The Use of Behavioural Insights in Promoting Residential Energy Efficiency: An overview of available literature

Dr Dina Dosmukhambetova

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Te Kaunihera o Tāmaki Makaurau

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Executive summary

In June 2019, Auckland Council declared a climate emergency, signalling the council's continued commitment to investing in a sustainable, resilient Auckland.

Auckland Council's Low Carbon Living (LCL) team leads the work on reducing household carbon emissions in Auckland. They have asked council's Research and Evaluation Unit (RIMU) to undertake a literature review of the way behavioural insights have been used to reduce residential energy use, to summarise lessons learnt and to provide recommendations for service delivery.

As part of this work, academic articles have been reviewed covering primary research, literature reviews, meta-analyses and summaries. Almost all of the reviewed articles describe empirical work conducted overseas, mostly in the United States and Europe.

This literature describes a number of behavioural insights (BI) that have been tested for effectiveness in improving residential energy behaviours. The main findings, ordered in terms of the strengths of the supporting evidence, are as follows:

Descriptive social norms refer to information about what most other people are doing and can be effective in producing behaviour change (e.g. Cialdini & Schultz, 2004; Goldstein, Cialdini & Griskevicius, 2008).

The effectiveness of descriptive social norms can be enhanced by ensuring the reference group to whom the normative information refers is as similar to the recipeint as possible (e.g. presenting university students with normative information about the behaviour of other university students rather than the behaviour of the general population), by providing **socially comparative feedback** about the performance of the target audience (e.g. how one's own water usage compares with neighbouring households), and by including **injunctive social norms** – information about what behaviour is desirable, for example by including emoticons to indicate approval or disapproval.

Practitioners are advised **not to use descriptive social norms when the undesired behaviour is widespread**, as this may backfire.

Trending norms are messages that emphasise that a minority norm (a relatively un-common behaviour) is becoming more prevalent. When undesired behaviour is the norm, using trending norm messages can be effective in producing positive behaviour change (Mortensen et al., 2019; Sparkman & Walton, 2017).

Getting individuals to make a **commitment** has also been shown to be an effective means of producing desired behaviours (e.g. Moriarty, 1975; Lockhorst et al., 2013). For example, Whitsett et al. (2103) found that participants who pledged to perform five specific household conservation actions later reported engaging in these activities.

In order to be effective, commitments need to be **effortful, voluntary and active** (Cialdini, 2016). In addition, Cialdini (2001) argues that commitments are more effective when they are **made in public**, because social pressure comes into play as well as the need for consistency.

The effectiveness of commitments can be also enhanced by **setting a goal** (Abrahamse et al., 2007). It is important to make sure the goal is neither too low to be meaningful (e.g. 2%) nor too high to be realistic (e.g. 30%).

Reminders and prompts can be used as stand-alone interventions or in combination with commitments. For example, Shearer et al. (2017) showed that placing a reminder sticker on the list of the refuse bins saying 'no food waste please' significantly increased the use of the food recycling caddy.

Interestingly, commitments can be combined with **descriptive social norms** to enhance the effect of both (Jaeger & Schultz, 2017).

Real-time feedback can be an effective tool in promoting sustainable energy behaviour. In a large-scale intervention in the UK, Ouesltai and Agrawala (2017) found that smart meters coupled with the installation of real-time in-home displays were the most effective at reducing residential energy consumption.

Defaults are pre-set options that take effect if nothing is done to make a change. Setting defaults to desired options is effective because people often 'go with the flow' rather than make active choices. Pichert and Katsikipoulos (2007) showed that when an electricity provider changed their default option from 'grey' (generated from unsustainable sources) to 'green' nearly 100 per cent of consumers remained with the environmentally friendly default.

Messenger effect is the effect of a person delivering a message on how people react to the message (Dolan, Hallsworth, Halpern, King & Vlaey, 2010). This effect has a strong **interpersonal dimension**, which means that things like rapport and familiarity with the messenger (relationship history) can play an important part in messenger effectiveness.

Trigger points are salient moments when people's lives are undergoing change. It is argued that these points are sufficiently disruptive that they could be leveraged to produce successful changes to behavioural patterns (e.g. Bamberg, 2006).

People tend to give more weight to losses than the equivalent gains (Kahneman & Tversky, 1979). Thus, framing possible outcomes in terms of what people stand to lose through inaction (**loss framing**) rather than in terms of what they stand to gain from action is more effective in motivating conservation behaviour (e.g. Thaler, 2008).

Making things easier and simpler to use can have a large effect on the success of behaviour change interventions (e.g. BIT, 2014). For example, Ouesltai and Agrawala (2017) found that **simplifying** energy efficient labels on appliances enabled consumers to purchase more efficient models.

Finally, **vivid language** uses concrete imagery and real-life example in order to convey a message. The use of vivid language helps individuals pay attention to the message, to process it more deeply and to remember it for longer. For example, when Gonzales, Aronson and Costanzo (1988) trained home energy auditors to use vivid case histories and language (e.g. saying that all cracks in the home added together would create 'a hole the size of a football'), participants were more likely to act on the auditor's recommendations.

Based on the insights above, the following 13 recommendations are offered to the Low Carbon Living team.

Recommendations

1. Produce a training module for eco-design / home performance advisors which would include an overview of behavioural techniques and how these can be applied in face-to-face visits, such as using **vivid language**, building trust and framing messages in terms of **loss**. This training could be either face-to-face or online. Such training can also be

used for other frontline workers delivering face-to-face interventions (e.g. Low Carbon Lifestyle door knockers).

2. Use effective **messengers**: leverage links with community actors, i.e. social and health workers and budgeting services. Build their capacity and provide access to resources (e.g. HEAT Kits) to promote actions or refer programmes to their communities (e.g. Retrofit Your Home and EDA).

3. Introduce **social norms**, **trending norms**, **loss framing** into promotion of services and actions, e.g. EDA, HEATKITs, Retrofit your Home, Shower and Save, and seasonal energy campaigns.

4. Use existing council channels and community services to capitalise on **trigger points**, e.g. antenatal classes, estate or rental agencies, consenting services and power companies. This is applicable to all Live Lightly initiatives.

5. Update the Live Lightly website to include **social norms** in messaging, more demographically representative images on the landing page (**messenger effect**), and **vivid language** and imagery.

6. Develop energy retailer partnerships and encourage them to use **social norms**, **injunctive norms** and **social comparisons** to promote energy conservation through power bills.

7. Review documentation, scripts and processes with a view to **simplifying** processes and messaging where possible (e.g. door knocking scripts in Low Carbon Lifestyles; application forms of Retrofit Your Home).

8. Partner with energy retailers to trial In-Home Displays in conjunction with smart metering (to enable **real-time feedback**).

9. Use personalised **reminders** to follow up with customers (e.g. EDA clients, HEAT Kit users) to prompt action, using simple text messages or automated email reminders.

10. Use effective **messengers** to improve Shower and Save (i.e. home improvement retailers and industry association / plumber endorsement), coupled with instore **reminders.**

11. Develop and trial the effectiveness of a non face-to-face communication intervention, such as leaving a doorhanger or similar, incorporating **social norm messaging** and **commitment making** techniques.

12. Review the **commitment** making mechanisms used in Low Carbon Lifestyles, Shower and Save and EDA to check that they adhere to reflect best practice (e.g. consider making them more active and/or public or combining with prompts).

13. Consider how **defaults** can be modified to support behaviour change (e.g. set-and-forget household items, working with builders and suppliers to change default products, building in ‘prompted choice’ procedures at key moments).

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1.0 Introduction

In June 2019, Auckland Council declared a climate emergency, recognising the urgency that is needed in combatting climate change and signalling the council's continued commitment to investing in a sustainable, resilient Auckland[1]. The overarching aim of the council's Climate Action Plan is to keep temperature rise within 1.5 degrees, while the interim target is to halve Auckland's emissions by 2030 (Auckland Council, 2019).

As residential energy consumption is a significant contributor to the annual CO_2 emissions in Auckland (residential energy emissions account for 5.2% of greenhouse gas emissions in the city, Xie, 2019), in 2016 Auckland Council set up a Low Carbon Living team and tasked it with reducing household carbon emissions in Auckland. The team manages Live Lightly – an umbrella programme that seeks to reduce emissions through several different initiatives, including a regional project called Home Performance Advice (HPA). HPA seeks to reduce household carbon emissions specifically from home energy use, as well as to achieve other outcomes for households such as health, social and financial co-benefits.

Home Performance Advice programmes include:

- Eco-Design Advisor (EDA): This service provides free impartial personalised advice to home owners, landlords and tenants. EDA is delivered through in-home visits, online, via emails and phone calls (see Hoffman, 2019, for the latest evaluation of the programme).

- Home Energy Assessment Toolkit (HEAT): This self-help toolkit is free to borrow from all Auckland Libraries. The toolkit contains advice as well as tools such as a hygrometer (temperature and humidity meter), an infrared thermometer and a power meter (see Rotmann, 2018).

- Low Carbon Lifestyles: This project delivers door-step surveys and tailored advice in defined geographic areas. In the future it will also include installations and free resources to homes experiencing energy poverty, e.g. swapping light bulbs and showerheads, hot water cylinder wraps, and installation of curtains (see Smith, 2019).

- Shower and Save Pilot: This was a behaviour change pilot project designed to encouraged homeowners to switch to efficient shower heads (see Zangger, 2019).

- Retrofit Your Home: This programme provides financial assistance to households (by offering low interest rates borrowing, repaid through targeted rates) that enables access to efficient home heating and insulation (see Rohani, McFarlane, Birchfield, & Adler, 2014). In the future, a compulsory home assessment will be added to the programme.

The Low Carbon Living team continuously evaluates the programmes it runs with the aim of understanding outcomes and improving future delivery (see programme-specific references above).

With a view to further enhancing service design, the team approached council's Research and Evaluation Unit (RIMU) with a request to undertake a literature review to explore the extent to which behavioural insights (BI) have been successfully used in promoting residential energy conservation in New Zealand and overseas, and to identify any lessons learned, with focus on BI application. Where possible, the team also wished to know whether

[1] https://ourauckland.aucklandcouncil.govt.nz/articles/news/2019/06/auckland-council-declares-climate-emergency/

there is empirical evidence to suggest which mode of delivery (e.g. face-to-face advice, self-help resources, community events) is most effective in producing behaviour change.

RIMU is well-positioned to undertake this review, as it follows previous work delivered by RIMU exploring the application of BI to council operations (see Allpress & Rangsivek, 2020; Williams, Allpress, & Rootham, 2018; Allpress, 2019; Allpress, 2018; Rangsivek, Allpress, Osborne & Huang, 2019).

1.1 Residential energy consumption and behavioural insights

It has been observed in the research literature that residential energy consumption is often not as efficient as it could be. More specifically, people tend to under-invest in the energy efficiency of their homes (e.g. installing proper insulation and replacing energy inefficient appliances, Persson, Göransson, & Gudbjerg, 2009) and to habitually over-consume household energy.

This poses a problem, not just for climate change but also for the wellbeing of residents, because over-consumption can be a powerful driver of energy poverty (DellaValle, 2019). 'Energy poverty' means that households spend more than 10 per cent of their income on domestic energy (White, 2019) and many, therefore, lack adequate warmth, cooling, lighting and energy required to power normal appliances, especially in the winter months. It is estimated that more than 100,000 New Zealand households experienced energy poverty in 2015/2016 (Stats NZ, 2017, in White, 2019).

Recognising the problem with residential energy consumption, authorities have sought to manage it using traditional marketing and education techniques, such as the provision of information (Geller, 1981; Staats et al., 1996) and economic levers, including incentives (Winnett, Kagel, Battalio, & Winkler, 1978; McClelland & Cook, 1980) and dynamic pricing (Price, 2015). However, these techniques often produce mixed effects on energy consumption (e.g. Abrahamse, Steg, Vlek & Rothengatter, 2005; OECD, 2017; Price, 2015).

At the same time, there has been a growing awareness among policy makers that combining BI with these more traditional measures can be very effective and government organisations in different countries have started to show interest in such approaches. For example, the United Kingdom's Behavioural Insights Team has been operating since 2010; and in New Zealand, the Department of the Prime Minister and Cabinet has a section on its website promoting the use of BI in policy design.[2]

Following several decades of relevant research (Abrahamse & Steg, 2013, Cialdini & Schultz, 2004; Goldstein et al., 2008; Gonzales, Aronson & Costanzo, 1988; Schults et al., 2007), the value of BI in promoting specifically residential energy efficiency is now well-recognised in the peer-reviewed literature. For example, in an article published in Nature Energy, Stern et al. (2016) argued that BI principles such as social norms and commitment strategies, can be effective in helping reduce energy consumption by households. More recently, Andor and Fels (2018) performed a systematic review of non-price interventions and their effects on energy conservation. They concluded that techniques such as social norms, social comparisons, commitment and goal setting can be very effective in this domain.

[2] https://dpmc.govt.nz/our-programmes/policy-project/policy-methods-toolbox/behavioural-insights

1.2 This report

As part of this work, academic articles have been reviewed covering primary research, literature reviews, meta-analyses and summaries. Where possible, research concentrating specifically on the use of BI in residential energy efficiency was used; however, as this is a relatively niche area of research, many examples were taken from related areas, e.g. water conservation, as these are also applicable to the Low Carbon Living team's Live Lightly programmes.

Almost all of the reviewed articles describe empirical work conducted overseas, mostly in the United States and Europe. It must be noted that this literature does not explore any cultural variations in the application or effectiveness of BI.

Taken together, this literature describes a number of BI principles that have been tested for effectiveness in improving residential energy behaviour – either separately or in combination with other BI. These are:

- Descriptive social norms
- Trending norms
- Commitments and goal setting
- Reminders and prompts
- Real-time feedback
- Defaults
- Messenger effect
- Triggers
- Loss framing
- Simplification
- Vivid language.

The order in which the BI are presented above roughly corresponds to the amount of relevant research available. BI such as descriptive social norms, trending norms and commitments are relatively well researched, while others such as messenger effect, simplification and loss framing – although well-used in other domains – do not seem to have been studied in depth in relation to residential energy conservation.

As mentioned earlier, the purpose of this report is to provide an overview of the available empirical literature concentrating specifically on detailing the examples of the way behavioural insights (BI) have been used to effectively reduce residential energy use. For this reason, detailed commentary on the methodological robustness of the reviewed studies is outside the scope of this report.

A note on other available literature

The nature of BI is such that they can be fruitfully applied across different domains. Readers interested in learning about a wider array of BI, whether or not they have been specifically tested in the domain of residential energy conservation, can consult works such as Dolan et al. (2010) or Allpress and Dosmukhambetova (2020).

Further, readers interested in other evidence-based perspectives on reducing household energy efficiency that are not specifically focused on BI are referred to Energy Cultures projects – a multidisciplinary work programme led by Otago University between 2009 and

2016. Energy Cultures[3] concentrated on understanding household energy behaviour in New Zealand and developing tools to support a sustainable energy transition.

Finally, for more international evidence and practice in the field of residential energy conservation, readers are referred to the Demand Side Management Technology Collaboration Programme of the International Energy Agency (IEA)[4].

Structure of the report

The chapters that follow present the findings of the review. In Chapter 2, the BI that have been researched in relation to residential energy efficiency are described and explained. They are presented roughly in the order that corresponds to the amount of relevant research available. In Chapter 3, the (limited) available literature comparing modes of intervention delivery is presented and discussed. In Chapter 4, key lessons are summarised and reiterated. Finally, in Chapter 5, a summary of the findings is presented along with the recommendations for Auckland Council's Low Carbon Living team.

[3] https://energycultures.org
[4] http://www.ieadsm.org

2.0 Behavioural Insights

This chapter describes the BI that have been studied in the reviewed literature, either by themselves or in combination.

The first five sections cover BI that have been relatively well researched and found to be effective in reducing residential energy use. These are descriptive social norms (together with reference groups, social comparisons and injunctive norms), trending norms, commitments (including goals setting and reminders/prompts), real-time feedback and defaults. The following five sections cover BI that are known to be effective in other areas but have received less attention from researchers of energy conservation. These are messenger effect, trigger points, loss framing, simplification and vivid language. Each section summarises the available evidence and then distils key insights in relation to the BI in question.

2.1 Descriptive social norms

Social norms refer to 'rules of behaviour that govern interactions with others' (p.3, Young, 2015), and descriptive social norms refer to descriptive information about what other people do (e.g. X% of people do Y). A number of meta-analyses and literature reviews in recent years have shown that using descriptive social norms is an effective method of producing behaviour change in energy and water conservation (e.g. DellaValle, 2019; Lede & Meleady, 2019; Nielsen et al., 2017; Price, 2015).

For example, in a study of 1207 households in the United States, Cialdini and Schultz (2004) looked at the effects of messages printed on door hangers on conservation behaviours, such as taking shorter showers, turning off unnecessary lights, turning off the air-conditioning at night and using fans instead of air conditioning. Some messages included descriptive social norms (see Table 1), while others appealed to self-interest (e.g. saving money), to protecting the environment, to social responsibility ("Do your part!") or provided information only. The use of descriptive social norms was the only campaign that produced changes in self-reported behaviours as well as actual energy conservation measured by electricity meters.

Table 1: Descriptive social norm message

Join Your Neighbours in Conserving Energy! Summer is here and most people in your community are finding ways to conserve energy at home. How are San Marcos residents like you conserving this summer? By using fans instead of A/C! Why? In a recent survey of households in your community, researchers at Cal State San Marcos found that ____% of San Marcos residents often use fans instead of air conditioning to keep cool in the summer. Using fans instead of air conditioning – Your Community's Popular Choice!

Cialdini & Schultz (2004)

Similarly, in 2008 Goldstein, Cialdini and Griskevicius showed that using social norm appeals was more effective in promoting environmentally friendly behaviour among hotel guests than using appeals focused on environmental protection. In an experiment involving 1058 hotel guests in 190 rooms over 80 days, researchers used different messages to encourage towel reuse. One message used descriptive social norms to promote the desired behaviour; while the other message focused on saving the environment, which was the

industry standard at the time (see Table 2). Both messages included further instructions on how to perform the behaviour. Results showed that descriptive social norms led to a significantly higher rate of towel reuse (44.1% vs 35.1%).

Table 2: Descriptive social norm and environmental messages

Descriptive social norm message	Environmental message
JOIN YOUR FELLOW GUESTS IN HELPING TO SAVE THE ENVIRONMENT. Almost 75% of guests who are asked to participate in our new resource savings program do help by using their towels more than once. You can join your fellow guests in this program to help save the environment by reusing your towels during your stay.	HELP SAVE THE ENVIRONMENT. You can show your respect for nature and help save the environment by reusing your towels during your stay.

Goldstein et al. (2008)

Key Insight: People are influenced by the knowledge of what most other people do; they like to follow suit.

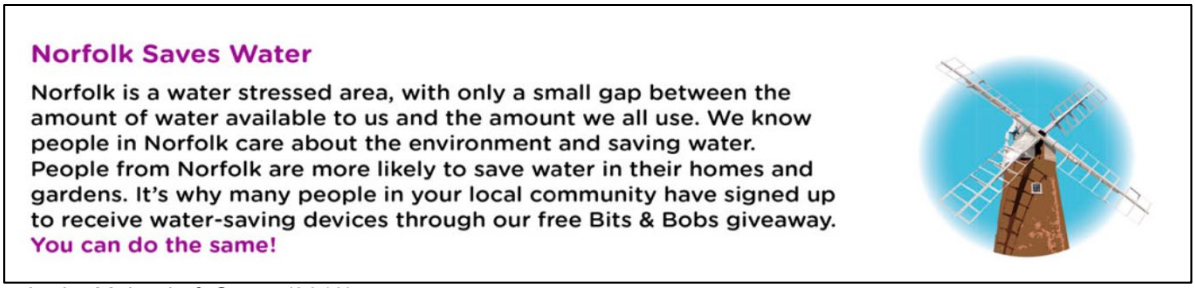
2.1.1 Reference groups

Descriptive social norms refer to information about what other people do. They work because they tap into a person's social identity (Tajfel & Turner, 1979) – their sense of who they are based on the groups they belong to (see more in Section 2.6). It is not surprising, therefore, that for descriptive social norms to work they need to be about *relevant ingroups*, i.e. individuals and groups who belong to the same social groups as the target audience.

Studies show that social norm messages work better when they are tied to ingroup members rather than more general groups. For example, in a follow-up experiment to the towel study described above, Goldstein et al. (2008) changed the reference groups of the descriptive norm (guests; guests who stayed in this room; citizens; men and women). The results showed that all descriptive social norms were more effective than standard environmental messages; but the 'same room' reference group yielded the highest rates of towel reuse.

Lede, Meleady and Seger (2019) conducted a study across 2300 UK households and found that linking local identity to water conservation increased sign-up for a free water-saving retrofit programme (see Figure 1).

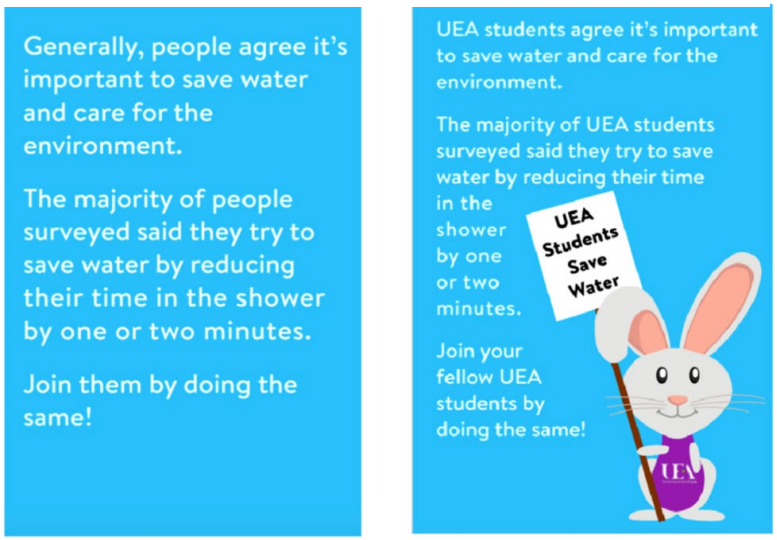
Figure 1: Message linking local identity to water conservation



Lede, Meleady & Seger (2019)

In a related experiment, showers in university dormitories were equipped with water-proof stickers (see Figure 2), containing either a social norm message or an ingroup norm message. Subsequently, self-reported water usage by students was lower in the ingroup norm condition than in the social norm condition and the no-norm condition. The social norm condition in this experiment did not differ from the no-norm condition.

Figure 2: Social norm and ingroup norm messages



Lede, Meleady & Seger (2019)

Key Insight: Choose the reference group for the social norm carefully – it is important that the reference group is relevant to the situation and/or is perceived as an ingroup (i.e. tied with target audience's social identity).

2.1.2 Social comparison (static personalised feedback)

Social norms can be used as stand-alone interventions. However, studies have found that combining social norms with socially comparative feedback can be helpful in increasing the effectiveness of social norm messaging (e.g. OECD, 2017; Lede & Meleady, 2019). We refer to this type of feedback as *static* in order to differentiate it from *real-time* feedback discussed in Section 2.4.

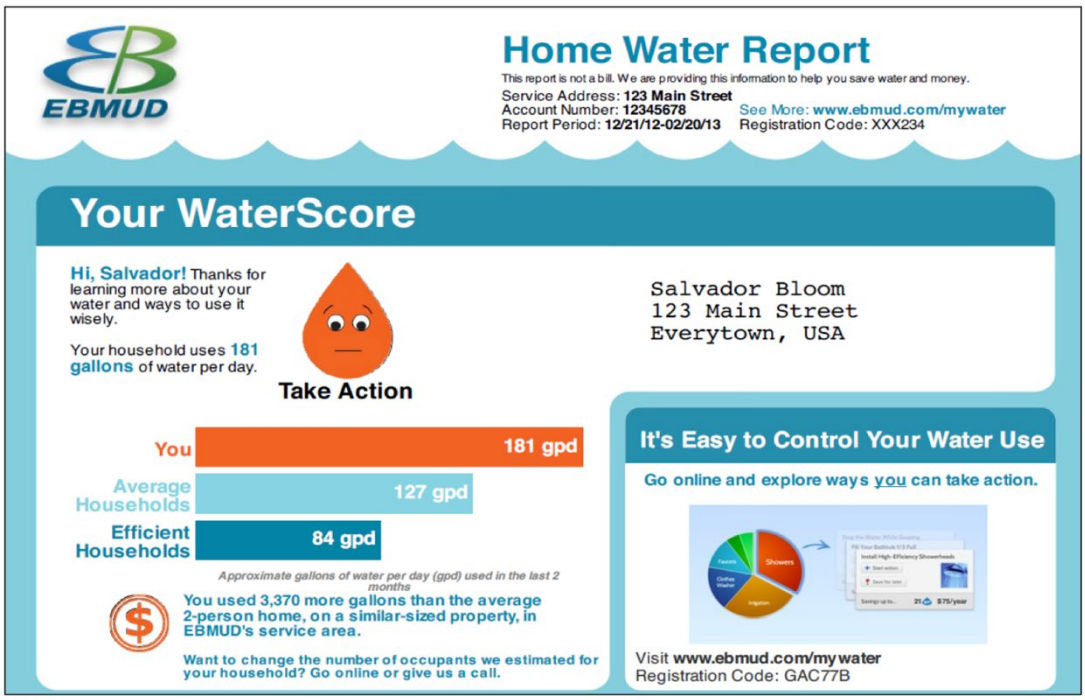
Provision of personalised feedback about individual water consumption in comparison to others was tested in a 12-month randomised control trial (Mitchell & Chesnutt, 2013; N* = 3386). As part of the intervention, households were sent home water reports once every two months either via direct mail or email (Figure 3). The reports included a descriptive social norm to motivate conservation behaviours (average use of similar households and average use of most efficient similar households) and provided personalised water usage information.

The results showed that the intervention led to water reductions of between 4.6 and 6.6 per cent. In addition, the households in the intervention condition were subsequently 2.3 times more likely to take part in energy efficiency audit and rebate programmes.

* Here and in the rest of this report, N refers to the sample size used in the relevant studies.

The effects of such social comparative feedback can endure too: for example, a one-off mail-out campaign using similar materials as above led to a 2.2 per cent reduction in water demand over six months (Hinton, 2017, in Lede & Meleady, 2019).

Figure 3: Message containing (static) personalised feedback



Mitchell & Chesnutt, 2013

In the studies described above, feedback was given in terms of measurements relevant to the resources used: in the case of water conservation, the *gpd*, or gallons per day. LaRiviere, Holladay, Novgorodksy and Price (2014) examined which units of measurement are most effective for social comparisons about household energy (monthly energy use, monthly energy expenditures, or annual CO_2 emissions). They found that comparisons in terms of expenditure and kWh were effective, while comparisons that are framed in terms of public good (CO_2 emissions) were not, indicating that comparisons should be made using an understandable and tangible units of measurement.

Key Insight: Feedback on the level of individual consumption and the way it compares to the consumption of others can be helpful in producing behaviour change. The comparisons should be made in terms of actual resources used (e.g. kWh) or in terms of monetary expenditure, but not in terms of a public good, like CO_2 emissions.

2.1.3 Injunctive social norms

Descriptive social norms have been shown to be effective in producing desired behaviour change in many contexts; however, early social norm marketing campaigns have produced mixed results (e.g. Granfield, 2005; Neighbors, Larimer & Lewis, 2004).

One reason for this is that the social-norm campaigns are usually targeted at the section of the population who do not perform the desired behaviour (i.e. who compare unfavourably to the stated norm). But what of the people who compare favourably to the stated norm?

Research shows that these people also adjust their behaviour to match the norm and engage in the desired behaviour *less* than they otherwise would have.

This phenomenon is known as a 'boomerang effect' and studies show that it is possible to counteract it by using injunctive social norms. Unlike descriptive social norms that refer to information about what other people do, injunctive social norms refer to information about whether others approve or disapprove of the behaviour in question.

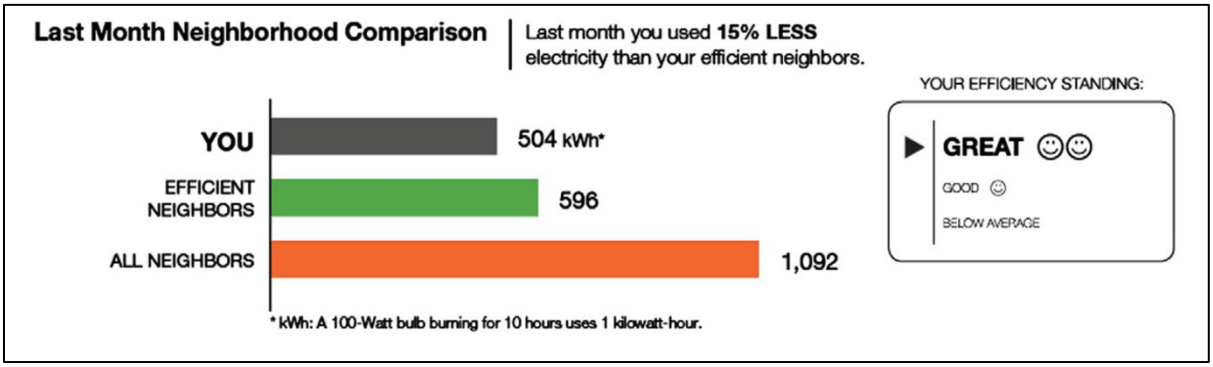
In a study of 290 households in the US, Schultz, Nolan, Cialdini, Goldstein and Griskevicius (2007) studied the ability of injunctive social norms to reduce boomerang effects. They used doorhangers containing handwritten information about how much energy was used, descriptive normative information about average energy consumption, and pre-printed suggestions for how to conserve energy. Injunctive social norms were signalled by including a smiley face (☺) for low energy use and a frownie face (☹) for high energy use (message designs were not available in the report).

The results showed that the households who used energy more efficiently than others *did not show* boomerang effect in their energy usage when they received an injunctive social norm message along with a descriptive social norm message. This was true both for short-term and for long-term outcomes (one week vs three weeks). Injunctive social norms prevented efficient users from being less efficient but did not make them much more efficient than before the intervention.

Several years later, Allcott (2011) ran a randomised control trial of 600,000 households across the US. In partnership with a large energy company, the researcher sent households letters (Home Energy Reports) that contained three parts (Figure 4):

- Descriptive social norms (information about how their usage compared to their neighbours).
- Injunctive social norms: 'Great ☺☺' for top 20th percentile of users, 'Good ☺' for above average users, and 'Below Average' for the rest. They did not include a frownie face for the 'below average' rating because of complaints from pilot recipients.
- Tips about how to conserve energy. These were personalised to energy consumption level and demographic characteristics.

Figure 4: Home Energy Reports



Allcott (2011)

Households received letters either quarterly, bi-monthly or monthly, or did not receive a letter at all. The overall effect of letters was that actual energy consumption was reduced by about two per cent on average (0.62 kWh per day). The true effect was probably larger than this because it is likely that many letters were unopened.

The effects of the campaign were larger for those households whose usage was high to begin with, as those in the highest decile reduced their usage by 6.3 per cent. The negative effect on low-usage households (boomerang effect) was not observed, probably due to the inclusion of the injunctive social norms (smiley faces).

The effects of this campaign started showing after several months and stayed stable while the reports were being delivered. Monthly reports produced larger effects, but quarterly reports may have been more cost effective.

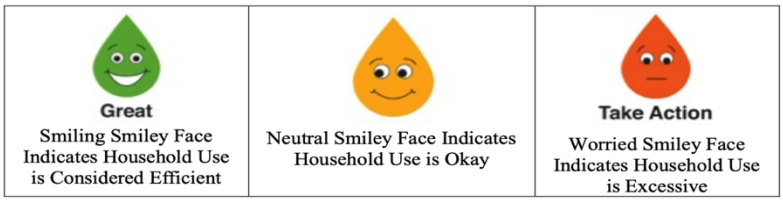
A similar design to Allcott (2011) has since been used in other successful interventions. In fact, in the Watersmart Home Water Report study described in the previous section (Figure 3, Mitchell & Chesnutt, 2013), the researchers based their design on that of Allcott (2011) and made use of injunctive norms alongside personalised feedback and descriptive social norms.

Lede and Meleady (2019) report that for low-usage households, Watersmart also used materials as shown in Figure 5. The injunctive norms were signalled with the help of the images in Figure 6.

Figure 5: Injunctive social norm message

from Lede & Meleady (2019): Watersmart graphics

Figure 6: Injunctive social norm images



Mitchell & Chesnutt, 2013

Key Insight: Injunctive social norms can help reduce the boomerang effect, whereby persons that perform better than average downgrade their behaviour to match the social norm.

2.1.4 A common mistake in application

The degree to which social norms shape behaviour is often underestimated. For example, in a study of 3805 households in the United States, Cialdini and Schultz (2004) showed that although residents believed that descriptive social norms would be the least influential aspect in their decision making, subsequent analysis showed that neighbours' behaviour (i.e. descriptive social norms) were one of the significant predictors of conservation behaviours, along with factors like age, wanting to protect the environment and wanting to save money.

Because the power of social norms to produce conformity is underestimated, social norms messaging is often used to detrimental effect when would-be influencers highlight the extent to which undesirable behaviour is common in the hopes of getting people to change their behaviour.

In 2006, Cialdini et al. studied the influence of social norms that highlighted positive and negative behaviours on the visitors to Arizona's Petrified Forest National Park. They observed 2655 visitors over five consecutive weekends. Four messages were presented, which varied (i) whether the social norm was descriptive or injunctive, and (ii) whether the behaviours emphasised were positive or negative (see Table 3).

Table 3: Positive and negative descriptive and injunctive norms

Negative Descriptive Social Norm	Positive Descriptive Social Norm
Many past visitors have removed the petrified wood from the park, changing the state of the Petrified Forest.	The vast majority of past visitors have left the petrified wood in the park, preserving the natural state of the Petrified Forest.
Negative Injunctive Social Norm	**Positive Injunctive Social Norm**
Please don't remove the petrified wood from the park.	Please leave petrified wood in the park.

Cialdini et al., 2006

Visitors stole the highest number of wood pieces when the emphasis was on the descriptive frequency of the negative behaviour (7.9%). Thus, compared to when no sign was present, the presence of a negative social norm message actually *increased* theft from the park

Key Insight: If the desired behaviour is not normative, DO NOT draw explicit attention to this fact in order to promote the desired behaviour. This will most probably backfire: it will promote the normative undesired behaviour.

2.2 Trending norms

If highlighting that undesirable behaviour is widespread can backfire, what can be done to promote desirable behaviour that is still not very common?

One strategy can be to provide normative information for a sample of the population who already engage in the desired behaviour (e.g. low-water usage households), but this strategy may be risky, as the low-usage group might be perceived by the target audience to be 'do-gooders' and different from the self (Lede & Meleady, 2019).

Research shows that using trending norms can be an effective way to produce behaviour change in these cases. Trending norms (sometimes called dynamic norms) are normative messages that emphasise that a minority norm is becoming more prevalent.

In one interesting study, Mortensen et al. (2019) explored the effects of messages containing minority social norms, trending norms and no norms on water conservation. In the experiment, researchers installed a water tank under sinks in the student dormitory, placed various messages at eye level (minority norm, trending norm or no norm, see Table 4), and measured the amount of water used during toothbrushing.

Table 4: Minority norm and trending norm messages

Minority norm	Trending norm
Research from [previous year] has found that 48% of [University name] students engage in one or more of the following water conservation behaviours. ...	Research from [previous year] has found that 48% of [University name] students engage in one or more of the following water conservation behaviours. This has increased from 37% in [2 years previous]. ...

Mortensen et al., 2019

As predicted, the results showed that students in the minority norm group *increased* their water usage compared to students in the no norm group. Importantly, students in the trending norm group significantly *decreased* their water usage. This effect occurred despite the fact that the promoted behaviour was similar to, but not the same as, the actual outcome measure.

Likewise, Sparkman and Walton (2017) conducted a series of five experiments (online and in real life) on the effects of trending norms on sustainable behaviour. They showed that trending norms increased desired behaviour (being interested in eating less meat) compared to minority norms; while the behaviour of no-norm condition fell in between the trending and minority norms (see Table 5).

Table 5: Minority norm and trending norm messages

Minority norm	Trending norm
Some people are starting to limit how much meat they eat. This is true both nationally and here at Stanford. Specifically, recent research has shown that, in the last 5 years, 30% of Americans have now started to make an effort to limit their meat consumption.	Some people are starting to limit how much meat they eat. This is true both nationally and here at Stanford. Specifically, recent research has shown that, in the last 5 years, 30% of Americans have now started to make an effort to limit their meat consumption. That means that, in recent years, 3 in 10 people have changed their behaviour and begun to eat less meat than they otherwise would.

Sparkman & Walton (2017)

In another experiment reported by Sparkman and Walton (2017), café goers were intercepted while they were queueing for lunch (N = 322). They were presented with trending norms, minority norms or control messages about meat consumption. Results showed that participants in the trending norm condition were much more likely to order a meatless lunch (34%) than participants in the other two conditions (17% and 21%).

The authors also showed a similar positive effect of trending norms on sustainable behaviours in their study of water conservation in a residential laundry facility (see Table 6).

Table 6: Minority norm and trending norm messages

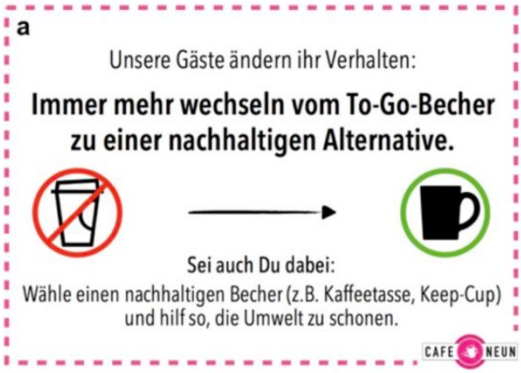
Minority norm	Trending norm
Most Stanford Residents Use Full Loads! Help Stanford Conserve Water!	Stanford Residents Are Changing: Now Most Use Full Loads! Help Stanford Conserve Water!

Sparkman & Walton (2017)

In a large-scale intervention field study, Loschelder, Siepelmeyer, Fischer and Rubel (2019) looked at the effects of trending norms on usage of disposable to-go-cups.

The study was conducted in a university café where coffee drinkers could choose either a disposable to-go-cup or a sustainable cup (a coffee mug and a keep cup, Table 7). After a 10-week baseline period, researchers placed an A4 sign at eye-level on the mug shelf containing a trending norm. The results showed that the trending norm intervention was effective in reducing the use of disposable cups by 17.3 per cent.

Table 7: Trending norm message

Trending norm	
	Our guests are changing their behaviour: More and more are switching from the to-go-cup to a sustainable alternative. Take part in this: Choose a sustainable cup (e.g. coffee-mug or keep-cup) and help to protect the environment.

Loschelder et al. (2019)

Key Insight: If the desired behaviour is not normative but is growing in popularity, draw attention to this increase in order to positively influence behaviour.

2.3 Commitments

Research since the 1970s has shown that eliciting a commitment to perform a behaviour is an effective means of increasing the likelihood of desired behaviour. For example, Moriarty (1975) showed that beach-goers who were asked to watch a stranger's belongings intervened to stop a thief in 95 per cent of cases, as opposed to only 20 per cent of cases when they had made no such commitment.

In 2013, Lockhorst, Staats, Van Dijk and Gale conducted a meta-analysis of commitment-making strategies in environmental research and concluded that this technique can be an effective tool in producing behaviour change in environmental behaviours, such as showering time (Dickerson, Thibodeau, Aronson, & Miller, 1992), recycling (DeLeon and Fuqua, 1995), and following recommendations of a home auditor (Gonzales, Aronson, & Constanzo, 1998). In these interventions, participants are usually asked to commit to (or pledge) doing a certain desired behaviour, e.g. conserve energy at home or recycle more. These can be made verbally, in writing or even online.

Some commitment procedures involve penalties associated with non-performance, e.g. dedicated savings account with penalty fees for withdrawal. Though these have also been shown to be effective (e.g. see DellaVille, 2019), they are not the focus of this section.

In one study, Whitsett et al. (2013) tracked the effectiveness of four variations of community-based pledge programmes (using pledge cards). Participants pledged to undertake any number of the five specific actions (see Figure 7). They completed the pledge forms in different ways: (i) competition: residents could sign up and prepare a video to win an 'energy makeover' for their household (N = 34,), (ii) through schools: students were asked to take pledges home and be their households 'energy managers' (N = 849), (iii) through a dedicated website: the website provided a platform for individuals to pledge online and interact with others (N = 24), (iv) other: residents could fill out pledge forms at various community events (N = 591). Participants reported engaging in a number of energy-saving behaviours post-pledge, even 18 months later.

Figure 7: Conservation actions card

Whitsett et al. (2013)

Cialdini (2016) argued that, in general, commitments are effective when they are effortful, voluntary and active. For example, Martin, Bassi and Dunbar-Rees (2012) studied patient

non-attendance at scheduled doctors' appointments in the UK. The usual procedure for getting patients to remember to attend was for the receptionist to write down the details of their next appointment on a card. When researchers changed this commitment procedure to a more active one where patients were asked to write down the details themselves, non-attendance dropped by 18 per cent.

Another good example of making participants more committed to following through by getting them to be actively involved in the process comes from Gonzales et al. (1988). In this study the researchers trained auditors to get homeowners (N = 250) actively involved in the process of an audit before getting a verbal commitment from them to follow through with the recommendations of the audit. Auditors got homeowners to climb up ladders to read meters during the audit process, which made the act effortful and active. At the end of the study participants reported that they were more likely to act on auditor's recommendations and they were also more likely to apply for utility programmes to finance retrofits.

Cialdini (2001) argued that commitments can be especially effective when they are made in public, because social pressure comes into play as well as the need for consistency. In line with this, Kast, Meier and Pomeranz (2012) showed that monetary savings by low-income micro-entrepreneurs in Chile was increased by as much as 65 per cent when they announced their savings goals as well as their weekly savings deposits to their self-help peer group.

DeLeon and Fuqua (1995) investigated the effect of commitment on curbside recycling (N = 76). The commitment procedure involved sending residents a letter asking them to make a formal commitment to recycle as much paper as they could and to give permission to print their name in the local newsletter, describing them and others who sign as people who are 'concerned about the future of our environment'. This was coupled with feedback on group performance, which was also made public. The authors found that the combination of public commitment and feedback had a significant effect on how well the residents' group was doing at recycling paper.

Other studies have also found that commitments need to be coupled with a heightened awareness of one's own performance in order to be successful. For example, Dickerson, Thibodeau, Aronson, and Miller (1992) showed that eliciting commitment from swimming pool users to conserve water (by making them print their name on a poster promoting shorter showers, see Table 8) led to significantly shorter showers, but only when it was combined with awareness of how much water they usually wasted.

Table 8: Poster message

Please conserve water. Take shorter showers. Turn showers off while soaping up. IF I CAN DO IT, SO CAN YOU!

Dickerson et al. (1992)

Key Insight: Where possible, elicit commitments and make the commitment procedure effortful, voluntary, active and public. Remember to provide feedback on performance.

2.3.1 Goal setting

The effectiveness of commitments can also be enhanced by building in a concrete reference point for successful behaviour – setting a goal. With goal setting, instead of simply committing to conserve energy or similar, individuals are asked to set a goal to, for example, reduce their consumption by "10 per cent by the end of the year". As studies below

demonstrate, goals can be successfully set either by individuals themselves or by external entities (McCalley & Midden, 2002).

Abrahamse, Steg, Vlek, and Rothengatter (2007, N = 189) showed that providing households with tailored information, an individual goal set at five per cent reduction in energy consumption and tailored individual feedback about consumption can reduce consumption of gas, electricity and fuel by about five per cent over a period of at least five months.

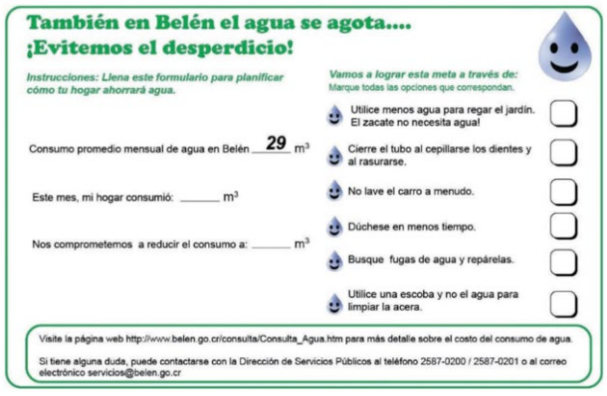
Becker (1978) showed that households who were given a relatively ambitious goal (20%) showed more savings (15-16%) than those who were given an easy goal (2%); in this experiment goal-setting was combined with regular feedback so that participants could monitor their consumption.

Though setting high goals may seem attractive, it may be wise to be cautious with setting goals that are too ambitious. Harding and Hsiaw (2014, N = 2487) showed that when individuals set non-binding self-set goals from a menu of conservation activities (no cost, low cost or home investment, roughly corresponding to 5%, 10% or 15% reduction), best savings are seen for those who choose realistic goals of about 10 per cent. This group achieved savings of about 11 per cent more than those who chose low or unrealistically high goals.

Loock, Staake, and Thiesse (2013) found a similar pattern. They investigated the effects of a web-based intervention used by a utility company to promote energy-efficient behaviour in private households (N = 1791). Participants were asked to choose a goal for reduction in energy consumption; the default goal was pre-set for consumers as either low (0%), medium (15%) or high (30%). The results showed that the intervention had a significant effect on energy consumption when the default was set to a medium level, rather than too low or too high.

Datta et al. (2015) reported that goal setting is particularly successful when participants can form a plan too, i.e. commitment is being made not just to achieve a goal, but also to do so through specific means. This strategy of specifying means (a plan) as well as ends (a commitment to a goal) is especially effective for low-consumption households (see Table 9).

Table 9: Goals and plans messages



Water is scarce even in Belén. . . . Avoid waste!
Instructions: Fill out this form to plan how you will save water.
Average monthly water consumption in Belén 29 m^3.
This month, my house consumed: ___ m^3.
We are committed to reducing consumption to: ___ m^3.

We will achieve this goal through (check all options that apply):
Use less water for the lawn; the lawn does not need water!
Turn off the tap while brushing teeth and shaving.
Wash car less frequently.
Take shorter showers.
Look for water leaks and repair them.
Use a broom and not water to clean the sidewalk."

Datta et al. (2015)

Key Insight: Goal setting can be an effective way to augment the effect of commitments. Goals can be successfully set by external entities (i.e. they don't have to be self-set), but practitioners need to be careful to set goals that are neither too low nor too high. It may be useful to provide a small list of specific actions that will help households achieve the set goal.

2.3.2 Reminders and prompts

Another mechanism that encourages individuals to follow through on their commitments is reminders and prompts (Backhaus & Heiskanen, 2009; DellaVille, 2019). Though discussed in the context of commitments here, it is important to remember that reminders and prompts can be used as stand-alone interventions too. Indeed, they have been used effectively to increase desired behaviour in many fields, ranging from voting behaviour (Catt & Northcote, 2009) to saving money with dedicated bank accounts (Karlan, McConnell, Mullainathan, & Zinman, 2016).

The importance of remembering commitments in residential energy conservation was shown by Whitsett et al. (2013, see page 11), who found that whether or not participants engaged in conservation behaviours they had pledged to perform depended heavily on whether they remembered that they had made the pledge in the first place.

Shearer, Gatersleben, Morse, Smyth and Hunt (2017) showed that placing a reminder sticker on the lid of refuse bins (N = 64,284 households, Figure 8) significantly increased the use of the food recycling caddy.

Figure 8: Reminder sticker

Shearer et al. (2017)

In another example, Katzev and Johnson (1983) conducted an experiment where they asked households for a commitment to conserve electricity by 10 per cent during the 12-week period of the study (N = 66). The researchers told participants that they were interested in whether 'voluntary efforts could lead to significant reductions in energy consumption'. Participants in the commitment conditions signed an acknowledgement form to reduce usage. They were also provided with a guide on household conservation and a sticker saying, 'Conserve Electricity by 10%', which they could place anywhere in their home. The experiment showed that participants in the commitment conditions used significantly less electricity than those in the control condition.

McKenzie-Mohr (2008) recommends that prompts should be noticeable, self-explanatory and close to where the action needs to be taken, while Allpress and Dosmukhambetova

(2020) advise that prompts and reminders can take many different forms, including auditory, visual and tactile, and can be delivered in relation to either a physical location, a task or a particular time.

Key Insight: To help people remember their commitments, provide reminders and prompts.

2.3.3 Combining with descriptive social norms

One final way that the effectiveness of commitments can be enhanced is by combining them with social norms.

As discussed in Section 2.1.4, people often underestimate the degree to which social norms shape behaviour. This means when social norms are at work, the behaviour change is likely to be perceived as internally driven rather than externally motivated. On the other hand, as we have seen, making commitments works best when the motivation to make the commitment is voluntary, i.e. internal rather than external.

Figure 9: Door hanger design

Jaeger & Schulz (2017)

Jaeger and Schultz (2017) tested the idea that the effects of social norm messaging can be made more permanent by getting individuals to make commitments as well.

In the study, water efficiency behaviours (watering the lawn less frequently) were encouraged by the use of doorhangers with various messages. The authors compared six different types of messages (Table 10): (i) social norms; (ii) social norms and commitments (Figure 9); (ii) strong warning; (iv) strong warnings and commitments; (v) information only (about behaviours required); and (vi) no contact.

In the social norm conditions, residents were informed that over 80 per cent of households in their community were abiding by the outlined water efficiency guidelines (a statistic gathered during a pilot study of residents in the region). Households in the strong warning conditions were reminded of the penalties associated with violating water restrictions, including a $500 fine, water service interruption and prosecution. For the households asked to make a commitment, residents were requested to indicate their commitment by checking a box, providing a signature and then returning the doorhanger to the front door for collection the following day. Each doorhanger was visibly labelled with the household's address in the top right corner.

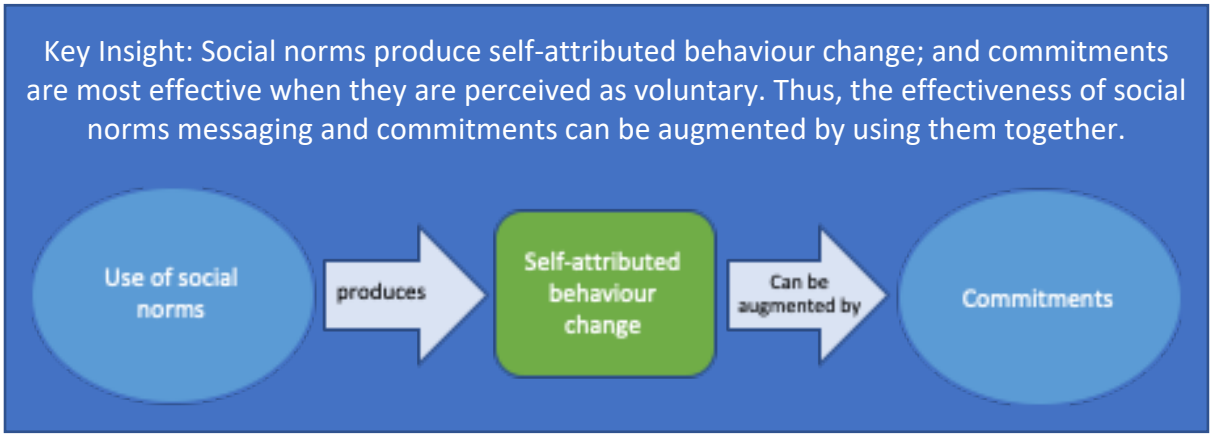
Both commitment groups decreased water consumption during the intervention month (3.5% and 5.6% reduction in water consumption), but only the commitment coupled with social norm messaging produced changes four months after intervention (8% reduction).

This research shows that you do not need to do face-to-face interventions to make commitments work.

Table 10: Strong warning and social norm messages

Strong warning	Social norm
We are in a drought. One of the best ways to use less water is to adjust your outdoor watering. During the drought, please keep in mind that using excessive and unnecessary amounts of water can results in penalties, including fines of up to $500, water service interruption, and /or prosecution. Regarding landscape irrigation be sure to: 1. Please use water efficiently!	We are in a drought. One of the best ways to use less water is to adjust your outdoor watering. Over ____% of households in your community use efficient landscape irrigation techniques, including: 1. Please join the ___ community and commit to using water efficiently!
+ Commitment	
Please commit to using water more efficiently! ☐, resident of _____ commit to efficiently watering my landscape. x _____Signature	

Jaeger & Schultz (2017)



2.4 Real-time feedback

In the discussion of the descriptive social norms, we have covered static provision of personalised feedback. This is usually done by utility companies that can provide accurate information about usage.

Studies have shown that provision of real-time feedback can also have a significant effect on energy consumption. As early as 2011, the UK's Behavioural Insights Team (BIT) recommended the use of real-time feedback devices to promote sustainable energy use (BIT, 2011). In particular, they recommended the use of smart meters which allow consumers to monitor their consumption. The feedback can also be delivered through new technologies, e.g. online, email, mobile apps, and social media.

In a large-scale intervention in the UK (N = 61,000, Ouesltai & Agrawala, 2017), smart meters coupled with the installation of real-time in-home displays were the most effective at reducing residential energy consumption.

Sustainable Energy Authority of Ireland (2018) reported that in-home displays of energy use can lead to savings of up to three per cent and Price (2015) reported that this type of feedback can be effective for behaviours like turning off lights when TVs and computers when not in use. Likewise, a literature review conducted by Nielsen et al. (2017) concluded that real-time feedback (e.g. through smart meters) can have significant impacts. Lede and Meleady (2019) also reported that smart water metering and digital in-home displays reduced water demand by 7-10 per cent in Sydney.

In 2019, the BIT investigated the impacts of alternatives to In-Home Displays on customers' energy consumption. They report that smart meters are expected to be offered to every home by the end of 2020 and energy suppliers will be obligated to offer households a free in-home display (IHD) as well. However, as new technologies develop (e.g. mobile apps), it is unclear whether IHD will be superior to mobile apps in producing consumer energy savings.

BIT (2019) studied UK households (N = 7069), who received either an IHD or a supplier developed app. They found that IHDs were more readily adopted, suited to a wide demographic, were better at engaging the whole household, and facilitated initial user learning; while apps were better at providing tailored tips, had greater potential for novel features and could use push-notifications.

Another example of real-time feedback is shower timers. Showering is an energy-intensive activity. Tiefenbeck et al. (2018) argue that feedback works because it makes the behaviour in question salient and 'immediately visible'. They demonstrated the efficacy of real-time feedback on showering behaviour in Swiss households, by installing a smart shower meter (see Figure 10). The device is placed between the showerhead and the hose. The smart meter measures and displays the number of litres of water used, the temperature of the water, and energy use. It operates without a battery and is powered by water flow. In a study of 697 households over two months, they found that those who had real-time feedback from the smart meter decreased their consumption during showers by about 22 per cent. The effect was strongest for high users; the approach generated savings of 1.2 kWh, which is higher than the average energy used for lighting for the same households.

Figure 10: Smart shower meter

Tiefenbeck et al. (2018)

One criticism of studies that rely on opt-in participants such as those in Tiefenbeck et al. (2018) is that these studies attract users who already have an interest in reducing energy consumption. However, Tiefenbeck et al. (2019) ran another study where they investigated the effects of the smart meter device on a large sample of hotel guests who were uninformed about the trials. The researchers installed the device in 265 rooms, which collectively made a total of 19,596 recordings of showering data over a three month period. They found that the real-time feedback provided by the device led to 11.4 per cent reduction in energy use.

Key Insight: If possible, invest in installing devices that provide real-time feedback on energy consumption.

2.5 Use of defaults

Defaults are pre-set options that take effect if nothing is done to make a change. Setting defaults to desired choices is effective because people often 'go with the flow' rather than make active choices.

The use of defaults has been shown to be successful in many different contexts, such as organ donation (Johnson and Goldstein, 2003) and pension plans (Choi, Laibson, Madrian & Metrick, 2004). The effectiveness of defaults in behaviour change is also well recognised in the literature on resource conservation (DellaValle, 2019; Lehner et al., 2016; Nielson et al., 2017; Ouesltai & Agrawala, 2017).

For example, Egebark and Ekström (2013) investigated the effect of default settings on double-sided and single-sided printing at a large university in Switzerland. Eighteen departments participated in a study that had a total of 25 printers. The results of the experiment showed a third of all printing is determined by the default setting. Daily paper consumption dropped by 15 per cent as a result of switching to a double-sided default. The effect was immediate and sustained. In sharp contrast to this, a more traditional approach that involved sending an email encouraging people to use double-sided printing and reminding them how easy it is to do so had no effect on printing behaviour, not even on the day when the email was sent.

In the field of residential energy efficiency, Pichert and Katsikopoulos (2007) reported two experiments that tested how the use of a sustainable ('green') default would affect electricity consumption. In the first experiment, 2500 inhabitants of a city in Germany had their default options changed from 'grey' (electricity generated from unsustainable sources) to green (electricity generated by an environmentally friendly supplier). In the eight years following this change (1998-2006) nearly 100 per cent of customers remained with the environmentally-friendly default.

In the second experiment reported by the same authors, a utility company in Germany started offering three new tariffs instead of one. The default was set to a green tariff that was more expensive than the 'grey' option (approx. 8% more expensive) but less expensive than a pricy green tariff (approx. 23% less expensive). Customers who wanted to remain on the default green tariff didn't have to do anything, while customers who wanted to switch had to reply to the letter sent to them. Two months after the request was sent, out of the 150,000 customers who were contacted, around 94 per cent of customers remained with the default option.

Finally, Brown, Johnstone, Haščič, Vong and Barascud (2013) investigated the effect of altering the defaults of thermostat settings in an OECD office building of a 6-week period in winter. Lowering the temperature by a moderate 1 °C led to a reduction of about 0.38 °C, while lowering the temperature by a large 2 °C did not lead to a significant reduction. The authors concluded that default settings can improve building-level energy efficiency.

Setting the right default can be powerful, and drawing on this insight, BIT (2011) argued that merely asking a question at an opportune moment can be effective in getting people to choose the options that are more pro-social (see Cabinet Office BIT, 2010), because it prevents people from 'defaulting' to less pro-social courses of action. In such 'prompted choice' procedures, individuals are explicitly asked to make a choice at a relevant juncture (e.g. asking whether they want to be organ donors or not when they apply for a driving licence). This procedure can be especially powerful when coupled with 'trigger points' (see Section 2.7)

Key Insight: Where possible, pre-set defaults to 'green' options to encourage energy conservation. Look for opportunities to use 'prompted choices'.

2.6 Messenger effects

The messenger effect is the effect of the identity of a person delivering a message on how people react to the message (Dolan et al., 2010).

In research literature, the messenger effect has been investigated from at least two different perspectives. The first of these is the social identity theory (Tajfel & Turner, 1979), which posits that whether or not we share an identity with the messenger would affect how persuasive the message is. The second is the literature on persuasion, which shows that for a message to be effective, the source of the message (messenger) needs to be perceived as credible (trustworthy and knowledgeable).

In 2012, Tsang and colleagues (Tsang et al., 2012) conducted a rapid evidence assessment of what works in promoting conservation in residential energy use. They concluded that there was a dearth of literature investigating the messenger effect in this area, but observed that it could play an important role. In 2019, Hafner, Elmes and Read (2019) also noted the lack of primary research into the effect of the messenger type in pro-environmental behaviour.

In this section the two perspectives on the messenger effect are explained and, where available, relevant examples of each are provided.

2.6.1 Social identity theory

Social identity theory research (Tajfel & Turner, 1979; Hornsey, 2008) shows that people's social identities, or groups to which they belong, have profound implications both for how they think of themselves and how they behave in the social world. People categorise the world into ingroups ('us') and outgroups ('them'), and these categorisations can shape their behaviour in powerful ways, including influencing how they respond to messages delivered by ingroup and outgroup members.

For this reason, the identity of the person delivering the message or, rather, whether that identity is shared by the target audience is important to the persuasiveness of the message. For example, Hornsey, Oppes and Svensson (2002) showed that participants were much more likely to take criticisms about their ingroup well when it came from a member of the ingroup, compared to when it came from a member of an outgroup (e.g. Australian participants reacting to comments about Australia from an Australian speaker or from a foreign speaker; university students reacting to comments about their university from a fellow student or from somebody who had never been to university).

Schultz and Fielding (2014) looked at the effect of different types of messaging about the benefits of using recycled drinking water on participants' self-reported acceptance of this concept, their perceptions of the associated risks and how positively they felt about it. The authors found that when participants were led to believe that the message came from a scientist who resided in the same area (vs. an unknown scientist), they were more influenced by the message. This was true only for participants who identified strongly with their area of residence.

It may seem that a person's identity is not something that can be easily changed; however, the above experiment shows that it is possible to make an aspect of identity more prominent

in the moment and capitalise on how this salience influences behaviour. In the experiment described above, for example, Schultz and Fielding did not simply rely on the fact that participants would have a strong regional identity already; instead, they made sure to bring that part of their identity to the forefront of their minds. As shown below (Table 11), participants were first reminded of this aspect of their identity in the description of the purpose of the study; they were then invited to reflect on this identity.

Table 11: Study materials

Study description	Task to make identity salient
We want to gauge how the South East Queensland community think about the possibility of recycled water being added to the water supply of all South East Queensland households for all uses, including drinking. We would be grateful if you, as a resident of the South East Queensland community, could please provide us with your thoughts and opinions.	Please take some time to consider what are the defining attributes of South East Queensland and the South East Queensland community. In a few words, please describe the South East Queensland lifestyle and/or the community that makes up South East Queensland.

Schults & Fielding (2014)

In general, literature shows that identity is a malleable construct (Gaertner & Dovidio, 2012), and that making membership in a social group salient (e.g. gender, ethnicity, nationality, even neighbourhood) can influence behaviour and increase conformism to the social norms of the salient ingroup (Tajfel, Billig, Bundy, & Flament, 1971).

Key Insight: Messengers are more influential when they are perceived to be similar to target audience, i.e. when they share an aspect of their social identities (e.g. living in the same area, having similar demographic characteristics, going to the same university)

2.6.2 Persuasion literature

For messages to be persuasive, the source of the message (the messenger) needs to be credible. Research literature has identified at least two dimensions that make up source credibility: expertise and trustworthiness. Expertise is whether or not the messenger is perceived as knowledgeable in the relevant areas, while trustworthiness is whether or not the audience considers the messenger's opinions valid (Pornpitakpan, 2004).

Craig and McCann (1978) showed that the effect of communication's message on energy conservation among high usage residential consumers can be enhanced by attributing the message to a credible source (in this case the Chairman of the New York Public Service Commission) rather than utility provider themselves (in this case the Manager of Consumer Affairs of Con Edison, utility provider).

There is recognition in the field that the trust dimension of the messenger is an important one; it may be for this reason that much of the literature refers to a credible source as a 'trusted source' or a 'trusted advisor'.

The Sustainable Energy Authority of Ireland (SEAI, 2018) reported that when information and initial contact came from a credible source (described as 'trusted advisor' by SEAI), householders' engagement on the uptake of retrofits was improved. Credible source in this

case was a messenger that was perceived to be acting in householders' best interests and to be impartial (due to their affiliation). According to SEAI, credible sources include:

- nationally recognised expert groups (qualified assessors, local contractors, energy suppliers)
- independent government bodies
- local community groups that householders know
- their employer.

In addition, many households that SEAI surveyed reported that they undertook the energy efficient upgrades based on a referral from advisors because they had already known them from previous encounters. Thus, 'trust' in this case was based not just on the affiliation of the advisor, but also on the interpersonal context, more specifically – relationship history.

In terms of the original theoretical framework, the advisors were perceived as credible because they were trusted (due to their affiliation and previous relationship history) and perceived to have the necessary knowledge (expertise).

The effect of relationship history on trust in the above example underscores the importance of the interpersonal dimension of trust. This dimension is a significant element of both trust and overall credibility. As research shows (see below), when the interpersonal element of truest is ignored, the use of advisors produces decidedly mixed results.

The UK's Department of Energy and Climate Change (DECC, 2014) ran a large randomised control trial (N = 1288), where they studied the impact of advice and information on thermostat use provided by what was considered to be a trusted source (boiler engineer) to vulnerable households. This intervention did not lead to a reduction in energy consumption. Post-intervention interviews with households revealed that the assumption that boiler engineers would be a trusted source may have been erroneous, as the residents had varied impressions of the engineers that delivered advice (there were 18 engineers in total, randomised to different conditions). Not all residents perceived engineers as a trusted source and personalities of individual engineers (i.e. how much rapport they could establish with householders) had an effect on how willing the participants were to receive advice from them.

In another example, a 'Five A Day' campaign in the UK (Department of Health, 2010) used a government medical officer to promote consumption of fruits and vegetables. This campaign was notoriously unsuccessful with consumption falling by 11 per cent in the subsequent five years. While it is difficult to judge what exactly made the campaign unsuccessful, it is clear that practitioners must be careful in assuming that a messenger's affiliation alone would be enough to make them 'trustworthy' in the eyes of the audience.

It is also worth noting that whether or not an affiliation *could be* successfully used as a proxy for trustworthiness would depend heavily on whether or not the target audience has a high trust in government organisations and services. First, some countries have generally lower levels of public trust in government institutions. For example, the American Psychological Association (APA, 2009) argued that one of the reasons communications offered by government officials (e.g. on matters like climate change) are ineffective is because of mistrust in government officials. Second, there is variation in trust within countries too, with lower income households having less trust in government. In the example of boiler engineers promoting efficient thermostat use (DECC, 2014), the target audience was vulnerable households who may have had somewhat lower trust in 'experts' than other households.

In New Zealand, trust in public institutions is generally higher than in either the United States or the United Kingdom[5], but New Zealand's State Services Commission reports that those with lower household incomes tend to have less trust in the government and its services (SCC, 2019). This means that when working with low-income households, practitioners need to be mindful of the interpersonal element of trust and design interventions that actively build on it.

Research shows that when interpersonal elements of trust are harnessed, the results can be encouraging. For example, in a review of literature, Abrahamse and Steg (2013) conclude that one successful approach to promoting residential energy efficiency is to use neighbourhood champions, or *block leaders.* This approach relies on the notion that people with a shared identity from the same social network as the target audience may be more effective in producing behaviour change because they are more likely to be trusted. In this approach (Burn, 1991; Cobern, Porter, Leeming & Dwyer, 1995, Weenig and Midden, 1991), neighbourhood champions work to motivate and organise their neighbours to perform certain environmentally-friendly activities (e.g. recycling).

In the block leaders approach, the social identity of the messenger is used to establish trust between the target audience and the campaign. This illustrates that the social identity approach to messenger effectiveness described in the previous section is not incompatible with research on source credibility (trustworthiness and expertise). On the contrary, social identity can be an important part of building trust.

Key Insight: Messenger credibility (trustworthiness and expertise) can affect the success of interventions. Whereas both trustworthiness and expertise have structural components (affiliation and knowledge), trustworthiness also has a strong interpersonal element.

2.7 Trigger points

The Behavioural Insights Team (2011) have suggested that effectiveness of behaviour change messaging can be improved by timing them to coincide with 'key moments' for recipients, e.g. when they are moving house. To influence energy efficient behaviour, BIT recommend factoring in 'trigger points' – salient moments when people's lives are undergoing change.

Bamberg (2006, N = 169) showed that the use of public transport can be successfully promoted by tying the relevant campaign (including a small financial incentive and relevant personalised information on public transport use) to a trigger point, in this case residential relocation. They showed that for the control group that relocated, but did not receive campaign materials, the use of public transport in the post-intervention period increased slightly but non-significantly (from 18% to 25%), whereas for the treatment group, the use of public transport increased significantly, from 18 per cent to 47 per cent.

More recently, Verplanken and Roy (2016) investigated whether moving house increased the effectiveness of an intervention designed to promote sustainable behaviours among residents of a small city in England. They delivered the intervention to households who recently moved to the area as well as (matched) households who were long-term residents

[5] https://ourworldindata.org/trust#differences-across-countries; http://archive.stats.govt.nz/browse_for_stats/snapshots-of-nz/nz-social-indicators/Home/Trust%20and%20participation%20in%20government/trust-govt-instit.aspx

(N = 521). The intervention consisted of (i) a personal interview about sustainable behaviours, (ii) a sustainable goodie bag, which included a bus timetable, a shower timer and eco-washing liquid among other things, (iii) a green directory – a booklet with personalised information on relevant green-living websites, and (iv) a newsletter containing information about sustainable lifestyles. The researchers measured sustainable behaviours described by the UK Department for Environment, Food, and Rural Affairs (Defra, 2008); these included shorter shower, using reusable shopping bags, turning down the heating, and washing clothes in cooler water. They found that, compared to non-movers, residents who recently moved house (less than three months before the intervention) showed a greater increase in sustainable behaviours post-intervention.

In a report summarising what works in stimulating home energy efficiency upgrades, SEAI (2017) argued that to be successful, campaigns targeting this behaviour need to be aware of when the relevant decisions are being made. Consumers usually make decisions about whether to invest in energy efficiency around key 'trigger points' that are related to their home renovation activities. Such activities can include redecorating the house or rooms in the house, replacing windows and/or doors, replacing the kitchen, extending the home, or converting spaces (e.g. attics or garages). According to SEAI, trigger points can also include changes in family composition and/or a family member's illness where home conditions have an impact on levels of comfort. They recommend tailoring the channels through which information is communicated to particular trigger points (see Figure 11).

Figure 11: Trigger points overview

Trigger point	Channel of communication
Anticipated home improvement	Architect, supply chain, contractors, banks, energy suppliers
Buying a new house	Mortgage broker, BER assessor, estate agent
Retirement	Pension provider, employer
Extending family or illness	Community-based services or doctors/hospitals
Community initiative	Sustainable Energy Communities

SEAI (2017)

One simple way to leverage such trigger points is to arrange for people to be presented with an explicit choice between sustainable and unsustainable alternatives at such moments. As noted in Section 2.5, such 'prompted choices' can be effective in producing behaviour change.

Key Insight: People are more likely to change behaviour and adopt new practices at moments in their lives when they are already undergoing change. Targeting such 'trigger points' with relevant campaigns (e.g. prompted choice) can be an effective way to promote energy efficient behaviour.

2.8 Loss framing

One important quirk of human psychology is that we tend to give more weight to losses than the equivalent gains (Kahneman & Tversky, 1979). This means, for example, that a person would be more upset at losing $1000 than they would be happy at winning the same

amount. In fact, research suggests that we feel losses about twice as strongly as equivalent gains (Tverksy & Kahneman, 1992).

This phenomenon can be used to make messages more powerful. Thaler (2008) argues that loss framing can be used to promote action. For example, we can expect that an information campaign that states 'if you use energy conservation methods, you will save $350 per year' (gain framing) will be less effective than one that states 'if you do not use energy conservation methods, you will lose $350 per year'.

Gonzales et al. (1988) successfully used loss framing in combination with other techniques (using vivid language and inducing commitments) in order to increase the effectiveness of home-audit interventions on residents' signup rates to a retrofit programme. Auditors were trained to present their recommendations in terms of energy and monetary losses that would result from inaction than in terms of gains that would result from action.

Key Insight: Framing messages in terms of what people stand to lose rather than what they stand to gain may be an effective way to produce behaviour change.

2.9 Simplification

Making things easier and removing friction is a fundamental component of most successful behaviour change initiatives. It is so important that Dan Ariely[5], a prominent behavioural scientist, summarises all behaviour change as ultimately amounting to the process of 'decreasing friction' and 'adding fuel'.

The Behavioural Insights Team (2011), for instance, found that removing the 'hassle factor' associated with taking up a service (e.g. offering a subsidised service to clear out the attic before installing insulation) can be more effective than providing financial discount on the service itself.

Another successful example of simplifying messages in order to promote energy-efficiency is in designing and using energy efficient labels to enable consumers to purchase more efficient models. Ouesltai and Agrawala (2017) report that presenting information on the lifetime energy costs of appliances alongside their standard tags was effective for high-consumption appliances (e.g. washer-dryers).

Behavioural Insights Network Netherlands (2017) report a study where 1100 companies with relatively high energy consumption participated in an energy saving scheme. These companies submit an annual report on their progress and subsequently receive an email containing a link to a page that has the feedback report; the report compares their consumption levels to those of other participating businesses (i.e. using social norm and social comparison). However, only a small percentage of these reports is downloaded. Researchers showed that when the emails are made shorter, simpler and included a direct link to the report (and included a personalised salutation), the download rate for the reports increased dramatically (from 14% to 46%).

Key Insight: Simplifying communications and processes is an effective way to improve participation and consequently produce behaviour change.

[5] https://cellosignal.com/blog/behaviour-change-five-steps-for-strategists

2.10 Vivid language

Vivid language uses concrete imagery and real-life examples in order to convey a message. Using vivid language encourages individuals to pay attention to the message, to process it more deeply and to remember it for longer, and authors in other fields have devoted a lot of attention to how to craft messages successfully (e.g. Heath & Heath, 2007). Although there are not many examples of using this technique specifically in the field of residential energy conservation, the evidence that exists is telling.

Gonzales et al. (1988) conducted a study where auditors were trained to communicate effectively. More specifically, they were trained to use vivid case histories of neighbours or other local 'super-conservers' who had saved more energy and money than average (these included concrete examples of measures taken and of the benefits that followed); auditors were also trained to use language that conjured up vivid and memorable images (Table 12). Participants in the study reported that they were more likely to act on their auditor's recommendations and they were also more likely to apply for utility programmes to finance retrofits.

Table 12: Message using vivid communication

If you were to add up all the cracks around and under the doors of your home, you'd have the equivalent of a hole the size of a football in your living room wall. Think for a moment about all the heat that would escape from a hole that size. That's precisely why I'm recommending that you install weatherstripping ... And your attic totally lacks insulation. We call that a "naked attic". It's as if your home is facing winter not just without an overcoat, but without any clothing at all.

Gonzales et al. (1988)

Key Insight: Use vivid language (concrete imagery and real life examples) in verbal communications with target audiences. This will help the message to be understood and remembered.

3.0 Mode of Delivery

This section provides a brief overview of literature that offers insight as to which mode of delivery is most effective in producing behaviour change in residential energy efficiency. The very limited literature available seems to indicate that face-to-face interactions are effective (e.g. Green, Crawford, Williamson, & DeWan, 2019) but that a variety of approaches need to be adopted, as households' preferences about types of engagement are varied. Per-person costs of each mode of delivery also need to be considered.

Ortega and Scartascini (2020) argue that the mode of delivery of interventions is an important predictor of the success of government initiatives and that there is a dearth of studies comparing modes of delivery directly. In their own study of tax collection in Colombia (N > 20,000) they compared three delivery mechanisms of messages to late payers (letter, email and personal visit) and found that personal visits were the most effective in encouraging payment (increasing payment rates by 67 per cent over no-intervention control condition), this was followed by emails (15% increase), and then letters (4% increase).

In line with this finding, in a meta-analysis of experimental studies that investigated the effect of information-provision strategies on residential energy conservation (N = 156 studies, 1975-2012), Delmas, Fischlein and Asensio (2013) found that face-to-face in-home audits resulted in the largest reductions in energy consumption. They also found that providing real-time feedback to households can decrease energy consumption, while providing information on financial benefits can backfire and increase consumption instead.

Further, the Sustainable Energy Authority of Ireland (SEAI, 2018) undertook a review of evidence on what works in energy conservation and they also concluded that provision of free, in-person energy audits and advice directly to households is an effective tool in reducing residential energy consumption. For example, Alberini and Towe (2015) found that information provided through home energy audits (N = 378) were as effective as financial incentives (rebates on the purchase of high efficiency air source heat pumps, N = 430) at reducing energy consumption in Maryland households; both of these interventions reduced consumption by about five per cent.

On the other hand, Hille, Weber, and Brosch (2019) studied consumer preferences of different electricity-saving programmes in Switzerland and observed a heterogeneity of opinions, which led them to conclude that when it comes to programmes that aim to reduce residential energy consumption, there is no single silver bullet that can be employed, because household preferences and needs differ widely. The study deals in hypothetical scenarios, so the findings need to be treated with caution; however, it does highlight that different strategies are likely to work for different people.

Finally, it has to be noted that though face-to-face interventions seem to be the most effective, they also tend to incur a much higher per-person cost, which means that when target audience is relatively large, the total cost of face-to-face interventions may become prohibitive. In these cases, other modes of delivery need to be considered (e.g. emails or letter campaigns).

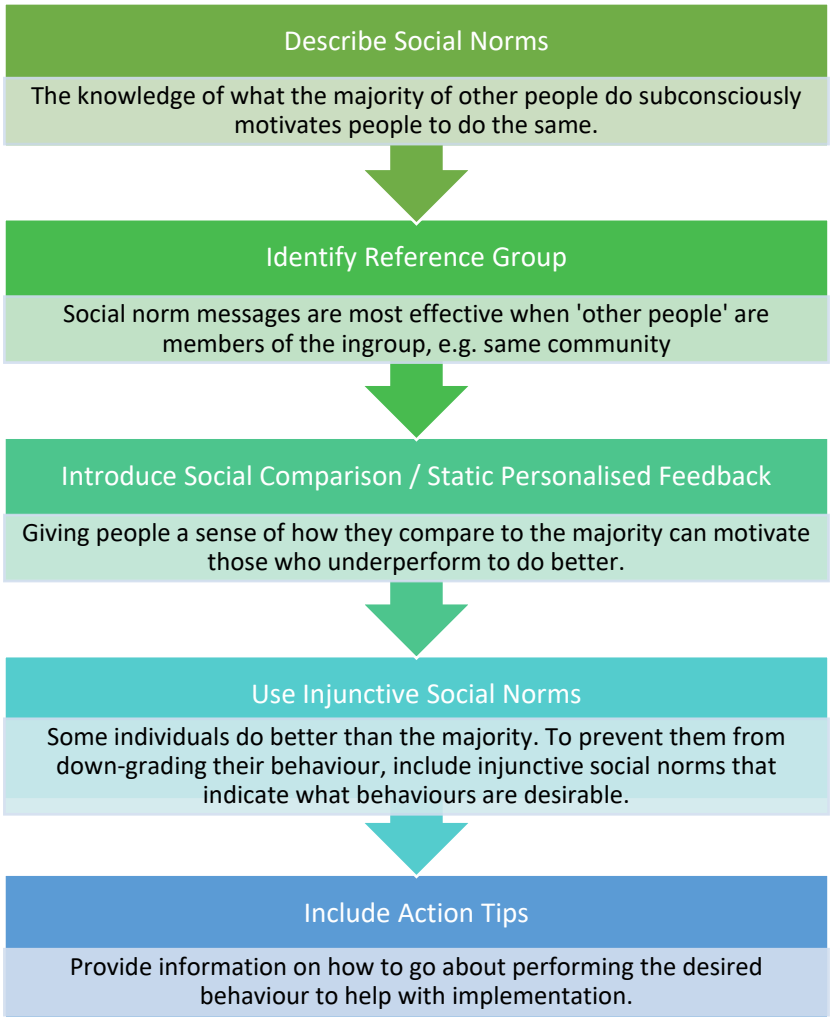
4.0 Key Lessons

In this chapter, key lessons from the literature review are summarised. The section deliberately leaves out detailed descriptions, as these can be found Chapter 2.

4.1 Working with descriptive social norms

Descriptive social norms have been used successfully in utility companies' letters to consumers, on door-hanger flyers and in advertising campaigns. They can also be used in verbal communication, although this is less well-researched.

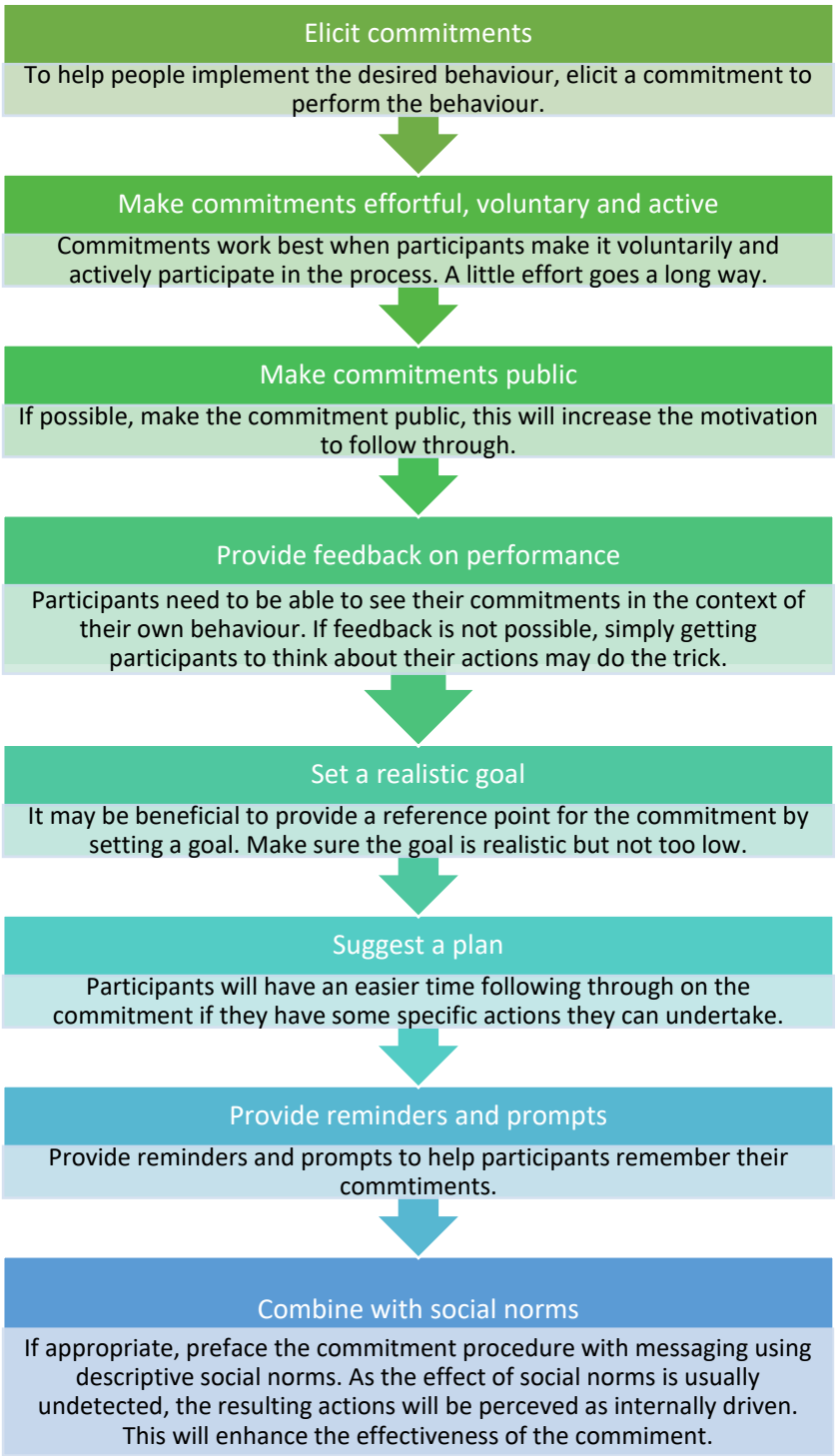
The reviewed literature showed that descriptive social norms can be effective in promoting residential energy efficiency and that they are most effective when combined with other BI (e.g. reference groups, social comparison). The graphic below summarises best practice in using descriptive social norms and related BI to promote sustainable behaviour. It is designed to help practitioners work through crafting a successful social norms message, and steps can be omitted if necessary.



4.2 Working with commitments

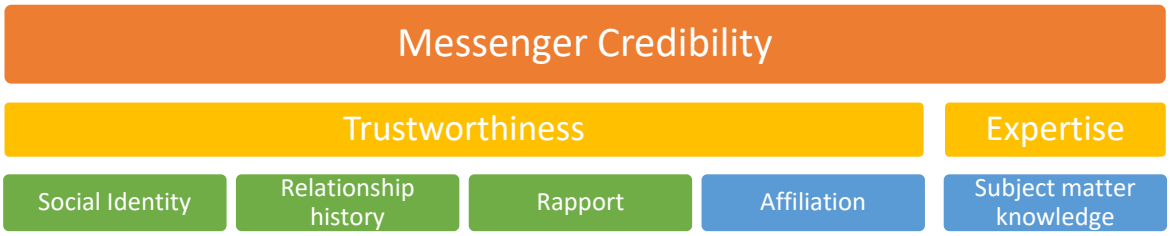
Commitment making has been used successfully in door-knocking campaigns, on door-hanging flyers, pledge cards, in web-portals, and in community events.

The reviewed literature showed that commitments can be effective in promoting residential energy efficiency, and that they are most effective when combined with other BI (e.g. goal setting). The graphic below summarises best practice in using commitments and related BI to promote sustainable behaviour.



4.3 Working with the messenger effect

There has been little empirical work specifically investigating the messenger effect in promoting residential energy conservation. However, a short exploration of the wider messenger effect, as well as the few relevant studies that were available, showed that the effect is based on several different elements. These are summarised in the graphic below.



Messenger credibility is made up of trustworthiness and expertise. While both of these dimensions have structural elements (blue boxes), trustworthiness also has a very strong interpersonal element (green boxes). Thus, whether the messenger is perceived as trustworthy is a function of at least four different elements: one structural (affiliation) and three interpersonal (social identity of the messenger, relationship history and rapport).

As discussed above, practitioners should be aware that overreliance on the structural elements of messenger credibility may be counterproductive, especially among those communities whose trust in experts and government services may not be very high. Recognising the key role of the interpersonal elements in messenger credibility, SEAI (2018) recommended that when agencies do not have direct ties in the community, they should seek out intermediaries who already have relationships with consumers.

4.4 Working with the other insights

In this section, a summary of the other BI described in Chapter 2 is provided. These were grouped together because the key messages relevant to the BI were relatively straightforward. These are presented along with suggestions of when to use them.

When the social norm is to not perform the behaviour → **Use Trending Norms**

Highlighting that the number of people who perform desired behaviour is growing can lead to desired behaviour change.

When you have access to technology that can provide real-time data → **Use Real-time Feedback**

Real-time feedback helps make behaviour and its effects salient. ('Static' feedback, e.g. monthly usage information, is also very effective – see Section 4.2)

When you have the opportunity to structure choices → **Use Green Defaults**

People often stick with the default setting chosen for them. If there is a point in time when participants can go with a sustainable or an unsustainable option, don't be afraid to set the default to green or offer them a 'prompted choice'.

When contemplating new approaches → **Leverage Trigger Points**

When people are going through moments of change (trigger points), they are more likely to adopt new behaviours. Consider what the trigger points might be and which agencies households may be in contact with at those times. Consider partnering with these agencies to deliver your intervention.

When you describe future outcomes → **Use loss framing**

Frame messages about outcomes in terms of avoiding losses rather than obtaining gains: avoiding losses is more likely to motivate action.

When you design process → **Simplify**

Making things easier to understand or do is a very useful enabler of behaviour change. Once you design your intervention process (procedures and materials), review it with the 'simplicity lens' in mind. Are things as easy as they can possibly be for your target audience? Can you make anything easier (even just a little)?

When you prepare verbal messages → **Use vivid language**

Using vivid language and imagery to communicate your message will help your audience understand and remember your point.

5.0 Conclusions and Recommendations

This report discussed the evidence for the effectiveness of a number of BI in promoting residential energy conservation. The available literature demonstrates that BI can be used successfully to produce behaviour change in this domain (in many cases these are as effective as implementing expensive tariffs).

In particular, the use of social norms, trending norms, commitments (including goals setting and reminders), real-time feedback and defaults have been researched relatively well and shown to be effective. On the other hand, other BI like messenger effect, trigger points, loss framing, simplification and vivid language have been shown to be promising but they lack a solid empirical research base in this specific domain at present.

As mentioned above, however, the nature of BI is such that they can be applied in many different contexts, so the report included the discussion of the less-researched BI because they had been successfully applied in many other contexts (e.g. BIT, 2014).

The ultimate purpose of this work was to provide recommendations to the Low Carbon Living team that would help them further improve initiatives within the Home Performance Advice regional programme and/or within the wider Live Lightly umbrella programme.

Based on the findings described in this report, we offer the following 13 recommendations to the team. These are not listed in any order.

Recommendations

1. Produce a training module for eco-design / home performance advisors which would include an overview of behavioural techniques and how these can be applied in face-to-face visits, such as using **vivid language**, building trust and framing messages in terms of **loss**. This training could be either face-to-face or online. Such training can also be used for other frontline workers delivering face-to-face interventions (e.g. Low Carbon Lifestyle door knockers).

2. Use effective **messengers**: leverage links with community actors, i.e. social and health workers and budgeting services. Build their capacity and provide access to resources (e.g. HEAT Kits) to promote actions or refer programmes to their communities (e.g. Retrofit Your Home and EDA).

3. Introduce **social norms**, **trending norms**, **loss framing** into promotion of services and actions, e.g. EDA, HEATKITs, Retrofit your Home, Shower and Save, and seasonal energy campaigns.

4. Use existing council channels and community services to capitalise on **trigger points**, e.g. antenatal classes, estate or rental agencies, consenting services and power companies. This is applicable to all Live Lightly initiatives.

5. Update the Live Lightly website to include **social norms** in messaging, more demographically representative images on the landing page (**messenger effect**), and **vivid language** and imagery.

6. Develop energy retailer partnerships and encourage them to use **social norms**, **injunctive norms** and **social comparisons** to promote energy conservation through power bills.

7. Review documentation, scripts and processes with a view to **simplifying** processes and messaging where possible (e.g. Door knocking scripts in Low Carbon Lifestyles; application forms of Retrofit Your Home).

8. Partner with energy retailers to trial In-Home Displays in conjunction with smart metering (to enable **real-time feedback**).

9. Use personalised **reminders** to follow-up with customers (e.g. EDA clients, HEAT Kit users) to prompt action using simple text messages or automated email reminders.

10. Use effective **messengers** to improve Shower and Save (i.e. home improvement retailers and industry association / plumber endorsement), coupled with instore **reminders.**

11. Develop and trial the effectiveness of a non face-to-face communication intervention, such as leaving a doorhanger or similar, incorporating **social norm messaging** and **commitment making** techniques.

12. Review the **commitment** making mechanisms used in Low Carbon Lifestyles, Shower and Save and EDA to check that they adhere to reflect best practice (e.g. consider making them more active and/or public or combining with prompts).

13. Consider how **defaults** can be modified to support behaviour change (e.g. set-and-forget household items, working with builders and suppliers to change default products, building in 'prompted choice' procedures at key moments).

Concluding thoughts

As demonstrated in this report, BI can add real value to the effectiveness of behaviour change interventions. It is possible to take these insights and apply them to intervention design without testing their effectiveness again. However, it is important to remember that the details of how BI are applied play an important role in determining their effectiveness, and there is great value in testing BI interventions and in learning from these tests (see e.g. Haynes, Goldacre & Torgerson, 2012). Where feasible, therefore, practitioners are urged to test BI interventions using robust methodologies and objective data.

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