Preferences for Recycled Water

Preregistration

Thomas Giebe and Tobias König

August 2026

1) Have any data been collected for this study already?

We have conducted a pilot survey with about 420 respondents. The pilot included about 130 respondents each in the Control and Quality conditions, and about 80 respondents each in the Goal and Combined Quality and Goal conditions.

The pilot observations will be included in the final analysis.

During the pilot, we added additional channel questions.

2) What's the main question being asked or hypothesis being tested in this study?

We aim to analyze whether individuals' preferences for EU Class A recycled water can be changed by providing video information about (i) the quality and safety of recycled water and (ii) the societal goals of recycled-water reuse, namely replenishing natural water resources and thereby reducing water-scarcity risk.

After collecting demographic information, respondents are randomly assigned to one of four conditions in a 2×2 between-subjects design:

- Control
- Quality information
- Goal information
- Combined Quality and Goal information

Following the information treatment, respondents answer questions measuring their perceptions of recycled water, support for recycled-water policies, willingness to use recycled water, and willingness to pay for recycled water.

Respondents also evaluate several within-subject scenarios. These vary the availability of recycled water under normal conditions and during a warm and dry summer, the provision method (water kiosk versus water taxi), the distance to the water kiosk (1 km versus 10 km), and different household, municipal, and commercial applications of recycled water.

For the experimental intervention, we test the following hypotheses:

- **H1:** Quality information increases perceived quality and safety of recycled water and increases support for, willingness to use, and willingness to pay for recycled water.
- **H2:** Goal information increases perceived environmental and societal benefits of recycled-water reuse and increases support for, willingness to use, and willingness to pay for recycled water.
- **H3:** The Combined Quality and Goal treatment has the largest positive effect on support for, willingness to use, and willingness to pay for recycled water.

Treatment effects on willingness to use and willingness to pay are examined across the water-kiosk and water-taxi scenarios and across different household and commercial applications.

For the within-subject scenarios in the main survey, we test the following hypotheses using data from the Control group. H4 and H5 capture transaction-cost effects:

- **H4:** Respondents are less willing to use and pay for recycled water when the water kiosk is located 10 km rather than 1 km from their home.
- **H5:** Respondents are more willing to use and pay for recycled water when it is delivered to their home by a water taxi rather than when they have to collect it from a water kiosk.
- **H6:** Respondents are more willing to use and pay for recycled water during a warm and dry summer.

3) Describe the key dependent variable(s), specifying how they will be measured.

Policy preferences:

1. Support for different household, municipal, and commercial applications of recycled water.
2. Support for introducing recycled water in the respondent's municipality.
3. Support for municipal investment in recycled-water infrastructure.
4. Support for a petition promoting recycled water in Sweden.

Behavioral preferences:

Here, we measure behavioral preferences through stated willingness to use and willingness to pay for recycled water.

5. Intended use of recycled water, measured by asking respondents how willing they would be, or how likely they would be, to use recycled water for different household purposes. Responses are recorded on the respective Likert scales.
6. Willingness to use and willingness to pay for recycled water under different scenarios. For household uses, respondents enter an amount between 0 and 170 SEK per cubic meter. A

reference price of 85 SEK per cubic meter is shown for ordinary tap water. For commercial uses, respondents are shown a reference price for the same service using drinking water.

Channels and secondary outcomes:

We include questions measuring perceived quality and safety of recycled water, perceived environmental and societal benefits of recycled-water reuse, trust in recycled-water treatment, perceptions of water scarcity, and normative views about whether water should generally be conserved. The normative-view questions were added during the pilot.

Respondents' preferred prices for drinking water and recycled water are analyzed as additional secondary outcomes.

For outcomes measured on a Likert scale, we additionally construct binary indicators for supportive responses, where applicable.

We also construct aggregate indices for policy preferences and behavioral preferences, as well as an overall index combining both outcome groups. To construct these indices, we first standardize each component using the Control-group mean and standard deviation, then average the standardized components within each index, and finally standardize the resulting index again using the Control-group mean and standard deviation.

4) How many and which conditions will participants be assigned to?

Four conditions:

1. Control
2. Quality information
3. Goal information
4. Combined Quality and Goal information

The randomization unit is the individual respondent.

We target a somewhat larger Control group because it serves as the common comparison group for all three information treatments. The three treatment conditions have equal target sample sizes.

We target approximately 30% of the final sample in the Control condition and approximately 23.3% in each treatment condition.

5) Specify exactly which analyses you will conduct to examine the main question or hypothesis.

To test H1–H3, we test the effects of Quality information and Goal information, as well as the interaction between the two information components. We also test whether the effect of Quality information differs from the effect of Goal information, without specifying a directional

hypothesis for this comparison. To test H3 specifically, we compare the Combined Quality and Goal condition with the Control, Quality information, and Goal information conditions.

The main analysis uses covariate-adjusted regressions controlling for the demographic characteristics collected in the survey. We also report unadjusted regressions. We use heteroskedasticity-robust standard errors and two-sided tests, and additionally report nonparametric tests.

To test H4–H6, we compare respondents' answers across the within-subject scenarios using paired t-tests. These comparisons are conducted in the Control condition. We report corresponding standardized within-subject effect sizes.

In the follow-up survey, conducted 5–7 days after the main survey, we test the persistence of treatment effects using one question on support for municipal use of recycled water and one question on willingness to use recycled water for private outdoor purposes. The goal of the follow-up survey is to assess whether treatment effects persist and how their magnitude compares with the effects observed in the initial survey. For context, follow-up effects in experimental studies are often smaller than the initial treatment effects, and we are interested in whether the estimated coefficients are broadly in line with the literature, where follow-up effects are often around 40–70% of the initial treatment effects.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.

We include an attention-check question. Respondents who do not pass the attention check will be screened out immediately and will not be allowed to complete the survey. The analysis sample therefore consists of respondents who complete the survey and pass the attention check.

If the same respondent identifier appears more than once, all observations associated with that identifier are excluded from the analysis.

We also include incentivized quiz questions to assess respondents' understanding of the information treatments. We may exclude respondents who fail these quiz questions as part of robustness analyses.

Survey questions required for the analysis are mandatory, so missing responses are not expected.

For household willingness-to-pay questions, respondents can enter an amount between 0 and 170 SEK per cubic meter. Responses within this range will be included in the main analysis. For commercial uses, respondents are shown a reference price for the same service using drinking water, with a pre-specified admissible range from zero to twice the reference price.

For other questions asking respondents to state their preferred prices for drinking water and recycled water, we do not pre-specify an admissible range. In robustness analyses, we will assess the sensitivity of the results to the exclusion of extreme outliers.

As a robustness check, we exclude respondents with extreme response times, defined as observations below the 1st percentile or above the 99th percentile of the response-time distribution.

7) How many observations will be collected or what will determine the sample size?

We aim for a final analysis sample of approximately 3,000 respondents, including the pilot observations. Depending on respondent availability through the survey provider in Sweden, the final sample may range from approximately 2,600 to 3,300 respondents. A sample of around 3,000 respondents is close to the maximum feasible sample indicated by the survey provider for Sweden.

For a sample of 3,000, we target approximately 900 respondents in Control and 700 respondents in each treatment condition. A key consideration in choosing this allocation was to provide balanced precision for the 2×2 treatment design, with a somewhat larger Control group as the common comparison group, rather than to maximize power for the follow-up survey.

At a final sample of 3,000, comparisons of an individual treatment arm with Control provide approximately 80% power at the 5% significance level to detect a standardized effect of about 0.14 standard deviations. Comparisons between two treatment arms provide approximately 80% power to detect a standardized difference of about 0.15 standard deviations.

Assuming an 80% follow-up response rate, as indicated by the pilot, the expected follow-up sample is about 2,400 respondents. In this follow-up sample, comparisons of an individual treatment arm with Control provide approximately 80% power to detect a standardized effect of about 0.16 standard deviations.

8) Anything else you would like to preregister?

As secondary analyses, we will estimate heterogeneous treatment effects by demographics, such as age, gender, education, household income, employment, municipality or region, household composition, housing characteristics, home ownership, garden ownership, number of cars, environmental attitudes, and previous experience with water scarcity.

Using responses from the Control group, we also conduct exploratory analyses of how recycled-water preferences correlate with respondent characteristics, perceptions of safety and quality, perceptions of water scarcity, and water-conservation attitudes.