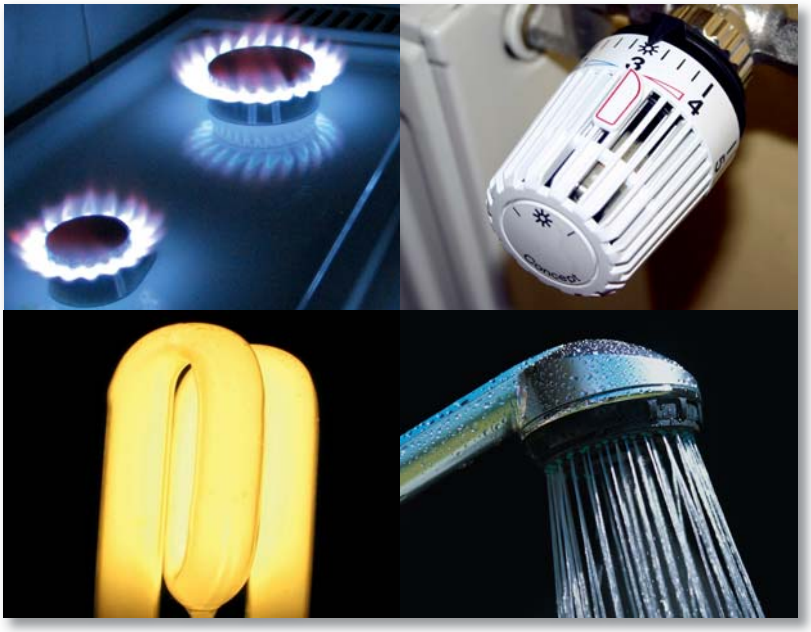
DEVELOPING AND IMPLEMENTING

EFFECTIVE HOUSEHOLD ENERGY AWARENESS SERVICES



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This manual is for the use of housing companies, municipalities, utilities, NGOs and other enthusiastic stakeholders who want to encourage residents to save both energy and money by providing energy awareness services.

Intelligent Energy Europe

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The BewareE project is a European project and is carried out by IZT in Germany (co-ordinator), EIFER in France, IVAM in the Netherlands and ISNAMET in Spain.

Content

About This Manual[1]

To fight climate change we must explore all possible routes to reduce energy consumption. Tackling climate change is not only a technological problem – replacing conventional energy with renewable energy – but it is also a problem caused by human behaviour. This manual explains how energy can be saved by changing domestic energy consuming behaviour. Households can, for example:

- employ energy efficient practices (e.g., washing in low temperature water);
- avoid practices with a high energy use (e.g., showering for a short time);
- avoid unnecessary energy use (e.g., closing curtains to keep out the cold);
- purchase energy saving equipment (e.g., energy efficient light bulbs).

If well planned, energy awareness services can become very powerful instruments for energy saving. This manual will help you to develop and implement effective measures for behavioural change. The manual is based on the findings of the BewareE project, which compiled and analysed examples of energy awareness services from throughout Europe. As a practical, but also theory-based guide, the manual explains how to implement services which enable residents to change their behaviours, reduce their energy consumption and their energy costs.

To develop effective energy awareness services, you should consider practical experience as well as scientific evidence from a variety of disciplines. Instigating behavioural change is most likely to be successful when drawing on insights from different disciplines.

Well organised awareness-raising services can bring about energy savings of 5 – 10% and in some cases even up to 20%!
This can result in household cost savings of up to € 300 per year.

[1] *We thank Laure Frachet, Jean-Michel Cayla, Lieke Dreijerink, Diana Uitdenbogerd, Daniel Pichert and Michael Knoll for their extremely valuable comments on this manual.*

Chapter 1: EU Policies to Fight Climate Change

The term "climate change" is commonly used and is also referred to as "global warming" and "the greenhouse effect". Climate change refers to the growth of man-made gasses in the atmosphere that trap the heat from the sun, causing changes in weather patterns on a global scale. Climate effects include changing rainfall patterns, melting ice, rising sea levels, river flooding, potential droughts, and heat stress. Among all greenhouse gases, the increasing amounts of carbon dioxide, methane, and nitrous oxides are of main concern. If the amount of these gases in our atmosphere continues increasing, the earth could warm by 1.8 to 4 degrees by the end of the 21st century (IPCC 2007). This will result in changes in global weather patterns. The pictures below show some examples of flooding in Europe.

Recent effects of climate change in Europe include the extremely dry summers in Spain and southern France that have caused water shortages. Germany, on the other hand, has suffered from increased numbers of storms which have caused severe damage and the Netherlands faces growing risks of river flooding due to heavy rainfall.

The European Commission aims to tackle the effect and the magnitude of climate change. Thus, the aim of the European Commission is to achieve a 20% reduction in energy consumption by 2020 (European Commission 2006). Reducing energy consumption through energy awareness services is an important part of European Union energy saving policies. In 2006, the European Union introduced the EC Directive on Energy End Use Efficiency and Energy Services (European Parliament and Council 2006). This directive calls for the implementation of energy services to reduce energy consumption. Part of this action plan focuses on energy saving by awareness raising and behavioural change. The directive stipulates that:

- Member States should achieve a national energy savings target of 9% by 2017;
- the public sector should lead the way in meeting these targets;
- Member States should impose obligations to promote energy efficiency on energy suppliers and distributors;
- Member States should adopt legislation on metering and billing to ensure that consumers are well informed before making decisions about their energy use.

The aim of the European Commission is to achieve a 20% reduction in energy consumption by 2020 (Energy Efficiency Action Plan 2006). Saving energy by changing behaviour is the most cost-effective way to meet this goal.

This manual, based on the results of the BewareE project, is intended to inspire and enable "energy awareness services" in all EU member states. Examples and evidence from research in the social sciences demonstrate that services dedicated to behavioural change can help to achieve EU objectives, as stipulated in the EC Directive on Energy End Use Efficiency and Energy Services (2006/32).

What Are Energy Awareness Services?

Human behaviour consists, to a considerable degree, of day-to-day routines and social practices, which are sometimes in opposition to energy saving goals. If consumers were to adopt energy saving patterns, it would impact considerably on Europe's energy consumption. The BewareE project[2], co-funded by the Executive Agency for Competitiveness and Innovation EACI, facilitates "energy awareness services" to reduce household-related energy consumption and costs associated with that consumption.

> *A household energy awareness service is any kind of action or tool to support residents in adopting sustainable energy consuming behaviours. These changes of behaviour relate to daily routines, purchasing and investment behaviours.*

In collaboration with housing associations and other relevant stakeholders, the project consortium systematically gathered information about energy awareness services. The partners collected more than 130 examples of such services from all over Europe. These services were analysed, evaluated and categorized in the BewareE database on European energy awareness services (www.izt.de/bewaree). Throughout this manual we will present a selection of these service examples in yellow boxes.

Why are Energy Awareness Services Important for You?

The targeted users of this manual are potential providers of energy awareness services: housing companies and organizations, municipalities, utilities, resident and consumer organisations as well as other enthusiastic stakeholders. Each of these organisations is driven by different motivations.

[2] *"BewareE-Energy Services: Reducing the Energy Consumption of Residents by Behavioural Change"*

Housing Companies

Energy awareness services are not a core business of housing companies. Yet, in the course of our work, we learned that there are various motives for housing organisations to implement awareness services; amongst others awareness services can strengthen the image of corporate social responsibility, can help low income households to reduce energy bills, thus avoiding possible defaulting on rental payments, and increasing the quality of apartments as well as community cohesion. These motives are outlined in the following paragraphs:

First, corporate social responsibility has become increasingly important. A commitment to climate protection has high public value. For instance, in the Netherlands, this environmental commitment was set out in an important 2008 Housing Corporation Sector Agreement (Ministry of VROM, 2008) which was signed by the Woonbond (the Dutch tenant association), AEDES, (the Dutch association of housing companies), and the Dutch Ministry for Housing. It aims at reducing energy consumption in housing stock through implementing a range of initiatives. In this sense, implementing energy awareness services is a very good means of achieving a positive public image.

Second, rising energy costs decrease the available household budget for covering domestic living costs and this may increase the risk of household debt and unpaid rent. It is in the housing company's best interest to keep energy costs as low as possible; energy awareness services can contribute to that objective.

Furthermore, the implementation of energy awareness services can, in some cases, be part of upgrading apartments and, if services are implemented in cooperation with residents, can also improve community cohesion. These incentives encourage more and more housing companies to become actively engaged in providing energy awareness services. Some of the most innovative energy awareness services in Europe are provided by housing companies (see the examples in yellow boxes).

Municipalities

Energy saving and climate change are important policy considerations for municipalities. More than 1.600 European municipalities have signed the Covenant of Mayors, committing them to the ambitious EU target on energy saving. These municipalities are now committed to submitting a local Sustainable Energy Action Plan (SEAP) within the year following their agreement (www.eumayors.eu). Providing energy awareness services is a cost-effective way to achieve the energy reduction goals of many of these municipalities. Municipalities are the state entity that is closest to citizens; municipalities are already well positioned to provide personal advice for energy saving to specific groups, such as low income households and the elderly.

Resident and Consumer Organisations

For resident and consumer organizations, energy awareness services are a practical instrument in helping households to save energy and reduce their energy costs. Between 2000 and 2007 the cost of energy, per household, rose by 70%, to an average of € 300 for electricity and € 455

for gas and oil each year (Kortman, 2009). It is probable that energy costs will rise even more in the future. Additionally, community-wide energy saving measures can improve social cohesion among residents.

Utilities

Another group of potential energy service providers are utilities. Like housing companies, utilities can boost their public image by implementing energy awareness services. Furthermore, under white certificate schemes, providing behavioural change programs can also be a means of complying with energy saving quota. Lastly, by reducing their energy costs, utilities can improve customer relations, which is essential in a competitive market.

How to Use this Manual

This introductory chapter aims to highlight the importance of energy awareness services in the battle against climate change in Europe. Chapters 2, 3, and 4 present important background information for designing effective behavioural change measures, in response to the particular circumstances of individual target groups. Chapter 2 describes the amount of energy consumption, and the distribution of its use, in European households. In addition, potential savings are highlighted in order to understand the importance of household energy consumption. In chapter 3, the challenges for changing energy behaviours are discussed from a theoretical point of view. Insights from the fields of economics, psychology and sociology are introduced to explain the complex factors that shape human behaviour. Using these ideas, chapter 4 explores different available "intervention strategies", i.e. ways to influence people's energy consuming behaviour. Typical methods such as media campaigns, incentives and consumer feed-back are discussed in this chapter.

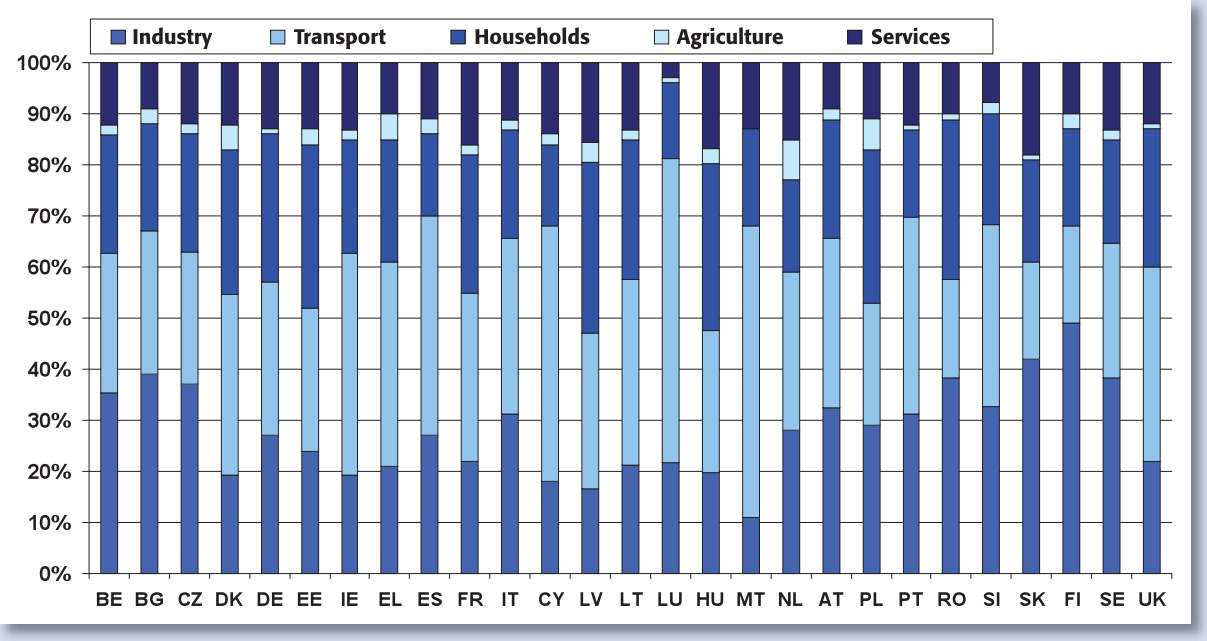
Chapter 5 and 6 are designed to support you in developing your own energy awareness services. Chapter 5 gives an overview of the different types of energy awareness services found in the BewareE database. These examples will inspire you to develop the most appropriate energy awareness service for your target group. Refer to our BewareE Database which contains more than 100 tried and tested energy awareness services. In addition, we suggest a six step approach for the implementation of successful services. This method was developed by drawing on the international experiences of the BewareE project and is meant to be a practical guide to help you develop and implement your own energy services.

Finally chapter 7 calls for your enthusiasm: Making it happen! To summarize, we outline Six Golden Rules for implementing effective energy awareness services. Start designing your service. Remember that well organized energy awareness services can bring about energy savings of 5 – 10% and in some cases up to 20% per year. This translates into real financial savings of up to € 300 per year.

Chapter 2: Energy Use in Households

Households were responsible for 26% of total energy consumption in Europe in 2007 (Eurostat 2010). There are interesting and notable differences between the different EU Member States consumption levels. The residential sector in Latvia (34%), Hungary (33%), and Estonia (32%) accounts for an energy consumption well above EU average. Countries such as Luxembourg (15%), Cyprus (16%) and Spain (16%) are at the bottom end (Eurostat 2010, see figure 1). These differences can be explained by several factors including climate conditions (e.g. less heating demand in southern countries such as Cyprus and Spain) and the relative importance of other sectors (e.g. the share of consumption for transport is surprisingly high in Luxembourg).

Figure 1: Final energy consumption in Europe by different sectors (2007)

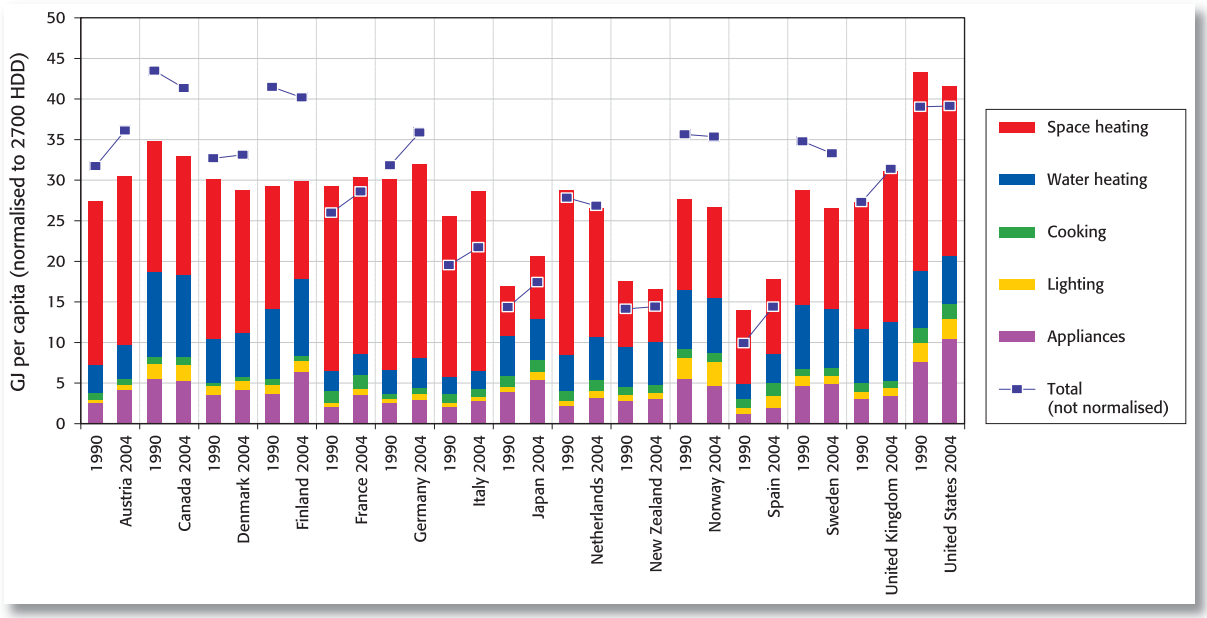


Source: Eurostat (2010)

Varying National Performances

Statistics also reveal strong differences in average absolute energy consumption by households within the EU27. Luxembourg displays the highest level with 9.697 kgoe/cap, while Romania accounts for only 1.860 kgoe/cap (Eurostat 2010). Furthermore, there is another significant variation in how households use domestic energy: whether for space heating, water heating, cooking, lighting and the running of appliances. Figure 2 shows this distribution for 15 industrialised counties from all over the world. Total household energy consumption differs considerably, ranging from 15 GJ per capita in Spain to 43 GJ per capita and year in the United Kingdom.

Figure 2: Energy use in residential buildings



Source: Lautsten (2008)

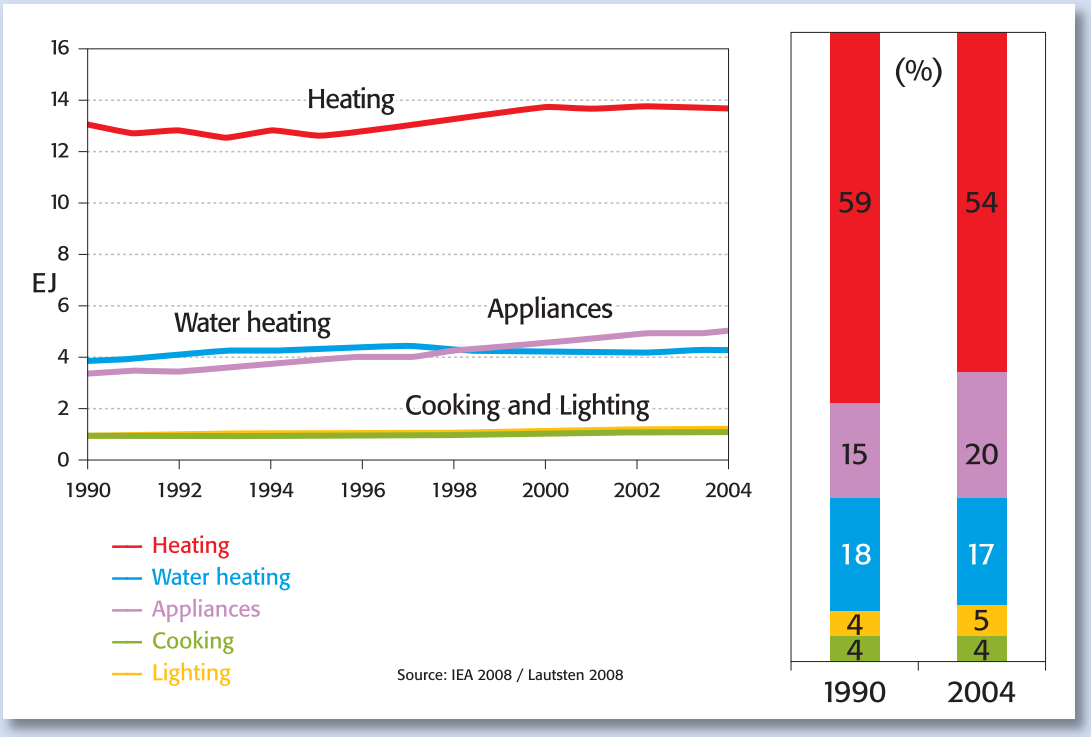
Energy consumption for space heating is above average in Austria, France and Germany and below average in Norway, Spain and Sweden. When energy consumption per capita is corrected by climate influences, it is striking that countries with relatively cold climates fall into the medium group (Norway, Sweden), while relatively warm countries such as France fall into high consumption category. This may be explained by the fact that buildings in cold climate zones tend to be better insulated than homes built in warmer climates. In terms of water heating, energy consumption is rather high in Finland, Sweden and the United Kingdom while Germany and Italy are at the bottom end. With regard to lighting, Norwegian households are high consumers, in contrast to France. Finally, compared to other countries, Denmark, Finland, Norway and Sweden spend a lot of energy on running appliances.

Trends in the Distribution of Energy Used at Home

Figure 3 shows that, due to the modernization of buildings, the share of energy consumption for space heating slowly decreased in the period from 1990 – 2004. This is contrasted by a higher share of energy use for appliances (computers, mobile telephones etc) which increased from less than 15% to almost 20% over the same time span.

In each category of energy use, behavioural changes can effect potential savings. The BewareE database contains service examples from all these energy use categories, which can serve as a starting point in the development of your own energy awareness services.

Figure 3: Energy consumption in residential buildings in Europe



Source: Lautsten 2008/IEA 2008

Heating

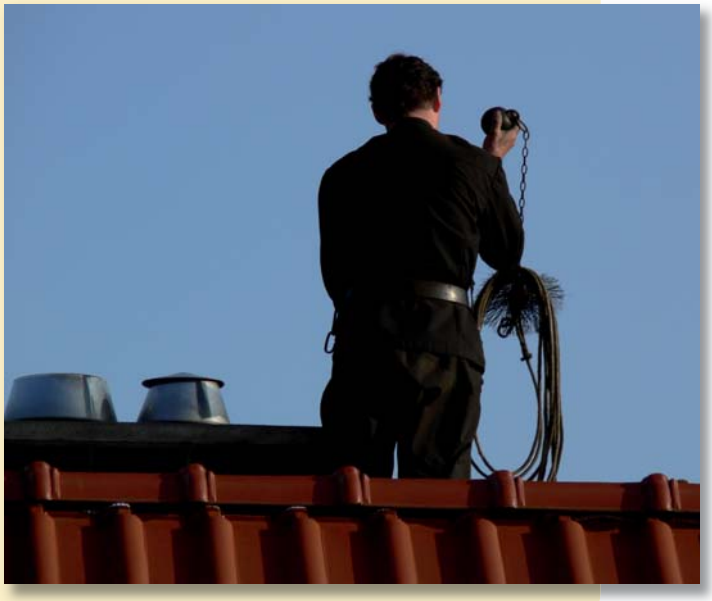
Space heating is the most important use of household energy consumption and accounts for more than half of total residential energy consumption in most IEA countries. Around one third of the energy awareness services in the BewareE Database are focused on the reduction of energy consumption for space heating. The following best practice example from the BewareE Database is one way of reducing energy used for heating.

Best Practice: ***Face-to-Face Advice – Chimney Sweeps as Climate Ambassadors***

Stakeholder in Focus: *The Austrian Energy Agency, in cooperation with other energy consulting agencies and industrial partners, worked with chimney sweeps as "climate ambassadors" to advise households during home visits.*

Special Aspects: *Integrating energy saving aspects into the chimney sweeps' usual business is a great idea. As chimney sweeps already make home visits, this is a perfect window of opportunity to address energy efficiency without making an additional appointment.*

The Experience: *This initiative is part of the programme "klima:aktiv leben" which was launched by the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management to enhance energy saving measures and climate friendly behaviour in privately owned homes. The chimney sweeps, who act as climate ambassadors, hand out flyers with energy saving tips during their home visits. In addition, they assess the condition of heaters and provide advice on the purchase of new, energy-efficient equipment. Furthermore, they provide information about thermal insulation and window replacement. Requests for further information or advice are recorded on an evaluation sheet and entered into a database. Direct enquiries are answered through a service hotline.*



More information: *www.klimaaktiv.at, www.energyagency.at, Scharp et al. 2008*

Water Heating

Water heating accounted for less than 18% of residential energy use in European households in 1990; its share had decreased to approximately 17% by 2004. Only a few services in the BewareE Database address the reduction of energy consumption for heating water. The service below is one of them.

Best Practice: ***Face-to-Face Advice – Boiler Inspectors***

Stakeholder in Focus: *Supported by Italian local administrations, boiler inspectors provide energy advice to tenants and home owners.*

Special Aspects: *Compulsory boiler inspections have opened a window of opportunity for energy advice.*

The Experience: *According to Law 10/91 article 31, Italian municipalities with more than 40.000 inhabitants must ensure that all residential boilers are inspected at least once every two years. This inspection includes the following checks: verification of the state of maintenance of all installed boilers and a guarantee of minimum energy efficiency standards; verification of the presence of automatic temperature regulation and safety equipment; confirmation that the boiler complies with legal requirements for heating equipment. The Inspector must also inform users about energy savings, safety rules and how to achieve good comfort levels. It is estimated that 11 million boilers will be inspected every two years. Results have already shown that the boiler inspection programme has increased citizens' awareness of the need to maintain boilers properly.*

More information: *www.eerg.it, Scharp et al. 2008*

Appliances

While appliances accounted for less than 15% of residential energy use in 1990, their share increased to almost 20% in most European countries by 2004. Amongst these appliances, washing machines, dishwashers, refrigerators and dryers are high consumers, despite increasing energy efficiency. One fourth of all the services in the BewareE Database target the reduction of energy consumption through appliances. Below you can find one example.

Best Practice:

Low Cost Incentives – Energy Metering Project "To Measure is to Know"

Stakeholder in Focus: *The environmental organisation MilieuCentraal lends energy meters to residents. MilieuCentraal delivers the meters to residents all over the Netherlands.*

Special Aspects: *Compared to other IT based metering services, the Conrad energy meter is a very effective way to make energy consumption transparent.*

The Experience: *Residents can measure both energy consumption and the resulting energy costs of their electrical appliances by using an energy meter (the Conrad Energy Check 3000) on loan from MilieuCentraal. This environmental organisation also provides information about the energy efficient use of appliances and about the alternative available energy saving appliances on the market. At the end of 2005 4.000 meters were circulating in the Netherlands. Each household is allowed to keep the meter for three weeks before passing it on to another household. 36.000 households have participated in this programme so far.*

More information: *Scharp et al. 2008*

Cooking and Lightning

Cooking and lighting accounted for about 8% of residential energy use in 1990; its share increased slightly to 9% by 2004. Energy consumption for lighting is expected to decrease due to the prohibition of conventional light bulbs in Europe. About ten energy awareness services in the BewareE Database are aimed at lowering energy use for cooking and lighting.

Best Practice: ***Energy Box with Small Energy Saving Products***

Stakeholder in Focus: *Housing company Woonplaats offers an energy box to its residents.*

Special Aspects: *The box is offered to residents during refurbishment, an excellent moment to raise energy awareness.*

The Experience: *During refurbishment tenants are expected to be more open to change. Hence, this is a good moment for directing people's attention to the importance of energy saving behaviour. To encourage tenants to save energy, Woonplaats, a housing company in Enschede, the Netherlands offered a free "Energy Box" to its tenants. This gift box is filled with several energy savings products, including energy saving light bulbs, insulation strips, standby killers, etc. Furthermore each Energy Box contains a handbook with information on energy saving ideas.*

More information: *www.eerg.it, Scharp et al. 2008*

Potential Savings Through Behavioural Change

Public attention is focused on improving energy efficiency in technology but this perspective overlooks the importance of human behaviour. Buildings with the same technical standards may display significantly different levels of energy consumption. For instance, Uitzinger (2004) showed that the variation in gas consumption per year, for houses with the same energy technical efficiency coefficients (EEC), is approximately a factor 1.5 – both below and above the average. Gardner and Stern (2008) demonstrate potential savings that can be achieved by changing daily routines or by making low or medium household investment (see figure 1; similarly, Kok et al. 2007 who claim potential savings of 19 +/- 5%).

Table 1: Potential savings by behavioural changes in the US

Daily routines	room temperature reduction (20° at day, 18° at night); summer cooling temperature 25,5° (instead 23°)	3,4%
	lower temperature for dish washing and laundry	1,2%
	Total	**4,6%**
Low- an medium cost investments	using energy saving bulbs	4%
	using weather strips at windows	2,5%
	exchanging old boilers	1,5%
	exchanging refrigerators	1,9%
	exchanging cooling equipment	2,2%
	Total	**12,1%**
Total		**16,7%**

Source: Gardner and Stern (2008)

In conclusion, there is still great potential for energy reduction which can be achieved through behavioural change among residents, without reducing their comfort levels. In the following chapter, we will discuss challenges to behavioural change programmes. Indeed, human behaviour is highly persistent and is not easy to change. Insights from different disciplines, such as economics, psychology and sociology, can help to get to understand the complexity of behaviour persistence and change.

Chapter 3: Why Is Changing Behaviour so Complicated?

European and national opinion polls suggest that public understanding of climate change, and its origins in man's excessive use of resources has been steadily increasing over the last few years. For instance, a study published by the German Ministry for Environment reports that 77% of Germans expect climate change to have serious consequences for mankind and that 75% of Germans believe consumers play a crucial part in climate change (BMU 2008). The French national energy agency, ADEME, observed that the percentage of the French public who perceived global warming to be one of the two most alarming environmental topics increased from 6 – 33% from 2000 to 2007 (ADEME 2008). On a European level the Eurobarometer indicates that 62% of the EU27 population consider climate change to be one of the most serious problems in the world; it is exceeded only by their concern about poverty, and lack of food and drinking water (68%; European Commission/European Parliament 2008).

Using these statistics as a starting point, one might conclude that green consumers will soon be predominant in our society. People's fear of global warming and recognition their own negative effect on climate should encourage modified behaviour.

However, experience shows that behaviour is not easy to change. For many of us, New Year's Eve is the time for good resolutions: to stop watching late night TV and to read a book instead; to do more sport and to work less; to try to use public transportation or bikes instead of the car. We resolve to buy local and seasonal fruit instead of c carbon-intensive fruit from across the world. Some weeks later our frustration is growing, because we cannot keep up with our own resolutions and cannot realise long-lasting behavioural change.

This discrepancy between knowledge, attitude and behaviour has been referred to as the "attitude-action-gap". A recent pan-European survey (LogicaCMG 2008) revealed that, on average, Europeans carry out only 1.4 out of 6 selected key energy saving behaviours in their homes. Overcoming this attitude-action-gap is one of the challenges of the climate change agenda. Human behaviour is complex and hard to predict. It does not follow the typical deterministic models of scientific law (such as Newton's Law of Gravity) that gave rise to the success of the natural sciences. However, because this "technical" approach to problem-solving is deeply rooted in our modern, rationalised, specialised society, it is difficult to understand the complexity, uncertainty and fuzziness of human behaviour and how and why it changes. This chapter presents insights into the complexity of human behaviour from the fields of economics, psychology and sociology. It is not an exhaustive review of literature but rather a way to compare the diverging perspectives on a general level and to draw conclusions about strategies for inducing behavioural change. For an excellent and more detailed overview on the different disciplines and their analytical frameworks see Breukers et al. (2009; similar also Ehrhardt-Martinez 2008 and Jackson 2005).

Insights from Economics

Economics and psychology traditionally dominate discussions about behavioural models. Classical economics assumes rational persons, driven by self interest, drawing on available (financial and time) resources, assessing information on, and calculating the cost of, alternative behaviours. This might explain certain investment and purchasing behaviours. For instance, according to economic research, consumers will purchase new energy-efficient fridges if the benefits of product and electricity savings exceed the less energy-efficient products and costs of maintaining their old equipment. Similarly, people do not retrofit their homes because of lack of investment capital, a bad return for investment or high financial risk. In addition, "transaction costs" for researching product information or training (e.g. how to use these new monitoring systems?) might impede user investments (Breukers et al. 2009: 39). Economists would argue that daily energy consumption routines can be explained by current energy prices, which are still too low to affect most people's energy bills. This is even though there is a growing concern about fuel poverty among the most vulnerable populations. Indeed, the "price elasticity" of demand, i.e. the way energy consumption decreases as a consequence of rising energy prices, appears to be rather low (Frachet 2010).

More recently, some economists modified the classical rational choice model by accepting people's **"Bounded Rationality"** that is, the assumption that users who do not always follow the logic of maximising benefits and minimising effort based on available information. Thus Kahneman and Tversky (1979) argue that people are "biased" in their behaviours and tend to behave irrationally in many situations. For instance, according to their **Prospects Theory**, human beings fear loss more than they are motivated by potential gain. Pilot studies show that a system of "critical peak pricing" is more successful at reducing energy consumption than the system of "peak time rebates" (eMeter Strategic Consulting 2009; IBM Global Business Services and eMeter Strategic Consulting 2007; Faruqui and Sergic 2009). Critical peak pricing is intended to encourage reduced consumption through high tariffs during peak times, potential expenses to the consumer; while peak time rebates, or premiums, are potential gains for the consumer. This bias might also explain, to a certain extent, why people refrain from purchases or investments even though there is a low likelihood of loss.

Richard Thaler and Cass R. Sunstein (2008) assume a bounded rationality that is not explained by biases, but by ***"heuristics"***, a kind of automatic cognitive programs that helps us cope with the complex problems of our daily life. According to Thaler and Sunstein the heuristics that they characterize as "auto-pilot" are in response to a given "choice infrastructure" – i.e. the availability or non-availability of "stand-by killers" – which can "nudge" people to behave in a certain way (see also Pichert 2010).

Despite recent modifications bringing economics closer to psychology and sociology, the basic paradigm of individual decision-making, maximising benefit and reducing cost, is very powerful and strongly defines public discourse on energy efficiency. To achieve energy saving goals, policy makers create financial frameworks (incentives and disincentives) and time savers to lower transaction costs (product labelling and standardisation) for consumers.

Insights from Psychology

Psychological research into environmental or consumer behaviours includes theories from social, cognitive, environmental and personality psychology. Psychologists investigate what people do in order to protect the environment; why they behave in certain ways (both sustainably and unsustainably); to what extent they are consistent in their behaviours; and how people can be stimulated to behave in sustainable ways. Psychological theories and models differ in their assumptions about how behaviour is formed. A distinction can be made between reasoned and habitual behaviours and between individually and socially driven behaviours (Steg & Buijs 2004). These different approaches lead to different models. The choice of a model depends upon the context and type of behaviours being examined.

Most theories that are used to explain environmental behaviour mainly concentrate on the behaviour of individuals. For example, the **Theory of Planned Behaviour** (Ajzen 1985) assumes that behaviour is the result of an intention and that this intention is the result of a person's attitude, social norms and perceived control over outcomes. In the case of car use, scholars would argue that a person's positive or negative attitude towards using a car, is shaped by the way his friends think about car use and the extent to which he is able to travel comfortably without a car. This intention then influences actual car use. In another example, **Norm-Activation Theory** (Schwartz 1977), states that behaviour is the result of personal norms, awareness of consequences, and the ascription of personal responsibility. Finally, the **Value-Belief-Norm Theory** (Stern 2000), incorporates a more sophisticated relationship between values, beliefs, attitudes and norms. For example, people who feel committed to 'green' values tend to be more aware of the impact of their behaviours on the environment and feel more responsibility for it. Furthermore, they feel a high sense of duty to save energy and tend to accept stricter energy policies.

These models assume that behaviour is, for the main part, the result of deliberate, cognitive processes. But many of our ordinary, everyday behaviours are carried out with very little conscious deliberation (Jackson 2005). **Cognitive psychology** suggests that habits, routines and automaticity play a vital role in the cognitive effort required to function effectively (e.g. Verplanken, Aarts & Van Knippenberg 1997; Dijksterhuis et al. 2006). Therefore the transformation of environmental consciousness into action is obstructed, in part, by the fact that energy use is often bound up with more comprehensive behavioural patterns and habits (Heijs et al. 2006). This explains, to some extent, the fact that despite good intentions, people are locked into automatic and unsustainable behaviours. Typical examples for this are: going to work by car, buying certain brands of coffee, turning the light on, turning the television off, disposing of waste paper, paying for electricity, running the bath or shower (Jackson 2005).

In order to combine both rational and habitual components of behaviour, integrative psychological models have been constructed. Examples of integrative models are the attitude-behaviour-context (ABC) model (Stern, 2000), Triandis' (1977) **Theory of Interpersonal Behaviour**, and the model of consumer action by Bagozzi, Gürnao-Canli and Priester (2002). Jackson (2005) states that a useful model has to account for: motivations, attitudes and values; contextual or situa-

tional factors; social influences; personal capabilities and habits. According to such integrative models, a person's energy use is defined in part by how he intends to use the energy, in part by his energy use habits, and in part by situational constraints and conditions (e.g. the type of house he lives in, the money available for energy efficient appliances, etc). His intentions can be influenced by social, normative and affective factors (e.g. what do other people do and think) as well as by rational deliberation (what does he know about energy use).

Insights from Sociology

While psychologists tend to analyse energy-related behaviours as autonomous individual processes, sociologists analyse energy consuming behaviours as actions embedded in larger "socio-technical systems". From this sociological viewpoint, technology and infrastructure can be used in very different ways and energy consumption might ultimately depend on social appropriations of technology: how people use the existing built environment, the transport or leisure time infrastructure, or their household electrical appliances[3] – sociologists refer to their "social practices" (Shove 2003 and 2009; Bartiaux 2008; Bartiaux et al. 2006; Wilhite 2007; Wilhite et al. 2000; Breukers et al. 2009; Heiskanen et al. 2009; Rettie and Stuttley 2009; Gram-Hanssen 2008).

When using energy, consciously or unconsciously, people, respond to social conventions of "how to do things", or to socially defined beliefs about "normal behaviour". Many behaviours, for instance using a car instead of a bike to go to an important meeting, have a strong symbolic meaning and are intended to signal belonging to a certain social group (Jensen 2005). By replicating these recognised social practices, people reconfirm the existing socio-technical "regimes", stable configurations of rules and practices that determine the evolution and use of technology. Thus, sociology assumes the "social construction" (Berger/Luckmann 1969) of energy consumption. Or, to use the words of Emile Durkheim (1895): these settings of social practices are becoming a sort of "social fact with a reality of its own", which is independent from the individual. From this perspective, changing consumption patterns is complicated because the individual does not act isolated from the outside world, but is part of a range of social networks that confirm certain practices and discourage others (Bartiaux 2008; Ehrhardt-Martinez 2008: 10).

It is important however to note that despite the high persistence of social practices these are not static (Shove 2003) as demonstrated by the following examples. The perception of an average normal room temperature has increased to 22° over the past few decades, although 18° is absolutely sufficient for health. Similarly, having daily showers is now a social convention of cleanliness, while previously a weekly bathing day was the norm. The Internet created new forms of social interaction, turning computers into permanent companions that are almost never out of service – something that the early innovators of personal computers could not

[3] *Likewise also technology shapes user behaviour by inherent "knowledge". Wilhite (2007) argues that for instance air-conditioning "colonized" important practices in the US, such as moving within cities: walking is unusual and even "hazardous" (ibid, p.28) as the infrastructure is made for car travel only. Similarly the use of fridges allowed for changes in food consumption practices in India, where Hindu religion considered leftovers as "dead" food to be avoided.*

have imagined. Flying used to be a privilege of a few upper-class people in the 50's it is now considered normal to take a plane for a weekend trip. The number of flown kilometres increased by a factor of 5, which has more than offset savings from efficiency gains of 50% (Pichert 2010). During the early days of car travel, pedestrians who felt disturbed by "joyriders" – or showcasing drivers – required their local administrations to restrict the speed of cars in towns to walking speed (von Randow 2009); nowadays cyclists and pedestrians are slowly regaining lost terrain in their cities.

These examples show routines and habits which are embedded in socio-technical systems. These socio-technical systems are not only historically variable (Rettie and Stuttley 2009), but may differ from country to country or region to region (Shove 2003: 199). For instance, waste separation has been accepted in Germany since the 1990's, but the Spanish and French have only recently started to use available containers for recycling glass and paper. Similarly, energy consumption patterns must be understood in a precise cultural context, which also varies within individual societies (Prose and Wortmann 1991). For instance, despite widespread acclaim for smart metering, a recent study of German society suggests that only 2 or 3 out of 10 identified social groups appreciate the idea of living in a "smart home", and could imagine integrating IT technology in their daily energy consuming practices (Sinus Sociovision 2009; similar a study by Birzle-Harder et al. (2008) who identified 4 target groups for smart meters). All in all, service providers should be sensitive to the importance of the social shaping of behaviour and remember that social practices vary over social segments and time. Consequently intervention should address practices specific to culture and time.

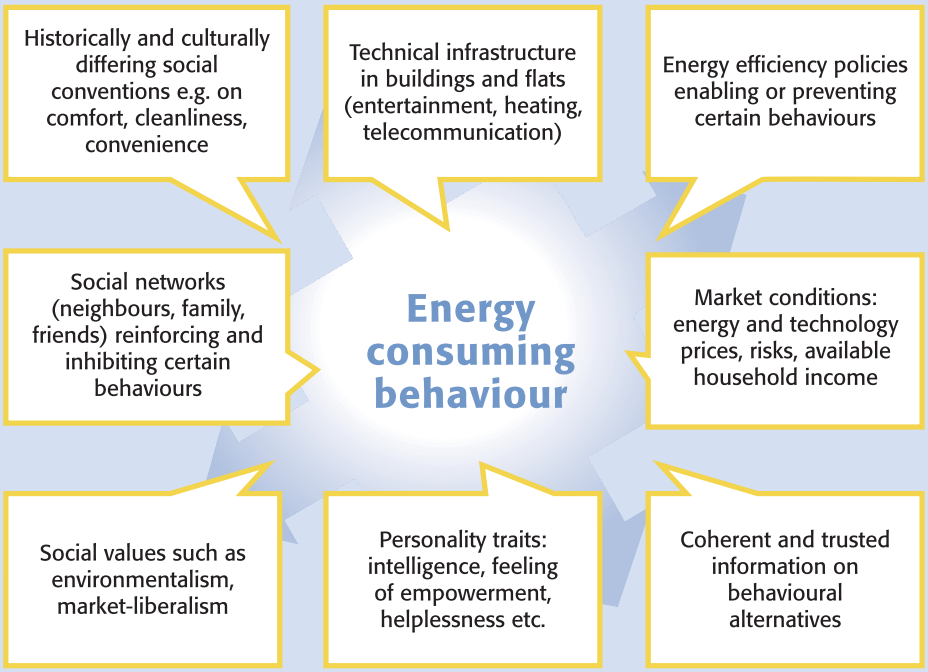
Aggregating Insights from Different Disciplines

Each of the different approaches presented above contributes to a better understanding of energy-related behaviours. None of them can claim an exclusive explanation. These approaches should be interpreted as complementary, each explaining part of the picture. Economics highlights the importance of market conditions for persistence or change in behaviours, in particular investment behaviour that depends on low risk and profitability. For one-shot purchases of fridges or washing machines this might be of outstanding importance. Psychology informs service providers about the interplay of attitudes and values, about conflicting intentions and the cognitive processes that lead to energy saving or energy using behaviours. Those variables can be expected to impact significantly, for instance on the chosen water temperature for washing machines. Finally, sociology emphasizes the social embedding of consumption patterns, leading researchers to analyse the persistence and change of social conventions over time and within social milieus, networks or communities. This perspective is important for discovering the trends beyond individual processes, trends that might shape the target group's cultural energy consuming patterns, e.g., when analysing young people's behaviours, take into account their "connectedness" to online social networking platforms such as Facebook.

Thus rather than adopting a strategy informed by one single discipline, practitioners should be aware of ideas from several schools' research into behavioural change. It is clear, however,

that this knowledge is on a general level (see remarks below) and for use as a kind of mind map to help approach the complexity of energy-related behaviours and draw conclusions for the design of their intervention strategies (see figure 4).

Figure 4: The complexity of human behaviour



Source: Own figure

Indeed changing energy consuming behaviours depend on a multitude of factors. *"Theoretical references as well as field experience force [us; inserted by the authors] to be very careful about predictions in the field of future energy behaviours. Consumers are indeed pushed by a combination of several factors, which are not only numerous and complex, but also in competition and even paradoxical."* (Bartiaux 2008: 1). For practitioners, it is impossible to exhaustively and scientifically analyse all the factors that might interfere with the energy consuming behaviours of the target group. Most service providers will be unable to hire a research company for an in-depth study of residents' particular energy consuming practices, of their knowledge levels, attitudes, perceptions of normal behaviours, financial resources etc. However, the ideas presented above may help practitioners to become aware of different factors that might shape the target group's behaviours and to reflect upon which variables might be especially relevant to them. This could help with the design of an intervention strategy based on pragmatic probability assumptions and, if the reflection process is done well, the outcome should be better than a uniform, one-size-fits-all approach. In any case, we strongly recommend involving your target group for designing your intervention strategy. Take the time to visit them at home to understand their situation, invite them to a round table or to an exchange on an online forum. Based on this bilateral relationship, you can then create an energy service which is more likely to fit the particular situation of your target group. In the following chapter we will elaborate on what kind of intervention strategies you can consider.

Chapter 4: Intervention Strategies

Today, a lot of effort and money is spent on awareness-raising campaigns and other behavioural change programs. However, many of them lack a clear theoretical foundation, do not draw from previous experiences and fail to develop a clear strategy about whose behaviour might be changed by what measures (Dahlbom et al. 2009). Consequently, a lot of behavioural change programs remain inefficient (Greer 2009).

In this chapter we will discuss ways of influencing consumer behaviour. Using the theoretical explanations in chapter 3 we will argue that interventions drawing on evidence from different disciplines are most successful. Behaviours are most likely to change with a combination of several instruments derived from different scientific disciplines, i.e. adopting a "full court press" approach (Stern 2009).

Most "intervention strategies" have been developed and examined by psychologists. Following the common idea of the theoretical models presented in chapter 3, psychologists mainly developed intervention strategies based on the vision of autonomous individual processes which lead to energy consuming behaviours (Wilhite 2010). There are many studies on the effectiveness of intervention strategies. Abrahamse et al. (2005) did a systematic assessment of empirical psychologist studies. Economists share an individualistic philosophy for intervening, but mainly focus on setting financial incentives and tailoring information to decrease transaction costs and help users to make well informed decisions. Typical instruments for influencing human behaviour, based on insights from psychology and economics, are feedback measures and personalised advice. In contrast, sociologists shift the attention away from individuals and highlight the importance of instruments such as social comparison or community action.

Media Campaigns

Media campaigns generally target people's attitudes. They try to overcome motivational "barriers" in human actions by connecting sustainable behaviours with desirable goals, such as protecting the environment, saving money, being progressive, etc. Like informational strategies, media campaigns tend to have limited effects (Abrahamse et al. 2005). However, there are famous examples, like the campaign against Shell the Brent Spar oil platform, that demonstrate their potential for success.

Clear, Coherent and Understandable Information

Information presented through websites leaflets, exhibitions or posters can provide background information to residents about how their domestic behaviour relates to energy saving and/or energy wasting. This sort of information is an essential precondition for sustainable behaviour.

A recent survey (LogicaCMG 2008: 16) revealed that around half of Europeans say they "have no idea how much energy" they are using. Even though there is need for more information, information strategies alone seem to have little effect on behaviours (Abrahamse et al. 2005; Bartiaux et al. 2006). Studies indicate that it is only when combined with other measures, like individual feedback, that significant behavioural change can be achieved. According to McMakin (2002) a 10% reduction in gas and electricity for heating was reached through targeted personal information and home visits (see also Bender et al. 2006). Winett et al. (1985; cited in: Abrahamse et al. 2005) claim that consumption can be cut by 20% if information strategies are combined with other methods.

Best Practice: ***Online-Check of Heating Costs***

Stakeholder in Focus: *The Deutscher Mieterbund (DMB), in cooperation with co2online gemeinnützige GmbH, offers home owners an online energy check.*

Special Aspects: *After checking their heating consumption, households receive a voucher for personalised advice on ways to reduce heating costs.*

The Experience: *Home owners can check their heating energy consumption data and costs on the co2online webpage. Individual household data are then compared to the average consumption and cost levels of similar buildings in the same area. Participants are then informed about options for potential savings and possible ways to upgrade their homes. The energy consumption assessment is based on more than 150.000 evaluated cases. For examining heat energy consumption and costs the recent heat energy bill is needed, Furthermore users of the online analysis can order a detailed written report with recommendations for change, which is sent to them within a few weeks. From 2004 – 2007 around 718.000 people used this online-check for heating costs. In 2007 alone, approximately 24.000 detailed written evaluations were created.*

More information:
www.mieterbund.de,
www.co2online.de, Scharp et al. 2008

Prompts

Prompts work as stimuli to remind us to behave in certain ways (see e.g. Pichert 2008; Matthies 2009b), for example, stickers on the wall encourage us to switch off the lights when leaving a room. Compared to other intervention measures, such as monitoring and visualisation installations (see below), prompts are unbeatably cheap. However, it seems that only if combined with other measures (feed-back, social norm marketing …) considerable savings can be achieved (Aronson and O'Leary 1982-83).

Goal Setting Strategies

Goal setting strategies with "carrots", or rewards, address the motivational side of user behaviour. These types of strategies aim to encourage desired behaviours by rewarding good performance. Combined with feedback, massive energy savings of up to 15% (electricity) seem to be possible. However, some studies report that, without personalised feedback (see below) and ambitious goals, the strategy is not very effective (Pallak and Cummings 1976, Katzev and Johnson 1983, Becker 1978; all cited in: Abrahamse et al. 2005).

Real-Time, Personalised Feedback

Real-time, personalised feedback, as delivered by smart metering systems, makes hidden energy consumption obvious. It increases understanding on the impact of behaviours, and motivates improvements to individual energy, carbon and financial balancing. According to several studies this strategy seems to be very effective (Darby 2006; Abrahamse et al. 2005; Save@work4homes 2009). Savings between 4 – 18% for electricity and 18% for gas consumption were reported in several studies (McCalley and Midden 2002, Midden et al. 1983; both cited in Abrahamse et al. 2005; Darby 2006; Save@work4homes 2009).

All in all, there is evidence that general information alone, communicated by flyers, brochures, exhibitions, events, or campaigns is not very likely to modify consumer habits. However, feedback, combined with individual consultation and incentive strategies, (as long as the incentives are maintained) seem to be a promising approach to shaping human behaviour. Depending on the chosen strategies, savings from 10 – 20% of gas and electricity consumption can be achieved (Darby 2006; Abrahamse et al. 2005). However, many of the studies reviewed have used a "laboratory" type of approach. As Abrahamse et al. (2005: 282) argue, *"households who participate in this type of studies tend to be highly motivated, tend to have (…) higher educational levels, making generalizations based on these studies rather difficult."* Furthermore, many behavioural changes in this type of "artificial" study design are likely to be short term as participants are likely to fall back into former behaviour patterns after the end of the study (ibid).

Best Practice: ***Karlsruhe is Keeping an Eye on Energy Efficiency***

Stakeholder in Focus: *By installing a monitoring and visualisation system the housing company "Volkswohnung GmbH – Karlsruhe" is helping tenants to keep an eye on their own energy-related behaviour.*

Special Aspects: *Continuous monitoring of energy consumption helps tenants living in modernized flats to adapt their behaviour to their new energy-efficient homes. Additionally, this has a second benefit of strengthening the company's corporate image in terms of social responsibility and attracts new tenants.*

The Experience: *Some recently modernized dwellings were equipped with sensors that analyze heat consumption and ventilation patterns. In addition, in half of the flats monitors were installed to display energy consumption. The residents' daily energy consumption was illustrated by three types of 'smileys' that tell users about their performance. The housing company intended to identify the impact of monitoring and feedback on household energy consumption and to assess whether potential energy-savings can be fully achieved using these measures. The results are impressive. Compared to the control group in the same building, the test group used around 7% less energy. This empirical evidence is encouraging the use of monitoring systems that for some households might be an excellent way of reducing energy consumption.*

More information:
www.volkswohnung.com,
Scharp et al. 2008

Incentive Strategies

Incentive strategies (e.g. low pricing strategies, preferential bank rates, consumption taxes, and subsidies for energy efficiency) address the self-interested homo economicus who wants to maximize his benefits. This kind of intervention appears to be the most effective method for saving energy, as long as the incentive is maintained. Several studies (Slavin et al. 1981/ electricity; Winett et al. 1985, McClelland and Cook 1980/gas; all cited in Abrahamse et al. 2005) show that up to 6% of electricity or gas can be saved by applying this strategy.

Best Practice: ***Training Forums – the Energy Challenge***

Stakeholder in Focus: *In 2005, the city of Brussels launched "the Energy Challenge" to encourage families to reduce their average consumption by 1 t of CO_2.*

Special Aspects: *The campaign included training sessions and personal advice, which significantly increased the chances of effective behavioural change.*

The Experience: *The aim of the "Energy Challenge" campaign was to reduce the annual CO_2 emissions of an average Brussels family by 1 tonne (average emissions are 5,2 tonnes CO_2 including transport). Participating families were encouraged to change their daily consumption patterns in, and around the house. Newspaper advertisements, radio broadcasts, bus posters and the Internet were all used to connect with participants. All participants were invited to attend a "kick-off evening" when the organisers explained the principles, objectives and obligations of the challenge. During the Energy Challenge, which lasted for six months, participants were invited to five further presentations on a specific topic. Furthermore, participants could call the "green phone" for free advice on energy saving measures and could access information on the campaign website. Last but not least, each participant received four newsletters. After 200 households in the first project cycle (2005 – 2006), 1.435 families participated in the second phase (2007 – 2008). The average energy saving in each participating household was of 20%, which corresponds to savings of 1 t CO_2 and around € 400.*

More information: *Scharp et al. 2008*

Those problems might be overcome if intervention strategies are not only tackle individuals but also try to give their instruments a "social dimension". Hence, from a sociological perspective, service providers should try take the social shaping of energy consuming patterns into account. This could be achieved through the following approaches:

Social Comparison

Defining behaviours as "normal", through 'social norm' marketing, can make a real difference in effecting behavioural change. Many motivational approaches to shape energy consumption appear to fail because the suggested "good behaviour" is seen as not normal, extreme or ideological behaviour and is therefore not imitated (Rettie and Studley 2009). The encouraging outcomes of feedback studies might even be improved if a comparative element were integrated (Bartiaux et al. 2006: 143). *"Rather than telling people what to do, it can be more effective to use 'social proof' (Cialdini, 2001); influencing behaviour by showing people what others do. (…) In particular, research indicates that feedback on an individual's level of performance (e.g. electricity consumption) can change their behaviour, and moreover, that this effect is enhanced if supplemented by feedback on the performance of a relevant social group."* (Rettie and Studley 2009: 5).

Best Practice: ***Energy Information – Kauno Energija's Comparative Energy Bills***

Stakeholder in Focus: *Energy Company Kauno Energija provides comparative energy bills to its clients.*

Special Aspects: *Energy Company Kauno Energija issues detailed comparative energy bills on heating and hot water to customers in multi-storey buildings in order to alert them to above average energy consumption.*

The Experience: *The bills provide both data on the actual energy consumption of the customer household and expected energy consumption, calculated as a function of the size of the customer's flat and the measured overall consumption of all flats in the buildings. Thus, residents are able to compare their own consumption to expected consumption and are given important incentives to pay more attention to their energy-related behavior.*

More information: *www.krea.lt, Scharp et al. 2008*

Making Use of the Power of Discourse

Talking is not just a means of transmitting information, it is part of the creative, interactive act of making reality (Berger/Luckmann 1966). By exchanging experiences on energy consumption we are creating a "discursive consciousness" (Bartiaux et al. 2006; Giddens 1984). A vivid debate gives people the feeling that energy use is a socially important topic that must and can be dealt with collectively. Thus, any kind of intervention should have some kind of interactive exchange element involving service providers and residents in designing measures to meet shared perceptions of energy-related issues and in addressing their integration into daily life.

Best Practice: ***Empowerment – Residents Participation***

Stakeholder in Focus: *French social housing operator, Opac38 (Grenoble) worked closely with tenants on the construction of 61 low-energy units in the "Grand Tissage" area (Bourgoin Jallieu).*

Special Aspects: *The project is exceptional because of its inclusive approach. Tenants' representatives were consulted and updated at all stages of the development to ensure that future residents contribute to low energy consumption.*

The Experience: *During the conception phase, a Tenant Union representative joined the planning team. Later on, an Environmental Performance Committee (Comité de Gestion HQE) was launched, composed of representatives of the Residents' Association "Friends of Grand Tissu", the Union of Tenants Organisations (Fédération d'Associations Représentatives des Locataires) and OPAC38's technical administrators, amongst others. This Committee assured that all the participants involved considered the objectives of sustainable housing and acted in a coordinated way. The presence of the Residents' Association, and the involvement of all the partners, was instrumental in analyzing problems and enabling good relationships for all relevant aspects of the construction (e.g.: quality of the building, treatment of reclamation, etc.). As they were important actors themselves instead of being passive recipients, residents were willing to cooperate and were committed to reducing their energy consumption. In comparison to the rest of OPAC38 estate, the Grand Tissage buildings'2007 energy costs were 44% below average for heating and 29% below average for hot water.*

More information: *www.opac38.fr, Scharp et al. 2008*

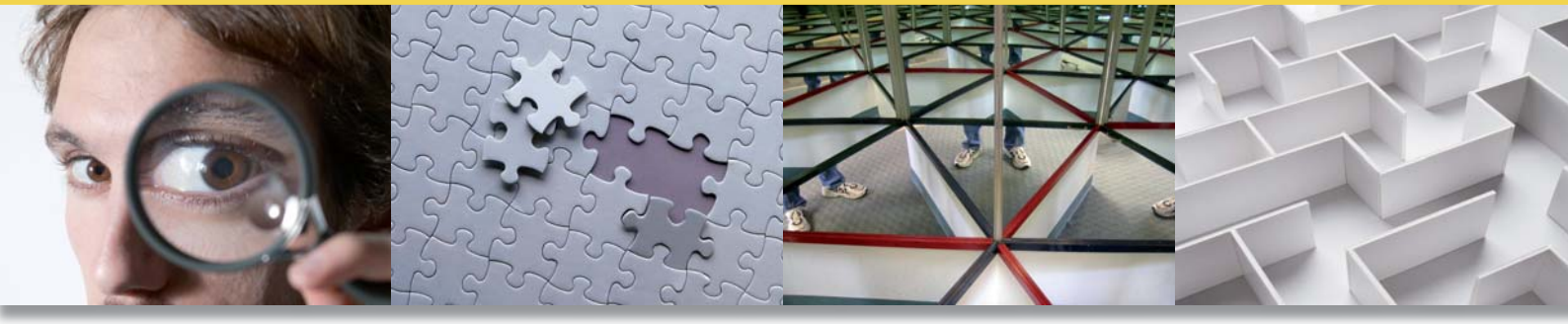
Collective Action

Acting together as well as talking together increases the likelihood of persistent behavioural change. In recent times, community-based approaches like "transition towns" have received a lot of attention (see e.g. Heiskanen et al. 2009; Middlemiss 2008; Middlemiss and Parrish 2009; Kenis and Mathijs 2009; Maloney et al. 2009; Bartiaux et al. 2006: 144) and demonstrate the power of common action for more sustainable consumption. Thus, possible interventions could transform people from passive recipients of advice into active participants in energy saving. Possible interventions might include training people to be "energy experts" who could then support neighbours or could involve them in competitions between families, quarters or even towns.

In summary, there is a range of possible intervention strategies with which practitioners can work. However, we want to point out again, that these measures do not guarantee more sustainable consumption patterns. We do believe, nonetheless, that if some of the following general guidelines are respected the likelihood of increasing lasting behavioural change is significant:

1) Before taking any action, take the time to understand the "life world" of your target group, or their "background" environment of competences, practices and attitudes as well as their life circumstances. Brainstorm to consider which factors are shaping their patterns of energy consumption (see chapter 4). What is typical about their behaviour that you might address? For example, elderly people generally prefer a higher than average room temperature and tend to wash their clothes at 90°.
2) Involve your target group in the whole process. They can give you important clues to their behaviours, the reasons behind it and ways in which you might intervene. In addition, they can become your allies in implementing energy savings.
3) Do not rely on one instrument alone. Try to make energy saving a permanent issue in people's lives. Start, for instance, by providing low-cost incentives such as energy saving light bulbs; add some clear and understandable background information to fill knowledge gaps; subsequently try to identify residents who might support you in further initiatives; train them to become energy experts and advisers to other residents. Once a network is established, work with interested households to launch an energy saving competition.

Do not start from scratch when developing your behaviour change programme. Draw on the tried and tested experiences of others. The next chapter presents the BewareE data base, aimed to inspire service providers in the design of their own strategies.

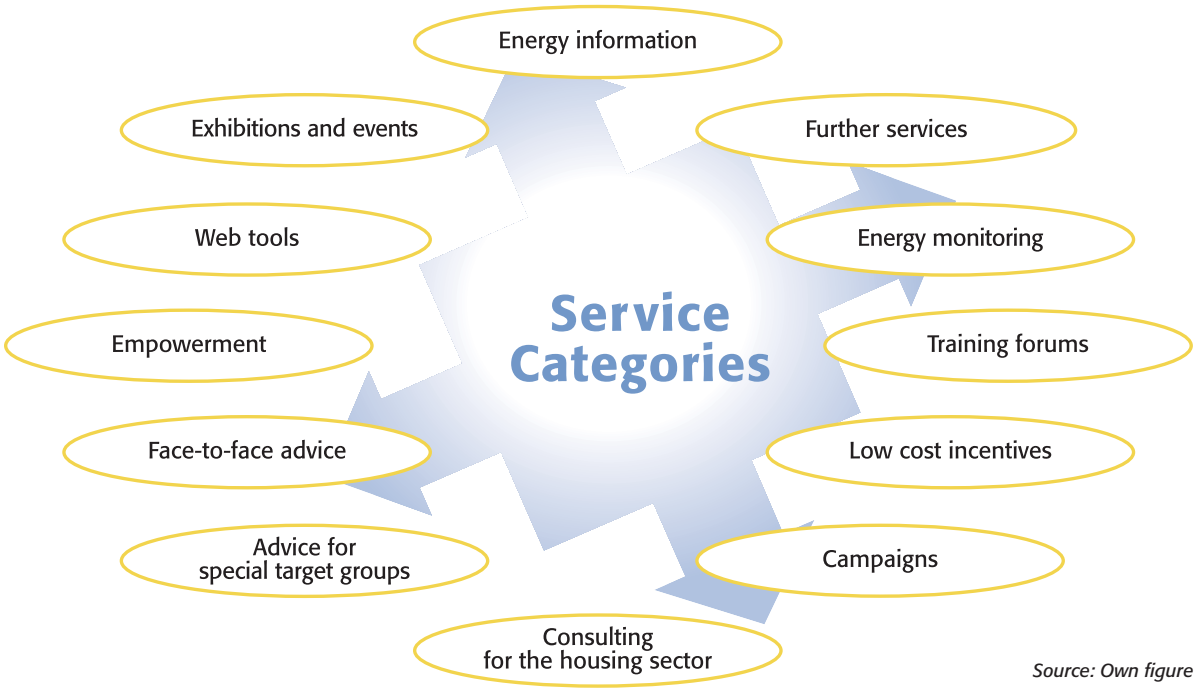


Chapter 5: Choosing a Service: Examples from the BewareE Project

The BewareE project has created a database of household energy awareness services. Project partners found more than 130 examples of services from all EU member states (see www.izt.de/bewaree). The selection is based on a two-fold assessment. First, the services were rated according to five indicators: potential market size, service costs, energy reduction potential, development stage and target group acceptance. All services featuring an overall rating above a calculated threshold were included in the initial short list. Subsequently, this group was analyzed for qualitative criteria, more precisely, for their degree of innovativeness. Thus, some of the highly rated services did not make the second cut as they were considered to be rather common, while other examples, which were very innovative, were included in the final selection, even though they might have displayed a rating below the threshold.

In order to categorise the 136 identified energy services, twelve groups were defined according to the main characteristics of services (see figure 5). These service categories are described below.

Figure 5: Service categories in the BewareE-project



Source: Own figure

Campaigns: These energy services are promotional and informational activities carried out by mail, email, television, radio etc. that aim to improve household energy efficiency. Campaigns address a great number of households and can even be nation-wide. Their messages are usually not focused on a particular group or a specific type of house.

Energy Information: 'Energy information' services use diverse media to provide specific information about how to reduce household energy consumption. This information is targeted at specific households' situations but, there is no face-to-face contact between energy service suppliers and the recipients.

Low Cost Incentives: These services combine energy information with small gifts in order to stimulate behavioural change related to energy consumption. For instance, the BewareE inventory includes two examples of "climate boxes" containing small gifts such as low consumption light bulbs, insulation strips and standby killers to demonstrate how energy can be saved without reducing comfort.

Exhibitions and Events: This category of services consists of organising events and exhibitions to disseminate general information on energy efficiency. They normally target a large number of households in a district, town or region. This category includes a multitude of ideas such as energy weeks, poster exhibitions and street theatre.

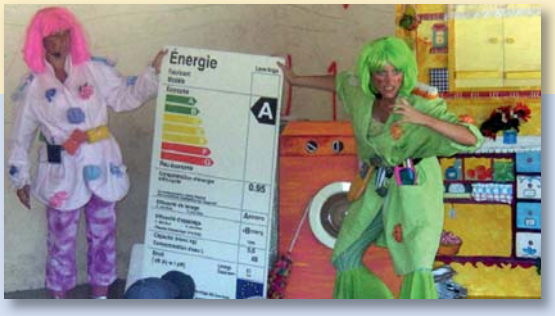
Best Practice: ***Theatre on Energy Efficiency***

Stakeholder in Focus: *The performances primarily addressed children in social housing in the French region of Haute-Savoie.*

Special Aspects: *Theatre is an innovative way to present the somewhat unexciting topic of saving energy.*

The Experience: *From 2000 – 2004, the Tartine Theatre Company performed a 45 minute street play ("Gaspi et Bontruc") about energy consumption (heating, electricity, hot water, cooking, choice of appliances …). The shows were organized in low-income areas of the city of Annecy (areas with social housing). The street shows were later presented to schools. In 2003, 12 performances of "Gaspi and Bontruc" were solicited by the department of Isère, outside Haute-Savoie).*

More information: *Scharp et al. 2008*



Energy Monitoring: 'Energy monitoring' services make household energy consumption, and their related costs, transparent. These services give direct real-time feedback on energy consumption, and usually rely on ICT devices, such as smart metering. In many cases, technical complexity necessitates collaboration between energy companies, energy or environmental agencies, housing companies, public administration bodies, NGOs or technology companies.

Web Tools: This category includes all services that provide information and advice to consumers via the Internet. In some cases, potential savings are calculated, while other websites present comparative data related to Kyoto objectives. They are usually initiated by electricity companies, NGOs or environmental agencies.

Best Practice: ***Unión Fenosa's Virtual Forest***

Stakeholder in Focus: *The Energy Efficiency Centre of the Spanish energy company Unión Fenosa launched a 'Virtual Forest'.*

Special Aspects: *Unión Fenosa donated 1 € to a reforestation project in Brazil for each participant in the Virtual Forest project.*

The Experience: *The Virtual Forest guided households towards a more efficient use of energy by inviting them to complete an on-line questionnaire about their consumption habits. This was followed by advice on ways to reduce energy consumption. If a participant submitted his or her e-mail address, he or she received a comparative evaluation of the present energy use in the household as well as practical recommendations for improvement. By 2009, around 55.000 people had been involved in the project. Unión Fenosa estimates that their Virtual Forest had prevented 2.600 t of CO_2 emissions in addition to the potential abatement effect of the 27.400 trees that had been planted.*

More information: *Scharp et al. 2008*

Training Forums: This category includes all kinds of training activities to target individuals who are able to shape household energy consumption, e.g. architects, builders, installers, owners, associations or building managers.

Empowerment: This type of service gives residents the skills to participate in detecting energy waste, as well as in the development and implementation of energy saving measures. This can transform them from being passive recipients of information to active participants of energy saving projects. The BewareE inventory contains one example of tenants training other tenants and another example of the creation of a resident environmental committee in a social housing company.

Best Practice: ***Residents Trained as Energy Experts***

Stakeholder in Focus: *Motiva Oy, the Centre for Energy Efficiency trains residents to act as energy experts. The service is provided in cooperation with the social housing organisation VVO.*

Special Aspects: *Energy advice given by neighbours is likely to be more trusted than advice given by "external" third parties.*

The Experience: *The Finnish "Energy Expert Training" project prepares residents to act as Experts on energy issues in the buildings in which they live. The Energy Experts monitor sudden changes in energy/electricity/heating consumption. They also use an extranet service to access information and training material and give advice to other residents on energy efficiency and conservation. Basic training is given through a three day course, and Experts receive further training and meet regularly with other Experts. VVO counts around 500 Energy Experts among its tenants. Since 1994, 3.000 Energy Experts have been trained by Motiva in Finland. The average savings in buildings with active Energy Experts is 5% in heating and 10% in electricity consumption and 20% in water usage.*

More information: *www.motiva.fi, www.vvo.fi*

Consulting for the Housing Sector: This category refers to services directed to housing organizations rather than residents. For instance, two services relate to benchmarking energy consumption and costs, enabling building managers to compare energy balances for several building and to find energy leaks.

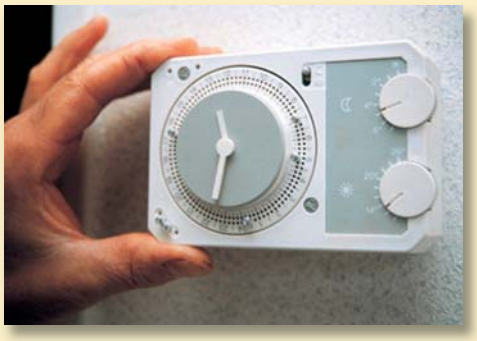
Best Practice:

Consulting for the Housing Sector: Benchmarking Operating Costs

Stakeholder in Focus: *In cooperation with the Berlin-Brandenburg housing association (BBU) the private Berlin-based company WohnCom, developed a benchmarking tool to be used by housing companies.*

Special Aspects: *Due to the cooperation of many housing companies, a comprehensive database was created which included thousands of homes and allowed for detailed comparisons.*

The Experience: *For this service, residential building consumption data, dependent on building structure, was compiled. The aim of the benchmarking tool is to compare key figures of different residential buildings in order to spot "weak points" in resource consumption. Benchmarking results can be used by all owners of multifamily buildings after paying an annual contribution. Since the service was launched in Berlin and Brandenburg, operation costs have been reduced by monthly € 0.15 to € 0.35 per m² living space. Therefore, despite the significant increase of energy costs within the last decade, housing companies have been able to reduce their costs by implementing saving measures.*



More information: *www.wohncom.de, Scharp et al. 2008*

Face-to-Face Advice: This category includes all kind of services with an Energy Expert offering tenants personalised, targeted advice on saving energy. This service implies a live chain of communication between service supplier and consumer.

Best Practice: ***French Energy Ambassadors Offer Personal Advice***

Stakeholder in Focus: *Created by the NGO, Prioriterre (France), the 'Energy Ambassadors' initiative involves intermediaries like social workers and other trusted volunteers with close contact to residents.*

Special Aspects: *Involving trusted intermediaries increases the chances for effective advice.*

The Experience: *Energy Ambassadors give practical advice and support to help low-income households manage – and lower – their energy bills.*

First, social workers were given special training on energy use in housing.

Second, a telephone service was set up for social workers and volunteers who are in touch with households in hardship. The aim of this service is to respond to any question on energy or water.

Third, a special manual (Le Guide de la Fourmi, 'The Ant's Guide') was prepared for Energy Ambassadors. It provides information on how to help families in difficulty to manage their energy consumption.

Fourth, home visits are available to families. These visits, however, can only have a positive impact if families feel a real need of the service and make an appointment. After the visits, families can draw on personalized advice.

More information: *www.prioriterre.org, Scharp et al. 2008.*

Chapter 6: How to Implement Successful Services

In previous chapters we presented the scientific background to human behaviour, we discussed different approaches for shaping people's consumption patterns, and we gave an overview of services that can be found in the BewareE database. We provided information and helpful experiences to support measures for behavioural change. However, this information alone is not enough to ensure the successful implementation of your service. Practical problems may obstruct the success of energy awareness services. This chapter is dedicated to those practical aspects, from the very beginning to the end of your project and will help you to overcome typical problems that might occur.

Based on the experiences of the BewareE project, we developed a six-step approach for creating and implementing services that target energy-related behaviours (see figure 6). This approach can be considered to be an adaptation of Service Engineering (SE) in the field of behavioural change (see for the service engineering approach Scharp and Jonuschat 2004):

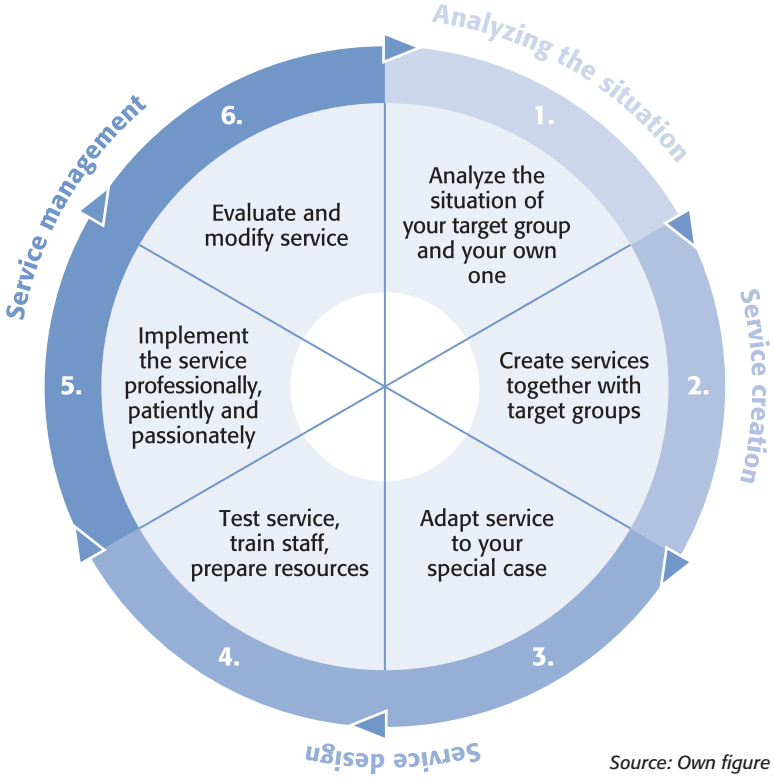


Figure 6: The six step approach for implementing behavioural change action

Source: Own figure

Step 1: Analyze the Situation of Your Target Group and Your Own Situation
First of all, try to understand the perspective of your target group, as outlined in chapter 3. Which factors are shaping their energy consuming behaviours? Get in touch with people. Try to identify their most important energy consuming patterns and the reasons behind them. What is the economic situation of your households? Which social values might drive their behaviours? What misunderstandings, in terms of energy use, might be influencing daily routines? What is the role of the specific social milieu of your target group? Are there typical social conventions that are reinforcing certain behaviours? Gather this information through opinion polls, face-to-face conversations or resident meetings. It is also necessary to analyze your own situation and your own interests as a service provider. What do you want to achieve as service provider? How much commitment of time, staff and money are you willing to invest in order to realise your service (see also the Box "How to Finance your Activity?") Do you have the necessary resources and competencies to realise your behavioural change measures? If your initial analysis is done well, your chances for success are good! Take the time for analysis early on and you can avoid frustration later.

Step 2: Create Services Together with Your Target Group
Based on the knowledge gathered in the first step, start planning your energy awareness service together with your target group. Don't start from scratch but get inspiration from others' experiences. Check the BewareE Database to find various examples of services. What ideas might suit your particular situation? No one can assess that better than your target group. If your target group likes your service approach and think it might be a valuable support for them, then this will considerably increase your chances for success. Avoid top-down attitudes and select appropriate activities together with your target group.

Step 3: Adapt the Service to your Specific Case
Modify the service idea in Step 2 in accordance with your target group and to your own situation. What kind of property is it (well-insulated or not)? What are the demographics of your target group (high income or not, highly educated or not, young or old, singles or families, alternative or conservative)? What is your housing market (social or private property, tenants or owners)? What is your scope of action (the legal requirements, organisational capacities, existing or potential networks and partners)? What are your available resources (money, staff, skills)? Adapt your chosen service to your situation. At this stage, be aware of potential partners and involve other stakeholders such as consumer or resident organizations, if necessary (see Box on "Alone or With Others"). Develop an implementation plan that details steps, time frames, resources, the relationship between partners and costs.

Solving Practical Challenges: ***How to Finance your Activity?***

Challenge: *One major obstacle to providing energy awareness services is getting sufficient funding. Implementing energy awareness services costs money. Energy awareness services are not considered core business for potential service providers like housing companies or utilities. Staff is needed to develop and implement effective services and, in some cases, so is expensive technical equipment. It may not be easy to get approval for spending on these services. Furthermore, residents are reluctant to pay for extra services. Therefore, new innovative forms of financing must be considered.*

Possible Solutions: *Some strategies might be:*

- *Integrating energy awareness measures into larger projects, not specifically dedicated to user behaviour. If awareness raising measures do not stand alone, but come along with other activities, such as large scale refurbishment works or street events, getting funding might be easier.*
- *Watching out for partners who might benefit from supporting services is also a promising strategy. For instance, utilities may be interested in funding projects enhancing customer loyalty.*
- *Involving private companies motivated by purely economic reasons. Thus energy service companies could work with social housing companies in energy contracting models which are combining technical and behavioural change measures in order to increase the overall savings.*
- *Encouraging utilities committed to energy savings by their obligations under the white certificate trading system, to obtain white certificates through awareness raising measures.*
- *Financing energy services through energy suppliers incorporating an "energy services" fee into the overall energy costs. Energy consulting, for example might be financed by taking a small fee from every housing unit. Energy suppliers and tenant/consumer associations can work together to determine what extra fee would be reasonable.*
- *Including energy services in operational costs. Housing companies could charge residents an indirect fee for services. Depending on the size of the housing company it might be possible to finance energy consulting, for example, by taking a small fee from every housing unit.*

Step 4: Test Service, Train Staff and Prepare Resources

To ensure success, plan your service thoroughly. Reserve some time to test it with a sample group of residents and, taking their feedback into account, finalise the service design. Start internal and external communication on time and train the staff involved in implementing the service. If you need products such as smart meters, be sure to test them before distribution.

Step 5: Implement the Service Professionally, Patiently and Passionately

The preparation phase is over, now get ready for implementation! This is the moment of truth but there are still uncertainties about whether your service will ultimately be successful. When realising behavioural change measures, you cannot ensure a desired outcome in the same way as when installing efficient technology[4]. Introducing an energy awareness service is a complex process that needs expertise, time and enthusiasm. Expertise is needed for competent project management. Patience, because changing behaviours is a long-term process and backward steps are likely. Enthusiasm, because you are a fulfilling a challenging and exciting job: creating something for, and with, other people! Hence, the implementation of an energy awareness service must be done *professionally, patiently and passionately.*

Solving Practical Challenges: ***Embedding your Service***

Challenge: *Implementing your service is also a question of good timing and coordinating it with other activities. The success of your service can be positively affected by the right or wrong moment and by good or bad side effects of your service.*

Possible Solutions: *Things to Bear in Mind:*

- ***Timing:*** *Be aware of windows of opportunity. Those windows can be opened both by external events and by events inherent to your own organisation (see Mourik et al 2009). Pay attention to what is happening in public life at local, national and international levels. Movies such as "An Inconvenient Truth" by Al Gore, political events such as the Copenhagen Summit or the launch of a local Agenda21, or even an abrupt rise in energy prices might be a good starting point for your action. Also, try to launch your activity at the right moment within your organisation. If you are planning major refurbishment work, it might be the perfect time to start energy awareness raising services. If new colleagues start their work, find out whether they are the ones to help launch your service.*
- ***Coordination:*** *Try to create positive side effects. If your service is integrated into other activities – for instance a neighbourhood street party – it might be an opportunity to gain support and attention for your scheme. Highlight all the positive outcomes of your service, for instance, improved social cohesion or, simply, fun!*

[4] *However, the "rebound" effect shows that even installing efficient technology by no means guarantees energy savings.*

Solving Practical Challenges: ***Alone or With Others?***

Challenge: *An important part of developing and creating services is determining ownership. Providing services doesn't necessarily mean creating services. Rather, there is a spectrum of possible ways to engage cooperative partners. Ask yourself, what can you do on your own and what can others do better?*

Possible Solutions: *You should consider the following aspects:*

- *Start by analysing your own resources and competencies; if they are sufficient then enable your service autonomously. This would mean that the entire design and implementation of the service would be in the hands of your organisation. Although this will simplify the process, you must be sure you want to do everything on your own. Do you have enough resources? Perhaps you can implement a specific part of the service well, but could others do it better? If so, draw on their skills and concentrate on other things!*
- *If you come to the conclusion that you don't have all it takes to move forward, then pursue a cooperative strategy and provide the service alongside another organization that complements your knowledge and skills. However, make sure that your partner is one that your target group will trust. For instance, utilities might not be the right partners for providing impartial advice, as they may appear motivated by profit. In the ideal case a fruitful partnership enables delivery of a professional service and leads to increased customer satisfaction.*
- *Residents themselves may be important partners in implementing the service. Resident boards committees and tenant Energy Expert networks are good ways to integrate tenants in your scheme. Involving residents is a very promising strategy as they are usually closer to their neighbours than you and are trusted. They have the advantage of common experiences and therefore might increase acceptance of the service.*

Step 6: Evaluate and Optimise Service

It is almost certain that you will experience some problems in your implementation phase. This is to be expected and you should remain flexible and consider your behavioural change service as a process of continuous learning. Accepting that trial and error are part of the process will help you to avoid high expectations and ensuing frustrations. Evaluate the experiences of your service and, based on your learning, effect continuous improvement. The process might never be over and will always give rise to new opportunities. Keep on going!

Chapter 7: Making it Happen

You may have thought that changing energy consuming behaviours is a "nice" add-on but that technical energy efficiency is still the core solution for tackling climate change. While technical improvements are, indeed, important for reducing CO_2 emissions, we would argue that we must stop looking only at this aspect and must pay more attention to the reduction of consumption in total volume (Wilhite 2010). For instance, despite an ever rising efficiency of aircraft and cars, energy consumption in the traffic sector is still rising: *"Although measures have been implemented to improve the energy efficiency of passenger and freight road transport, gains have been far outpaced by increasing transport demand."* (European Environment Agency 2010: 16). Similarly, in the household sector both electrical appliances and building infrastructure have seen significant efficiency gains, but nevertheless the total consumption of this sector has remained more or less stable since 2005 and only started decreasing in 2006 (Eurostat 2009). This again points to the importance of lifestyle and energy practices in the home.

Those findings clearly indicate that technical energy efficiency gains alone, will not be sufficient to fight global warming. Our emphasis on the technical side is, from a financial point of view, somehow irrational. Even though behavioural change measures are not easy to implement (as explained by this manual) they are, if successful, more cost efficient than many technical measures. The table below presents the costs of three technical measures compared to one behaviour-related measure. The behavioural action is clearly the most cost-effective (Uitzinger, IVAM, 2009).

Table 2: The cost efficiency of behavioural change measures *Source: Uitzinger, IVAM, 2009*

Wind turbine: 44 € / ton CO_2	**Washing machine: 570 € / ton CO_2**
▶ 1.300.000 €	▶ 200 € extra for the A label
▶ Life expectancy 30 years	▶ Life expectancy 7 years
▶ Saves 980 ton CO_2/year	▶ Saves 0.05 ton CO_2/year
PV solar collector: 600 € / ton CO_2	**Behavioural campaign: 30 € / ton CO_2**
▶ 6.000 €	▶ 30.000 €
▶ Life expectancy 25 years	▶ Life expectancy 1 – 3 years
▶ Saves 0.4 ton CO_2/year	▶ Saves 360 ton CO_2/year

These behavioural changes can, to a certain extent, be stimulated or even enforced by policy makers, by taxing fuels for example. However, the local level is at least as important for inciting behavioural change as is the governmental level. Thus you, as a potential service provider on the local level, can make the difference! Go ahead and implement your service!

When planning your service keep in mind the six following golden rules that have been developed in the course of our work.

1. **Have a closer look.** For developing effective energy awareness services it is important to know the particular situation of your target group. What energy consuming behaviours do they typically show? Which factors shape these behaviours? Look at the technical building infrastructure, at household income levels, at energy policies, at social values and norms, at social networks and also at the larger socio-cultural context.
2. **Make it with, and for them.** Household participation is a key factor in the successful design and implementation of effective services. Involve households from the very beginning and make them participants rather than employing a top-down approach. Search for passionate allies among tenants who might encourage other households in their social network to take part.
3. **Don't reinvent the wheel.** Learn from others' experiences. You will probably not be able to transplant another service directly to your organisation, but you might be able to draw important conclusions for designing your particular service. Try to avoid common errors and copy what has worked well elsewhere. Keep in mind what research projects have already revealed. Studies suggest, for instance, that information alone, dispersed through flyers etc, is not likely to modify consumer habits, whereas feed-back combined with personal advice is a promising approach to shape human behaviours.
4. **Make it special.** Energy saving is not a household priority. Energy is not consumed like consumer goods, but is a hidden part of daily life, for instance while watching TV. In this sense energy only has meaning as part of a service. Therefore, energy awareness services should be not only be professionally planned and implemented but also attractive to people.
5. **Clever timing and coordination.** Take advantage of good opportunities to launch your service. Choose the right moment to implementing services, for instance, during a refurbishment process. Try to create positive side effects for your service, like increased social cohesion in the neighbourhood. If your service is integrated into other activities – a neighbourhood street party – this might help gather more support and publicity.
6. **Don't do on your own what others can do better.** Identify what parts of the service you want to implement on your own. Even though contracting another organisation will cost more, that expenditure might be well invested if it helps you to produce an efficient service.

Annex – List of services (Service Inventory)

Tip: All services are well described at the project website www.izt.de/bewaree. You can also download several descriptions of the services included in the service inventory.

ID = Identification number
Co = Country
SI = Service of the Service Inventory
BP = Best Practice

ID	Co	Type	Name	Inventory
1	PL	campaign	Energy saving campaign	SI
2	PL	campaign	Energy awareness campaign	SI
21	BE	campaign	Laundry washing: The 'turn to 30°-action'	BP
40	NL	campaign	Behavioural change campaign for municipality employees	SI
41	NL	campaign	Warm and comfortable living	SI
46	RO	campaign	Investing and cooperating for energy efficiency	BP
52	SK	campaign	Energy efficiency campaign Vraku a	SI
113	GR	campaign	Energy efficiency campaign	SI
8	DE	consulting for the housing sector	Residents' advisory Committee	BP
9	DE	consulting for the housing sector	Benchmarking operating costs	BP
57	SL	consulting for the housing sector	Online benchmarking of building energy performances	BP
122	IT	consulting for the housing sector	Promoting the construction of one million energy-efficient homes	BP
4	UK	empowerment	Local tenant energy network	BP
5	UK	empowerment	Advising tenants in sheltered housing	SI
34	NL	empowerment	Training students as energy ambassadors	SI
55	FI	empowerment	Tenants train tenants	BP
61	F	empowerment	Residents participation for building project	BP
68	F	empowerment	Energy neighbourhoods	SI
69	F	empowerment	Energy ambassadors for low income households	BP

70	SE	empowerment	Demand side management	SI
89	HU	empowerment	Do-It-Yourself Solar collector	BP
106	PT	empowerment	Evaluating household energy use: The EcoFamilias project	BP
118	SE	empowerment	Demand side management in new buildings	SI
138	NL	empowerment	Personal organizer for energy savings	BP
10	DE	energy information	Energy advice	SI
18	AT	energy information	Energy saving book	SI
33	SE	energy information	Energy letter with personalized advice	BP
53	SK	energy information	Individual energy advice	SI
64	F	energy information	Climate action programme for households	SI
74	ES	energy information	Advising households on energy efficiency	SI
124	DE	energy information	Checking heating costs	SI
134	LT	energy information	Comparative energy bills	BP
11	DE	energy monitoring	Displaying energy consumption	BP
47	DK	energy monitoring	Reducing stand-by losses through behavioural changes	SI
48	DK	energy monitoring	ICT-based advice for energy savings	SI
65	F	energy monitoring	Internet platform for controlling energy consumption	SI
66	F	energy monitoring	Interactive energy terminal 'Poweo Box'	BP
120	IT	energy monitoring	Installing smart meters	SI
131	F	energy monitoring	ICT-based control of energy costs	BP
15	AT	exhibitions and events	Community events on energy saving	BP
37	FI	exhibitions and events	Energy awareness week	SI
45	RO	exhibitions and events	Energy efficiency week	SI
56	CY	exhibitions and events	Theme park for RES and energy saving	SI
63	F	exhibitions and events	Competition 'I love my planet'	SI
67	F	exhibitions and events	Theatre play about energy-saving behaviour	BP
71	LV	exhibitions and events	Exhibition on household appliances	SI

97	IT	exhibitions and events	Sunday events for promoting thermal solar systems	SI
109	LUX	exhibitions and events	Exhibition on renewables and energy saving	SI
112	GR	exhibitions and events	Energy events in municipalities	SI
114	GR	exhibitions and events	Street campaign on energy efficiency	SI
117	BE	exhibitions and events	Poster exhibition for housing associations	SI
16	AT	face-to-face advice	Chimney sweepers as climate ambassadors	BP
17	AT	face-to-face advice	Advice on efficient appliances	SI
19	AT	face-to-face advice	Heater check for house owners	SI
32	SE	face-to-face advice	Local energy advisors	BP
36	NL	face-to-face advice	Training for low income households	BP
38	FI	face-to-face advice	Tenants' "energy conversations"	SI
58	BG	face-to-face advice	Advice for low income households (SHARE)	SI
59	BG	face-to-face advice	Advice for low income households (ISEES)	SI
94	IT	face-to-face advice	Boiler inspector advice service	BP
111	LUX	face-to-face advice	Advice on energy efficiency	SI
7	DE	financing and consultation	Energy contracting	BP
31	IE	financing and consultation	Home energy saving scheme for owners	SI
54	EE	financing and consultation	Information service on subsidies for refurbishment measures	SI
127	DE	financing and consultation	Advice on appropriate behaviour in low energy houses	SI
132	SL	financing and consultation	Energy contracting for households	SI
12	AT	low cost incentives	Advice on energy efficient light bulbs	SI
42	NL	low cost incentives	Energy box for energy awareness raising	BP
115	NL	low cost incentives	Energy metering "to measure is to know"	BP
130	F	low cost incentives	Climate Box	BP
139	DE	low cost incentives	Fifty-Fifty energy saving projects	SI

14	SL	training forums	Seminars on low energy consumption houses	SI
20	BE	training forums	Children controlling their energy consumption	SI
51	CZ	training forums	The TREAM educational programme	SI
72	LT	training forums	Training on refurbishment measures	SI
73	LT	training forums	Seminars for home owners and housing associations	SI
116	BE	training forums	Five energy trainings for households	BP
128	DE	training forums	Training for building managers (janitors)	SI
129	LV	training forums	Seminars for constructing energy-efficient buildings	BP
135	LT	training forums	Seminars on reducing heat and electricity consumption	SI
24	BE	web tools	Action book for households	BP
26	BE	web tools	Online energy consumption check	SI
27	BE	web tools	Energy performance calculator	SI
30	IE	web tools	Advice on energy-saving measures	SI
35	NL	web tools	Energy efficiency guide (“compass service”)	BP
39	NL	web tools	Energy shops	BP
49	CZ	web tools	Web portal about energy saving	SI
79	ES	web tools	Virtual calculator and ‘Top Ten’ appliances	BP
86	ES	web tools	The Virtual Forest	BP
105	PT	web tools	Simulating energy consumption with Eco Simulador	SI
121	M	web tools	Energy saving tips per sms	SI
125	DE	web tools	Online-check of heating costs	BP
126	DE	web tools	“Energy consumption account” and saving measures	SI

References

Abrahamse, W., L. Steg, Ch. Vlek and J.A. Rothengatter (2005):
A review of intervention studies aimed at household energy conservation, Journal of Environmental Psychology 25 (2005), pp. 273–291.

Ajzen, I. (1985):
From intentions to actions: A theory of planned behavior. In: J. Kuhl & J. Beckman (Eds.), Action-control: from cognition to behavior.

Aronson, E., & O'Leary, M. (1982-83):
The relative effectiveness of models and prompts on energy conservation: A field experiment in a shower room. Journal of Environmental Systems, 12, 219–224.

Bagozzi, R. Gürnao-Canli, Z., & Priester, J. (2002):
The social psychology of consumer behaviour.

ADEME (2008):
ADEME et vous. Strategie & études : Le réchauffement climatique : une prise de conscience grandissante du grand public. Online: http://www2.ademe.fr/servlet/getBin?name=C0E6E4C31EA33A3CA4C9FA6F958BEDC71202478031665.pdf

Bartiaux, Françoise (2008):
Changing energy-related practices and behaviours in the residential sector: Sociological approaches. Paper presented at the Efonet workshop "Behavioural changes – backcasting and future trends". Madrid, 6./7. November 2008. Online: http://www.efonet.org/index.php?option=com_docman&task=doc_download&gid=119&Itemid=41

Bartiaux, Françoise, Guy Vekemans, Kirsten Gram-Hanssen, Dries Maes, Madelaine Cantaert, Benoît Spies and Johan Desmedt (2006):
Socio-technical factors influencing Residential Energy Consumption. Online: http://www.belspo.be/belspo/home/publ/pub_ostc/CPen/rappCP52_en.pdf

Becker, L. J. (1978):
Joint effect of feedback and goal setting on performance: A field study of residential energy conservation. Journal of Applied Psychology, 63(4), 428–433.

Benders, R.M.J., R. Kok, H.C. Moll and G. Wiersma (2006):
New approaches for household energy conservation – in search of personal household energy budgets and energy reduction options, Energy Policy 34 (2006), pp. 3612–3622.

Breukers S., E. Heiskanen, R.M. Mourik, D. Bauknecht, M.Hodson, Y. Barabanova, B. Brohmann, V. Bürger, C.F.J. Feenstra, M. Jalas, M. Johnson, P. Maier, S. Marvin, H. Meinel, J. Pariag, M. Rask, S. Rinne, S. Robinson, M. Saastamoinen, J. Salminen, I. Valuntiené and E. Vadovics (2008):
Interaction Schemes for Successful Energy Demand Side Management. Building blocks for a practicable and conceptual framework. Online: http://www.energychange.info/downloads/doc_download/385-d6final

Berger, Peter L. und Thomas Luckmann (1967):
Die gesellschaftliche Konstruktion der Wirklichkeit. Eine Theorie der Wissenssoziologie.

Birzle-Harder, B., Deffner, J. & Götz, K. (2008):
Lust am Sparen oder totale Kontrolle? Akzeptanz von Stromverbrauchs-Feedback.

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (2008):
Umweltbewusstsein in Deutschland 2008. Ergebnisse einer repräsentativen Bevölkerungsumfrage. Online: http://www.umweltdaten.de/publikationen/fpdf-l/3678.pdf. Zugriff: Januar 2010.

Cialdini, R. B. (2001):
Influence: Science and Practice (4th ed.), Allyn & Bacon: Boston.

Dahlbom, Bo, Heather Greer, Cees Egmond, and Ruud Jonkers (2009):
Changing Energy Behaviour. Guidelines for Behavioural Change Programmes. Online: http://www.energy-behave.net/pdf/Guidelines_Changing_Energy_Behaviour.pdf

Darby, Sarah (2006):
The effectiveness of feedback on energy consumption.

Dijksterhuis, A., Bos, M.W., Nordgren, L. F., & Van Baaren, R. B. (2006):
On making the right choice: the deliberation-without-attention effect. Science 311 (5763), p. 1005–1007.

Durkheim, Emile (1895):
The Rules of the Sociological Method.

eMeter Strategic Consulting (2009):
PowerCentsDC™ Program Interim Report. Online: http://www.powercentsdc.org/ESC%2009-11-02%20PCDC%20Interim%20Report%20FINAL.pdf

Ehrhardt-Martinez, Karen (2008):
Behavior, Energy, and Climate Change: Policy Directions, Program Innovations and Research Paths. ACEEE Report Number E087.

European Commission (2006):
Action Plan for Energy Efficiency: Realising the Potential. COMMUNICATION FROM THE COMMISSION. COM(2006)545 final. Online: http://ec.europa.eu/energy/action_plan_energy_efficiency/doc/com_2006_0545_en.pdf

European Commission and European Parliament (2008):
Eurobarometer: Europeans' attitudes towards climate change. Online: http://ec.europa.eu/public_opinion/archives/ebs/ebs_300_full_en.pdf

European Environment Agency (2010):
Transport at a crossroads. TERM 2008: indicators tracking transport and environment in the European Union. EEA Report No 3/2009. Online: http://www.eea.europa.eu/publications/transport-at-a-crossroads

European Parliament and Council (2006):
Directive on energy end-use efficiency and energy services. Directive 2006/32/EC. Online: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32006L0032:EN:NOT

Eurostat (2010):
Statistical Pocket Book 2010. Table 2.2.7. Online: http://ec.europa.eu/energy/publications/statistics/statistics_en.htm

Eurostat (2009):
Final energy consumption, by sector – [tsdpc320]; Final energy consumption – Households. Online: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tsdpc320&plugin=1

Faruqui Ahmad and Sanem Sergici (2009):
BGE's Smart Energy Pricing Pilot Summer 2008 Impact Evaluation, The Brattle Group Inc., April 2009.

Frachet, Laure (2010):
An economist perspective: Incentive systems for reducing household energy consumption. Presentation at the informal BewareE – EDF meeting. Paris, 18.2.2010.

Gardner, G.T., and Stern, P.C (2008):
The short List: Most Effective Actions U.S. Households Can Take to Limit Climate Change. Environment, 2008, 50(5), 13 24.

Giddens, Antony (1984):
The constitution of society. Outline of the theory of construction.

Gram-Hanssen, K., 2008:
"Energy in Homes: An Historical Approach to Understanding New Routines", In Rüdiger, M (ed.), The Culture of Energy, Cambridge Scholars Publishing, Newcastle, s. 180–199.

Greer, Heather (2009):
Possible Course for Future of Behavioral Change Programs in Europe. Presentation at the European Sustainable Energy Week 2009, Wednesday 11th of February 2009. Online: http://www.energy-behave.net/bulletin.htm.

Heiskanen, Eva, Mikael Johnson, Simon Robinson, Edina Vadovics and Mika Saastamoinen (2009):
Low-carbon communities as a context for individual behavioural change. Energy Policy (2009), doi:10.1016/j.enpol.2009.07.002

Heijs, Wim (2007):
Residential energy use: habitual behavior and possible interventions. In: Conference Proceedings "First European Conference Energy Efficiency and Behaviour", 18.10.2009, Maastricht. Online: http://www.eceee.org/conference_proceedings/eceee/2007/Panel_9 /9.040/

Heijs, W. J. (2006):
Household energy consumption. Habitual behavior and technology. In: P. Verbeek & A. Slob. User Behavior and Technology Development.

Hinding, Barbara (2002):
Klimawandel und Energiekonsum. Eine empirische Untersuchung zur psychischen Verarbeitung von Klimaänderungen und ihre Beziehung zu Mustern des Energiekonsums.

IBM Global Business Services and eMeter Strategic Consulting (2007):
Ontario Energy Board Smart Price Pilot Final Report. Online: http://www.oeb.gov.on.ca/documents/cases/EB-2004-0205/smartpricepilot/OSPP%20Final%20Report%20-%20Final070726.pdf

Intergovernmental Panel on Climate Change (2007):
IPCC Fourth Assessment Report – Working Group I Report on "The Physical Science Basis". Online: http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm

Jackson, T. (2005):
Motivating Sustainable Consumption. A review of evidence on consumer behaviour and behavioural change. Surrey: Centre for environmental strategy.

Jensen, O.M. (2005):
Consumer inertia to energy savings? ECEEE Summer study proceedings 2005.

D. Kahneman und A. Tversky (1979):
Prospect theory: An analysis of decision under risk. Econometrica, Vol. 47, No. 2, S. 263–291.

Katzev, R. D., & Johnson, T. R. (1983):
A social-psychological analysis of residential electricity consumption: The impact of minimal justification techniques. Journal of Economic Psychology, 3, 267–284.

Kenis Anneleen and Erik Mathijs (2009):
From Individual to Collective Change and Beyond: Ecological Citizenship and Politicisation. Paper presented at the European Sociological Association Conference 2009. Lisbon, September 2-5, 2009.

Kok, G., Jonkers, R., Uitdenbogerd, D. (2007):
Energieverbruik en gedragsverandering in de woning. Een literatuuronderzoek naar determinanten en interventieprogramma's. The Hague: ministery of VROM.

Kortman, Jaap (2009):
National Background for Energy awareness services in The Netherlands. Working Paper D42f. Online: http://projekte.izt.de/bewaree/downloads/

Lautsten, Jens (2008):
Energy Efficiency Requirements in Building Codes, Energy Efficiency Policies for New Buildings. International Energy Agency and OECD.

LogicaCMG (2008):
Turning Concern into Action. Energy Efficiency and the European Consumer. Online: http://www.logica.com/energy+efficiency+and+the+european+consumer/400008607)

Marteens, Ree (2009):
How to change energy relevant behaviour? Presentation at the CECED conference "Achieving energy efficiency at home – tools and policies in theory and practice". European Sustainable Energy Week 2009, Brussels, 10 February 2009.

Matthies, Ellen 2009a:
Energierelevante Entscheidungen aus Energienutzungsverhalten und aus psychologischer Sicht. Vortrag auf dem Real Estate Dialogue: "Alles im grünen Bereich!". Senatsverwaltung für Bauen und Wohnen, Berlin, 16.11.2009.

Matthies, Ellen 2009b:
Planning interventions on a theoretical basis. Application of a new integrative influence model of pro-environmental behaviour to promote energy efficient behaviour. In: Conference Proceedings "First European Conference Energy Efficiency and Behaviour", 18.10.2009, Maastricht.

McCalley, L. T., & Midden, C. J. H. (2002):
Energy conservation through product-integrated feedback: The roles of goal-setting and social orientation. Journal of Economic Psychology, 23, 589–603.

McClelland, L. & Cook, S.W. (1979-80):
Energy conservation effects of continuous in-home feedback in all-electric homes, in: Journal of Environmental Systems 9 (1979-80), 169-73

McMakin, A.H. et al. (2002):
Motivating residents to converse energy without financial incentives, in: Environment and Behavior 34 (2002), 848-63

Ministry of VROM, Aedes and Woonbond (October 2008):
The Corporation Sector Energy Conservation Agreement. Ede, the Netherlands.

Midden, C. J. H., Meter, J. E., Weenig, M. H., & Zieverink, H. J. A. (1983):
Using feedback, reinforcement and information to reduce energy consumption in households: A field-experiment. Journal of Economic Psychology, 3(1), 65–86.

Middlemiss, L. (2008):
Influencing individual sustainability: a review of the evidence on the role of community-based organisations. Int. J. Environment and Sustainable Development, Vol. 7, No. 1, pp. 78–93.

Middlemiss, L., Parrish, B.D. (2009):
Building capacity for low-carbon communities: The role of grassroots initiatives. Energy Policy (2009), doi:10.1016/j.enpol.2009.07.003

Moloney, S. (2009):
Transitioning to low carbon communities — from behaviour change to systemic change: Lessons from Australia. Energy Policy (2009), doi:10.1016/j.enpol.2009.06.058

Mourik, R.M. et al. (2009):
Past 10 year of best and bad practices in demand management: a meta analysis of 27 case studies focusing on conditions explaining success and failure of demand-side management programmes. Deliverable 4 of the CHANGING BEHAVIOUR project, available at www.energychange.info/deliverables.

Pallak, M. S., & Cummings, N. (1976):
Commitment and voluntary energy conservation. Personality and Social Psychology Bulletin, 2(1), 27–31.

Pichert, Daniel (2008):
The Energy Challenge. Changing Human Behavior and Lifestyle. Presentation at the Efonet workshop "Behavioural changes – backcasting and future trends", Madrid, 6 and 7 November 2008. Online: http://www.efonet.org/index.php?option=com_docman&task=cat_view&gid=109&Itemid=41

Pichert, Daniel (2010):
Design for Change. Choice Architecture, Feedback & Ergonomics. Presentation given at the Efonet workshop "Policy Tools to Speed up Innovation in the Energy Sector". San Sebastian, 11./12.3. 2010. Online: http://www.efonet.org/index.php?option=com_docman&task=cat_view&gid=48&Itemid=41

Prose, F. and K. Wortmann (1991):
Energiesparen: Verbraucheranalyse und Marktsegmentierung der Kieler Haushalte – Endbericht. Band I–III. Kiel.

Rettie Ruth and Matt Studley (2009):
CHARM: Social Norm Marketing for Energy Efficiency. In: Conference Proceedings "First European Conference Energy Efficiency and Behaviour", 18.10.2009, Maastricht.

Save@Work4Homes (2009):
How to implement Energy Awareness Services for European social housing tenants? Methodological guide for social housing companies developed by Save@Work4Homes.

Scharp, Michael and Jonuschat, Helga (ed., 2004):
Service Engeneering – Entwicklungsverfahren, Praxisbeispiele und Dienstleistungen der Wohnungswirtschaft. IZT Werkstatt-Bericht Nr. 65. Institut für Zukunftsstudien und Technologiebewertung: Berlin. Online: http://www.izt.de

Scharp, M., Huber, A., Kortman, J., Martin, A. (2008):
Energy Services in Europe. Online: http://projekte.izt.de/bewaree/downloads/

Schwartz, S. H. (1977):
Normative influences on altruism. In: L. Berkowitz (Ed.), Advances in experimental social psychology, 10, 221–279. Academic Press, New York.

Shove, Elisabeth (2003):
Comfort, Cleanliness and Convenience: the Social Organization of Normality.

Shove, Elisabeth (2009):
Behaviour Technology Practice. Transitions in practice, climate change and everyday life. In: Conference Proceedings "First European Conference Energy Efficiency and Behaviour", 18.10.2009, Maastricht.

Sinus Sociovision (2009):
Gesellschaftliche Akzeptanz "intelligenter" Informations- und Kommunikationstechnologien. Präsentation auf dem Workshop Smart Home Vision. Karlsruhe, 14.5.2009.

Slavin, R. E., Wodanski, J. S., & Blackburn, B. L. (1981):
A group contingency for electricity conservation in master-metered apartments. Journal of Applied Behavior Analysis, 14(3), 357–363.

Steg, L., & Buijs, A. (2004):
Psychologie en duurzaamheid. De psychologie van milieugedrag en natuurbeleving. Nijmegen: Netwerk Duurzaam Hoger Onderwijs.

Stern, Paul C. (2009):
The Behavioural Wedge: The Potential for Rapidly Reducing U.S. Carbon Emissions by Household Action. Presentation given at the "First European Conference Energy Efficiency and Behaviour", 18.10.2009, Maastricht.

Stern, P.C. (2000):
Toward a coherent theory of environmentally significant behavior. Journal of Social Issues, 56 (3), 407–424.

Triandis, H. (1977): Interpersonal Behaviour. Monterey, CA: Brooks/Cole.

Thaler, Richard and Cass R. Sunstein (2008):
Nudge. Improving decisions about health, wealth, and happiness.

Uitdenbogerd, Diana; Kortman, Jaap; Scharp, Michael (2009):
BewareE: using an energy services database in a five step approach for the development of projects about energy saving with household behaviour. In: Conference Proceedings "First European Conference Energy Efficiency and Behaviour", 18.10.2009, Maastricht. Online: http://www.eceee.org/conference_proceedings/EE_and_Behaviour/2009/Panel_4/4.405/. Zugriff: Januar 2010.

Uitzinger, J. (2004):
Analyse EPC en energieverbruik bij woningen, IVAM, Amsterdam.

Verplanken, B., Aarts, H., & Van Knippenberg, A. (1997):
Habit, information acquisition, and the process of making travelmode choices. European Journal of Social Psychology (27), p. 539–560.

von Randow, Gero (2009):
Die Macht des Wandels. Fischstäbchen, Facebook und Fotovoltaik: Ein Streifzug durch die Technikgeschichte. In: DIE ZEIT, Nr. 50/2009.

Wilhite, H., E. Shove, L. Lutzenhiser and W. Kempton (2000):
The Legacy of Twenty Years of Demand Side Management: We Know More about Individual Behavior But next to Nothing About Demand. In: E. Jochem, J. Stathaye and D. Bouille (eds), Sociey, Behaviour and Climate Change Mitigation.

Wilhite, H., (2007):
Will efficient technologies save the world? A call for new thinking on the ways that enduse technologies affect energy using practices. ECEEE proceedings, pp. 23–30.

Wilhite, Hal (2010):
Unexploited perspectives from the social sciences. Presentation at the Efonet workshop "Policy Tools to Speed up Innovation in the Energy Sector". San Sebastian, 11./12.3.2010. Online: http://www.efonet.org/index.php?option=com_docman&task=cat_view&gid=48&Itemid=41

Winett, R.A. et al. (1985):
Effects of television modeling on residential energy conservation, in: Journal of Applied Behavior Analysis 18 (1985), 33–44.

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