Chapter 3
Using behavioural insights to increase energy conservation and energy efficiency

This chapter analyses the behavioural interventions that have been implemented in the realm of energy policy, highlighting the behavioural biases they tackle and the behavioural levers they build upon. Behavioural interventions in this area have aimed at reducing energy consumption (e.g. providing feedback to consumers), increasing investment in energy efficiency (e.g. framing in a clear and salient way information related to energy efficiency), and encouraging the use of energy from renewable sources (e.g. leveraging green defaults).

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.
The majority of applications reviewed in this report are in the realm of energy policy. Indeed, some of the long-standing puzzles in this policy area, such as the low uptake of energy efficient appliances or investments in thermal insulation, can be explained by analysing the behavioural biases driving them. At the same time, some of the current priorities in this policy area (e.g. energy efficiency improvement) require behaviourally motivated policy solutions since their attainment fundamentally rests on behavioural change.

In the energy realm, three types of behaviour are prone to behavioural biases (see Reader’s Guide for definitions of all technical terms):

- **Energy consumption**, both at home and at work, is based on routine, automatic behaviour rather than on deliberate choices. Energy is an auxiliary good, necessary to consume the services provided by domestic appliances, electronics, etc. Being a routine behaviour, it is strongly dependent on automatic processes.

- On the other hand, deciding to **invest in energy efficiency improvements** (e.g. energy efficient appliances, building insulation), is infrequent for households. Being a rare event, it involves a different decision-making process, in which complex trade-offs between attributes of durable goods are made.

- **Switching energy contract or provider** is another example of effortful choice that is prone to inertia. It requires searching for an alternative deal that better matches one’s preferences, and then taking all the required steps to successfully subscribe to it. This is an issue that concerns energy regulators at large, but the focus of this report is on the decision-making process underlying the shift from contracts based on conventional energy sources (e.g. fossil fuels) to contracts based on renewable energy sources.

**Promoting energy conservation**

Associating specific energy consumption figures to the use of electric appliances or energy-powered services can be complex for consumers. This is due to the fact that energy bills generally present aggregate information (e.g. on the total amount of power consumed throughout a billing period) with a monthly frequency. With conventional energy meters, consumption information is conveyed to consumers with a delay rather than in real time. Infrequent and limited feedback provision prevents users from having a clear picture of the amount of energy required to power a given appliance, as well as of the cost of such an energy service. This issue ultimately leads consumers to optimise their energy consumption given incomplete information. Besides this market failure however, energy consumption choices are also affected by specific behavioural biases:

- **Status-quo bias**: while individual thermostats allow users to adjust heating parameters whenever and as often as they wish, individuals tend to neglect this flexibility and rather stick with the default setting, or adjust it sporadically.

- **Attitude-behaviour gap**: even when considering themselves environmentally concerned, individuals face difficulties adapting their daily behaviour to match their beliefs and preferences. Commitment mechanisms can help, by setting goals for energy conservation and providing regular, timely feedback regarding the advancement towards them. Goals can function as references, thus prompting reference-dependent individuals to overcome their inertia.

- **Framing**: thermostat controls and energy meters are not always designed in an accessible, intuitive way. Furthermore, they are often placed in remote areas of the house, making energy consumption patterns quasi-invisible. Smart thermostats and
smart meters\textsuperscript{1} paired with real-time in-home displays can increase the salience and accessibility of information about energy consumption and costs.

Awareness of these biases, related to \textit{bounded rationality} and \textit{bounded willpower}, can help design policy interventions to tackle them and foster energy conservation. Furthermore, there is evidence that behavioural interventions leveraging \textit{bounded self-interest} can also drive energy savings. Since individuals, affected by social norms and comparisons, care about their relative performance with respect to their peers, providing feedback on energy consumption relative to comparable households in the same neighbourhood has proven to be an effective nudge towards energy conservation (Allcott, 2011).

A project that illustrates the potential of behavioural insights applications to encourage energy conservation was developed between 2007 and 2011 by the British Office of Gas and Electricity Markets (OFGEM). Involving a number of behavioural levers, ranging from feedback mechanisms to changes to the physical environment and target setting paired with commitment devices, it is an apt opening for this chapter. After providing an overview of this multifaceted set of behavioural interventions, the rest of the chapter zooms in on the most successful ones. The OFGEM-led Energy Demand Research Project included a set of behavioural interventions aimed at studying consumers’ response to improved information about their energy consumption. This initiative was undertaken to inform the UK Government’s proposed roll-out of smart meters.

The interventions involved over 61,000 households and were delivered by four different energy utilities (AECOM, 2011). The treatments evaluated, individually or in combination, were:

- energy efficiency advice;
- historic energy consumption information (such as comparison of energy consumption with earlier periods);
- benchmarking of the customer’s consumption against the consumption of comparable households;
- customer engagement using targets (commitment to reduce consumption);
- smart electricity and gas meters;
- real-time display (RTD) devices that show energy use (including audible usage reduction alarms);
- control of heating and hot water integrated with RTDs;
- financial incentives (including variable tariffs) to either reduce consumption or shift energy use from periods of peak demand to periods of lower demand;
- other digital media for delivering information (web, TV) (AECOM, 2011).

The most successful treatment in reducing energy consumption was found to be the deployment of smart meters coupled with the installation of real-time information displays. In fact, with two exceptions (real-time displays and benchmarking against comparable households’ consumption – both leading to energy savings of about 1%), interventions excluding the use of smart meters did not entail any significant energy savings. One of the reasons why smart meters may have delivered important energy savings in this context is that they provide actual feedback on historic consumption, thus enabling consumer learning in the longer run. Furthermore, precise information from smart meters allows energy utilities to bill consumers on the basis of actual consumption rather than estimates.
The project also showed that coupling behavioural levers leads to larger impacts. This is important, even though only separately testing individual behavioural levers allows disentangling their specific impact. For instance, complementing a smart meter with a real-time display is important, and yields energy savings that are 2-4% higher than in the absence of the real-time display. The positive impact related to bundling smart meters and real-time displays may be due to the fact that RTDs make energy consumption more salient, frequent and accurate than meters alone.

While this project provides a good sense of the range of behavioural insights that can inform energy conservation policy, the next sections zoom in on some of these insights, which have been tested in other geographical contexts and through a variety of design choices.

**Feedback provision channels: real-time options**

The OFGEM project has showcased the potential of feedback mechanisms for energy savings. In a study commissioned by the Norwegian Water Resources and Energy Directorate (Ministry of Petroleum and Energy), research and advisory firm VaasaETT reviewed findings from a broad range of electricity consumption feedback programmes rolled out in Europe and beyond, for a total of over 90 samples and 30 thousand energy consumers (Norwegian Water Resources and Energy Directorate, 2014).

The review zoomed on the relative effectiveness of such feedback programmes, developed using a variety of feedback channels: real-time, in-home displays (RTDs), informative bills and leaflets, web portals, and mobile applications. It also discussed the extent to which responsiveness to feedback varies across households, and the benefits of automating certain metering functions to deliver higher energy savings. Two of the key take-homes were:

- **Effectiveness of feedback channels:** While all feedback mechanisms have positive impacts on energy conservation, RTDs appear to be the most effective channel. It is important to consider the specificity of each channel prior to choosing one for roll-out, and opting for multiple mechanisms may be the most sensible approach. As mobile applications are a relatively recent feedback mechanism, evidence on their impact is currently insufficient and requires further experimentation.

- **Long-term impact of feedback:** the largest yearly energy savings are delivered by interventions with longer time horizons. In fact, differences in the duration of interventions can explain about 50% of the variation in their impact on energy conservation.

The advantage of performing such a broad-based review is that it allows to draw more general recommendations, on the basis of interventions that have proven to be effective across different geographical, cultural and market contexts. At the same time, the report provides an estimate of potential benefits of extending similar feedback programmes to Norway. It also outlines advantages and disadvantages of each mechanism and suggests how to adapt their roll-out to the Norwegian market.2

Alongside smart meters, **smart heating** solutions are emerging in order to promote energy conservation. New generation heating controls allow consumers to turn on/off the heating remotely via a smartphone app, and some models automate heating schedules and set-point temperatures through smart learning algorithms. The Behavioural Insights Team is currently evaluating the impact of smart heating controls on household gas consumption in the UK winter heating context, collaborating with a leading heating control manufacturer and a large energy supplier on a two-phase research project. Full results of this ongoing study will be published in 2017 (Behavioural Insights Team, 2016).
**Feedback provision via clearer energy bills**

The understanding that consumers have of their energy bills is crucial in allowing them to plan and implement energy-saving actions. For this reason, the Chilean Superintendence of Electricity and Gas (Superintendencia de Electricidad y Combustibles) and the national agency for consumer protection (Servicio Nacional del Consumidor, SERNAC), together with the innovation hub Laboratorio de Gobierno, are planning a major reshaping of the content and layout of household energy bills.

The project started out diagnosing that electricity bills containing unclear or complex expressions do not allow consumers to understand the procedures and the charges associated with energy services. This was followed by a prototyping stage where new bills were designed building upon consumers’ feedback. The key changes involved making important information more salient, reducing information overload by synthesising facts in a clear way using simpler terms, and eliminating redundant points. The final prototype for new energy bills is currently being tested through a pilot programme.

**In-person guidance and information provision**

In co-operation with the Behavioural Insights Team, the UK Department of Energy and Climate Change (DECC) used a randomised controlled trial to test the impact of advice and information provision on household energy consumption (for a more detailed description of the study, see Annex 3.A1). More specifically, the field experiment aimed at testing whether providing households with in-person advice on how to use their thermostat via a trusted messenger (in this case, boiler engineers) led to increased energy savings relatively to written information provision or no intervention (Department of Energy and Climate Change, 2014a).

Thermostat use poses various challenges to consumers, including unintuitive design, difficult to read displays, poorly positioned buttons and controls and overall lack of effective guidance information. This may lead heating users to misuse their heating controls, or to entirely give up their use. This suboptimal thermostat use may lead some particularly vulnerable households to extreme situations such as fuel poverty. This field experiment, rolled out between October 2013 and March 2014, targeted households living in social housing, which were assumed to be particularly prone to these critical situations.

The experiment did not lead to any statistically significant findings; neither guidance nor information provision on thermostat use appeared to generate significant energy savings. Despite no statistical difference in energy use, qualitative analysis following the trial did find that households receiving the treatment reported feeling in more control of their heating versus the control group. Ultimately, given the prevalence of under-heating in social housing dwellings (Department of Energy and Climate Change, 2014a), the impact of the interventions may rather have enabled treated households to live in higher thermal comfort. Testing the same interventions in households prone to higher energy consumption would be informative in order to assess whether they have the potential to deliver energy savings in over-heated dwellings.

These results prevented DECC from extending these interventions to a wider set of British households. Associating qualitative analysis to the quantitative assessment of the intervention’s results has enabled DECC to grasp the drivers of energy consumption in this specific subset of the population. This highlights the importance of employing both quantitative and qualitative data collection methods.
Leveraging social comparison to conserve energy in the office environment

While all of the aforementioned interventions tackle household energy consumption, behavioural insights can also inform interventions targeting energy consumption behaviour in office buildings.

The Government of the Western Cape Province in South Africa aims at curbing energy consumption in office buildings. Since employees are subject to different incentives regarding home and office energy use, ad-hoc behavioural solutions are needed to prompt employees to perform energy savings at work. Several behavioural interventions are being run in office buildings:

• Simply framed information provision via monitors connected to smart meters (on each floor) and via e-mail (reminders and tips).
• Inter-floor competition: leveraging social comparison and status, this intervention pushes for competition among teams of employees working on different floors.
• Identify “champions of energy efficiency” on each office building floor, to act as persons of reference.

While the results of this pilot project are still to be assessed, it is apparent that ongoing interventions on energy conservation at home and in the office differ in behavioural motivations and levers. The former involve simplified energy bills (Chile) and smart thermostat solutions (United Kingdom) and leverage framing and feedback provision, the latter leverage social norms and comparisons as well as framing effects.

Encouraging investment in energy efficiency

Infrequent and limited feedback on energy consumption complicates the understanding of energy requirements to power electric appliances and to heat buildings. This, together with the complexity of an ever-evolving supply of appliances and building insulation options, makes it hard for consumers to understand to what extent their energy expenses could be reduced by investing in energy efficiency.

Given such market features, the significant amount of time and effort required to estimate their long-term financial and environmental benefits can discourage households from investing in energy efficiency improvements (e.g. insulation and retrofit for residential housing). Performing such effortful calculations requires overcoming the status-quo bias driven by:

• Information overload associated with search costs and effort: making an investment requires sifting the market for e.g. building insulation for the best deal, which entails search costs. Furthermore, a particularly competitive market, providing a wealth of alternative options to consumers, may actually overwhelm them with an unmanageable quantity of information.
• Perception of sunk costs: even though the infrastructure in place – be it roof insulation or incandescent light bulbs – is obsolete and improving its energy efficiency would deliver benefits both in terms of comfort and in terms of financial savings, individuals may still feel that getting rid of functioning assets is a waste, in spite of their cost being sunk.

Investment in energy efficiency improvements is a good example of a decision-making process carrying intertemporal consequences. On the one hand, it requires short-term costs, both in terms of upfront expenditures and overcoming non-monetised barriers
It is difficult for consumers to understand the long-term benefits that could be reaped if they invested in energy efficiency. Their substantial discounting of future benefits entails that energy efficiency investments are considered as unattractive. This phenomenon is due to impatient consumers’ limited willpower, which manifests itself through myopic preferences. This kind of short-sightedness complicates the comparison of the short-term costs of energy efficiency investments with their long-term benefits.

Energy efficiency labels can guide consumers towards more energy efficient purchases. *Framing* energy efficiency attributes in a more salient way, making them visible and clear, is an effective way to ensure that they are not left unconsidered at the moment of purchase. Translating figures on expected energy consumption associated with e.g. a certain class of domestic appliances to estimates of monetary costs of operating them can make the benefits of investing in energy efficiency more conspicuous.

**Framing cost information to encourage uptake of energy efficient electric appliances**

Comparing the short-term purchase costs of energy efficient domestic appliances with the expected long-term savings in energy bills is complex for consumers. If the financial cost of the energy needed to power a certain appliance is not transparent per se, the cumulative costs of operating the appliance throughout its lifetime (lifetime energy cost) are even more complex to calculate.

Introducing information on appliances’ lifetime energy costs alongside their standard price tag and energy efficiency label is a way to allow consumers to work out this calculation and compare expected savings across different appliances. With the support of the Behavioural Insights Team, the UK Department of Energy and Climate Change tested the impact of adding estimates of lifetime energy costs to the EU energy label for electric appliances on consumer purchases (for a more detailed description of the study, see Annex 3.A2). The intervention was tested with a field experiment rolled out between September 2013 and April 2014 in a retail chain.

This randomised controlled trial showed that purchases of energy efficient electric appliances can be incentivised by making the energy expenditures incurred throughout the expected lifetime of the appliance more salient. However, this outcome was statistically significant only for high-consumption appliances, such as washer-dryers. For this category of white goods, products sold at treated stores had average expected yearly energy consumption 0.7% lower than products sold at control stores. The consumption differences between high and low energy efficiency washer-dryer models was particularly wide; opting for the more energy efficient ones provided a large potential for savings (Department of Energy and Climate Change, 2014b).

In 2015, the Swiss Federal Office of Energy commissioned an online field experiment to test a similar kind of label including monetary information on the lifetime operating costs of electric appliances, such as tumble-dryers, vacuum cleaners, freezers and televisions (Schubert and Stadelmann, 2016 – for a more detailed description of the study, see Annex 3.A3). More specifically, this “new” label not only displayed information on
the annual electricity costs implied by a given appliance, but also on the relative savings or extra costs for lifetime energy consumption compared with the average appliance in the same class. This framing leveraged loss aversion.

The experiment, carried out on an online retail platform, consisted in exposing consumers alternatively to the “new” label or to the standard EU energy label. The impact of both labels was compared to a pre-experiment baseline situation in which no energy efficiency information was provided to consumers. Consumers who eventually purchased a good on the online retail platform were invited to respond to a questionnaire aimed at understanding the drivers of their purchase decisions.

Overall, these two labels were found to have similar effectiveness in reducing the average annual electricity consumption associated with purchased tumble dryers, leading to an 8-9.6% reduction with respect to the baseline, with the highest reduction being associated with the display of the new labels. On the other hand, neither label influenced the mean annual electricity consumption of purchased freezers.

The label displaying monetary and lifetime costs, however, was less effective than the EU energy label for goods with low annual energy costs such as vacuum cleaners, with the former driving a 4.5% reduction as opposed to a 10.2% reduction associated with the latter. The authors of the study offer two explanations for this result. First, 59% of questionnaire respondents stated that the EU energy label was more comprehensible than the new label, mainly because it was already well-known and looked more familiar. Second, labels displaying lifetime costs may lead consumers to neglect the potential for energy savings from the use of goods with relatively low energy consumption, such as vacuum cleaners. Ultimately, while such labels seem to be more promising in incentivising the purchase of more energy-intensive appliances such as tumble dryers, their potential may be more limited when it comes to less energy-intensive ones, such as vacuum cleaners.

Jointly with the Ministry of Energy, the behavioural insights team at the Israeli Ministry of Environmental Protection is currently testing alternative energy efficiency labels for domestic appliances building upon the same behavioural insights. The before/after intervention is implemented through a price comparison website. This allows testing whether and to what extent alternative energy efficiency labels drive consumers to purchase more energy efficient refrigerators. The labels differ in the way information on energy efficiency and running costs is framed: information on energy costs over ten years, savings relative to least efficient fridge, or pay-back time of investment in high-efficiency refrigerators.

Framing energy efficiency information to encourage uptake of energy efficient electric appliances

In the context of the impact assessment and revision of its Energy Efficiency directive, the European Commission ordered a cross-country study to assess how various label designs affect consumer understanding and purchase decisions (London Economics and IPSOS, 2014 – for a more detailed description of the study, see Annex 3.A4).

Developed in 2014, the study was based both on a stated choice experiment (carried out on a simulated online platform) and on a field experiment involving respectively over 5000 and 500 consumers in 9 European countries (Czech Republic, France, Italy, Norway, Poland, Portugal, Romania, Slovenia and United Kingdom). It showed that labels with alphabetic scales were generally more intuitive and thus better understood by consumers than labels with numeric scales, and were ultimately more effective, leading to more choices of energy efficient products.
Furthermore, the experiment showed that such intuitive and effective label design is more important to inform consumers who are generally inattentive to energy consumption than energy-conscious ones. In fact, energy-conscious consumers are aware of energy efficiency indicators, understand them easily and take them into account in their choices, regardless of label designs. In contrast, improving the intuitiveness of label design (e.g. basing energy efficiency indicators on letters rather than numeric scales) can significantly increase the awareness of consumers who would not necessarily consider energy efficiency in their appliance purchases and drive them towards more energy efficient choices.

Online shopping behaviour is different from its traditional retail counterpart in a number of dimensions. First, switching between retailers is essentially immediate and costless. Second, because of the wealth of options available, consumers tend to simplify their decision-making process using a two-step approach: the comparison tools offered by most retail websites allow consumers to narrow down their pool of considered alternatives to a manageable number, comparing goods along the same criteria. Once this is done, choosing the best option among the shortlisted ones is relatively easier. Finally, on online retail platforms, room for information provision is relatively limited in comparison with traditional shopping outlets.

Because of these differences, designing energy efficiency labels for the online purchase environment could help consumers to choose more energy efficient appliances. In 2014, the Consumers, Health, Agriculture and Food Executive Agency (CHAFEA) followed up on the previous study and, on behalf of the European Commission, ordered an impact assessment of a range of new label designs (ECORYS, Tilburg University and GfK, 2014 – see also Annex 3.A5). It was rolled out in 10 EU countries (France, Germany, Greece, Ireland, Italy, the Netherlands, Poland, Portugal, Romania and Sweden), involving over 11 700 consumers.

Using a stated choice experiment carried out on a simulated online platform, the study assessed the relative effectiveness of various label designs in inducing consumers to choose more energy efficient appliances (washing machines, refrigerators, televisions and lightbulbs). At the same time, the experiment aimed at understanding when it is best to expose consumers to energy labels. More specifically, it tested whether label exposure led consumers to more energy efficient purchases: a) when they were browsing the retailer’s website to select a subset of products matching their needs (set formation stage) or b) when the good to purchase was selected from the relevant subset of products (final choice stage).

Participants were exposed either to the first or to the second experiment. Within each experiment, four different labels were tested: i) a label indicating only the energy efficiency class of a good (e.g. “A”); ii) a label additionally indicating the class indicator and its meaning (e.g. “energy efficiency A’’); iii) a label including a frame of reference (e.g. “A B C D E F G” rather than just “A” to represent a product with energy efficiency class A) and iv) a pictogram label, conveying both the meaning of energy efficiency and the complete scale of energy efficiency classes (labels are pictured in Annex 3.A5). These were “simplified” labels, smaller and more concise than the more detailed EU energy label for household appliances normally shown in physical stores. To enable comparisons of the influence of simplified labels on individual behaviour with the influence of the EU energy label, a group of participants was also exposed to the latter at the final choice stage. Control groups in the two experiments were defined as follows: in the experiment looking at the set formation stage, the control group was exposed to no information on energy efficiency; in the experiment dealing with the final choice stage, the control group was exposed to non-prominent information on energy efficiency (e.g. the energy efficiency class was written in the same font as other product attributes).
In both experiments, all proposed simplified labels were found to lead to a higher consideration of more energy efficient products than the information provided to the control groups. Among simplified labels, the best performing one was label (iii), i.e. the one including a frame of reference. At the set formation stage, label (iii) led to the most efficient product being selected on average 61% of the time as opposed to 51% of the time in the control group. At the final choice stage, the margin was lower: the most efficient product was selected 68% of the time when label (iii) was shown as opposed to 65% of the time in the control group. In that experiment, all four simplified labels outperformed the standard EU energy label normally shown in physical stores. Ultimately, the findings of the study suggest that simplifying energy efficiency information on product labels presented online – especially in the early stage of the choice-making process – can lead to more energy efficient purchases.

**Framing the costs and benefits of household retrofit to increase their salience**

In conjunction with Plymouth University, the Behavioural Insights Team recently completed a randomised controlled trial aimed at encouraging investment in residential building insulation using thermal imaging (Behavioural Insights Team, 2016). Thermal images allow visualising the flow of heat, spotting heat loss due to drafts. In an attempt to raise awareness of the benefits of insulation, the city council of Plymouth, UK, sent three different types of letters to residents of the municipality, announcing public grants for households interested in retrofitting their homes. The first type of letter showed a thermal image of an uninsulated home, with salient heat loss; the second type of letter showed, side by side, an insulated and an uninsulated home. The control group instead received a plain, text-only letter informing them of grant possibilities. The objective of thermal images was to make the cost of poor building insulation clearly visible, thus prompting the uptake of grants to invest in insulation. However, the redesigned letters including thermal images led to fewer letter recipients inquiring about grant possibilities relative to the control group. This may be due to recipients considering thermal images irrelevant for their case (e.g. possibly because they portrayed a similar building rather than precisely their own home), or not understanding them properly.

While this study aimed at increasing the salience of the costs due to missing insulation (through telling thermal images of leaking heat), increasing the salience of potential benefits connected to retrofitting buildings can also help consumers. Enhancing energy efficiency labelling or certificates for buildings can be a way to increase the salience of expected benefits (e.g. providing estimates of expected energy savings) and to outline specific actions needed to reap them (e.g. loft insulation, double glazing).

In this respect, the Social and Behavioural Sciences Team nested within the White House has paired with the US Department of Energy in order to design and assess the impact of the Home Energy Score. The score assesses residential buildings’ energy efficiency profiles and provides recommendations for improving them in order to reap energy savings (Social and Behavioral Sciences Team, 2016). This project is still ongoing; hence, the impact of this specific intervention has not yet been empirically assessed.

**Leveraging social norms and inertia to encourage the uptake of building insulation**

Behavioural insights can inform environmental policy design by motivating tweaks to conventional instruments such as financial incentive schemes. For example, leveraging social norms, policy makers can design group financial incentives that are increasing in the number of group members making a certain target investment (e.g. the uptake of building insulation). Another example of behaviourally motivated variation of standard subsidies
relies on easing or removing the non-financial burdens preventing the target investment (e.g. lack of time, perceived hassle and disruption), rather than solely subsidising the latter. The Behavioural Insights Team (BIT) has tested similar behavioural tweaks to financial incentives in order to encourage investment in building insulation in residential housing.

In autumn 2011, the BIT investigated the impact of social norms on the uptake of insulation for housing. Recognising that people tend to adopt the behaviour of others and align with others’ opinions and judgements, this policy intervention leveraged the importance that social networks have in the adoption of green behaviours and in the uptake of environmentally sustainable investment.

More specifically, social norms were exploited by proposing group incentives to insulation purchasers, in the form of discounts that increased with the number of consumers opting in. Instead of engaging consumers individually, this incentive scheme built upon the sense of community through which environmentally friendly (or unfriendly) behaviours can spread. The more community members participated in the scheme, the higher the discount each investor obtained on their purchase.

The effectiveness of this intervention was tested with a randomised controlled trial in two different British towns (Greater London area) with the co-operation of a home improvement retailer: in the treated area, households purchasing insulation were offered the group incentive scheme, while no incentives were offered in the control area.

The intervention did not result in any significant effect of group incentives on insulation uptake. For this reason, the extension of this type of discount to a broader set of eligible British households was not pursued. This result prompted the BIT to study the impact of outstanding hurdles to the uptake of insulation even in the presence of financial incentives. One such barrier is that installing thermal insulation in buildings requires effortful preparatory tasks, e.g. loft clearance in the case of loft insulation. The cost associated with the required immediate effort may seem disproportionate relative to the expected future benefits of energy savings and lower bills. This kind of investment is constrained by inertia and resistance to change on the one hand, and by myopia due to high discounting of future benefits on the other.

The UK Department of Energy and Climate Change, together with the Behavioural Insights Team, ran a randomised controlled trial in spring 2012 to assess the impact of a “hassle removal” package offering subsidised loft clearance alongside insulation (see also Annex 3.A6). The objective of the package was to nudge investment in household retrofit and insulation improvement. This randomised controlled trial tested whether proposing packages including loft clearance and insulation (either at full cost or at a discount) would increase the installation of loft insulation with respect to offers mentioning insulation only.

While there was some indication that reducing the hassle factor increased the uptake of loft insulation (particularly at a discount), it was not possible to conclude with certainty because overall participation in the trial was low (Department of Energy and Climate Change, 2013). This did not allow a disentangling of the different barriers to uptake (e.g. physical limitations with the property, motivation of the household…).

Understanding consumers’ perception of energy efficiency labels

A 2016 study commissioned by the Swiss Federal Office of Energy analysed consumers’ information search behaviour in the context of product choice (e.g. purchase of electric appliances – for a more detailed description of the study, see Annex 3.A7). Through a set of three stated choice experiments and a lab eye-tracking experiment, the study aimed at
understanding the extent to which consumers dwelled on energy efficiency and energy consumption information provided on product labels, and what their understanding of these indicators was (Wächter, Sütterlin and Siegrist, 2015a, 2015b, 2016). When asked to pick the appliance with the lowest energy consumption, consumers often tended to base their decision solely on the energy efficiency rating (e.g. between A+++ and D in EU energy labels), without comparing the actual information on energy consumption provided in the label.

Consumers are thus prone to what the authors of the study call the “energy efficiency fallacy”, that is, they are prone to infer the amount of energy required to power appliances from their energy efficiency rating. This phenomenon is, at least to some extent, a consequence of the relative salience and higher consumer awareness of the letter-based energy efficiency rating as compared with information on actual energy consumption. Hence, consumers use the former indicator as a heuristic for the latter. This can be misleading as energy efficiency ratings are relative indicators, whereas information on energy consumption allows getting a sense of the actual energy requirements of an appliance in absolute terms. Ultimately, by considering solely the energy efficiency rating, consumers may end up purchasing appliances which are very energy efficient with respect to other goods in their class (e.g. televisions with the same screen size), yet energy intensive in absolute terms (e.g. televisions with smaller screen sizes).

**Encouraging the use of energy from renewable sources**

The behavioural phenomenon of inertia is apparent in the choice of energy contracts. Because searching for alternative contracts (or providers altogether) is burdensome, consumers tend to adhere to the default option provided by energy retailers. If the policy objective is to increase the uptake of electricity contracts based on renewable energy, this default bias can be addressed by making such contracts the default choice. At the moment of contract choice, consumers should be signalled whether and to what extent these contracts entail higher costs than their counterparts based on electricity from fossil fuels or nuclear energy.

Through an incentivised laboratory experiment, a study financed by the Swiss Federal Office of Energy analysed the effects of such changes in default options, whereby electricity retailers offer renewable energy via default contracts (Ghesla, forthcoming – for a more detailed description, see Annex 3.A8). In a lab setting, participants were exposed to three treatments: the baseline one, where they actively chose the proportion of renewable and conventional energy within their electricity contract, and two different default contracts, based either entirely on conventional energy or on renewable energy (respectively, “grey” and “green” defaults). Nonetheless, even when they were proposed a default contract, participants could choose to create their own energy mix instead, indicating their desired proportion of renewable and conventional electricity. This “contract change”, however, required additional effort. Alternative scenarios were modelled: while conventional electricity was always cheaper than renewable electricity, the latter could be associated with a low (CHF 0.01 to CHF 0.03 per kWh) or high (between CHF 0.04 and CHF 0.2 per kWh) price premium with respect to the former.

When the renewable energy price premium was low, the study showed that green defaults led participants to choose significantly more renewable electricity than in the active choice and grey default situations. For example, with a price premium of CHF 0.01 per kWh, the mean share of green electricity in contracts reached 86% under a green default, 67% under active choice and 71% under a grey default. As shifting away from a default situation entailed effort, consumers tended to stick with the default contract.
whenever they assessed the benefit of shifting was lower than the cost of doing so. In this kind of price scenario, green defaults seem to induce a higher consumption of renewable energy than the one seemingly desired by consumers. Conversely, if the price premium associated with renewable electricity was high, there was no statistically significant difference between the mean share of renewable energy driven by active choice and by green default contracts, while grey defaults, intuitively, led to a significantly lower demand for green electricity than active choice. Thus, in this price scenario, the outcome of the green default option matched that of active choice. It seems that energy regulators should induce consumers to actively choose the energy mix that best suits them, removing where needed the market barriers that oust this. The final outcome of consumer choice of electricity contracts, however, depends on their energy literacy of consumers and on their ability to navigate the power market.

While changes to default options can be one way to promote the adoption of renewable energy sources, another ongoing project financed by the Swiss Federal Office of Energy considers the impact of social norms in increasing the uptake of renewables by both households and firms. More specifically, it compares the impact of alternative policy measures – traditional market-based tools (e.g. subsidies), communication/marketing campaigns and behaviourally motivated social marketing campaigns leveraging peer effects – on the probability of investing in solar energy installations. As this project is ongoing, it has not yet undergone empirical assessment.

Conclusion on energy conservation and energy efficiency

A fundamental reason behind the wealth of behavioural interventions on energy efficiency and consumption is that it is relatively straightforward to measure their outcomes. For example, the success of an intervention aimed at curbing household energy consumption can be assessed through the change in consumption of electricity (in kWh) before and after the intervention, comparing a treatment with a control group. As will be discussed in the following chapters, effective and intuitive indicators are not necessarily as easily available when it comes to, inter alia, waste reduction or transport mode change.

In terms of the design of interventions on energy, the main trend observed is towards increasing the salience of energy consumption and efficiency indicators, mainly through better designed energy efficiency labels (leveraging simplification and framing of information) but also through smart meters and thermostats (changes to the physical environment). Providing feedback, changing default options and benchmarking energy consumption against peers – thus exploiting social norms and comparisons – are also popular interventions. The main methodologies behind behaviourally tested applications in this policy area are field experiments (13 applications) followed by stated preference studies (3) and lab experiments (2). Two behaviourally informed applications are also presented.

Evidence from completed interventions should be interpreted bearing in mind the specific context in which the various experiments were carried out. However, some general policy-relevant results could be pointed out.

Energy efficiency labels do seem to induce consumers to purchase more energy efficient appliances. However, not all types of labels do so, and design choices are crucial for ensuring that a label’s meaning is well understood by consumers. This result has motivated the European Commission’s proposed revision of energy efficiency labels, put forward in summer 2015 (European Commission, 2015). At the same time, the European Commission has been exploring possibilities to enrich energy efficiency labels with
information on other aspects of product environmental footprint, such as e.g. carbon emissions (Annex 3.A9 describes a behavioural intervention implemented to test two variants of such environmental footprint labels).

There is evidence that consumers are prey to the so-called “energy efficiency fallacy”, whereby they use information on an appliance’s energy efficiency rating as heuristic for its energy consumption. This can be misleading as energy efficiency ratings are relative indicators, whereas information on energy consumption provides an estimate of an appliance’s energy requirements in absolute terms. Ultimately, by considering solely the energy efficiency rating, consumers may end up purchasing appliances which are very energy efficient with respect to other goods in their class, yet energy intensive in absolute terms (Wächter et al., 2016).

Complementing energy efficiency labels with estimates of lifetime running costs of appliance use can further help consumers in turning their choice towards more energy efficient white goods (Department of Energy and Climate Change, 2014b; Schubert and Stadelmann, 2016). However, while both studies reviewed in this chapter have shown promising results of such labels for electric appliances with high energy consumption (e.g. washer-dryers), there is evidence that they provide insufficient incentives when it comes to purchasing less energy-intensive appliances such as vacuum cleaners (Schubert and Stadelmann, 2016). While the usefulness of adding estimates of lifetime running costs to energy labels has also been demonstrated in scientific research (Kallbekken et al., 2013), to the best of our knowledge it has not yet prompted policy action in this direction (cf. Chapter 4 for fuel efficiency labels).

Incentives for investment in measures to increase energy efficiency (e.g. by installing home insulation) building upon social norms and “hassle removal” did not prove to have statistically significant results in the British context. Similarly, providing guidance and information on thermostat use did not yield statistically significant impacts (Department of Energy and Climate Change, 2013, 2014a). Two lessons can be drawn from these findings. First, it is worth repeating that conclusions from pilot programmes carried out in very specific contexts cannot necessarily be generalised. Second, non-statistically significant results can impact policy-making too. Testing interventions prior to mainstreaming new policies to the entire population has prevented the British government from incurring sizeable public expenditures for measures which have not proven to be effective. Preceding policy implementation with this kind of ex-ante assessment can ensure public spending is directed to impactful interventions.

Providing feedback on energy consumption via smart meters drives energy savings across households (AECOM, 2011). It is important to pair smart meters with visible devices, such as real-time information displays, in order to make energy consumption patterns salient.

There is limited evidence on the impact of changes in defaults on consumers’ choice of electricity contracts differing in the energy mix they propose (i.e. share of renewable and conventional energy). The findings of Ghesla (forthcoming) suggest that the outcomes of green defaults – as opposed to active choice of the energy mix – very much depend on the relative prices of conventional and renewable energy. It would be useful to further investigate the impact of green defaults on consumer choices of energy contracts, using larger and more representative samples of individuals.
Annex 3.A1

Guidance, information provision and energy savings – UK

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<th>Behavioural intervention</th>
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<td><strong>Environmental policy objective</strong></td>
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<td><strong>Behavioural issue</strong></td>
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<td><strong>Behavioural lever</strong></td>
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Evaluation of the intervention: methodology

**Relevant population:** Social housing tenants in Newcastle.

**Sample size and sampling method(s):** 1556 households, sampled among Newcastle social housing tenants.

**Method:** field experiment designed as a parallel randomised controlled trial: testing of the interventions occurs in parallel.

The experiment tested a change in default policy: rather than providing only a routine check on boilers, boiler engineers started providing guidance and/or information on thermostat use to the households they visited.

The sample was divided into three groups:

- **Advice treatment:** boiler engineers provide advice on efficient boiler usage (312 households),
- **Information treatment:** boiler engineers leave an information leaflet (570 households),
- **Control:** boiler engineers visit the household for the standard check but provide no guidance/information (674 households).

Treatment was randomly assigned in two ways: engineers were randomly assigned to their specific duties (perform boiler check and provide advice/information leaflet/no intervention) and households were randomly assigned to the engineers who were to perform their boiler check.

**Units of measurement:** Percentage change in individual household gas consumption (before/after the intervention).
Findings

None of the interventions had a significant effect on energy use.

Thus, the trial did not provide evidence supportive of guidance and information provision as effective tools for reducing gas consumption in social housing. However, follow-up qualitative interviews provided evidence that interventions led tenants to reach higher thermal comfort in their homes.

Source


Annex 3.A2

Perception of cost savings related to the use of energy efficient white goods
– UK

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<tr>
<th>Context</th>
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<tbody>
<tr>
<td><strong>Who?</strong></td>
<td>Department of Energy and Climate Change (DECC) in partnership with the Behavioural Insights team and the retail chain John Lewis.</td>
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<tr>
<td><strong>Where?</strong></td>
<td>Several locations, UK</td>
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<tr>
<td><strong>When?</strong></td>
<td>September 2013 – June 2014</td>
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<tr>
<td><strong>Why?</strong></td>
<td>To analyse the impact of different types of energy efficiency labelling on purchases of energy efficient appliances. More specifically, the intervention tested a variation of the EU energy efficiency label by including in it information on lifetime electricity costs of electric appliances.</td>
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<th>Behavioural intervention</th>
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<td><strong>Environmental policy objective</strong></td>
<td>Promote private investment in more efficient technologies</td>
</tr>
<tr>
<td><strong>Behavioural issue</strong></td>
<td>Attitude-behaviour gap; status-quo bias; myopic preferences. A relatively small number of purchases of energy efficient appliances underline a discrepancy between consumers’ stated intentions to reduce expenditures on energy and their behaviour at the moment of purchase, where energy efficiency is only one among various product attributes under scrutiny.</td>
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<tr>
<td><strong>Behavioural lever</strong></td>
<td>Simplification and framing of information</td>
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Evaluation of the intervention: methodology

**Relevant population:** Customers of John Lewis retail shops for home appliances throughout the UK.

**Sample size and sampling method(s):**

The sample consisted of customers of 38 stores of John Lewis.

The sample was stratified by store location: town-centre and out-of-town stores. This segmentation choice was made as the two types of stores target different groups of consumers.

**Method:** field experiment, designed as cluster parallel randomised controlled trial.

This means that randomisation was clustered at store level rather than at the individual consumer level.

Stores were randomised into:

- Treatment group: 19 stores, where white goods information tags reported lifetime electricity costs on top of EU energy label.
- Control group: 19 stores, where white goods were only tagged with the standard product information and EU energy label.
The experiment involved four types of appliances: washing machines, washer dryers, and two types of tumble dryers (vented and condensed).

**Units of measurement:**

Percentage change in average amount of energy consumed (in kWh/year, calculations based on type-approval energy efficiency values) by the appliances sold within each product category.

**Findings**

The impact of including full lifetime electricity costs in energy efficiency labels was positive for washer-dryers: on average, products sold at treated stores had average yearly energy consumption 0.7% lower than products sold at control stores (washer-dryers sold in treated stores consumed on average 6.64kWh/year less energy than their counterparts sold in control stores). This impact was statistically significant at the 10% level (p≤0.1). No significant impact was detected for washing machines and dryers. This may be due to the important difference in running costs between low and high efficiency washer-dryers, while this difference is less marked for the other white goods analysed.

The impact seems to be more pronounced for out-of-city stores than for urban ones.

Two caveats:

- It was impossible to disentangle the impact of information on lifetime electricity costs of appliances from the impact of training staff to provide advice in interpreting labels.
- Because the experiment did not involve any in-store survey with consumers, the reasons behind certain findings (e.g. no statistically significant impact of labels including lifetime costs on purchases of washing machines and dryers) could not be pinned down with certainty.

The cost-effectiveness of this intervention was evaluated through a broad cost-benefit analysis, based on the extrapolation of the statistically significant results of the trial to sales of washer-dryers over one year to two broader scenarios: 1) all John Lewis stores in the UK and 2) all appliance stores in the UK.

First, this showed that extending the use of the new type of labels to washer-dryers throughout the whole retail chain (John Lewis) would entail costs of around GBP 1 000 (in present value terms) to design labels and train employees. The net present value of social benefits associated with the intervention would be around GBP 47 000, thanks to GBP 48 000 benefits from avoided emissions. The retail chain decided to continue the pilot with new labels, potentially adapting them to include yearly energy costs rather than lifetime energy costs to improve readability.

Second, extending the intervention to label all washer-dryers throughout all appliance shops in the UK would deliver a social NPV estimated at GBP 1.7 million throughout their lifetime. This consists of GBP 1.8 million benefits due to avoided emissions and GBP 0.1 million in costs to business.

**Source**

## Annex 3.A3

**Drivers of the purchase of energy efficient durables – Switzerland**

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<tr>
<td><strong>Behavioural lever</strong></td>
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### Evaluation of the intervention: methodology

**Relevant population:** Consumers of energy-using durable goods in Switzerland.

**Sample size and sampling method(s):** The sample consisted of the consumers who purchased the products sold on the online platform participating in the experiment between June 2015 and December 2015.

The sample size varied per type of product sold:

- Freezers: 330
- Vacuum cleaners: 865
- Tumble dryers: 128
- Televisions: 1416

**Method**

This study built on a three-fold approach.

*Part 1* of the study provided a literature review.

*Part 2* assessed whether and to what extent there is an energy efficiency gap related to energy-using durables purchased in Switzerland. This was done by matching pairs of otherwise identical products differing in energy use and purchase price, and calculating the discounted total lifetime cost of each option (based on purchase costs, energy costs and individual discount rates). An energy efficiency gap exists if the energy efficient product
is cheaper – in terms of total lifetime costs – than its less efficient counterpart, yet it is not purchased. The authors gathered data on appliances’ list prices from Swiss manufacturers’ and calculated the discounted total lifetime cost associated to a number of appliances: they found that the energy efficient product was never the most convenient option in this subset of retailer-product combinations. In contrast, when using online shop prices, they found evidence that choosing the energy efficient product was often the economically rational choice because of lower discounted total lifetime cost relative to less energy efficient counterparts.

*Part 3* used an *online field experiment* to test the impact of two types of energy efficiency labels on the purchase of energy-using durable goods. This was carried out on an online retail platform and involved goods with high variability in energy consumption and energy efficiency classes, i.e. tumble dryers, vacuum cleaners, freezers and televisions.

The labels tested in the field experiment were:

- Treatment 1: the EU energy label
- Treatment 2: monetary costs and lifetime-oriented label. This label displayed:
  - The annual electricity costs of a product on a colour-coded scale from green (low electricity costs) to red (high electricity costs). The scale gave a sense of the minimum and maximum energy expenditures for products in the same class (e.g. products with the same size/capacity).
  - A relative assessment of a product’s lifetime energy costs with the average appliance in the same class: this was expressed as a gain or a loss relative to the average.

The treatment allocation was designed as follows: starting in June 2015 and for six months, the labels associated with treatment 1 and 2 were alternatively shown for periods of four weeks alongside the product description on the partner website. Both labels were thus displayed on the website for a total of 12 weeks (3 times 4 weeks), which allows testing for seasonal effects.

Impacts were measured relative to baseline data from product sales in the 12 weeks preceding the experiment (end of March 2015 to mid-June 2015), where no information on energy efficiency or consumption was shown.

The field experiment was followed by a survey. Information on customers was gathered via online questionnaires sent to participants after their purchase. These included questions on “purchase motives, expectations on product lifetime, perception of energy labels, environmental attitudes and energy literacy” (Schubert and Stadelmann, 2016, p. 32). Customers who responded to the questionnaire were rewarded for their participation with a gift card for the online shop. A total of 469 questionnaires were received.

**Units of measurement**

- Share of energy efficient products in the purchases made during each treatment period.
- Average energy consumption of products sold during each treatment period.
Findings

Regarding the share of energy efficient products sold during each treatment period, both labels were found to lead consumers towards the purchase of a higher proportion of energy efficient vacuum cleaners, tumble dryers and freezers relatively to the baseline period. The impact on television sales could not be assessed because of a lack of data from the baseline period.

Results on the average energy consumption of purchased products were instead less homogeneous across products. Overall, the EU energy efficiency label and the monetary costs and lifetime-oriented label seemed to have similar effects on the average annual electricity consumption of tumble dryers and freezers. Tagging goods with the EU energy label drove a statistically significant reduction in the mean annual electricity consumption of tumble dryers by 8% with respect to the baseline situation, while tagging them with the monetary costs and lifetime-oriented label drove a reduction of 9.6%. The two labels were found to be equally ineffective in encouraging the sales of more energy efficient freezers.

The monetary and lifetime-oriented label, however, was shown to be less effective than the EU energy label for goods with low annual energy costs such as vacuum cleaners. For this category of goods, the EU label led to a -10.2% reduction in mean annual electricity use of purchased vacuum cleaners with respect to the baseline, whereas the figure was -4.5% when consumers were shown the new energy label.

This may be explained by looking at answers to the online questionnaire, which showed that the majority of consumers preferred the EU energy label, as they were more familiar with it. Furthermore, because the annual electricity costs of using vacuum cleaners are very low (on average 7.20 CHF), the new labels based on monetary impacts may lead consumers to neglect the potential for energy efficiency improvements from such low-consumption goods.

Note that the purchase of freezers was associated with a “volume effect”, whereby both labels led to purchases of appliances that were both more energy efficient and larger. The authors suggest that “[a]n approach to eliminate the volume-effect could be to rate products only based on their absolute electricity consumption and not on electricity consumption relative to the size of the product (as done by the EU Energy Label). For the newly designed energy label, the volume-effect might be eliminated by arranging products of all sizes on one single range of annual electricity costs” (Schubert and Stadelmann, 2016, p. 46).

Finally, the study compared the average energy consumption per category of sold products in the period in which the EU energy label was shown and in the period in which the new label was shown. The only products for which there was evidence of a statistically significant difference in the average energy consumption of sales were vacuum dryers.

Source


Annex 3.A4

Energy efficiency labelling and consumer behaviour – European Commission

<table>
<thead>
<tr>
<th>Context</th>
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<tbody>
<tr>
<td><strong>Who?</strong> Study realised by London Economics and IPSOS on behalf of the European Commission.</td>
</tr>
<tr>
<td><strong>Where?</strong> According to the phase of the project, a total of 9 European countries are involved: Czech Republic, France, Italy, Norway, Poland, Portugal, Romania, Slovenia and United Kingdom.</td>
</tr>
<tr>
<td><strong>When?</strong> 2014</td>
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<tr>
<td><strong>Why?</strong> The intervention investigated the impact of alternative energy label designs on consumer understanding and the choice of home appliances.</td>
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<tr>
<th>Environmental policy objective</th>
<th>Promote private investment in more efficient technologies</th>
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<td><strong>Behavioural issue</strong></td>
<td>Attitude-behaviour gap; status-quo bias; myopic preferences. A relatively small number of purchases of energy efficient appliances underline a discrepancy between consumers’ stated intentions to reduce expenditures on energy and their behaviour at the moment of purchase, where energy efficiency is only one among various product attributes under scrutiny.</td>
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<tr>
<td><strong>Behavioural lever</strong></td>
<td>Simplification and framing of information</td>
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Evaluation of the intervention: methodology

**Relevant population:** Consumers from the Czech Republic, France, Italy, Norway, Poland, Portugal, Romania, Slovenia and the United Kingdom.

**Sample size and sampling method(s)**

- *Online stated choice experiment:* 5012 respondents (about 1000 each from France, Italy and the United Kingdom; about 500 each from the Czech Republic, Norway, Poland and Romania).
- *Field experiment:* 500 respondents (125 each from the Czech Republic, France, Slovenia and Portugal). Participants were recruited both in-store and on the street.

**Method:** The study comprised a literature review and the aforementioned two experiments.

The literature review collected information about consumer responses to and understanding of various energy labelling schemes.

The experimental work aimed at assessing the impact of different energy label designs on consumption choices and on consumers’ understanding of the provided information. It was carried out in two phases:

- An incentivised *stated choice experiment* in a simulated online environment. Participants in this experiment were rewarded with higher payoffs the more energy efficient products they picked.
- A *field experiment* in retail stores.
Stated choice experiment

The products involved in this experiment were televisions, washing machines and light bulbs.

The tested labels were:

a. closed alphabetic scale (A to G scale) – this was the baseline treatment;
b. closed numeric scale (30 to 100);
c. open numeric scale (0 to 110, with grey bars for energy efficiency of past and future technologies, respectively indicated with scores lower than 30 and higher than 100);
d. closed numeric scale with a benchmark marker showing current best available technology;
e. closed reversed numeric scale (7 to 1).

Exposure to labels was randomised.

Participants were exposed either to a choice experiment (eliciting their favourite option between two products differing in energy efficiency and other attributes) or to a bidding experiment (eliciting their willingness to pay for more energy efficient products).

Field experiment

The tested labels were:

a. an A+++ to D label;
b. an A to G label;
c. a numeric label with ratings for possible future technologies shown in grey;
d. a reverse numeric label (9 to 3).

Participants were asked to consider making two hypothetical purchase choices: one regarding televisions and one regarding washing machines. Exposure to labels was randomised. Following the choice statement, participants were surveyed in order to assess their understanding of labels and preferences regarding energy efficiency.

Units of measurement

Impact of labels on product choice:

• Proportion of respondents that chose the most energy efficient appliance among the proposed ones.
• Share of participants willing to pay a premium for the more energy efficient product across the different energy label framings.
• Bids placed for products of various energy efficiency levels.

Impact of labels on understanding:

• Share of participants that could correctly identify the most energy efficient product when faced with different energy label framings, with and without prior explanation of label specificities.
• Share of participants that could correctly identify the meaning of specific features of different energy label framings.
Findings

Summarising the findings of both experiments, the authors pinned down a number of elements related to consumer choice when exposed to different energy efficiency labels, as well as to consumer understanding of the labels themselves.

Most importantly, they found evidence that letter-based scales outperformed numerical scales in terms of consumer understanding. The understanding of the A+++ to D scale and of the A to G scale was relatively similar. This translated into letter-based scales leading to higher proportions of consumers opting for energy efficient products with respect to numeric scales. When it came to product choice, the A to G scale seemed to perform better than the A+++ to D scale.

Source

Annex 3.A5

Energy efficiency labelling for online retail – European Commission

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<td><strong>Behavioural issue</strong></td>
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<td><strong>Behavioural lever</strong></td>
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**Evaluation of the intervention: methodology**

**Relevant population:** Internet users in France, Germany, Greece, Ireland, Italy, the Netherlands, Poland, Portugal, Romania, and Sweden.

**Sample size and sampling method(s):** The study was conducted online among 11,764 consumers in 10 countries. Countries were selected so as to have a balanced picture of EU member states in terms of internet access, as well as in terms of other characteristics which may affect purchases of durables, such as economic growth rates.

Participants were chosen from GfK’s online panels, ensuring nationally representative samples of active internet users.

**Method:** Stated choice experiment in a simulated online environment testing the effectiveness of four designs of the energy efficiency label. The experiment was followed by a questionnaire surveying experiment participants about their background (socio-demographics, purchasing behaviour) and investigating possible sources of variation in responses to energy efficiency information.

Participants went through the simulation of a shopping trip in an online retail environment selling four different appliances (refrigerators, televisions, washing machines, light bulbs) and were randomly assigned to one of the following two experiments:
• **Consideration experiment**: participants were asked to form a consideration set out of several product alternatives.
  - **Treatments**: the four labels pictured in Figure 3.A5.1.
  - **Control**: no information on energy efficiency.

• **Choice experiment**: participants were asked to make a final product decision out of a restricted set of product alternatives.
  - **Treatments**: the four labels pictured in Figure 3.A5.1; the full EU energy label.
  - **Control**: non-prominent information on energy efficiency, written in the same font as other product attributes.

Figure 3.A5.1. **Reduced label variants tested in the study**

<table>
<thead>
<tr>
<th>Label 1: Class-only label</th>
<th>Label 2: Meaning</th>
<th>Label 3: Frame of reference (FoR)</th>
<th>Label 4: Meaning + FoR</th>
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<tbody>
<tr>
<td>![Label 1]</td>
<td>![Label 2]</td>
<td>![Label 3]</td>
<td>![Label 4]</td>
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*Note:* “Energy” is written in the language of the specific country.


Within each experiment, the study used a between-subject design, in that energy information shown to participants was varied between subjects.

**Units of measurement**

Multiple criteria were used to assess the relative effectiveness of different label designs in prompting the consideration/choice of energy efficient goods, e.g.:

- Average energy efficiency level of goods selected in the consideration experiment/ of the good chosen in the choice experiment;
- Probability that the most energy efficient good is selected in the consideration experiment/chosen in the choice experiment.

**Findings**

- In both experiments, all proposed simplified labels were found to lead to a higher consideration of more energy efficient products than the information provided to the control groups.
- Among simplified labels, the best performing one – all goods considered together – was label 3, which included a frame of reference.
- Consideration experiment: label 3 led to the most efficient product being included in the consideration set on average 61% of the times as opposed to 51% of the times in the control group (exposed to no information). Label 4 was found
to be the least effective in increasing consideration of more energy efficient products, but still delivered better results than the no information scenario. These results are largely consistent across product categories and across countries (label 3 is the best option in 6 out of 10 countries and is the second-best option in the remaining 4).

- Choice experiment: label 3 led to the most efficient product being selected 68% of the time as opposed to 65% of the time in the control group (exposed to non-prominent information). While differences in impacts among labels were smaller at this stage, all four simplified labels outperformed the standard EU energy label normally shown in physical stores.

Source

Annex 3.46

Reducing the “hassle factor” – UK

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**Evaluation of the intervention: methodology**

**Relevant population:** Residents of individual houses without loft insulation in the South London area.

**Sample size and sampling method(s):** 72,480 households, resident in three boroughs in the South London area (Merton, Sutton, Kingston).

The sample was designed to ensure that only appropriate offer-recipient households would be targeted, e.g. excluding areas with a high proportion of flats or rented accommodation or households eligible for free loft insulation schemes.

First, statistical areas were randomly assigned to each of the treatment and control groups. Next, a screening was performed, comparing the profiles of selected statistical areas across groups, in order to ensure treated and control households are similar.

**Method:** field experiment, designed as a between-group randomised controlled trial.

Loft clearing is viewed as a hassle preventing consumers from undergoing loft insulation. Proposing a bundle including loft clearing in conjunction with loft insulation aims at removing the hassle factor associated with the latter (i.e. clearing out one’s loft prior to the insulation works) and thus encouraging energy efficiency investment.
This intervention was based on a change in the default policy: instead of promoting loft insulation by itself, it promoted a bundle including loft clearance and loft insulation services.

72,480 households were contacted by mail with leaflets reporting three different kinds of offers:

- Merton: loft insulation and loft clearance at a cost of GBP 369.
- Sutton: loft insulation and loft clearance at a cost of GBP 450.
- Kingston (control group): standard loft insulation package at a cost of GBP 179.

Interested households were required to contact home improvement retailer B&Q. Follow-up interviews/questionnaires were conducted with households which eventually completed the loft clearance and insulation installation process and with households that did not complete the installation in spite of showing initial interest for it.

**Units of measurement:** Percentage of households taking up loft insulation following subsidised loft clearance.

**Findings**

Following the dispatch of the 72,480 leaflets:

- 36 households (0.05%) showed interest in the offer and received audits: very low response to leaflets to perform robust analysis of the differences across groups.
- 28 households (0.04%) installed loft insulation: of these, 25 were in treated groups (Merton and Sutton).

The number of households investing in insulation was too small to perform empirical analysis.

**Source**

Annex 3.A7

Individual behaviour in purchasing electric appliances: the energy efficiency fallacy – Switzerland

Detection of an energy efficiency fallacy

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Evaluation of the intervention: methodology

**Relevant population:** Potential buyers of home appliances in Switzerland.

**Sample size and sampling method(s):** $n = 166$, selected from an online panel of 300 individuals.

Respondents participated in three experiments related to energy issues.

**Method:** Online stated choice experiment with between-subjects design.

Different energy labels for a television with a screen size of 47 inches were designed, yielding four experimental conditions:

a. television with high energy efficiency (A) and high energy consumption (118/kWh/year, based on daily use of 4 hours),

b. television with high energy efficiency (A) and low energy consumption (72/kWh/year),

c. television with low energy efficiency (B) and high energy consumption (118/kWh/year),

d. television with low energy efficiency (B) and low energy consumption (72/kWh/year).
Participants were then randomly assigned to one of these four experimental conditions. After seeing a picture of a television with one such label, they had to indicate the rating of electricity consumption associated with the appliance (between a numerical scale from 0, very low, to 100, very high).

**Units of measurement:** indication of estimated energy consumption of a given appliance, on a scale from 0 to 100.

**Findings**

Within the same level of energy consumption (e.g. high or low consumption indicated in the label), participants always estimated lower electricity consumption for A-rated than for B-rated goods. This effect was shown to be statistically significant. As put by the authors, “This means people judged the electricity consumption of a television based on the efficiency class despite differences in actual electricity consumption (kWh). Thus, a television with a good efficiency rating (i.e. A) is automatically associated with low energy consumption, and a television with a worse efficiency rating (i.e. B) is perceived as a product that consumes a lot of energy. This effect will henceforth be termed the energy efficiency fallacy.” (Wächter, Sütterlin and Siegrist, 2015a, p. 197)

**Source**


The energy efficiency fallacy in a comparative setting

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**Why?** This online stated choice experiment was part of a broader behavioural study which investigated consumers’ information search behaviour in the context of energy consumption, zooming on the influence that energy-related information has on product choice and energy consumption. The experiment investigated whether the energy efficiency fallacy emerges in contexts where consumers are exposed to two products at the same time, therefore having the possibility to compare them and their energy labels.

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Evaluation of the intervention: methodology

**Relevant population:** Potential buyers of home appliances in Switzerland.

**Sample size and sampling method(s):** n = 305. Participants were recruited from an online panel of 330 users provided by a market research institute. They received a small incentive for their participation (about EUR 2.5).

**Method:** stated choice experiment with between-subjects design.

All participants were exposed to the same tasks and questions; the only variation was the order with which the products were portrayed in the tasks, which was randomised.

Consumers were shown the descriptions of a couple of products belonging to the same class, side by side: first two televisions, then two freezers.

The product descriptions contained information which is routinely present on in-store labels: energy labels and technical specifications (e.g. display technology for televisions, volume for freezers).

The two televisions and the two freezers differed in their energy efficiency class, in size and in annual electricity consumption: the larger television/freezer was characterised by a high energy efficiency rating and high annual energy consumption, whereas the small counterpart for both products was characterised by a lower energy efficiency rating and more modest annual energy consumption.

Participants were asked to pick one of the two televisions/freezers as if they had to recommend it to a highly energy-conscious person. The choice decision was not framed as choice for personal use in order to prevent participants from choosing a product on the basis of personal preferences regarding technical specificities other than energy efficiency (e.g. screen size for televisions).

**Units of measurement:** Share of participants recommending a given appliance.
Findings

As table 3.A7.1 shows, 45% of participants recommended the television with high annual electricity consumption. When it came to freezers, the high annual energy consumption appliance was recommended by 73% of participants. The authors explain these results as follows:

“Results suggest that a majority of the participants based their decision on the energy efficiency information. The difference in the percentages for the TV and freezer tasks might be due to the different emotional attachment to these products. A television fulfills various functions (e.g. status symbol, symbol of affinity for technology of its owner) in addition to its actual purpose (i.e. transmitting moving images) whereas a freezer keeps its actual purpose as a cooling unit. People might spend more time on and evaluate more information for a product they are emotionally attached to, which can explain the higher number of correct answers in the television task”. (Wächter, Sütterlin and Siegrist, 2015a, p. 198)

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<th>High annual electricity consumption, high energy efficiency</th>
<th>Low annual electricity consumption, low energy efficiency</th>
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<tr>
<td>Television</td>
<td>45%</td>
<td>55%</td>
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<td>Freezer</td>
<td>73%</td>
<td>27%</td>
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*Source:* adapted from (Wächter, Sütterlin and Siegrist, 2015a).

Source


Confusing appliances’ energy efficiency ratings and energy consumption

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**Evaluation of the intervention: methodology**

**Relevant population:** Potential buyers of home appliances in Switzerland.

**Sample size and sampling method(s):** n = 166, selected from an online panel of 300 individuals.

Respondents participated in three experiments related to energy issues.

**Method:** online stated choice experiment.

Participants were randomly assigned to the control group or to one of two experimental treatments.

Participants of all groups were simultaneously shown pictures of a freezer and a fridge, with their corresponding energy efficiency labels.

In the control group, the two products virtually had the same level of annual energy consumption and the same energy efficiency rating.

In the treatment groups, the energy efficiency rating and annual energy consumption of the refrigerator shown in the labels was the same under both treatments. When it came to the freezer, however, while annual energy consumption was the same under both treatments and always higher than that of the refrigerator, the energy efficiency rating varied as follows:

- **Treatment (a):** freezer and refrigerator had the same energy efficiency rating.
- **Treatment (b):** the freezer’s energy efficiency rating was lower than that of the refrigerator.

**Units of measurement:** indication of estimated energy consumption prompted by the question “How much electricity does the freezer consume compared to the refrigerator?”
Participants had to indicate their answer on a scale from 0 (the freezer consumes much less than the refrigerator) to 100 (the freezer consumes much more than the refrigerator), where 50 indicated equal consumption for the two appliances.

Findings

As explained by the authors, “Hypothesizing that the energy efficiency class determines how the electricity consumption of a freezer in relation to a refrigerator is perceived, the following results were expected: The electricity consumption in condition (a) (high efficiency) should be rated lower compared with condition (b) (low efficiency) as we expected the participants to mainly consider the energy efficiency class for their estimation. Thus, in condition (a), the estimate of the electricity consumption of the freezer relative to the fridge should approach the level of the refrigerator.” (Wächter, Sütterlin and Siegrist, 2015a, p. 199)

Participants estimated the freezer’s energy consumption to be substantially higher than the refrigerator’s under treatment (b) than under treatment (a), even though in both treatment conditions the freezer’s label reported an annual energy consumption of 201 kWh/year. More specifically, under treatment (b) the estimated energy consumption of the freezer relative to the refrigerator was 77 (on a scale from 0 to 100, as indicated above), whereas this figure was 67.2 under treatment (a). This difference was statistically significant (p = 0.02).

The authors explain this stating that “the energy efficiency fallacy might distort the perceived electricity consumption (i.e. energy friendliness) of a product category that generally consumes an excessive amount of energy. This finding strengthens the hypothesis that the energy efficiency class is used as the basis for judgments, although participants could have compared the information on actual electricity consumption (kWh/year)” (Wächter, Sütterlin and Siegrist, 2015a, p. 200).

The fallacy led participants to think that the freezer consumed as much as the refrigerator just because they both had a high energy efficiency rating, ignoring information on annual electricity consumption.

Source


Understanding consumer perception of energy labels with eye-tracking

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Evaluation of the intervention: methodology

**Relevant population:** Potential buyers of home appliances in German-speaking areas of Switzerland.

**Sample size and sampling method(s):** n = 117, the subsample of eligible individuals who agreed to participate starting from a random sample of 500 German-speaking households to whom an invitation letter was sent. Individuals under 20 and over 65 years old, as well as those wearing glasses or hard contact lenses, or suffering from eye diseases were excluded due to technical requirements of eye-tracking machinery.

Participants received a small sum of money as an incentive to take part in the experiment.

**Method:** lab (eye-tracking) experiment with between-subject design.

Two sets of products were shown to participants in randomised sequence: freezers and televisions.

Participants had to pick a product out of four options being given information on, *inter alia*, their price, energy efficiency, volume (freezers), screen size (televisions). The menu of options was representative of what could be on sale in an online shop. The product whose label was indicating the highest level of energy efficiency was not necessarily the one with the lowest annual energy consumption.

Participants were randomly exposed to one of four experimental conditions:

1. choosing a product for oneself, with information in a table format (without energy labels);
2. choosing a product for oneself, with information in a table format and the corresponding energy labels;
3. choosing a product for a person who would want to save energy, with information in a table format (without energy labels); and
4. choosing a product for a person who would want to save energy, with information in a table format and the corresponding energy labels.
The eye tracker monitored fixation over the various “areas of interest” present in the material presented to participants. Fixation, which is measured when the eye remains still for a given period of time, indicates underlying cognitive processes and attention to a given element.

**Units of measurement**

The following parameters related to fixation were monitored:

- Dwell time or gaze duration.
- Number of fixations.
- Mean fixation duration: fixation time divided by the fixation count.

**Findings**

The experiment showed that exposing participants to the energy label increased their focus on energy-related information (energy consumption and energy efficiency rating), especially in conditions 4, where participants were to pay special attention to energy savings. Energy efficiency ratings appeared to be processed by participants in a shorter time if reported through labels. However, that was the case only when choosing among televisions; not when choosing among freezers. Furthermore, in spite of increased focus, labels did not appear to necessarily increase energy-friendly choices.

Ultimately, the findings are rather mixed, as in the authors’ words “[t]he study’s results partially support the EU’s mandatory policy, showing that the energy label triggers attention toward energy information in general. However, the energy label’s effect on consumers’ actual product choices seems to be rather low. The study’s results show that the currently used presentation format on the label is insufficient. The findings suggest that it does not facilitate the integration of energy-related information. Furthermore, the current format can attract consumers to focus more on energy-efficiency information, leading them to disregard information about actual energy consumption. As a result, the final energy consumption may increase because excellent ratings on energy efficiency (e.g. A++) do not automatically imply little consumption” (Wächter, Sütterlin and Siegrist, 2015b, p. 1).

**Source**


Annex 3.A8

Defaults in green electricity markets – Switzerland

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Evaluation of the intervention: methodology

**Relevant population:** Households in Switzerland.

**Sample size and sampling method(s):** n = 161. All participants were university students, largely undergraduate; therefore the majority of them had no experience with the choice of electricity contracts.

**Method:** lab experiment.

Participants were given a fixed budget and had to choose their preferred electricity mix for a given amount of kWh, between green and conventional electricity. While conventional electricity was always cheaper than green electricity, the price of the latter changed across five choice scenarios, according to the renewable source used to generate it (e.g. hydro or solar power), in order to mimic real world prices.

More specifically, the five choice situations differed in the price premium that green electricity bore relative to conventional electricity: a premium of CHF 0.01, CHF 0.03, CHF 0.1, CHF 0.15 or CHF 0.2 per kWh of green electricity.

Participants were randomly allocated to one of three treatments:

1. **Active choice:** participants actively selected their preferred mix of green/conventional electricity.
2. **Green electricity default:** participants received green electricity as their default power supply. In this treatment condition, participants could either stick to the default option, or opt out of it and choose their preferred energy mix.
3. Grey electricity default: participants received conventional (“grey”) electricity as their default power supply. On top of this and of the normal budget, they received additional budget to replace conventional electricity with green electricity. Again, participants could either stick to the default option, or opt out of it and choose their preferred energy mix.

When exposed to green or grey defaults, participants could move away from the default option by choosing another energy mix between five alternative contract options:

- **Alternatives to grey default option**: 10% green electricity, 40% green electricity, 60% green electricity, 90% green electricity and 100% green electricity.
- **Alternatives to green default option**: 0% green electricity, 10% green electricity, 40% green electricity, 60% green electricity and 90% green electricity.

In both cases, shifting away from the default option required going through different effortful reporting tasks.

Choosing 100% green electricity depleted the whole budget (which varied with the price of renewable energy to allow for this freedom), while choosing a portion of conventional electricity allowed participants to keep a part of it. Participants faced a trade-off between opting for more expensive green energy, contributing to a public good (the reduction in harmful emissions), and cheaper conventional energy, which on the other hand gave them a monetary payoff.

**Units of measurement**

- Percentage of participants opting for 100% green electricity.
- Mean share of green electricity in electricity contracts.

**Findings**

When the price premium for green electricity was **low** (up to CHF 0.03 per kWh), green defaults led participants to choose significantly more green electricity than in the active choice and grey default situations. For example, with a price premium of CHF 0.01 per kWh, the mean share of green electricity in contracts reached 86% under a green default, 67% under active choice and 71% under a grey default.

This signals a mismatch between consumer preferences in the active choice and green default case. This is explained by the fact that consumers find that opting out of the green default requires too high a cost – in terms of effort – relatively to the benefit of having an electricity contract closer to their preferences. Thus, as the author puts it, they “overreact” to the green default by keeping more often the contract with the 100% green energy mix. Conversely, the difference in the share of renewable energy between the active choice and grey default case was not statistically significant.

When the price premium for renewable energy was **higher** (between 0.04 and 0.2 CHF per kWh), there was no statistically significant difference between the mean share of green electricity in contracts allowing active choice and those with the green default option. Under that renewable energy price scenario, consumer preferences for green electricity under active choice were matched with those under the green default scenario. It is thus important to offer consumers the opportunity to modulate their energy mix flexibly, as done in this experiment. This choice possibility seems to be preferred to contracts based on an entirely green or entirely grey energy mix.
Source

Annex 3.A9

Environmental footprint labelling and consumer behaviour – European Commission

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Evaluation of the intervention: methodology

**Relevant population:** Households in 9 European countries (UK, France, Germany, Italy, Norway, Poland, Romania, Spain, Estonia).

**Sample size and sampling method(s):** 6409 participants (United Kingdom: 884 participants; France: 925; Germany: 926; Italy: 898; Norway: 525; Poland: 508; Romania: 502; Spain: 737; Estonia: 504).

“The data from the experiment was weighted back to the known profile of the population in each market (by age, gender and work status) to ensure the findings were nationally representative.” (Ipsos MORI, London Economics and AEA, 2012, p. 89).

**Method:**

The study was developed in three phases: it consisted of: i) a review of existing studies; ii) qualitative discussion groups with consumers to elicit initial reactions to alternative designs of environmental footprint labels; and iii) two behavioural experiments (a bidding experiment and a stated choice experiment, both carried out on an online platform) and a survey.

The experiments aimed at testing how environmental footprint labels could impact consumer preferences and willingness to pay for three categories of products (washing machines, televisions and light bulbs) differing in their environmental footprint. Two
alternative designs for environmental footprint labels were tested, to be added alongside energy efficiency labels:

- **Proposed Energy and Environmental Label**: this design added four environmental lifecycle indicators (carbon footprint, water footprint, resource depletion and water eco-toxicity) to the EU energy efficiency label.

- **Proposed Energy and Carbon Footprint Label**: this design added only the lifecycle carbon footprint indicator to the energy efficiency label.

Additionally, participants were exposed to one of the following conditions prior to the start of the experiments:

- **No information group**: no information on the meaning of labels,
- **Explanation group**: explanation of the current EU energy efficiency label, as well as of the two proposed labels including environmental impact information.
- **Explanation plus prompt group**: on top of receiving label explanations, these participants were prompted to consider these elements in their bids and product choices.

**Bidding experiment**

Participants were shown a product with its label, they were informed of its redemption value (i.e. the amount for which they could redeem a product successfully secured in the experiment) and of the price range of the product. They received a fixed endowment and were invited to place a bid for the product.

If their offer was higher than the product’s sale price, respondents “won” it, earning the redemption value net of the sale price. This net value was given to them in the form of shopping vouchers (incentivised experiment).

In order to reward environmentally friendly choices, when respondents “secured” environmentally friendly products, a financial contribution was donated to a fund dedicated to environmental protection.

Consumers were required to place three bids for each of the three products: washing machine, television and light bulb.

They were randomly allocated to one of two groups:

- Group 1 was exposed either to the proposed Energy and Environmental Label or to the standard EU energy efficiency label;
- Group 2 was exposed either to the proposed Energy and Carbon Footprint Label or to the standard EU energy efficiency label.

**Choice experiment**

Participants were asked to make a hypothetical choice between two alternatives for each product category (washing machines, televisions and light bulbs) differing in their environmental ratings and prices.

They were randomly allocated to one of two groups:

- Group 1 was exposed either to the proposed Energy and Environmental Label or to the standard EU energy efficiency label;
- Group 2 was exposed either to the proposed Energy and Carbon Footprint Label or to the standard EU energy efficiency label.
Units of measurement

- **Bidding experiment**: Willingness to pay for products labelled with the proposed labels.
- **Choice experiment**: Share of consumers choosing the more environmentally friendly product.
- Share of consumers correctly interpreting labels.

Findings

**Impact on willingness to pay and purchase decisions:**

- Consumers placed higher bids for more environmentally friendly products when they were shown the environmental footprint or the carbon footprint label.
- Both footprint labels encouraged consumers to purchase more environmentally friendly goods, *ceteris paribus*. It did not seem that the composite environmental footprint label changed behaviour to a greater extent than the carbon footprint label.

**Understanding of label meanings and its impact on purchase decisions:**

- If they had a higher level of understanding of the label, respondents were more likely to choose the better performing product (from a lifecycle analysis perspective) and to be willing to pay more for it. This was shown to be valid for both labels.
- Consumers exposed to explanatory information on the labels had a better understanding of the ratings.

**Differences in impacts across products:**

- The labels seemed to increase willingness to pay for washing machines and televisions but not for light bulbs, possibly because of the lower monetary stakes associated with purchasing the latter.

**Behavioural drivers of label understanding and purchase decisions:**

- Consumers are likely to focus mainly on standard indicators such as product performance characteristics and less so on environmental or carbon footprint indicators, especially when their understanding of the latter is limited.
- Consumers’ pro-environment stances or prior exposure to product labelling do not seem to strongly drive their willingness to pay for greener products.

**Source**

Notes

1. Smart meters record and convey real-time electricity information to electric utilities. Connecting smart meters to salient devices such as in-home displays, real-time information on energy consumption and/or energy prices can be made available to consumers in an intuitive and timely format.

2. The average historical savings from the applications reviewed in the report amount to about 6% per year (for consumers with electric heating and no automation). The authors of the report state that this figure is a realistic estimate of the potential of feedback mechanisms for energy conservation in Norway.

3. As explained in Schubert and Stadelmann (2016), the Swiss government has adopted the EU energy label for household appliances. However, the display of these labels in online retail platforms was not yet fully enforced when the study took place, which is why the baseline situation is one where no energy information was displayed alongside product information.

4. Unlike other laboratory experiments analysed in this report, all participants in this experiment were students.

References

AECOM (2011), Energy Demand Research Project: Final Analysis, report for OFGEM.


Cabinet Office Behavioural Insights Team, Department of Energy and Climate Change and Department for Communities and Local Government (2011), Behaviour Change and Energy Use, London.


Department of Energy and Climate Change (2013), Removing the hassle factor associated with loft insulation: Results of a behavioural trial, DECC, London.


London Economics and IPSOS (2014), Study on the impact of the energy label and potential changes to it – on consumer understanding and on purchase decisions, report for the European Commission, Brussels.

Norwegian Water Resources and Energy Directorate (2014), Smarte målere (AMS) og feedback (Assessing the potential of energy consumption feedback in Norway), Oslo.


Social and Behavioral Sciences Team (2016), Social and Behavioral Sciences Team 2016 Annual Report, Office of Science and Technology Policy, Washington, DC.


Reader’s guide

The objective of this report is twofold: first, to understand the extent to which behavioural insights are being incorporated in environmentally relevant policy making, as well as the outcomes of this process; and second, to provide policy makers with concrete examples of successful as well as unsuccessful applications of behavioural insights to the design and implementation of relevant policies.

This reader’s guide presents all definitions of terms related to behavioural biases, interventions and levers, as well as those related to the methods used to test and assess the impact of behavioural interventions. While the definitions of these terms are also presented in Chapters 1 and 2, this guide mainly aims to support the reading of the chapters reviewing applications of behavioural insights to various policy areas: energy consumption and energy efficiency, water consumption, food consumption, transport and car choice, waste management and resource efficiency, and compliance with environmental regulation. These chapters make frequent use of the terms defined here.

Which behavioural biases affect environmental policy outcomes?

Behavioural biases are the features of human behaviour that, if observed through the lens of standard economic theory, can be defined as deviations from rational decision-making. Following Mullainathan and Thaler (2000), behavioural biases can be grouped into three categories, depending on the behavioural deviation from the characteristics of homo economicus: bounded rationality, bounded willower and bounded self-interest. While behavioural sciences have provided evidence for many more behavioural biases, the focus here is on the biases which have the potential to impact environmental policy and its effectiveness.

Bounded rationality

“Bounded rationality reflects the limited cognitive abilities that constrain human problem solving.” (Mullainathan and Thaler, 2000)

- **Framing effect**: the way an option is presented (or framed) affects individual choice among alternatives. More specifically, individuals can draw different conclusions from the same amount of information, depending on how it is presented and the relative salience of its elements.

- **Loss aversion** arises when the cost associated with giving up something is perceived as greater than the benefit that would accrue to the acquisition of the same thing (Gsothbauer and van den Bergh, 2011). Loss aversion can help explain the endowment effect and the status-quo bias:

  - **Endowment effect**: “The value of a good to an individual appears to be higher when the good is viewed as something that could be lost or given up than when the same good is evaluated as a potential gain” (Kahneman, 2003)
- **Status-quo bias**: “Because the reference point is usually the status quo, the properties of alternative options are evaluated as advantages or disadvantages relative to the current situation, and the disadvantages of the alternatives loom larger than their advantages. This leads to inertia.” (Kahneman, 2003)

**Bounded willpower**

“**Bounded willpower** captures the fact that people sometimes make choices that are not in their long-run interest.” (Mullainathan and Thaler, 2000)

- Inconsistencies between individual beliefs and behaviours can be denoted as **cognitive dissonances**. This phenomenon leads to an attitude-behaviour gap, a mismatch between beliefs and concrete behaviours. Sometimes, people may react to this mismatch by aligning their beliefs to their behaviour instead of the opposite (Carlsson and Johansson-Stenman, 2012).

- **Myopia in intertemporal choices**: individuals tend to show time-inconsistent preferences when considering decisions characterised by time-varying discount rates. This means that they will apply discount rates that are higher in the short run than in the long run (hyperbolic discounting), rather than constant over time. In other words, individuals with this type of preferences would rather obtain one Euro today than one Euro tomorrow, but when presented with the choice between receiving one Euro in one year and the same amount in one year and one day, they will gladly wait for an extra day. This type of discounting drives short-sighted decisions, placing disproportionate weight on immediate costs and benefits relatively to long-term ones (Gsottbauer and van den Bergh, 2011).

**Bounded self-interest**

“**Bounded self-interest** incorporates the comforting fact that humans are often willing to sacrifice their own interests to help others.” (Mullainathan and Thaler, 2000)

- Individuals are not motivated exclusively by their own utility: **altruism, fairness and social norms** also affect individual decision-making. While altruism and fairness need not be defined, social norms and their impact on consumer behaviour deserve further scrutiny. People conform to behaviours which are perceived as the norm in society, and compare their own behaviour to these ideal benchmarks.

**What are behavioural interventions?**

A recent report from the European Commission (Sousa Lourenço et al., 2016) provides a typology of the extent to which behavioural insights have been taken into consideration and have informed the policy process:

- **Behaviourally tested interventions** are “initiatives based on an ad-hoc test, or scaled out after an initial experiment”;

- **Behaviourally informed interventions** are “initiatives designed explicitly on previously existing behavioural evidence”; and

- **Behaviourally aligned interventions** are “initiatives that, at least a posteriori, can be found to be aligned to behavioural evidence”.
This report focuses solely on behaviourally informed and behaviourally tested interventions, as they are the outcomes of deliberate efforts of policy makers to draw upon behavioural insights when developing and implementing policies. Here, these two types of interventions are denoted as behavioural interventions. Conversely, while behaviourally aligned initiatives may be effective in delivering policy results, they are not based on a good understanding of the behavioural mechanisms upon which they act. This limits the possibilities to replicate them in the future or in other contexts.

What types of behavioural levers can policy makers use?

Policy makers can use a range of behavioural levers to design and roll out an appropriate policy intervention. These levers are, in fact, the building blocks of behavioural interventions and, as such, constitute concrete tools for policy makers. Extending the classification provided by Mont, Lehner and Heiskanen (2014), seven main types of behavioural levers can be distinguished:

- **Simplification and framing of information**: simplifying complex information can prevent information overload. Framing aims at representing information by consciously activating certain values and attitudes of individuals. The way information is framed can also affect how it is processed by its recipients. For example, energy efficiency labels can be framed to provide a sense of the relative ranking of an electric appliance with respect to the best-in-class one, and the savings that one could enjoy when switching to the latter.

- **Changes to the physical environment**: the physical environment can substantially affect individual decision-making, especially in contexts in which choices are made spontaneously, on the basis of automated mechanisms and habits. Examples of such interventions are changes in the location and appearance (e.g. colour) of recycling bins, or the installation of automatic (sensor-based) water taps to curb water consumption.

- **Changes to the default policy**: as individuals are prone to status-quo bias, they often postpone making decisions until or unless it becomes inevitable to do so. Defaults can, thus, have a great impact in contexts in which people are resistant to change. An example of such interventions is a change to the default setting of thermostats (i.e. to a lower baseline temperature in order to foster energy savings).

- **Use of social norms and comparisons**: as individuals are social beings, not solely driven by their own payoffs, they are affected by the way people surrounding them behave (social norms), by how they compare to their peers (social comparison) as well as by moral injunctions. An example of this type of intervention is the comparison of a household’s energy or water consumption to the consumption of a same-sized household in the same neighbourhood.

- **Use of feedback mechanisms**: several routine behaviours, such as energy consumption or waste disposal, have considerable environmental impacts. However, these impacts are often not sufficiently salient for consumers. Providing them with timely feedback can make such contexts more transparent, increasing awareness of environmental externalities stemming from daily consumption choices. For example, real-time in-home displays connected to smart energy meters can provide real time feedback on energy consumption and costs.

- **Reward and punishment schemes**: can be used as “carrots and sticks”, associating a salient, material payoff to consumers’ achievements. For example, rewarding
households who have been particularly savvy with water consumption during scarcity periods may generate a positive norm for water conservation.

- **Goal setting and commitment devices**: as individuals are bound by status-quo bias and inertia, effortful behaviour changes can be encouraged by setting specific and measurable goals and using commitment devices to regularly follow up on progress. One such example involves pinning down an objective of energy savings and following up on the objective with regular feedback and tips.

Note that “hybrid” interventions can be designed by building upon several of these insights at once. For example, energy conservation can be prompted by reframing energy bills in order to make them more intuitive and by using social comparisons therein.

Price-based policies, instead, leverage the most traditional form of market-based tools, such as taxes, to induce economically rational changes in individual behaviour. They should, thus, not be confused with policies building upon behavioural insights, which aim at tackling behaviours that are not consistent with the model of rational economic behaviour.

What methods can be used to test and assess the impact of behavioural interventions?

*Experiments* enable the estimation of a policy’s causal effect. The cornerstone for credibly identifying the causal effect of a policy is the construction of the correct counterfactual (List and Price, 2016). The idea behind the establishment of a counterfactual is to compare the impact of the policy of interest on a group that is exposed to it (or, in the experimental jargon, “treated” with it), with its impact on a control group, which is unaffected by the policy intervention. The empirical findings of experiments can inform policy makers, motivating the launch of new policies or changes in existing ones.

Harrison and List (2004) argue that “[c]ontrolled” experiments, which include laboratory experiments and field experiments, represent the most convincing method of creating the counterfactual, since they directly construct a control group via randomization” (p. 1014). In fact, randomisation ensures that the individuals or groups of people exposed to the policy to be tested and those exposed to the control condition are truly comparable (Haynes et al., 2012). Experiments based on the randomised assignment of participants (individuals, households, firms…) to treatment or control groups (in short, randomised treatment allocation) are called *randomised controlled trials* or, in short, RCTs (see also Haynes et al., 2012; Gertler et al., 2016). According to the type of randomisation process, Charness, Gneezy and Kuhn (2012) distinguish two different types of design:

- “In a “within-subject” designed experiment, each individual is exposed to more than one of the treatments being tested, whether it be playing a game with two different parameter values, being treated and untreated, answering multiple questions, or performing tasks under more than one external stimulus. With such designs, as long as there is independence of the multiple exposures, causal estimates can be obtained by examining how individual behavior changed when the circumstances of the experiment changed.

- In a “between-subject” designed experiment, each individual is exposed to only one treatment. With these types of designs, as long as group assignment is random, causal estimates are obtained by comparing the behavior of those in one experimental condition with the behavior of those in another.” (Charness, Gneezy and Kuhn, 2012, p. 1)
Likewise, one can talk about between-group and within-group experimental design, if the randomisation is carried out at the level of groups of individuals (e.g. a village, a cohort of students...) rather than at the level of single individuals. According to the experimental context, one can distinguish between:

- **Laboratory (lab) experiments** are conducted with volunteer participants in a controlled laboratory facility (Levitt and List, 2009; Noussair and van Soest, 2014).

- **Field experiments** are carried out in naturally occurring settings, often with subjects that are unaware of being part of an experiment. Field experiments also include experiments carried out on real online platforms (e.g. e-commerce websites or social networking platforms), which are becoming increasingly popular. Such experiments are denoted in this report by the term online field experiments (Chen and Konstan, 2015). These should not be confused with experiments carried out on simulated online environments specifically designed for experimental purposes.

**How to assess policy impacts when treatment allocation is not randomised?** For some of the interventions described in this report, impact evaluation is not based on the randomised assignment of experiment subjects to a treatment or control group. In such cases, causally identifying the impact of the policy intervention requires different methodological approaches based on the analysis of what Levitt and List (2009) call “naturally-occurring data” or “uncontrolled data” (see e.g. Blundell and Costa Dias (2009) for a technical overview of such methods and Gertler et al. (2016) for a non-technical one). This approach to causal identification of policy impacts works as long as the policy is introduced as an “exogenous shock”, and randomly – in a statistical sense – allocates subjects to control (unaffected by the policy) and treatment (affected by the policy) groups.

**What about stated preference studies?** An entirely different category of policy interventions involves stated preference studies, such as **stated choice experiments**. In this type of experiments, subjects are presented with hypothetical choice scenarios where they have to select their preferred alternative among a menu of hypothetical options (see also Alpízar et al., 2003). This type of experiment can be carried out in the context of a survey (with the help of a questionnaire), or in simulated online environments. The aim of this type of studies is to elicit individual preferences and willingness to pay for specific goods or attributes – usually for those not yet available in the market or those for which no market exists.

**References**


