

Energy Use Behaviour Change



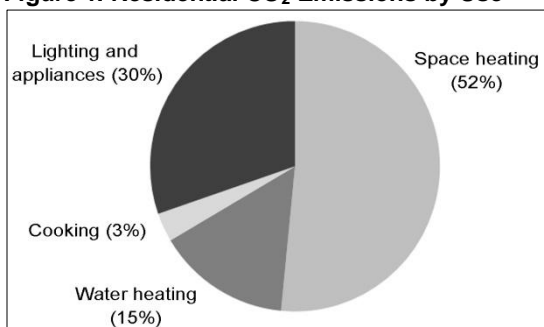
Behaviour change concerning energy use is an emerging area of research that has important implications for policy. This note introduces the factors and interventions that can influence behaviour. It also discusses the behavioural aspects of the Green Deal and the smart meters programme.

Background

Human behaviour is the way that people act socially and in the environment and spans a number of scientific disciplines including psychology, sociology, behavioural economics and neuroscience. Over recent years, behaviour change has gained prominence in policy with the House of Lords (HoL) Science and Technology Select (S&T) Committee inquiry on behaviour change¹ and creation of the Cabinet Office's Behavioural Insights Team.

Encouraging consumers to reduce and change their patterns of energy use at home could make a significant contribution to reducing greenhouse gas (GHG) emissions, as required by the Climate Change Act (2008). In 2010, 27% of the UK's end-user GHG emissions came from

Figure 1. Residential CO₂ Emissions by Use²



Overview

- Engaging the public on energy use and encouraging behaviour change could contribute to the UK's energy policy goals of reducing emissions while maintaining energy security and affordability.
- Providing information to generate knowledge is important but not necessarily sufficient for changing behaviour.
- A mix of regulatory and non-regulatory interventions is more effective than single measures at creating behaviour change.
- A number of behaviour change frameworks are used across government departments with the intention of informing policy.
- The government has agreed that more focus is needed on proper evaluation of behaviour change interventions.

the residential sector, the majority from space and water heating (Figure 1).³ A central scenario from the Committee on Climate Change (CCC) for meeting carbon budgets involves 98 mega-tonnes of CO₂ (MtCO₂) being saved by the residential sector in the year 2030, which is a 34% of the total required reduction from 2010 levels.² This depends upon consumers choosing to insulate 90% of lofts, 90% of cavity walls and 45% of solid walls, measures that would save 2.0, 4.9 and 6.0 MtCO₂ respectively.² It also requires the uptake of more efficient appliances, adoption of low-carbon technologies such as heat pumps (which will be covered in a forthcoming POSTnote), and changes in the way that consumers use energy (Box 1).

Box 1. Impact of Energy Behaviour Changes

The evidence base for quantifying the impact of energy behaviour change is limited. The CCC included some headline behaviour changes within its carbon budget modelling. These data have been made available for this POSTnote. Its models suggest that habitual behavioural changes could reduce emissions by 4.5 MtCO₂ in the year 2022, which is equivalent to just over 3% of total CO₂ emissions from residential buildings in 2010.

| Behaviour change | Households | Abatement |
|--|------------|-----------------------|
| Turning down thermostats by 1°C | 15 m homes | 4.1 MtCO ₂ |
| Switching unnecessary lights off | 15 m homes | 0.1 MtCO ₂ |
| Washing clothes at a lower temperature | 8 m homes | 0.3 MtCO ₂ |

Models of Behaviour

A range of models describe the factors that influence behaviour. There is no one dominant model of behaviour but there is overlap between models. The Department of Energy and Climate Change (DECC) uses models from both sociology and psychology. From sociology, DECC uses Social Practice Theory (SPT). This considers energy-using behaviours, such as cooking, showering and travelling to work, as societal phenomena, rather than just as individual actions or choices. SPT asserts that unless practices are changed at the societal level, it is unlikely that significant numbers of individuals will change the way they act. An example of an intervention that targeted social practices is ‘Coolbiz’ (discussed later).

From psychology, DECC uses the Triandis model, which identifies the following key factors that influence behaviour:⁴

- **intention** to act, which relates to the decision-making process and is shaped by:
 - **attitude** towards the behaviour in question, which is influenced by people’s values and their knowledge and understanding of the behaviour
 - **social factors**, including personal identity (how people view themselves and how they feel society views them) and norms, which are how people generally act within society
 - **emotion**, which is influenced by people’s values and mood at the time of the decision
- **habits**, which are frequently repeated behaviours that are automatic and often ingrained
- **facilitating conditions** which are people’s perceived and actual ability to act and relate to barriers that could be social, infrastructural or economic.

The Triandis model thus presents behaviour as a consequence of intention, habits and facilitating conditions. Habits and intentions are likely to be mediated by two separate systems in the brain, referred to by Daniel Kahneman as System 1 and System 2:^{4,5}

- **System 1: the ‘fast’ or ‘automatic’ system** that is reflexive and uses a range of non-conscious processes to

compute information very quickly and carry out actions with minimal mental effort.

- **System 2: the ‘slow’ or ‘reflective’ system** that is conscious, controlled and deliberative. The reflective system makes judgements in a self-aware and considered manner and is associated with deliberate formulation of plans.

These systems interact, and much behaviour is probably a blend of both processes. A common simplification of behaviour is to split it into two types:

- **Habitual behaviours**, which are repeated behaviours such as turning the lights off when leaving a room (Box 1). These are generally mediated by the ‘fast system’.
- **One-off behaviours**, which are actions related to occasional decisions, such as insulating a loft or other one-off purchases. These are generally mediated by both systems, with planning and higher order decision-making modulated by the ‘slow system’.

Policy and Interventions

A range of interventions can be used to try and generate behaviour changes.⁹ These can be ordered into a ‘ladder of interventions’ (Box 2).⁶ The higher up the ladder, the more restrictive the intervention and the greater the justification needed to ensure public support for it. Different interventions are needed depending on the behaviour that is trying to be changed. The HoL S&T Committee concluded that single interventions alone are unlikely to generate change. Instead, a mix of interventions including both regulatory and non-regulatory measures, are most effective at changing behaviour.¹ The Government agreed with this in its response. Various frameworks are used by government to ensure that policy uses a mix of interventions (Box 3).

Barriers to Energy Behaviour Change

There are many barriers to energy behaviour change to be considered when designing policy, including:

- **Low prominence of energy efficiency** – energy is ‘invisible’ and saving energy is often a low priority

Box 2. Ladder of Interventions^{1,6}

| | | Interventions | Illustrative examples to encourage energy saving light bulbs |
|--|---|---|---|
| Regulation | | Eliminate choice | Prevent the use of conventional, inefficient light bulbs |
| | | Restrict choice | Stop selling conventional light bulbs (current policy ⁷) |
| Fiscal measures | | Guide through financial disincentives | Increase tax on conventional light bulbs |
| | | Guide choice through financial incentives | Reduce tax or subsidise energy saving light bulbs |
| Non-regulatory and non-fiscal measures | | Guide choice through non-financial incentives or coerce through non-financial disincentives | Offer a reward, e.g. entry into a prize draw, for buying energy saving light bulbs |
| | | Persuade individuals using argument and coercion | Persuade people that improving energy efficiency is important and that energy saving light bulbs help save energy whilst reducing bills |
| | Nudges | Guide choices through changing the default policy | Supply energy saving light bulbs in new light fittings and lamps |
| | | Enable choice by designing or controlling the physical or social environment | Make energy saving light bulbs the most prominent type at the point of sale |
| | | Use social norms and salience, provide information about what others are doing | Use adverts to show how many people are buying energy saving light bulbs |
| | | Provide information to educate and increase knowledge and understanding | Explain how energy saving light bulbs work and how they save energy |
| | Do nothing or monitor the current situation | Track sales in different types of light bulb | |

- **Low cost of energy** – efficiency measures can be, or are perceived to be, relatively expensive
- **Availability of energy efficient technology**
- **Lack of knowledge and understanding** of energy saving behaviour and efficiency measures available
- **Hassle factor of installing efficiency measures**, such as the need to clear out the loft before insulation
- **Aesthetics**, for example where people are concerned about the attractiveness of energy saving alterations
- **Social norms** (what other people are doing around you) – norms influence people's behaviour and can prevent them from adopting a new efficiency measure⁸
- **Policy acceptability**, for example, Government is unlikely to heavily regulate energy use because of a lack of acceptability within the electorate.

Current policies seek to overcome some of these barriers. The Green Deal aims to reduce the barrier of upfront cost, while smart meters aim to increase the prominence of energy use in the home by providing feedback on household energy use. As with all energy efficiency interventions, estimates of potential energy savings should consider the possibility of rebound effects, which can result in savings that are smaller than projected (POSTnote 409). Interventions can be broadly split into three categories: regulatory measures; fiscal measures; and non-regulatory and non-fiscal measures (Box 2).¹

Regulatory Measures

Regulation involves making and changing laws or establishing rules that eliminate or restrict choice.

Regulating Boilers

Since 2005, the Government mandated that all new gas central-heating boilers must be efficient condensing boilers. This has led to a significant increase in the prevalence of

condensing (including combi-condensing) boilers, from 10% in 2005 to 50% in 2009, improving energy efficiency and thus reducing emissions.

Fiscal Measures

Fiscal measures refer to financial measures, mainly incentives and disincentives that can encourage behaviour change. However, people do not always make decisions to maximise their financial interests, because of the barriers to energy behaviour change discussed above. Green Alliance, an environmental think tank, states that appealing to other factors that can drive behaviour change, such as values, the use of trusted messengers, and the framing of choices, may increase the effectiveness of interventions.¹¹

The Green Deal

The Green Deal aims to reduce carbon emissions and increase energy efficiency through the installation of one-off energy efficiency and micro-generation measures. The Green Deal reduces the barrier of the upfront cost of these measures, through companies offering a loan that is paid for by the savings subsequently made in energy bills (see House of Commons Library Standard Note SN/SC/5763).

Green Deal measures will be installed by accredited suppliers, many of which will be energy companies. The International Energy Agency (IEA) has said that the success of the policy depends on the trust of consumers in Green Deal suppliers. However, trust in energy companies is low and more work will be needed to build trust and drive demand for Green Deal energy efficiency measures.¹² To encourage uptake of the Green Deal, the IEA recommends that the Government raise awareness of the benefits of energy efficiency and inform the public of how the Green Deal will work.¹² Green Alliance supports this, identifying good communication as essential for a successful Green Deal.¹¹ Consumers will be supported in the Green Deal process by the Energy Saving Trust, which operates an advice line for DECC and an online service. However, concern has been raised by the CCC that take up of energy efficiency measures under the Green Deal will be lower than in current schemes that offer free measures.¹³ An Energy Company Obligation will run alongside the Green Deal to help the most vulnerable households and hard-to-treat properties that need certain expensive measures. The Government has also announced up front financial incentives to encourage early take-up.

Non-Regulatory and Non-Fiscal Measures

Within the category of non-regulatory and non-fiscal interventions (Box 2), the use of 'nudges' has been prominent in recent policy debates on behaviour change. Thaler and Sunstein define a nudge as "any aspect of the choice architecture (the context in which people make decisions) that alters people's behaviour in a predictable way, without forbidding any options or significantly changing their economic incentives".¹⁴ For example, removing chocolate from the till point in a supermarket is a nudge, but banning chocolate or significantly raising its price is not.

Box 3. Behavioural Insights and UK Policy Making

Multiple frameworks are available and used to support policy makers in applying behavioural insights to policy, though most do not cover all possible interventions.⁹

Department for Environment, Food and Rural Affairs (Defra)

Defra's 4 E's (enable, engage, exemplify and encourage) framework is a checklist of four elements that should underpin behaviour change policies. These elements ensure that a mix of interventions is employed to create the right conditions for behaviour change, which includes addressing motivations and barriers. Green Alliance asserts that the 4 E's is a useful tool for policymakers because it highlights the importance of integrated policy.

The Behavioural Insights Team, Cabinet Office

The Institute for Government in collaboration with the Cabinet Office developed MINDSPACE (a mnemonic) which built on the 4 E's.¹⁰ MINDSPACE is used within the Behavioural Insights Team and 'provides a useful checklist for working through new policy areas and challenges'. The team has organised a series of seminars across Whitehall to inform senior policy makers, including senior civil servants and ministers, on the framework.

DECC

DECC's Customer Insight Team has recently run a training programme for staff based on social practice theory and the Triandis model. It also uses the framework MINDSPACE.

Population-wide communication campaigns have focused on providing information to change people's behaviour. Examples include 'Are you doing your bit?' and 'Act on CO₂'. However, the assumption that providing information at a population level will lead to a behaviour is not supported by the evidence base.¹ Two examples of successful non-regulatory, non-fiscal interventions are detailed in Box 4.

The roll-out of smart meters with customer displays from 2014 will offer opportunities to nudge consumers to reduce their energy use. The customer displays and the information that they provide could be utilised to create nudges that increase the prominence of energy use whilst encouraging a reduction in consumption.

Smart Meters with Customer Displays

Smart meters (POSTnote 301) enable accurate energy billing and real-time measurement of electricity use and can communicate this information through a customer display, often referred to as an in-home-display (IHD). The IHD can also communicate real-time electricity prices. Smart meters could change people's habitual energy use in two ways:

■ **Reducing Overall Energy Consumption**

Trials of IHDs with smart meters have shown reductions in electricity consumption of 3% to 19%, though an average of 5% is realistic for larger-scale trials that include uninterested customers.¹⁵ In its impact assessment of smart meters, DECC conservatively projected that information and feedback on energy use through the IHD will result in annual reductions of 2.8% in electricity use and 0.5% to 2% in gas use. The National Audit Office has queried how much consumer energy use will change, and for how long, but evidence of durable effects is emerging.¹⁵ The design and delivery of the roll-out programme will affect these figures and the extent of behaviour change.

Box 4. Changing Habitual Behaviours

Student Switch Off

The Student Switch Off is a National Union of Students campaign that encourages students living in university halls of residence to adopt energy-saving actions, such as switching the lights off and not over-filling the kettle. Using inter-hall competitions, prize rewards, peer-to-peer communication and social media, the campaign calculates that it achieved an average reduction in electricity use of 6% (1,405 tonnes of CO₂) at 43 UK Universities in 2011/12. The campaign aims to embed positive habits and reaches students at a stage in their life when they are particularly amenable to changing their habits.

Coolbiz

'Coolbiz' is a successful Japanese Government campaign. Launched in 2005 in response to Kyoto targets, it continues largely because of energy shortages. Every summer, 'Coolbiz' encourages office workers to ditch their suits and instead wear more appropriate office clothes so that air-conditioners can be set to 28°C – warmer than average – to reduce energy consumption. The campaign has been promoted by clothing retailers and prominent business people wearing cool office clothes. Prior to the campaign office workers did not feel comfortable breaking dress codes. This campaign has removed social barriers and shifted what is socially acceptable in terms of work wear.

■ **Shifting Energy Consumption**

Smart metering could play a key role in enabling demand side management. This involves managing demand to meet available supply by influencing the timing of when people use electricity, rather than how much they use (POSTnote 372). Smart meters and smart grids could enable this through tariffs that adjust electricity prices with the time of use. "Smart" appliances could be programmed to respond automatically to varying prices.

There has been some public concern about the impact of smart meters on personal privacy. For a review of these concerns see Standard Library Note SN/SC/6179.

Evaluating Behaviour Change Interventions

The HoL S&T Committee identified gaps in understanding of what influences people's behaviour and which interventions work, particularly in relation to habitual behaviours.¹ It highlighted a need for better monitoring and measurement of behaviour change interventions to develop a strong evidence base, with evaluation that establishes whether policies are effective at delivering their outcomes and representing value for money.¹ It also said that the evaluation process needs to be considered during policy design, and to continue beyond the lifespan of the intervention to monitor if behaviour change is maintained.¹ There is debate over the most effective evaluation method. The British Academy recommends more experiments, and particularly randomised controlled trials (RCTs) as the best means for understanding behaviour change. Professor Pawson has challenged RCTs, arguing that, "in some cases, demonstrating the effectiveness of a policy would sometimes require a 'comprehensive' or a 'multi-method evaluation'."¹ In its response to the HoL S&T inquiry, the Government agreed that it is of critical importance that behavioural interventions are properly evaluated and said that it is focusing increasingly on this area.

Endnotes

- 1 House of Lords Science and Technology Committee, 2nd Report of Session 2010-12, *Behaviour Change*.
- 2 Committee on Climate Change, Apr 2012, *The 2050 target – achieving an 80% reduction including emissions from international aviation and shipping*
- 3 For further information about current energy use in the residential sector, see: DECC, 2011, *Energy Consumption in the UK*; and Defra, DECC and Energy Saving Trust, 2012, *Powering the Nation: Household Electricity Using Habits Revealed*.
- 4 Chatterton and Anderson, Dec 2011, *An Introduction to Thinking about 'Energy behaviour': a Multi Model Approach*
- 5 Evans, 2008, *Annu Rev of Psychol*. 59, 255-78
- 6 Nuffield Council on Bioethics, Nov 2007, *Public Health: Ethical Issues*.
- 7 <http://www.energysavingtrust.org.uk/In-your-home/Lighting/Energy-saving-light-bulbs-take-over>
- 8 Cabinet Office, Jul 2011, *Behaviour Change and Energy Use*
- 9 Michie et al., 2011, *Implementation Science*. 6: 42
- 10 Institute for Government, Mar 2010, *MINDSPACE Influencing Behaviour through Public Policy*
- 11 Green Alliance, May 2012, *Neither Sermons nor Silence*
- 12 IEA, 2012, *Energy Policies of IEA Countries – The UK 2012 Review*
- 13 CCC, Dec 2011, *Open Letter to Chris Huhne: Proposals for the Green Deal / Energy Company Obligation*
- 14 Thaler and Sunstein, C.R., 2008, *Nudge: Improving Decisions about Health, Wealth, and Happiness*
- 15 VaasaETT, 2011, *The potential of smart meter enabled programs to increase energy and systems efficiency: a mass pilot comparison*.
<http://www.esmig.eu/press/filestor/empower-demand-report.pdf>