Behaviour Change Interventions in the Water Sector

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Abstract

The water sector is increasingly making use of behaviour change interventions across a wide range of applications. These interventions can be alternatives to traditional infrastructure or end of pipe solutions by mitigating problems created by human behaviours. This article reviews 60 behaviour change interventions carried out during AMP6, addressing behaviours related to water use, water recycling and those focusing on maintaining broader environmental sustainability. Based on this review, we identify opportunities for strengthening the development processes in the sector for behaviour change interventions.

Highlights

- Long-term change and increased adoption of new behaviours can be inspired by exploring new forms of interventions like environmental restructuring and modelling. Interventions can be designed and targeted more precisely with the support of more preliminary research and the use of best practice derived from primary or academic research.
- The benefits of interventions can be improved by including reinforcement the newly introduced behaviours, supporting long-term behaviour changes.
- There is a good foundation available for identifying and adopting new methods of data collection and impact analysis to formalise and streamline the process of impact assessment.

Keywords

Behaviour, behaviour change, water consumption, water recycling, sewerage, sustainability, non-household behaviours, intervention design, intervention implementation, intervention evaluation

Introduction

From the increasing water consumption to the impact of FOGs and health and safety, human behaviour is an integral part of the challenges we face as an industry. Traditionally the burden of meeting these challenges has been met by water companies themselves via engineering and technical solutions. More recently, the industry has begun to recognise the role consumers can play in addressing these challenges. Long-term sustainable – and sustained – changes in how customers use water and water recycling services on an everyday basis have the potential to make significant contributions.

An important challenge in encouraging consumers to change their water-related behaviours comes from the nature of the typical person's interaction with water. Frequent and habitual behaviours, such as showering, brushing, flushing wipes, and so on, account for a significant portion of the water a typical consumer uses. People perform these actions without conscious thought or deliberation. Further, it is not easy for someone to observe the link between their water-related behaviours and the resulting consequences. Water is generally inexpensive, in terms of both overall and marginal cost, especially in comparison to other utilities such as gas and electricity. Many people also perceive water as a resource that is abundantly available.[1] The habitual and customary relationship people have with water use indicates another type of tool, the **behaviour change intervention**, is needed to establish and support long-term shifts in how people interact with the water sector. Behaviour change interventions extend the traditional toolkit of regulatory and economic mechanisms. Legal requirements and financial incentives can be – and frequently are – part of a well-designed and successful behaviour change intervention. However, intervention design also draws on broader research and insights from psychology and behavioural economics to inspire change in the internal antecedents that ultimately underpin human behaviour. A well-designed behaviour change intervention can therefore enable long term, sustainable adoption of desired behaviour in situations where regulatory or economic policies on their own are not sufficient. Behaviour change interventions have been deployed successfully across industries including energy[2], transport[3], and health[4].

In this article, we survey a sample of recent interventions conducted in the UK water sector. We identify existing good practices, as well as opportunities for improving how evidence bases can support the design of interventions, and how the effectiveness of interventions can be monitored and evaluated over various timescales.

Methodology

We identified 60 behaviour change interventions in the UK water sector during the period of AMP 6 (2015-2019): 54 by Anglian Water[5 6], 1 by Southern Water[7], 3 by Scottish Water[8] and 2 by the Consumer Council for Water[1 9.] We collected information about these interventions through informal interviews and communications with members of the teams involved in the projects, as well as by reviewing project summary reports, where available. Broadly, the interventions target three categories of behaviour.

- **Household sewerage** (55%). These targeted behaviours related to the disposal of fat, oil, and grease (FOGs), other food waste, and sanitary waste and the use of reusable sanitary products.

- **Household water consumption** (30%). These targeted behaviours focused on water use in the kitchen for cooking, washing vegetables and using a dishwasher as well as water use in the bathroom while showering, brushing teeth, and flushing the toilet. It also includes behaviours related to leakages and metered billing.

- **Non-household behaviours** (15%). This residual category includes interventions within the firms, including driving related behaviours like single occupancy travel, speeding and harsh events and vehicle idle time, as well as water use in agricultural practices related to pesticide usage and soil health and in commercial kitchen management practices.

We categorise the interventions in four dimensions::

- **Behaviour change approaches.** What method was used to engage the target audience.

- **Research practices.** What type of research, if any, underpinned the design of the intervention: primary research, secondary research, and/or expert advice.

- **Implementation practices**. How the intervention was rolled out, including whether trial runs or follow-ups were used.

- **Evaluation practices**. How the effectiveness and impact of the intervention was measured and assessed.
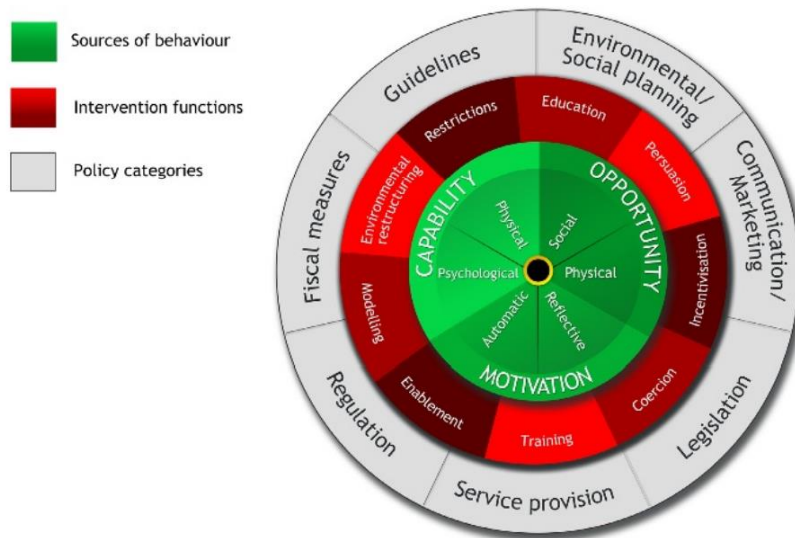
Figure 1. The Behaviour Change Wheel

Behaviour change approaches

The Behaviour Change Wheel framework (Figure 1) provides a taxonomy of nine **intervention functions**, each of which represents a different lever for potential behaviour change.[10]

- **Education** – increasing knowledge and understanding

- **Training** – imparting skills

- **Enablement** – providing support tools

- **Restriction** – using rules to hinder the opportunity to perform the behaviour

- **Environmental restructuring** – change the environment in which the behaviour is performed

- **Persuasion** – induce positive or negative feelings to stimulate action

- **Incentivisation** – create an expectation of reward

- **Coercion** – create an expectation of cost or punishment

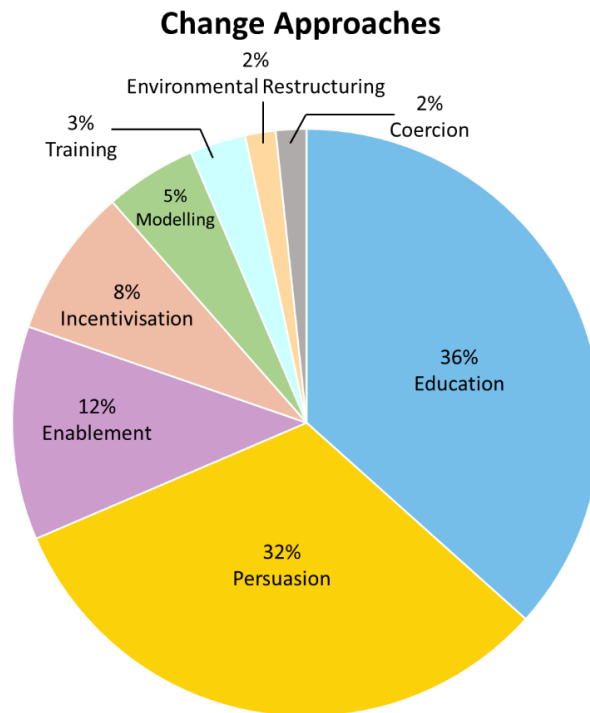- **Modelling** – provide role models

Change Approaches

Figure 2. Summary of change approaches

Figure 2 summarises the behaviour change approaches adopted in the interventions in our survey. An immediate observation is that two-thirds (68%) of the interventions used either education or persuasion as the primary intervention function. Examples of the education approach include spreading awareness of the issues among the target audience through education modules in schools, provision of advice, tips for efficiency and other information. Interventions based on persuasion encouraged their target audience to adopt appropriate behaviours through marketing campaigns. Examples of other intervention functions include provision of water efficient devices (enablement) or financial rewards (incentivisation), to encourage the adoption of desirable behaviours.

Looking ahead

Interventions based on education or persuasion are a good first step into behaviour change, especially as they are often easy to organise through existing communications channels. However, these intervention functions often place the onus of making the change on the audience. There are opportunities for the sector to become more than an onlooker, by.

- using less explored change approaches, such as consciously planning the physical design of the decision-making environment; identifying and working with members of the community who can become role models; and contributing to shaping social norms within the community

- thinking of marketing and communication campaigns not as intervention functions of their own, instead using these channels in a complementary way to support and enhance the effects of interventions based on other approaches.

Example of Good Practice: **Slug it Out**

This intervention by Anglian Water's Catchment team encouraged farmers to reduce the use of Metaldehyde from catchments surrounding surface water reservoirs through a Payments for Ecosystem Services (PES) scheme. One of the payments was a product substitution payment that covered the additional costs of switching to Ferric Phosphate (a less harmful alternative). The first two years of the intervention focussed on encouraging farmers in the catchment areas of six Anglian Water reservoirs to participate in the intervention.

Through discussions with various stakeholders, the team discovered that Metaldehyde had a blue colour that was easily visible and ensured that the slugs died on the surface of the land, whereas Ferric Phosphate made the slugs photosensitive, resulting in them retreating into the soil and dying underground. The effects of Metaldehyde were therefore much more evident to the farmers, prompting the purchase of the product. The farmers already knew that Ferric Phosphate could help manage slugs and that it is less environmentally harmful; what they lacked was a trust in its effectiveness. In this situation, a marketing campaign providing information about the benefits of Ferric Phosphate would have had limited effect in changing the farmers' motivation to participate in the intervention. Instead, the team decided to demonstrate the effectiveness of Ferric Phosphate to the farmers in person, and subsequently increased the participation of farmers in their interventions.

Research practices

A person's behaviour is the product of a variety of interacting forces. Behaviour is influenced by **internal factors** such as a person's attitudes, preferences, beliefs, perceptions, biases, and emotions, and **external factors** such as regulations, finances, infrastructure, and technology. The impact of these factors may further be dependent on or mediated by the person's social, cultural, demographic, or geographic **context**. Therefore, the same behaviour may be driven by different factors in different populations. Conversely, the same intervention may differ in effectiveness in different populations. The design of an effective intervention must therefore be grounded in evidence that maps out the factors that underpin the target behaviour in the context of the target audience. To produce this evidence base, intervention designers can conduct different types of research:

- **Primary research**, in which information is collected specifically for the purpose of the intervention;
- **Secondary research**, which uses information already available from academic and non-academic sources;
- **Expert advice**, in which intervention designers consult with subject matter experts, who can lend their expertise based on their own experiences.

Figure 3. Summary of research practices

Figure 3 summarises the research methodologies used by the designers of the interventions in our survey. Only one in five (20%) of the interventions were supported by primary research focused on understanding the drivers of the targeted behaviour, and over a third (35%) had no supporting

evidence base. The rest of the interventions relied principally on desk research or the skills of external consultancies.

Looking ahead

Compiling a targeted evidence base represents an up-front cost. Further, it is tempting for an intervention designer to think they already know the drivers of the behaviour based on personal introspection, or experience in a different context. However, investment in underpinning research will pay off in the long run in more effective interventions. Some ways the sector could make a start on this include:

- Conduct primary research wherever it is possible. This will enable the designing teams to target the right factors to change and will help tailor the intervention to the unique needs of the target audience.
- Embed skills and best practice for designing research materials within the sector. This will allow for more primary research through interviews, focus groups, surveys and will enable the sector to actively participate in the design of their interventions when working with third party consultants.
- Increase engagement with academic experts and sources of information. These can open doors to innovative ideas that have not yet been explored within the sector, as well as provide access to research materials that can be adapted rather than being designed from scratch.

The team undertaking the Keep It Clear programme at Anglian Water conducted a research study along with academics from Manchester University to identify new pathways for interventions influencing the avoidable flushing of 'unflushables'. The project process exemplifies the complementary use of primary and secondary research in developing an intervention plan.

The team conducted a Rapid Evidence Assessment (REA) of academic literature on the topic and identified 5 socio-material causes for such behaviour (secondary research using academic literature.) They then reviewed activities conducted by the Keep It Clear programme to identify opportunities for action; this is an example of secondary research of grey literature. They identified the Change Points Methodology (www.changepoints.net, Figure 4) as a suitable framework for the task and used it to explore possible intervention ideas through discussions with various stakeholders (primary research). This process led to nine new ideas for behavioural or technical interventions.

Figure 4. The Change Points Methodology

Implementation practices

Research will generally suggest some routes as promising candidates for interventions while ruling others out as being unlikely to succeed. Given the complexity of the interactions that drive people's behaviour, research will rarely – if ever – produce a single, off-the-shelf, unambiguously best way to proceed. Interventions require tailoring to successfully address the target behaviour in the target audience with the available resources. Implementation practices refer to the stages a project can undertake to roll out the intervention effectively. Ideally, the roll-out process has three stages:

- **Trial run** – Conducting a trial run can provide an insight into effective methodologies as well as areas for improvement. This knowledge can help further tailor and polish the design such that the main rollout results in a significant change in behaviour. It also reduces the risks associated with spending on a large-scale roll-out without initial data on its likely effectiveness.
- **Main roll out** – Once the original design has been trialled and polished, the improved version can be rolled out to the larger audience. The intervention then needs to be regularly monitored and evaluated to measure its effectiveness and impact.
- **Reinforcement** – Behaviours which are habitual in nature are often those which are well-suited to targeting by behaviour change initiatives. For these behaviours to change, they need to be replaced with a new habit. A person is more likely to form a new habit when they are reminded, whether explicitly or subtly, to perform the behaviour, up to the point where the performance of the behaviour becomes an unconscious decision for them. This means that reinforcement of the new behaviour past the timelines of the initial roll out can be an essential part of the design
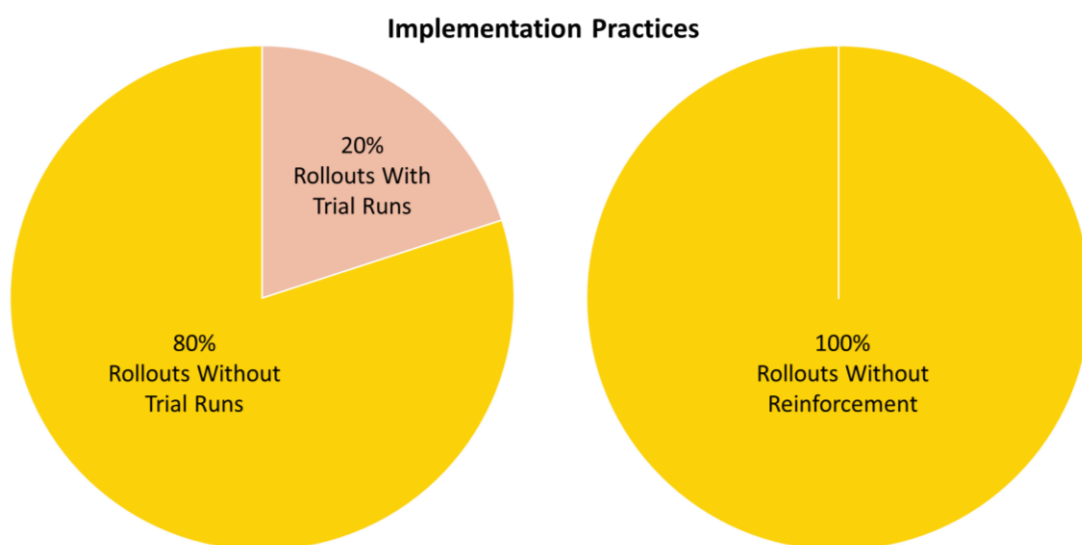

Implementation Practices

20%
Rollouts With
Trial Runs

80%
Rollouts Without
Trial Runs

100%
Rollouts Without
Reinforcement

Figure 5. Summary of implementation practices

Figure 5 summarises the delivery methodologies used in the interventions in our survey. Only one in five (20%) of the surveyed projects conducted feedback sessions and discussions to inform different iterations of the intervention at the design stage. None of the projects incorporated a reinforcement phase as part of the main project period.

Looking ahead

Because behaviour change is a continuous process, it is important to remember that effective interventions are strategic in nature and will play out over a period of time. Short or one-off projects may result in short-term changes, but without reinforcement behaviour may revert to the status quo over time. There are several ways in which the water sector can improve the benefits of interventions.

- Include time for small trials when planning project timelines. This provides opportunities to fix any problem areas before the main roll out. This is especially important if the intervention being undertaken is based only on secondary research. In this case, trial runs can help you understand early on if the chosen intervention is applicable for your target audience before investing in a full-scale roll out.
- Start thinking about reinforcement during the initial planning stages and build the reinforcement strategy into the design of your intervention rather than bolting it on as an afterthought. Some options for reinforcement include sending reminders, providing cues, or leveraging social media to continue conversations.
- Conduct a comprehensive review of interventions that you have previously designed before beginning the design of a new intervention to help identify opportunities for reinforcement. Conducting primary or secondary research can also help you determine the frequency and duration for your reinforcement.

Example of Good Practice: **Turn Off the Tap**[6]

This intervention headed by the Metering team at Anglian Water influenced household water consumption behaviours by encouraging customers to turn their taps off while brushing their teeth.

Based on a review of academic literature, the team identified three potential messages (Figure 6), each addressing a different psychological attribute. The team used a bathroom in a civic building in Norwich and conducted an experiment in which one of these three messages was displayed on the mirror related to turning off the tap when brushing teeth. Participants brushed their teeth, and the amount of water used was measured using an audio recorder. The water usage was compared to a control condition, in which no message was displayed. The data demonstrated that all three messages were effective in reducing water consumption – and so the intervention of displaying a message did have an impact and was a viable candidate for an intervention design - and further identified that the message that highlighted the contributions of a group as a whole (collective efficacy) was most effective in bringing about a change in behaviour. The team rolled out this message to a larger audience.
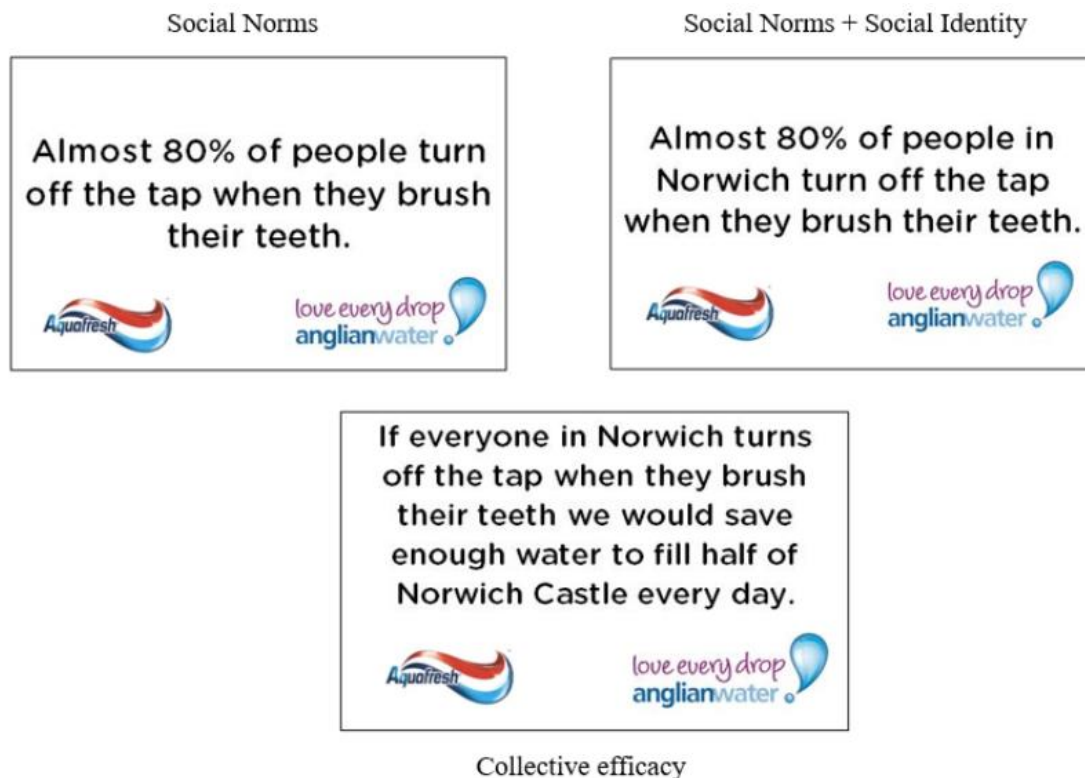
Social Norms

> Almost 80% of people turn off the tap when they brush their teeth.
>
> Aquafresh   love every drop anglianwater

Social Norms + Social Identity

> Almost 80% of people in Norwich turn off the tap when they brush their teeth.
>
> Aquafresh   love every drop anglianwater

> If everyone in Norwich turns off the tap when they brush their teeth we would save enough water to fill half of Norwich Castle every day.
>
> Aquafresh   love every drop anglianwater

Collective efficacy

Fig 6. Messages trialled

Evaluation practices

The goal of a behaviour change intervention is to achieve a measurable and sustainable change in the target behaviour. Although there are general principles for designing effective interventions, each intervention targets a given behaviour in a given context using a given approach. Rigorously assessing the outcomes of an intervention supports a cost/benefit analysis of the project and can inform future work by identifying which features of the intervention did or did not work as anticipated. Interventions can be assessed in two ways:

- **Measured assessment,** which follows a systematic quantitative or qualitative analysis of collected data;
- **Anecdotal assessment,** which draws inferences through informal interactions and feedback from members of the target population and the project team.

Evaluation Practices

43%
None

38%
Measured
Assessment

19%
Anecdotal
Assessment
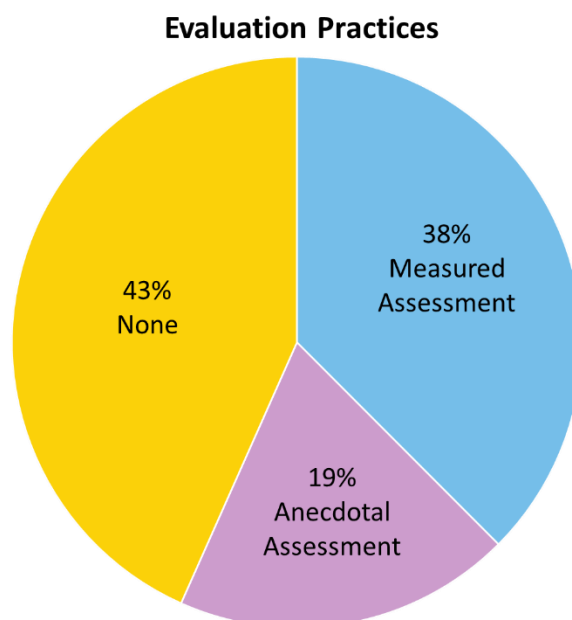
Figure 7. Summary of evaluation methods

Figure 7 summarises the assessment methods which were part of the interventions in our sample. Of these projects, 43% conducted no assessment of the outcomes of the intervention, and only 38% conducted any kind of systematic assessment. A driving factor in whether assessment was done at all, and the extent of assessment, was whether there was pre-existing data sources which could be used, such as water meter readings or incident reports. Projects rarely build in targeted data collection methods, so where existing data sources are not available, projects tended to rely on informal feedback about people's engagement with the intervention – or, in most cases, performed no assessment at all.

Looking ahead

The adoption of systematic assessment can support a virtuous cycle of developing a culture of using behaviour change interventions. Assessment builds an evidence base on what does (and does not) work, which can be used to target future interventions; the assessment of one intervention becomes part of the evidence base of subsequent ones. There are some recommended practices to build up this assessment capacity.

- Build the assessment of the intervention into its design. When you identify at the design stage measures that can be used to assess the impact of the intervention and determine how these can be collected over the course of the intervention, you will be in a position to carry out a comprehensive evaluation at the end.

- Develop data collection and analysis skills within designing teams. A team will get more out of feedback mechanisms like focus groups and surveys by following good practices in designing materials and conducting sessions. Evaluation strategies, such as randomized control trials, provide powerful techniques for identifying the effectiveness of an intervention. Teams with these skills will be able to extract more information about the effectiveness of their intervention.

- Measure the behaviour in terms of the action being performed. In the absence of targeted measurement, some projects use supplementary information such as engagement with a social media campaign, in part because it is easier to collect. However, engagement with social media, or other indirect measures such as stated intention to change behaviour, may have little or no correlation with whether people actually change their behaviour. These supplementary measures can be useful for understanding the channels through which an intervention operates but are not a substitute for evidence which either measures the behaviour directly, or indirectly though changes in outcomes that can be attributed to the adoption of the desired behaviour.

Example of Good Practice: **Bits and Bobs**

This intervention by the Metering team at Anglian Water aimed to reduce household water consumption by promoting the adoption of water efficient devices such as tap inserts and digital shower timers through their Bits and Bobs programme (Figure 8).

Data was collected both before and after the installation of the devices, allowing the team to identify and quantify the effect the devices had on household consumption. Information was also collected from the plumbers who installed the provided devices about the percentage of home visits conducted as well as the number of items that they fit at each of the households. This allowed to focus the evaluation on homes that actually had the devices installed and get a more accurate picture of the effect of installing the devices. It also provided a chance to understand the factors that influenced whether people agree to have the devices installed or not as well as the devices that people chose to get installed, both of which provide valuable information for future interventions.

Figure 8. Bits and Bobs programme

Conclusion

Our survey of behaviour change interventions in the water sector during AMP 6 shows the potential of how these interventions can complement more traditional engineering-based and technical-based approaches. The projects we have highlighted as examples of good practice, as well as many others, have demonstrated that well-designed interventions based on principles of behavioural science can deliver substantial and cost-effective improvements.

Our survey also identifies some gaps which, when filled, will unlock more of the potential of these interventions. Behaviour-based interventions are often seen as attractive because they are usually inexpensive – certainly when compared to the cost of major engineering projects. However, this can result in an ad-hoc `try something in case it works' approach. Based on the taxonomy we report above, a sizeable majority of interventions we surveyed are delivered via standard communications channels and would have benefited from some underpinning research or evidence base. Trial runs, and measurement of outcomes in terms of changes in behaviour could also have helped optimise the interventions, increasing the likelihood that investment made in the larger roll out would be successful. Research shows that these one-off `fire and forget' interventions are unlikely to result in significant success. Further, they miss an important opportunity to build a knowledgebase and community of practice in the sector, in which successful interventions can propagate more widely, while unsuccessful ones can be examined to understand behaviour better and improve the design of future ones.

Developing this strategic approach to designing and deploying behaviour change interventions will result in better outcomes within individual firms, as well as across the sector as a whole. Likewise, behaviour change is not a silver bullet; but rather, to mix metaphors, it is another string to the bow. The people in the target audience for any given intervention are also being encouraged to change their behaviours in many other aspects of their lives and would struggle to respond to each of those prompts. A strategic approach will help to identify and focus on the situations in which behaviour change initiatives are likely to deliver the best results.

Acknowledgments

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