



How Do Online Water Audits Affect Residential Demand?

Evidence from a 400,000-Household Field Experiment



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Water scarcity in the UK

It is accepted to think of the United Kingdom as a rainy country. However, parts of the UK, particularly in the Southeast of England, are expected to suffer severe water shortages by 2030 because of climate change and a growing population. To mitigate this problem, UK water companies plan to invest billions of pounds to improve the ageing infrastructure and secure future water supply. Such “supply-side” interventions range from fixing leaky pipes to building new reservoirs. For example, at Thames Water leakage is currently at the lowest ever level. We are fixing around 650 leaks a week, prioritising the biggest ones first. Moreover, from 2025 to 2030, we’ll invest nearly £20 billion to improve our services and upgrade our pipe network.

While, the infrastructure plays a crucial part in preserving water supply, water-efficient customer behaviour is equally important. Water companies increasingly rely on “demand-side” solutions that are designed to help households use less water. Smart meters that track customers’ water usage in real-time, alerts that notify customers about leaks, tariffs that charge more for high water usage, and communication campaigns that compare a household’s water consumption to that of its neighbours all belong to this toolkit.

Online water audits are one of the most popular “demand-side” tools used by the water companies in the UK and internationally. An online water audit is usually a short online questionnaire that asks about one’s water consumption habits, such as the number and typical lengths of showers in a week, the number of weekly dishwasher and laundry loads, the presence of a garden, and the like. At the end of the questionnaire, customers receive personalized tips about how to use less water. Despite ease of implementation and popularity, little is known about whether such water audits lead to customers becoming more water efficient. In this context, we posed several questions:

- How can we increase the uptake of online water audits at Thames Water?
- Which customers will be more likely to complete an online water audit?
- Do customers who complete an online water audit subsequently reduce their water use?

We tackled these questions with a scientific approach, using Behavioural Science experiments to understand what works.

What is Behavioural Science and why does Thames Water invest in it?

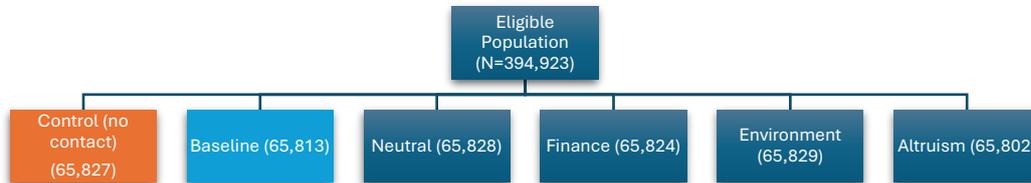
For water companies it is important to understand how customers think and make decisions, as well as whether efforts to change their behaviour and habits (e.g., saving more water) are effective. This is where Behavioural Science—the field that studies human behaviour and how to change it combining insights from psychology, neuroscience, economics and other disciplines—becomes most helpful. Behavioural Science relies on a rich toolkit of observational and experimental methods (e.g., A/B tests, natural field experiments, survey experiments), helping water companies to design user-centric communication, services, and products, among other outcomes. Our dedicated Behavioural Science unit at Thames Water is focused on ensuring that our efforts to help customers change their behaviour (e.g., save water) are not just well-intentioned, but also based on evidence.

How did we answer the three questions we posed?

We ran a (natural field) experiment with 394,923 smart-metered households, randomly allocating them into six comparable groups, either receiving no communication or a different type of invitation email. The groups are as follows:

- **Control Group:** No communication at all.
- **"Baseline" Group:** We sent a neutral email encouraging households to save water and providing the link for the online water audit.
- **"Neutral" Group:** We sent a neutral email, based on insights from behavioural science, to make it clearer and more engaging. For example, we added a call-to-action inviting recipients to complete the online water audit. We also simplified and streamlined the content, focusing it on using the calculator to save water rather than delivering a generic water-saving message.
- **"Finance" Group:** We modified the *Neutral* group's email to highlight the financial benefits the water audit can provide. This template was designed to evoke financial reasoning to complete the online water audit.
- **"Environment" Group:** We modified the *Neutral* group's email to emphasize the environmental benefits the water audit can provide. This template was designed to evoke moral reasoning, nudging households to complete the online water audit.
- **"Altruism" Group:** We modified the *Neutral* group's email to focus on the benefits the water audit can provide to future generations. This template was designed to evoke moral reasoning, nudging households to complete the online water audit.

The figure below illustrates the structure of the experiment.



Note. The experiment randomized 394,923 smart-metered households into 6 different groups.

What did we find?

- **Behavioural principles matter.** All emails designed following the principles of Behavioural Science (Neutral, Finance, Environment, Altruism) were around 2-3 times more effective at nudging households to complete the online water audit than the email in the *Baseline* group, which was composed without these principles.
- **Money talks.** The *Finance* email motivated the households to engage with the email and generated the highest number of online audit completions.
- **Do we engage the households with high water usage?** Households who used the most water before the experiment were the least likely to complete the online water audit during the experiment. Perhaps these households either knew that they cannot reduce their water consumption, therefore, did not act upon the emails, or they had little interest in becoming more water efficient.
- **Does the audit reduce water consumption?** Completing the online audit reduced a household's average daily water consumption by about 6 litres in the 6 months following the audit.

What implications do these results have for Thames Water and the wider water sector?

Test, test, test: Interventions for changing human behaviour need rigorous tests like this one. Only by investing time and money in such experiments can water companies gain valuable insights about the actual behaviour of their customers. This will allow to streamline the operations and make the investments more effective.

One size doesn't fit all: Companies differ in their customer bases. For instance, Thames Water also serves London and has a unique customer base compared with the rest of the UK. What works or does not work for a water company may perform differently elsewhere in the UK. This is demonstrated by a similar online water audit study that illustrates sizeable water efficiency gains of about 40 litres/day for Northumbrian Water Group customers in the UK (Akesson et al., 2023).¹

Online water audits may need changes: The current static model of online water audits, in which a customer answers questions and receives tips, may not be enough to create sustainable behaviour change. Behavioural modifications of the audit, such as goal setting post-audit, reminders to follow the audit tips, and gamification (e.g., rewards for hitting certain consumption targets) may help to increase the effectiveness of online water audits.

¹ Akesson, J., Hahn, R. W., Kochhar, R., & Metcalfe, R. D. (2023). *Do Water Audits Work?* (No. w31831). National Bureau of Economic Research.

Email templates

Figure 2 Baseline



The email template features a light blue header with the Thames Water logo and the headline "Make every drop count, come rain or shine" in bold blue text. Below the headline is the subtext "with our water saving calculator" and a green "Start saving now" button. A collage of images shows people engaged in water-saving activities like watering plants, washing dishes, and using a shower. The main body of the email is white with a simple greeting "Hello," followed by a paragraph explaining that recent rain has kept reservoir and river levels high, but it's still smart to save water for sunny days ahead. At the bottom, a light blue footer contains the question "Did you know you could be saving bucket loads?"

Thames Water

Make every drop count, come rain or shine

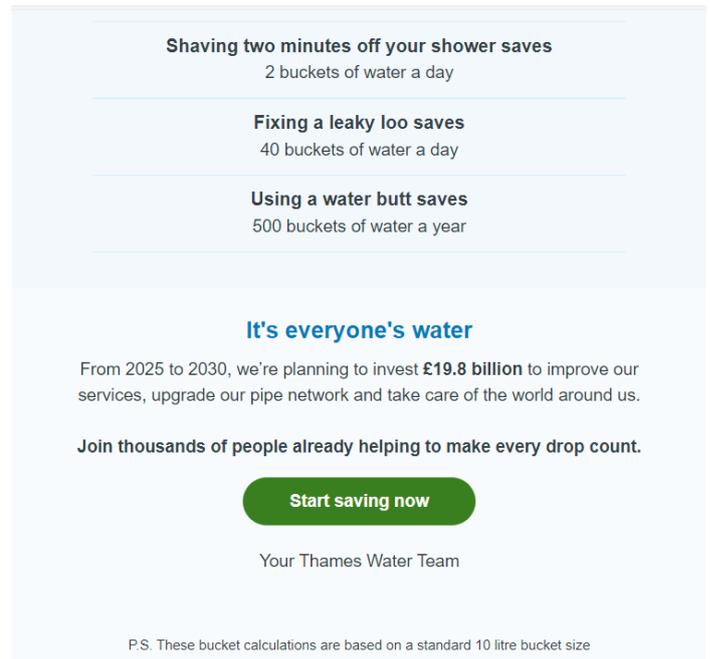
with our water saving calculator

[Start saving now](#)

Hello,

We've had plenty of rainy days recently, so our reservoir and river levels are where they should be. But it's still smart to save water for the sunny days ahead!

Did you know you could be saving bucket loads?



This section contains the body text of the email. It lists three water-saving tips, each with a horizontal line above and below it: "Shaving two minutes off your shower saves 2 buckets of water a day", "Fixing a leaky loo saves 40 buckets of water a day", and "Using a water butt saves 500 buckets of water a year". Below this is a section titled "It's everyone's water" in blue, followed by a paragraph about a £19.8 billion investment plan from 2025 to 2030. A line of text says "Join thousands of people already helping to make every drop count." Below that is a green "Start saving now" button and the sign-off "Your Thames Water Team". At the very bottom, in small text, it says "P.S. These bucket calculations are based on a standard 10 litre bucket size".

Shaving two minutes off your shower saves
2 buckets of water a day

Fixing a leaky loo saves
40 buckets of water a day

Using a water butt saves
500 buckets of water a year

It's everyone's water

From 2025 to 2030, we're planning to invest **£19.8 billion** to improve our services, upgrade our pipe network and take care of the world around us.

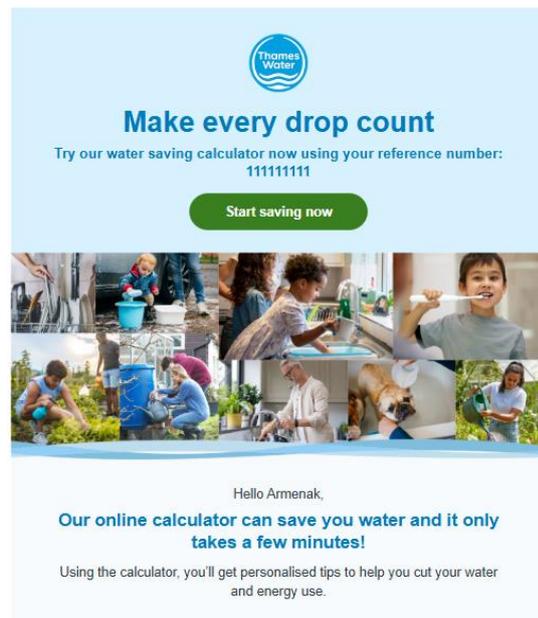
Join thousands of people already helping to make every drop count.

[Start saving now](#)

Your Thames Water Team

P.S. These bucket calculations are based on a standard 10 litre bucket size

Figure 3 Neutral



The email template has a light blue header with the Thames Water logo and the headline "Make every drop count" in bold blue text. Below the headline is the subtext "Try our water saving calculator now using your reference number: 11111111" and a green "Start saving now" button. A collage of images shows people engaged in water-saving activities. The main body of the email is white with a greeting "Hello Armenak," followed by a bold blue headline "Our online calculator can save you water and it only takes a few minutes!" and a paragraph explaining that the calculator provides personalized tips to reduce water and energy use. At the bottom, a light blue footer contains the text "Using the calculator, you'll get personalised tips to help you cut your water and energy use."

Thames Water

Make every drop count

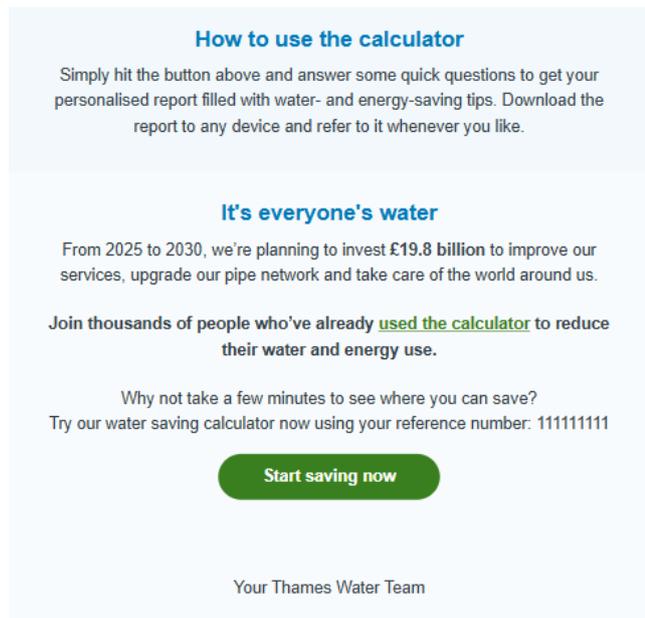
Try our water saving calculator now using your reference number: 11111111

[Start saving now](#)

Hello Armenak,

Our online calculator can save you water and it only takes a few minutes!

Using the calculator, you'll get personalised tips to help you cut your water and energy use.



This section contains the body text of the email. It starts with a section titled "How to use the calculator" in blue, followed by a paragraph explaining that users can get a personalized report with water- and energy-saving tips by hitting a button and answering questions. Below this is a section titled "It's everyone's water" in blue, followed by a paragraph about a £19.8 billion investment plan from 2025 to 2030. A line of text says "Join thousands of people who've already used the calculator to reduce their water and energy use." Below that is a paragraph asking "Why not take a few minutes to see where you can save?" and "Try our water saving calculator now using your reference number: 11111111". Below that is a green "Start saving now" button and the sign-off "Your Thames Water Team".

How to use the calculator

Simply hit the button above and answer some quick questions to get your personalised report filled with water- and energy-saving tips. Download the report to any device and refer to it whenever you like.

It's everyone's water

From 2025 to 2030, we're planning to invest **£19.8 billion** to improve our services, upgrade our pipe network and take care of the world around us.

Join thousands of people who've already used the calculator to reduce their water and energy use.

Why not take a few minutes to see where you can save?
Try our water saving calculator now using your reference number: 11111111

[Start saving now](#)

Your Thames Water Team

Figure 4 Finance



Make every drop count

Try our water saving calculator now using your reference number:
11111111

[Start saving now](#)



Hello Armenak,

Our online calculator can save you money – and it only takes a few minutes!

Using the calculator, you'll get personalised tips to help you cut your water and energy bills.

How to use the calculator

Simply hit the button above and answer some quick questions to get your personalised report filled with water- and energy-saving tips. Download the report to any device and refer to it whenever you like.

It's everyone's water

From 2025 to 2030, we're planning to invest **£19.8 billion** to improve our services, upgrade our pipe network and take care of the world around us.

Join thousands of people who've already **used the calculator** to save **£££** on water and energy.

Why not take a few minutes to see where you can save?
Try our water saving calculator now using your reference number: 11111111

[Start saving now](#)

Your Thames Water Team

Figure 5 Environment



Make every drop count

Try our water saving calculator now using your reference number:
11111111

[Start saving now](#)



Hello Armenak,

Our online calculator not only saves you water but also helps the environment – and it only takes a few minutes!

Your local area is classed as being under serious water stress. Using the calculator, you'll get personalised tips to help you cut your water and energy use and reduce your environmental impact.

How to use the calculator

Simply hit the button above and answer some quick questions to get your personalised report filled with water- and energy-saving tips. Download the report to any device and refer to it whenever you like.

It's everyone's water

From 2025 to 2030, we're planning to invest **£19.8 billion** to improve our services, upgrade our pipe network and take care of the world around us.

Join thousands of people who've already **used the calculator** to help the environment.

Why not take a few minutes to see where you can save?
Try our water saving calculator now using your reference number: 11111111

[Start saving now](#)

Your Thames Water Team

Figure 6 Altruism



Make every drop count

Try our water saving calculator now using your reference number:
11111111

[Start saving now](#)



Hello Armenak,

Our online calculator can help you save water for the future – and it only takes a few minutes!

Your local area is classed as being under serious water stress. If nothing changes, there will be less and less water left for future generations.

Using the calculator, you'll get personalised tips to help you cut your water and energy use and save water for the future.

How to use the calculator

Simply hit the button above and answer some quick questions to get your personalised report filled with water- and energy-saving tips. Download the report to any device and refer to it whenever you like.

It's everyone's water

From 2025 to 2030, we're planning to invest **£19.8 billion** to improve our services, upgrade our pipe network and take care of the world around us.

Join thousands of people who've already **used the calculator** to reduce their water and energy use.

Why not take a few minutes to see where you can save?
Try our water saving calculator now using your reference number: 11111111

[Start saving now](#)

Your Thames Water Team