £5.03)
	Couple	12%	£12.74	£6.18	83%	**£4.62** (£4.33, £4.91)
	3 or more	13%	£12.54	£6.20	83%	**£4.27** (£3.96, £4.58)

↓ indicates a significantly lower result compared to the average
↑ indicates a significantly higher result compared to the average

Subgroup analysis

Households in rural areas reported a significantly higher level of support for the service improvements to combat Extreme Events.

		Extreme Events				
	Subgroup	**Prefer status quo**	**60% acceptance**	**70% acceptance**	**% willing to pay at least £1.10**	**WtP (95% confidence interval)**
Region	Merseyside	16%	£12.06	£6.02	83%	**£3.89**↓ (£3.55, £4.23)
	Cumbria	9%↓	£11.47	£5.65	82%	**£4.61** (£3.88, £5.34)
	Gr Manc	14%	£12.03	£6.00	83%	**£4.66** (£4.36, £4.96)
	Lancashire	12%	£11.91	£5.93	82%	**£4.64** (£4.25, £5.03)
	Cheshire	16%	£11.25	£5.51	81%	**£4.98** (£4.44, £5.52)
Geography	Urban	15%	£10.65↓	£5.13↓	80%↓	£4.15 (£3.71, £4.61)
	Rural	13%	£14.20↑	£7.31↑	86%↑	£4.65 (£3.9, £5.4)
	Suburban	13%	£13.17	£6.70	84%	£4.82 (£4.33, £5.31)

↓ indicates a significantly lower result compared to the average
↑ indicates a significantly higher result compared to the average

Business Customer Valuations of Extreme Events

N=184 Business customer completed the stated preference choice experiment to express their desired level of service in relation to Extreme Events.

- Customers were invited to choose which level of service was preferable when shown different options with the associated risk of water restrictions occurring and the impact on the customer's bill.
- N=184 UU business customers were interviewed and data was weighted to reflect the profile of North West businesses as a whole in terms of business size.

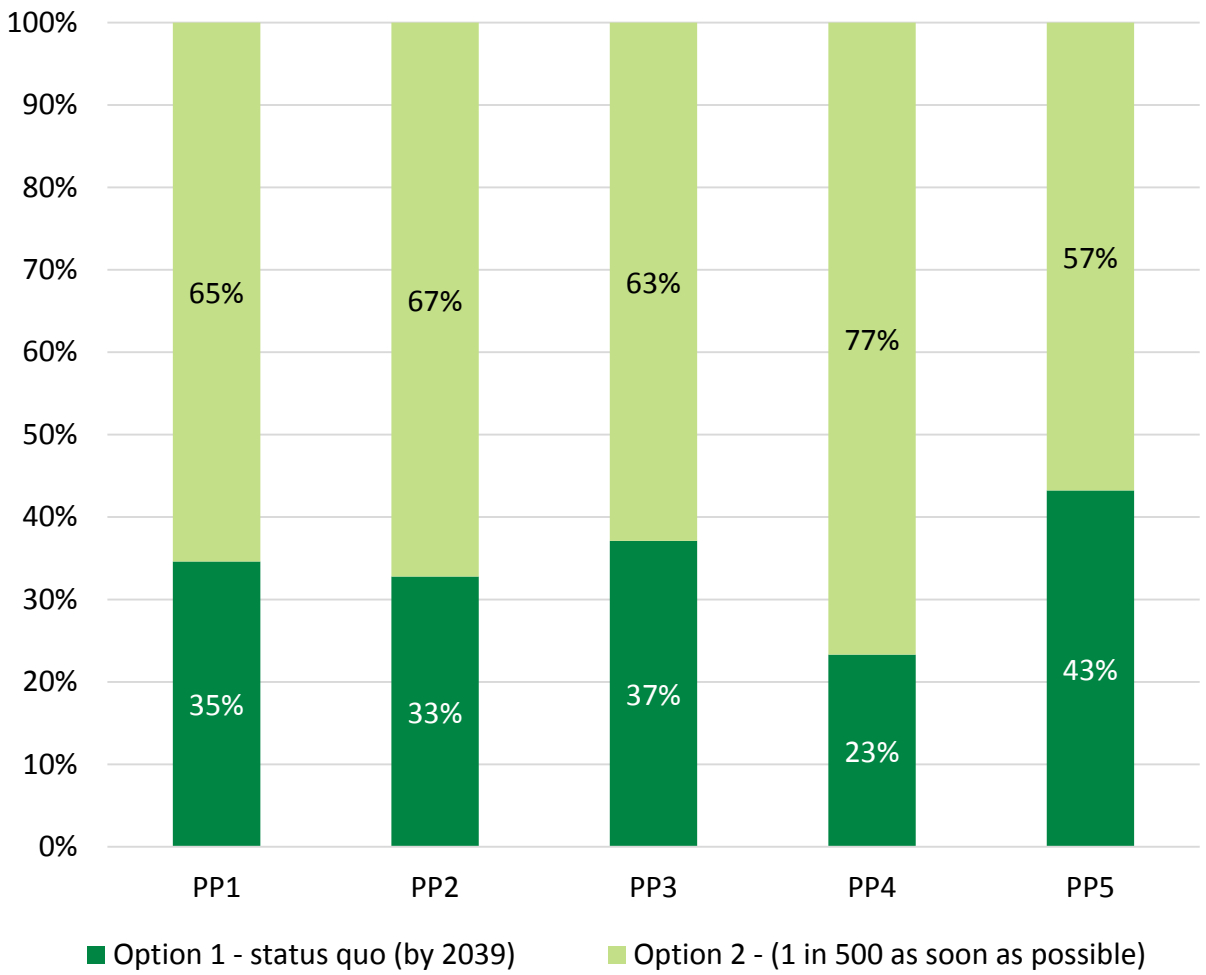
Business size	Unweighted	Weighted
Micro (0-9)	20%	35%
Small (10-49)	23%	20%
Medium (50-249)	31%	24%
Large(250+)	26%	21%

Extreme Events
Option 1 no change (wait until 2039)
Option 2 improvement (1 in 500 as soon as possible)

The bill impact shown on the first iteration was randomised to avoid a starting point bias.
A double-bounded dichotomous choice model was used (i.e. if the respondent rejected the first price shown for improvements the question was posed again with a lower price point but if the respondent accepted the first price point then the repetition included a greater bill impact).
Business customers were shown a bill impact in % increase based on their bill.

Extreme Events – which options do NHH customers prefer?

Option choice (NHH) by Bill impact



Analysis of the first choice set shows preference is in favour of an improved level of service for Extreme Events across all bill impacts shown.

At the highest bill impact, an increase of 0.9% on water bills, 57% of business customers preferred the improved level of service.

Overall, 22% of business respondents preferred the Status Quo across all the options they were shown.

Price point	Option 1 – status quo	Option 2 - improvement
PP1	£0	0.1%
PP2	£0	0.2%
PP3	£0	0.4%
PP4	£0	0.5%
PP5	£0	0.9%

Extreme Events – which options do NHH customers prefer?

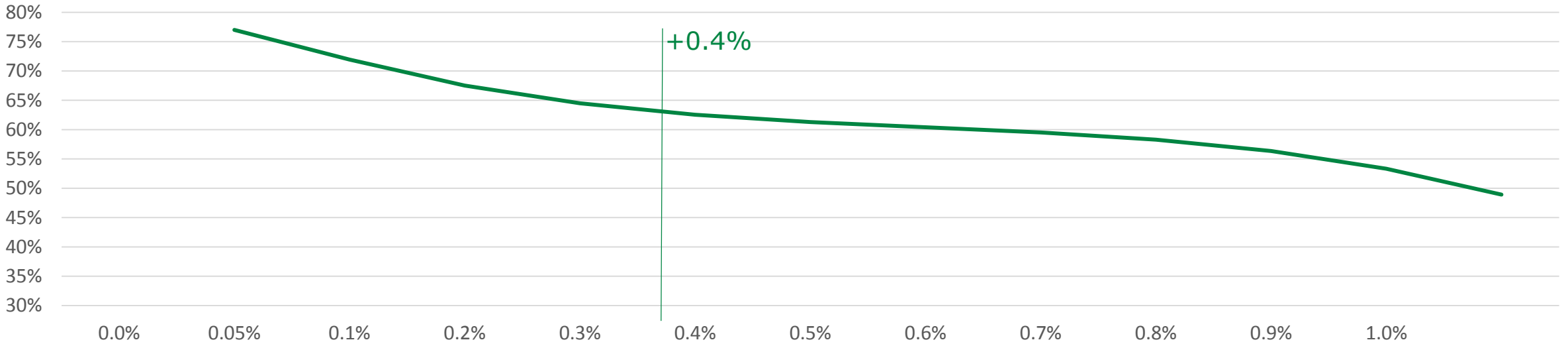
	Prefer Status Quo option	60% acceptance	% willing to pay at least +0.4%	WtP (95% confidence interval)
Extreme Events	**22%**	**+0.61% increase on bill**	**62.5%**	**+0.57%** (0.5%, 0.65%)

62.5%% of business respondents preferred option 2 (moving to 1 in 500 as soon as possible) over option 1 (by 2039) at **+0.4% increase to bill.**

60% of customers would accept a bill increase of **+0.61%** to achieve the improved service level

The average willingness to pay for the improved level of service was **+0.57%.**

% HH customers willing to pay for improvement (1 in 100)



Subgroup analysis

Willingness to pay is very similar for medium and large businesses, highest levels of willingness to pay amongst small businesses. Higher willingness to pay noted for businesses with high reliance on water, though not significantly so.

		Extreme Events			
	Subgroup	**Prefer status quo**	**60% acceptance**	**% willing to pay at least +0.4%**	**WtP (95% confidence interval)**
Business size	**Micro (0-9)**	25%	+0.52%	62%	0.53% (0.41%, 0.65%)
	Small (10-49)	12%↓	+0.69%↑	76%↑	0.68% (0.51%, 0.85%)
	Medium (50-249)	23%	+0.36%	57%	0.51% (0.36%, 0.67%)
	Large(250+)	25%	+0.37%	57%	0.52% (0.32%, 0.72%)
Water reliance	**Low** (for example similar to a household, hairdresser, office with less than 50 employees)	22%	+0.57%	65%	0.58% (0.47%, 0.69%)
	Medium (for example, office of more than 50 employees, a car wash, a large business where water is not a key component, small farmer)	24%	+0.35%	56%	0.51% (0.39%, 0.63%)
	High (For example, large manufacturing business, a large chemical company, large (arable) farmer)	15%	+0.63%	70%	0.73% (0.44%, 1.02%)

↓ indicates a significantly lower result compared to the average
↑ indicates a significantly higher result compared to the average

Appendix

Ofwat standards for high-quality research

Ofwat have set out requirements for High Quality Research in their Customer Engagement Policy. All water company research and engagement should follow best practice and lead to a meaningful understanding of what is important to customers and wider stakeholders.

Useful and contextualised
The insight used from this research fed directly into developing a best value plan in line with Water Resource Planning Guidelines.

Fit for purpose
This research was designed with the customer in mind. Three stages of cognitive testing were carried out to ensure the complex subject matter was presented in a way which was as understandable and engaging as possible for respondents. Visual stimulus was created in order to aid participant understanding, using images and symbols. Adjustments were made following each round of testing to ensure the materials were to a high standard and fit for purpose.

Ethical
This research was conducted by DJS Research who are a member of the Market Research Society. Participants were informed that they could be open and honest in their views due to anonymity and DJS and United Utilities were subject to strict data protection protocols.

Continual
The outputs of this research, including customer preferences and willingness and pay/accept various Water Resources options fed directly into developing a best value plan in line with Water Resource Planning Guidelines.

Neutrally designed
Every effort has been made to ensure that the research is neutral and free from bias. Where there is the potential for bias, this has been acknowledged in the report. Participants were encouraged to give their open and honest views and reassurances were given throughout the research that United Utilities were open to hearing their honest opinions and experiences.

Inclusive
Quotas were set based on the known profile of United Utilities' customers and weighted to mitigate variations in the sample population. The research materials went through robust testing to make sure they were accessible and engaging.

Shared in full with others
The research is published and shared on our website and through our industry customer insight newsletter, The Source.

Independently assured
All research was conducted by DJS, an independent market research agency. United Utilities collaborated with Your Voice, the Independent Challenge Group, who reviewed all research materials and provided a check and challenge approach on the method and findings

Options Ranking Econometric Model: Household

Choice	Coef.	Std.Err	Z value	P value	Lower	Upper
Mean						
Managing the land	1.556	0.2036	7.64	0.000	1.157	1.955
Recycle indirectly	1.924	0.1580	12.18	0.000	1.614	2.233
Take more from ground	0.477	0.4146	1.15	0.250	-0.336	1.289
Increase size of reservoirs	0.271	0.3583	0.76	0.450	-0.432	0.973
Take more from rivers	-1.501	0.9014	-1.67	0.096	-3.268	0.266
Increase capacity of WTW	0.956	0.3054	3.13	0.002	0.358	1.555
Reduce leakage	2.958	0.1756	16.84	0.000	2.614	3.302
Install more water meters	1.172	0.2491	4.71	0.000	0.684	1.661
Improve water efficiency	2.145	0.1588	13.51	0.000	1.833	2.456
Std deviation						
Managing the land	1.022	0.3989	2.56	0.010	0.240	1.804
Recycle indirectly	-0.092	0.5619	-0.16	0.869	-1.194	1.009
Take more from ground	0.483	1.0253	0.47	0.637	-1.526	2.493
Increase size of reservoirs	2.008	0.4323	4.65	0.000	1.161	2.856
Take more from rivers	-2.218	0.7319	-3.03	0.002	-3.652	-0.783
Increase capacity of WTW	1.125	0.5109	2.20	0.028	0.124	2.127
Reduce leakage	1.281	0.2147	5.97	0.000	0.861	1.702
Install more water meters	1.277	0.4042	3.16	0.002	0.485	2.069
Improve water efficiency	-0.393	0.4186	-0.94	0.347	-1.214	0.427
No of observations			18117(671*10+9+8)			
No of respondents			671			
Pseudo R^2			0.13			

Mixed logit estimates. The sign of the estimated standard deviations is irrelevant.

- Respondents asked to indicate top three priorities
- Omitted base option: Transfer from other regions (serves as base)
- Data organised as ‘exploded choice sets’, yielding three choices for each participant (preferred option from a set of 10 options; preferred option from the remaining 9 options; etc.)
- The model fits the data well (pseudo $R^2 = 0.13$)
- Most mean and standard deviation coefficients are highly statistically significant
- Individual-level coefficients were derived for each random coefficient and every participant
- Priority scores were calculated at the individual level by dividing each option’s exponentiated coefficient by the sum of exponentiated coefficients over all options (including the omitted base option), giving a measure on a 0-100 scale
- Individual-level priority scores were averaged over the relevant sub-samples to obtain segment rankings

Options Ranking Econometric Model: Business

Choice	Coef.	Std.Err	Z value	P value	Lower	Upper
Mean						
Managing the land	0.770	0.2394	3.22	0.001	0.301	1.239
Recycle indirectly	0.497	0.3542	1.40	0.160	-0.197	1.191
Take more from ground	0.095	0.3001	0.32	0.751	-0.493	0.684
Increase size of reservoirs	-0.002	0.4451	0.00	0.996	-0.874	0.870
Take more from rivers	-1.056	0.7909	-1.33	0.182	-2.606	0.495
Increase capacity of WTW	0.455	0.3410	1.33	0.182	-0.214	1.123
Reduce leakage	0.799	0.3730	2.14	0.032	0.067	1.530
Install more water meters	-2.257	1.2543	-1.80	0.072	-4.715	0.202
Improve water efficiency	0.992	0.2992	3.32	0.001	0.406	1.579
Std deviation						
Managing the land	0.479	0.6081	0.79	0.431	-0.713	1.671
Recycle indirectly	2.177	0.6727	3.24	0.001	0.859	3.496
Take more from ground	0.345	0.8862	0.39	0.697	-1.391	2.082
Increase size of reservoirs	1.873	0.7444	2.52	0.012	0.414	3.332
Take more from rivers	2.022	0.8864	2.28	0.023	0.285	3.759
Increase capacity of WTW	-0.733	0.8860	-0.83	0.408	-2.470	1.004
Reduce leakage	3.023	0.8186	3.69	0.000	1.418	4.627
Install more water meters	3.353	1.3235	2.53	0.011	0.759	5.947
Improve water efficiency	2.140	0.6698	3.19	0.001	0.827	3.453
No of observations			4968(184*10+9+8)			
No of respondents			184			
Pseudo R^2			0.05			

Mixed logit estimates. The sign of the estimated standard deviations is irrelevant.

- Respondents asked to indicate top three priorities
- Omitted base option: Transfer from other regions (serves as base)
- Data organised as 'exploded choice sets', yielding three choices for each participant (preferred option from a set of 10 options; preferred option from the remaining 9 options; etc.)
- The pseudo R^2 of 0.05 is relatively low
- A number of mean coefficients are not statistically significant indicating that, at the mean, the relevant options were not considered to be substantially more or less important than transferring water from other regions (omitted base option)
- Preferences vary across the NHH customer base as indicated by the statistically significant standard deviations for six of the options
- Priority scores were calculated at the individual level in the same way as for households
- Individual-level priority scores were averaged over the relevant sub-samples to obtain segment rankings

Statistically Significant Differences in Priorities: Households

1st	**Reduce leakage**: No significant differences found	
2nd	**Improve water efficiency**: No significant differences found	
3rd	**Recycle or 're-use' water indirectly**: No significant differences found	
4th	**Managing the land to improve water quality**	
		Customers aged 18-29 yrs (3rd ↑)
5th	**Install more water meters**: No significant differences found	
6th	**Increase capacity of water treatment works**	
	Customers aged 60-74 yrs (7th ↓)	Customers aged 30-44 yrs (6th ↑)
	Cheshire (7th ↓)	
	Unmetered (7th ↓)	Metered (6th ↑)
7th	**Increase the size of existing reservoirs**	
	Merseyside (7th ↓)	Lancashire (6th ↑)
	HH income > £20,000 (7th ↓)	HH income < £20,000 (5th ↑)
	Metered (7th ↓)	Unmetered (6th ↑)
8th	**Take more water from under the ground**: No significant differences found	
9th	**Transfer water from other regions**: No significant differences found	
10th	**Take more water from rivers and lakes**	
		Cumbria (8th ↑)

Overall, the household customer base is relatively homogenous in terms of supply-demand priorities

- Significant differences between any segment and the complement 'Other' (e.g., age group 18-29 vs those above the age of 29):
  - rank difference of at least one place
  - difference between priority scores statistically significant at the 5% level
- ↑ (↓) indicates higher (lower) priority than for the complement segment

Statistically Significant Differences in Priorities: Businesses

1st	**Reduce leakage**	
	Large (250+ employees) (2nd ↓)	
2nd	**Improve water efficiency**: No significant differences found	
3rd	**Recycle or 're-use' water indirectly**: No significant differences found	
4th	**Managing the land to improve water quality**	
	Micro (0-9 employees) (5th ↓)	Large (250+ employees) (4th ↑)
	Low water consumption (5th ↓)	Medium water consumption (4th ↑)
5th	**Increase the size of existing reservoirs**	
	Small (10-49 employees) (6th ↓)	
6th	**Increase capacity of water treatment works**	
	Micro (0-9 employees) (7th ↓)	Large (250+ employees) (5th ↑)
		Low water consumption (6th ↑)
7th	**Install more water meters**: No significant differences found	
8th	**Take more water from under the ground**	
		Large (250+ employees) (7th ↑)
9th	**Transfer water from other regions**	
	Large (250+ employees) (10th ↓)	
10th	**Take more water from rivers and lakes**: No significant differences found	

There were relatively many differences considering that subgroup analysis was carried out only by business size and water consumption/reliance

- Significant differences between any segment and the complement 'Other' (e.g., micro businesses vs all other businesses combined):
  - rank difference of at least one place
  - difference between priority scores statistically significant at the 5% level
- ↑ (↓) indicates higher (lower) priority than for the complement segment

Choice Experiment Econometric Model

Choice	Coef.	Std.Err	Z	P value	Lower	Upper
Mean						
Bill change	-0.0223	0.0010	-21.89	0.000	-0.0243	-0.0203
Bill change × Business customer	-0.0991	0.0090	-11.01	0.000	-0.1167	-0.0815
Bill change × South Staffs	-0.0209	0.0058	-3.58	0.000	-0.0323	-0.0094
Bill change × Severn Trent	-0.0081	0.0014	-5.60	0.000	-0.0109	-0.0053
Carbon	0.0115	0.0007	16.95	0.000	0.0101	0.0128
Carbon × South Staffs	0.0089	0.0028	3.17	0.002	0.0034	0.0143
Flood risk	0.0051	0.0003	19.22	0.000	0.0045	0.0056
HSWB	0.0047	0.0003	16.88	0.000	0.0042	0.0052
SNR	0.0067	0.0003	21.55	0.000	0.0061	0.0073
MAB	0.0041	0.0003	15.77	0.000	0.0036	0.0047
MAB × South Staffs	0.0021	0.0011	1.85	0.065	-0.0001	0.0043
Std deviation						
Carbon	0.0113	0.0013	8.38	0.000	0.0087	0.0139
Flood risk	-0.0046	0.0005	-9.18	0.000	-0.0056	-0.0036
HSWB	0.0041	0.0007	6.07	0.000	0.0028	0.0054
SNR	0.0067	0.0005	14.90	0.000	0.0059	0.0076
MAB	-0.0046	0.0005	-8.64	0.000	-0.0056	-0.0035

No of observations	34,752(2,172*8*2)
No of respondents	2,172(765 [ST] + 837 [UU] + 570 [SSW])
Pseudo R^2	0.14

Note: Mixed logit estimates. The sign of the estimated standard deviations is irrelevant. The sample combines household and business customers of Severn Trent Water (ST), United Utilities Water (UU), and South Staffs Water (SSW).

- The analysis is based on a joint mixed logit model combining households and businesses from United Utilities, Severn Trent, and South Staffs Water. Weights were applied to reflect relative wholesale revenue contributions from each of the six segments. The random coefficients were assumed to have independent normal distributions.
- The attribute levels were translated to scores obtained from "ValueStream1_R05-00", except for Carbon. The scores for Carbon were derived by calculating the NPV of carbon emissions equivalent to each of the levels of the metric based on the time series of 'Central' values contained in BEIS (2021) 'Supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions'.
- Bill changes are measured in £ per household per year for households and in percentage points of the annual combined water and wastewater bill for businesses.
- The initial (conditional logit) specification included a set of interaction terms between attribute levels (including bill change) and dummy variables for companies and business customers. Statistically not significant interactions were dropped in a stepwise procedure.
- The signs of the coefficients are all in line with expectations and the model provides a good fit to the data.
- There is significant heterogeneity in preferences as indicated by the standard deviation coefficients.

Calculation of WTP values

- The coefficient estimates from the econometric model are used to derive mean WTP values for the attribute levels
  - for households in terms of £ per household per year per unit score
  - and for businesses as a percentage of the annual combined water and wastewater bill per unit score
- The WTP values for households are translated in terms of % of United Utilities' water only bill by multiplying the former values by the score values and then dividing the product by the average annual household water only bill of £202.
- The WTP values for businesses are translated in terms of % of United Utilities' water only bill by multiplying the former values by the score values and multiplying the product by the ratio of the average annual combined (water and wastewater) bill of £422 and the average annual household water only bill of £202.

Calculation of preference weights

- Mean WTP values per unit of score were calculated as a percentage of the United Utilities annual average water bill for households and businesses as detailed above.
- The cost-equivalent of the bill impacts for the different attribute levels were then calculated (in £m NPV) separately for households and businesses based on a data from United Utilities showing that 1% on the annual United Utilities water bill was equivalent to £199.3million NPV of totex.
- Household and business results were combined with weights based on wholesale water revenue contribution to United Utilities. The shares of wholesale revenue attributable to households and businesses were calculated as 73% and 27% respectively.

Calculation of preference weights

- Scaling factors were applied to the raw weights to adjust for differences in company size.
- To calculate the scaled/adjusted weights, we used the following data:
  - The size of the 2050 WRW deficit, measured in ML/day
  - The median-sized scheme in WRW, also measured in ML/day
  - Population in each company area, derived from GIS analysis of Ofwat boundary shapefiles and Census 2011 data.
- The scaling factors for SSW, UU and SVT were calculated to be equal to the number of median-sized supply-demand options needed to address the WRW deficit, allocated across WRW companies in proportion to the population in each company's supply area.
- These scaling factors can be interpreted as the number of average-sized schemes needed to meet the 2050 deficit for all three companies if this deficit were allocated proportionally to population across companies. Applying these scaling factors is consistent with the interpretation of customers' choice data as reflecting preferences across metrics for an average sized scheme.

Quality control

As standard in the industry quality checks are implemented to ensure that the data collected is of sufficient quality and robustness. The most common checks are for respondents who have completed the survey in an unrealistic timeframe (meaning it is unlikely they have read through the stimulus). However, given the amount of stimulus a question was added to help determine if the materials were fully understood. Despite the cognitive interviews improving the experience, it was clear that there was a proportion who struggled with the choice experiment.

For those who said they struggled to understand the survey a follow up open ended question was provided so they could provide details on why this was the case.

If the respondent was clearly unable to provide an informed answer/ didn't understand what was being required of them they were removed from the survey.

142 household respondents were excluded from the study because they did not feel they had been able to faithfully complete the water resources choice experiment.

64 business respondents were removed using the same criteria.

Study inclusion

Further investigation of excluded respondents

Our sample of n=671 respondents all met the strict inclusion criteria. We actually interviewed a much larger number of UU customers but n=142 were excluded from the study because they did not feel they had been able to faithfully complete the water resources choice experiment.

Analysis of the n=142 respondents has been conducted. We're interested in finding out if this group of customers had different preferences in TUBs and Extreme Event levels of service.
The excluded customers tended to be older, more likely to be from Lancashire and more likely to be male.

SEG	Included	Excluded
ABC1	53%	64%
C2DE	47%	36%

Gender	Included	Excluded
Male	49%	59%
Female	51%	41%

Age	Included	Excluded
Age 18 to 29	5%	5%
Age 30 to 44	22%	19%
Age 45 to 59	34%	23%
Age 60 to 74	25%	37%
Age 75 Plus	14%	17%

Location	Included	Excluded
Merseyside	20%	11%
Cumbria	7%	8%
Gr Manc	37%	30%
Lancashire	21%	35%
Cheshire	14%	16%

Further investigation of excluded respondents

The respondents who are excluded from the study because they had struggled with the Choice Experiment element have lower willingness to pay estimates and a higher preference for keeping things as they are with no bill impact.

The pattern of preference within the excluded groups follows the general pattern we've seen throughout the study – that there is a strong preference for the improved level of Extreme Events service provision and the majority of customers also would like to see the level of TUBs service improved.

Extreme Events	WtP	% willing to pay at least £1.10	Prefer Status Quo option
Included	**£4.56**	82%	14%
Excluded	**£4.31**	74%	19%

TUBs (1 in 40)	WtP	% willing to pay at least £1.90	Prefer Status Quo option
Included	**£6.04**	67%	27%
Excluded	**£5.51**	59%	34%

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