

Behaviour change for energy efficiency



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Summary

Whilst major investments are being made into new technologies and materials for improving energy efficiency, there are a number of human-related factors that also need to be addressed. Strategies and targets need to be in line with the motivations of individual building users and owners, and actions need to be easily integrated into daily behaviours to be effective. Changing this daily behaviour is a major challenge, requiring training and awareness activities, as well as feedback measures and incentives to trigger long-term change. Behavioural sciences are increasingly being applied to energy efficiency policies, resulting in new policy interventions that can have high impact on user behaviour.

Policy Context

As buildings account for 40% of energy consumption in the EU and more than 35% of CO₂ emissions, improving their energy performance has become a key policy aim in order to meet long-term climate and emissions targets. The 2010 Energy Performance of Buildings Directive (EPBD) has been revised in 2018, requiring member states to develop long-term strategies to support renovation of public and private buildings to be nearly zero energy buildings in 2050, with milestones for 2030 and 2040.

Meeting these goals will require a combination of new and established technologies, innovative market mechanisms and financial instruments, long-term policies and strategies, and also significant efforts to change consumer and user behaviours.

The impact of behaviour

Behavioural issues need to be considered in all aspects of the energy transition, from improving awareness of the benefits of energy efficiency and renewable energies, to making sure that technologies are easy to use, and that financial decisions can be made in a well-informed manner. The challenge is to consider how real people react to everyday decisions and situations, how they plan in the long-term, and how they therefore make investment decisions.

Whilst new technologies and materials are widely available, encouraging uptake and proper use require individuals to make choices which are in the long-term societal interest. For many, this may clash with their own (or perceived) interests, or they may simply be unaware of the options available to them.

Long-term planning and investment decisions, such as building insulation and installation of new technologies, require conscious decisions with an awareness of benefits, and available financial means. However, even once investments have been made retrofitting buildings with energy efficient technologies can sometimes trigger 'rebound effects', where lower energy bills simply encourage users to use more energy, or where cost savings are directed towards



purchasing other energy intensive goods and services. The resulting energy efficiency gap – the difference between expected and actual impact – is related to the behaviour of its users.

This is why we must consider the role of behaviour in energy efficiency, in everything from when to make investments in building renovations, to when to use and operate electrical equipment, and the settings and modes in which to use them. Behaviour change therefore includes change in both long-term direction and thought, as well as in day-to-day behaviour.

Understanding behaviour

Standard economic models and theories consider humans as rational actors, who make rational decisions by weighing up costs and benefits. However, behaviour scientists and behavioural economists have examined our decision-making processes, highlighting how the brain does not work in the logical way that many classical economists and political-scientists have assumed it to. The founder of the field of behavioural economics, Daniel Kahneman, has demonstrated that humans do not act as logical beings, instead making decisions under the influence of ‘cognitive biases’, driven by two systems of thinking:

- *System One* enables people to make fast decisions and come to conclusions. It operates automatically and quickly, with little voluntary control. This system controls much of our day-to-day behaviour and habits. It helps us to make reflexive decisions and process information without requiring deliberative thinking, often taking short cuts and relying on earlier decisions and behaviour, or habits. It is useful for tackling short term, day-to-day issues, but does not have capacity for deep thinking, or for long-term orientation and planning.
- *System Two* allocates our limited mental capacity (or attention) to *slow*, effortful mental activities, and can carefully consider information, make long-term decisions, and concentrate on complex activities. However, as it requires more work, and therefore more effort and energy, it will defer to system one whenever possible.

The way that we make decisions is influenced strongly by these two systems, particularly by system one dominance, where the brain relies on heuristics to make fast decisions. Heuristics are ‘cognitive shortcuts’ – ways in which our brains can solve problems based upon previous experiences and readily available knowledge. This allows us to make fast decisions, though not necessarily accurate or logical ones.

Heuristics are just one of a number of ‘cognitive biases’ – issues that influence our behaviour, without us being consciously aware – which also include errors of memory, limited information processing power, overconfidence, feelings and moods, and social influence. A number of these cognitive biases, which have an impact on energy efficiency behaviour, are presented in the table below.

Cognitive Biases	
Conservatism bias	Individuals do not revise their beliefs when presented with new evidence. It takes considerable thought and effort to overturn an existing belief, leading people to stick with what they know. New information is likely to



	be criticised and dismissed more than existing belief, resulting in suboptimal decisions being made, including options that can go against that individual's interest.
Present bias	Individuals will evaluate options based on immediate, rather than long-term gains, as immediate system one gratification cannot override system two long-term planning. For example, although insulating a home may lead, in the long-run, to cost savings, many people put off such an investment, preferring to use the money for more immediate gratification.
Status quo bias	Related to the conservatism bias, individuals will make the same choices as they have done previously (for example, when renewing a lease or an electricity contract), rather than shopping around for alternatives.
Bandwagon effect	System one makes the assumption that what most people do must be correct. Individuals are likely to adopt views that they hear often, especially if supported by people they like or respect.
Substitution	If individuals are faced with a question that they do not know the answer to, then the brain will often simplify it for an easier question. For example, rather than considering energy efficiency, individuals may think instead of how environmentally conscious they are, their feelings related to renewable energy may come into play, or they may consider their financial situation if they think of energy efficiency as being expensive.
Anchoring	Individuals are usually over-reliant on the first piece of information that they hear; for example, making decisions based on existing standards, even when more advanced options are available.
Blind-spot bias	Individuals underestimate how much biases influence them. One survey in the United States found that 85% of people believed themselves to be more rational and resistant to biases than the average person, a statistical impossibility.
Diversification bias	When individuals need to make several decisions at once, they will make different decisions than if they had to make these decisions spaced apart by several hours. (e.g., full building renovations requiring many choices)

Social and contextual issues

The impact of these cognitive biases on individuals can be heavily influenced by their social and contextual surroundings. As well as the 'bandwagon bias', where following others is a mental shortcut, our social and environmental situation can strengthen or weaken other biases.

For example, for individuals living with economic scarcity, making short-term decisions with immediate results will take precedent over long-term decisions, compared to those who are well off. Social status (or perceived social status) can also have a large impact, if energy efficiency is seen as socially desirable. Inhabitants in social housing meanwhile may face a social stigma that can lead to underperformance and lower effort levels and drive.



The relationship of the user to the property and technologies also has a large impact, with differences in calculations of costs and benefits. An employee in a company may view energy efficiency measures differently to a company owner, who is ultimately responsible for covering energy costs. Landlords and tenants will view energy efficiency differently; for a landlord there is seldom a cost benefit from investment, as they will not benefit from energy savings. Tenants will not invest in energy efficiency measures that add value to property that they do not own. Social housing tenants who may benefit from discounted or subsidised energy bills may view renovations and burdensome and intrusive, and of little benefit to themselves in the long-term.

Guiding Principles

If properly taken account of, these different social and economic contexts, combined with cognitive biases, can be used to formulate policies and policy-instruments that can benefit everyone. A bundle of measures are needed, however, combining both ‘carrots’ and ‘sticks’ – measures that both push and pull behavioural change – as well as an awareness of the context in which decisions are made, including provision of information and feedbacks.

Nudging involves using an understanding of behaviour in order to make it easier for people to make a specific decision, in pursuit of a policy aim. It contrasts directly with education and training, regulation and enforcement, by unconsciously steering decisions through available choice architecture, without forbidding any options or changing incentives. .. Two of Kahneman’s colleagues, Richard Thaler and Cass Sunstein, have led the way in applying behavioural economics principals to policy-making. They argue that whilst policy-makers have often sought to control behaviour via restrictions and incentives, they should also be willing to steer people towards making decisions and adopting beneficial behaviours that can meet policy goals; a principle they refer to as ‘nudging’.

Co-creation of solutions involves those who will be implicated by the outcome of an activity or action in the definition of said action. By bringing together various stakeholders and engaging them in thinking about the challenge, policies and interventions can be made with people and not for them. This helps to overcome feelings of imposition or restriction, and helps to build trust. For the policy-maker, there is the benefit that they can understand better the situation on the ground, and get feedback on ideas and implementation. Actively engaging individuals and groups requires them to use their system two, contributing also to changes in attitudes and beliefs as users are required to interact with new ideas and concepts.

Automation is becoming increasingly important in energy efficiency discussions thanks to new technologies, ICT, big data and artificial intelligence. These technologies should be used, where possible, to take decisions and manage systems, so that individuals do not have to. Energy management systems are increasingly seen as a solution for improving energy performance, being able to automate the use of energy using smart systems, internet connectivity and artificial intelligence. One of the major benefits of these technologies is that they can circumvent human behaviour, managing energy systems without the need for humans to make decisions and take actions. However, such technologies are far from widely be rolled out, and they require, in the first place, that humans take actions.



Many of these key points have been summarised in the **EAST Framework**, defined by the Behavioural Insights Team of the United Kingdom's Cabinet Office (sometimes called the 'Nudge Unit'). This approach advocates that interventions make change **E**asy, **A**tttractive, **S**ocial and **T**imely.

The EAST Framework

1) Define the outcome

Identify what behaviour you are seeking to change; how can it be measured, and how large a change is needed to make your efforts worthwhile?

2) Understand the context

Consult with those you are trying to influence, understand their viewpoints and contexts. Take account of current performance as a base rate.

3) Build your intervention

Use the EAST framework and return to the first two steps as often as needed.

- *Make it Easy:* As individuals very often go with default settings and options, make sure that these options benefit your ultimate goal. Reduce the hassle of taking up a new service or option (less bureaucracy, multiple ways to apply) so that less effort is required to make change. Simplify messages and use them consistently to get through; break large targets and goals into smaller, simpler actions.
- *Make it Attractive:* Use personalised messaging and striking images to gain attention; make it exciting and non-technical to encourage engagement. Design rewards and sanctions for incentivising change.
- *Make it Social:* Highlight the good behaviour of others and show the benefits that come from it. People react when they believe that other people are acting. Use networks for peer-to-peer learning, and use network leaders and influencers to drive change. Encourage people to make commitments to others and make public declarations and goals.
- *Make it Timely:* Prompt people to make change at times when they are most receptive – for example, prompting energy behaviour change in energy bills. Use policy interventions to alter the immediate costs and benefits of actions to overcoming the present bias. Provide tools to help people plan change, identify barriers and solutions, and keep track of their progress.

4) Test, learn, adapt

Implement the intervention and use randomised control groups to check impact, adapt as required to improve performance.

Source: EAST – Four simple ways to apply behavioural insights (2014)



Policy interventions for behavioural change

- **Energy Audits**

As a starting point, audits establish energy usage as it stands, and can be used to identify energy and cost-saving options, highlighting improvements that can be made. It has been widely determined that energy audits are a vital first step in long-term behaviour change, but that they do not directly trigger such change. Instead, energy audits are vital for understanding the beginning position of an energy system, and can be used to determine where problems lie and what needs to be changed. To this end, whilst not a direct behaviour change tool, they can be used to determine strategies and long-term targets, around which to plan and implement interventions. Energy audits should be ongoing, not just a one-off activity, to keep ahead of plans that may be off-track and to monitor any emerging problems that may arise. The cost and technical complexity of full energy audits may not be possible for smaller interventions, but are cost-effective at scale.



GOOD PRACTICE: Sustainability Observatory

The sustainability observatory is a web-based platform for monitoring the performance of municipal electrical equipment, including buildings, transport fleets and street lights in the six municipalities around the city of Porto, under the Energaia energy agency. The platform can be accessed by technicians from municipalities, and provides real-time consumption monitoring, of 5,500 buildings, 4,000 street lights and more than 1,000 municipal vehicles. The observatory helps the municipalities to manage their energy bills for these equipment, producing reports and alerts for monitoring performance to highlight where change is needed. The observatory has resulted in annual savings of EUR 30,000 in municipal energy invoices by reducing the number of energy contracts, and EUR 180,000 from identified energy conservation measures.

[For more information, visit the project website.](#)

- **Feedback measures**

Feedback measures involve communicating energy consumption to energy users in order to trigger a change in behaviour. This can involve direct feedback (consistent, ongoing feedback), or indirect feedback (aggregated information); though a mixture of both has been shown to be the best way of all to influence consumer behaviour.



GOOD PRACTICE: Energy Janitors in the City of Lille

The City of Lille is aiming to reduce its greenhouse gas emissions by 40% by 2030, having signed up to the Covenant of Mayors in 2017. The city identified public buildings as a key area of intervention and is aiming to change the behaviour of their users. The Energy Janitor scheme appoints one individual in each public building to act as a link with the city's energy department. The Energy Janitor is trained in his duty and then monitors the performance of the building, posting annual summaries of energy performance and improvements from one year to the next, and promotes energy efficiency actions with labelling, meetings, trainings and public events. The Energy Janitor is also responsible for reporting major problems to the city's energy department, and directly implementing small actions. The scheme has reduced heating bills by 14%, electricity bills by 4% and water bills by 29%, with a total saving of around EUR 90,000 per year.

[For more information, visit the project website.](#)

Consumers need to be provided with adequate framing and anchors to know if their energy consumption is excessive; left to their own devices, consumers may not know that their usage needs to change, or that they could be saving money from introducing even small measures. Direct feedback can be provided by smart meters, but also by web-based platforms and mobile apps, whilst indirect feedback usually comes in the form of usage reports, as part of monthly or quarterly bills. Both methods of feedback are especially effective when they provide comparisons with others, for example, comparing with the average household in the user's neighbours.

Feedback is an essential element in effective learning and change reinforcement, and users are most open to committing to change when they have just received feedback, and they can be encouraged then to set their own targets (co-creation) for reducing their energy bills. Introducing an element of competition could then be especially effective, with rewards for those who do best.

Opower Home Energy Report

The American energy company, Opower, provides its customers with a monthly Home Energy Report, which provides an overview of energy usage, as well as comparisons with



the performance of neighbours. Household performance is rated in terms such as 'Great', 'Good', 'More than average' (whilst avoiding negative language for poor performers) to provide social appraisals to performance. Additionally, the reports provide feedback on activities that could help to bring down energy usage. The reports have helped households to reduce their energy by around 3%.

[More details](#)

- **Training and awareness raising**

Awareness raising and trainings are essential tools for changing behaviour; the introduction of new information and ways of thinking takes time, as well as feedback and reinforcement, to cause long-term reorientation towards new actions, which can become habits.



GOOD PRACTICE: School Carbon Reduction Programme

Durham County Council (UK) has implemented a programme for reducing carbon emissions from schools, which were responsible for 54% of CO₂ emissions from public buildings and had energy bills of over EUR 7 million per year. The programme allowed schools to access their gas, electricity and water data from an online portal, to monitor usage, and each school got support from a team of educational specialists, which provided educational sessions for pupils, teachers and other staff. The programme, costing EUR 115,000 per year, covers 240 schools and has saved 13,000 tonnes of CO₂ and EUR 3.05 million.

[For more information, visit the project website.](#)

Implementing energy efficiency measures requires people to engage and to gain new awareness and new skills. Such interventions should begin with those who are best placed to make change, but also those who are best placed to influence others. Trainings can cause long-term re-orientation towards new ideas, and 'de-bias' individuals, giving them new cognitive resources and to make decisions, thus causing long-term reorientation and creating new habits. As trainings can be intensive and expensive, they will not be able to reach all target audiences, but training an individual to take the lead in a community is a good start.

However, long-term awareness raising efforts – which should be both interactive and engaging – and campaigns are also needed for reaching the broader population. These campaigns can



use a variety of measures to make change including videos, group discussions, information campaigns, games, personalised (one-on-one) engagement and demonstrations.

- **Choice Architecture**

Every day we make choices, and these choices are subliminally steered by choice architecture, that is, how information is presented to us. Knowing that people often revert to the mean, or simply follow what others before have done, we need to think more about how choices are presented to the user to help to ensure the desired outcome is reached. This involves being careful to not use negative language, keeping choices simple, and being aware of how they are anchored. Choice architecture should make decisions as easy and hassle-free as possible, guiding people towards energy efficient decisions.

- **Defaults:** When making a decision, people often stick to the default provided, as it requires the minimum effort. Energy companies can be encouraged to make it automatic for new customers to opt-in to sustainable energy, or to receive information on their energy consumption. Technologies can be pre-installed with default settings. Users still have the choice of how they act, but the choice architecture provided to them makes it more likely that they will choose the efficient option.
- **Reduce choices:** People like to be able to choose, but if they are faced with hundreds of options they can face decision fatigue. It is better to give just a handful of options, and people are more likely to engage.
- **Framing:** This relates to how information is displayed and can and the context in which people are asked to make decisions. For example, saying 45% of residents have committed to the cause already, rather than 55% of people remain to sign up, anchors a high number (45%), suggesting that lots of people are signing up and the figure will rise. The second option instead suggests that most people are resisting the option.
- **Labelling:** Making information striking and immediately available helps individuals to make effective decisions, without having to engage too much thought.

Energy Efficiency Labelling

The EU has a long-established system for labelling the energy performance of products, enabling consumers to make easy and informed choices about purchasing efficient goods. The system establishes a minimum performance level that technologies must reach, but then rates all products above that minimum from A+++ to G. From 2021 onwards, the system will be re-scaled, so that an A+++ rating will become a B, leaving space at the upper end of the scale for more efficient technologies as they emerge.

[More details](#)

- **Incentives and prohibitions**

Incentives and prohibitions are well known for promoting investment in new technologies, and play a role in behaviour change. For the most part, this is linked to providing subsidies, bonuses and awards (sometimes from competitions). One innovative example which has been put



forward is that of participatory budgeting, wherein energy users in public buildings make a deal with energy providers, and if they are able to reduce their energy use, they get something back. Banning the use of certain technologies, can, of course be incredibly effective at changing behaviour; but must be well trailed and positive language should be used, as has been the case with energy inefficient lightbulbs. For the most part, prohibitions and punishments should be avoided, as they can prove to be counterproductive, as they can be demotivating and raise resistance amongst the target audience. The topic of financial incentives will be explored in a future policy brief.

- **Community initiatives**

Community initiatives are noted as being especially effective as behaviour change tools as they can involve groups of people who already know each other and can encourage commitments and build trust. Community initiatives encourage monitoring and feedback within the group, with an aspect of competition. Group efforts can encourage individuals to not let the side down by failing to implement actions where they have made a commitment to the group. Outside of group activities, community initiatives can involve public pledges to make energy savings, which are harder to break than private pledges, due to social pressures.



GOOD PRACTICE: 'Positive Energy Families' Challenge

The 'Positive Energy Families' Challenge is a competition that encourages teams of families, colleagues and friends to save energy through everyday actions. Each team aims to make an 8% improvement in energy efficiency, with an average saving of 200 Euros per year. Each team gains guidance from a facilitator, appoints a captain to keep track of efforts, and gets a guide of 100 'eco-gestures', monitoring equipment and access to an online platform to monitor consumption. The practice highlights that motivation can be kept up in a group with existing bonds. In 2015, more than 8,000 teams participated, making savings of 12%, and around half of participants committed themselves to investments in their properties.

[For more information, visit the project website.](#)



GOOD PRACTICE: The Big Switch Off

The Big Switch Off campaign is an initiative by Durham County Council, active since 2012, to implement energy savings measures in council buildings, by engaging building users. It has directly impacted upon 18,000 staff members, and indirectly impacted thousands of other users. Durham estimated that it could make a 5-10% saving by switching off unused lights and computers and reducing gas consumption for one hour per day. Staff were trained in each building, and competition was introduced to see which building could make the most savings over a set period. Within 12 months, energy use had fallen by 17%.

[For more information, visit the project website.](#)

Online Discussion on behaviour change

The Policy Learning Platform arranged an online discussion with thirteen partners from the CLEAN, EMPOWER, ENERSELVES, FINERPOL, LOCARBO, MOLOC, REBUS, and ZEROCO2 projects on 5 December 2018 to discuss the challenges of behaviour change. The discussion was also joined by European Academy of Bolzano, a participant in the Horizon 2020 SINFONIA smart cities project.

The participating partners emphasised the importance of benchmarking and monitoring of energy usage to trigger change, though they noted that the impact of feedback measures is context dependent and that excessive feedback can be demotivating for some users. The discussion also highlighted that getting funding for energy efficiency campaigns can be difficult, but that it can be secured if the business case is proven and the economic case is made. Where financing is not available, low-cost interventions can be made with a minimum of human resource usage; that is, appointing an individual to lead voluntary efforts. Finally, the discussion went onto the topic of community initiatives, and highlighted a number of successful community initiatives from around Europe.

A full write-up, the presentation slides, and other reference materials, can be found at the [website of the Policy Learning Platform.](#)



Recommendations

- Measuring energy use and giving frequent feedback are essential for supporting behaviour change. The nature and frequency of feedback are highly dependent on the users, but should remain positive, without being overly detailed or overwhelming. Monthly reports for private households (Opower), continuous feedback for energy managers (Sustainability Observatory) and infrequent feedback for public building users (Energy Janitors) have proven to be successful in the case studies provided;
- Nudging, co-creation and automation should be used as far as possible to make behaviour change easy, and to avoid resistance;
- For co-creation, put together an engagement forum to bring stakeholders together, discuss the issue and find common solutions;
- The EAST framework provides a clear and easy to follow methodology for preparing behaviour change measures and should be used by public authorities when devising new interventions. The monitoring and feedback steps are vital for continuously improving the intervention;
- Interventions should use a mixture of measures from the available options, mixing training, awareness raising, optimised choice architecture and community action;
- Identify leaders and trusted individuals in a community to be the first engaged in energy efficiency activities; others can then be reached via these frontrunners who can act as community examples, as in the Energy Janitors practice;
- As in the Big Switch Off and Positive Energy Families, use competition, community actions and public commitments to secure long-term buy-in to activities;
- Avoid negative language and prohibitions as far as possible; people can be highly resistant to such negative actions. Use positive feedback as much as possible, making comparisons with what others are doing to make the benefits of action clear.

Sources, further information

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