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Deliverable 5:

Interaction Schemes for Successful Energy Demand Side Management. Building blocks for a practicable and conceptual framework

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Executive Summary

Introduction

This document (Deliverable 5, D5) has evolved from the work done in Work Package 2 and 3 of the CHANGING BEHAVIOUR project, a project that aims to support change in energy use and energy services, by applying social research on technological change to practical use. CHANGING BEHAVIOUR defines energy demand-side management as “an organised set of programmes, and initiatives that primarily aim to change the quantity and patterns of energy consumption on end-user level, by initiating interaction schemes between end-users and programme initiators to motivate and facilitate end-user energy demand reduction”.

CHANGING BEHAVIOUR places a particular focus on programmes involving intermediary organizations that work on demand side management. Energy intermediaries seek to intervene in energy systems. By energy intermediary organisations we are encompassing a wide variety of organisations that includes government or semi-government energy agencies working at different scales of governance, Non Governmental Organisations (NGOs), agencies sponsored by utilities, ESCOs and so.

CHANGING BEHAVIOUR focuses on four different (partly overlapping) end-use sectors: households, small and medium sized enterprises (SMEs), the building sector and municipalities. In each of these sectors, a significant proportion of energy efficiency improvement potential is not realized. This is often called the “energy efficiency gap”, i.e. the difference between the actual energy efficiency and the higher level of efficiency that would still be cost-effective. Overall, each of these end use sectors has its particular issues which may encourage or constrain opportunities for energy efficiency and behavioural change. The target group involves people from these end use sectors. Other stakeholders can furthermore be identified which may affect the opportunities, constraints, chances on success of a programme, such as local or regional government, banks, housing corporations, etc.

Apart from various stakeholders and end users, the context in which a energy demand-side management project is going to be started involves a wide variety of physical (geographical, technical), institutional (policies, regulations), cultural (norms, values, traditions), political (ideological, local political), economic and social (e.g. existing social networks) conditions which may influence the energy demand-side management initiative for the better or the worse. This environment spans from the local and immediate context of a project or programme, to the larger regional, national and global context.

We distinguish two types of energy-related behaviour: efficiency or investment behaviour: one-shot behaviour, i.e. the purchase of energy efficient equipment and/or appliances; and curtailment behaviour: repetitive efforts to reduce energy use.

The overall aim of Work Package 2 is to develop a theoretically rich yet practicable model of the sociotechnical change involved in energy demand-side management programmes. D5 presents the comprehensive body of knowledge that so far has resulted from theoretical investigation and empirical research, the latter involving case studies and a variety of interactive encounters between researchers and intermediary practitioners. This body of knowledge consists of the building blocks for a practice-oriented conceptual framework on energy demand-side management and is translated into general recommendations for intermediaries and policy makers. The framework is presented in Deliverable 6 and the practical context-sensitive toolkit will be available online by the end of 2010.

A review of theories on energy-related behavioural change

D5 summarizes three major approaches to studying energy-related behavioural change: economics, psychology and social psychology and sociology, including the sociology of technology. The boundaries between these disciplines are not clear-cut. Moreover, there is no room to give a comprehensive presentation of all research and the various approaches that exist within these disciplines. The focus is on research that is relevant for energy efficiency and the design and evaluation of energy demand-side management programmes. The purpose is to identify the main ‘lessons’ for energy demand-side management programme design that can be drawn from these research approaches, and understand how the assumptions underlying the approaches influence the kinds of ‘lessons’ produced. The starting point is that all these disciplines have valuable contributions to the design and evaluation of energy demand-side management programmes. Yet each discipline examines energy issues from a partial perspective, whereas the reality of energy use and energy demand-side management practice cuts across the disciplinary boundaries. Table 1.1 summarises the key questions and perspectives of each discipline.

Table 1.1 *Key questions and a summary of the perspectives of each discipline*

	Economics	Psychological and social psychological research	Sociological and sociotechnical research
1. What are the key units of analysis in energy-related behavioural change?	Individuals Markets (Institutions)	Individuals (‘Internalised others’ – via social norms)	Society Social practices Sociotechnical networks Systems of provision
2. What is the logic of action of programme managers/policy makers?	Rational action (public choice)	Usually rational action (bounded by lack of psychological competence)	Reflexive: programme managers are part of the society they are trying to manage, and their action is influenced by social structures as is the action of the target group.
3. What is the logic of action of target groups?	Goal-oriented, self-interested Rational action or bounded rationality	Multiple motivations (self-interested and altruistic) Experience-, goal- and norm-oriented Bounded and multiple rationalities	Norms-oriented, driven by conventions and social structure Structured: actors can also change structures through action
4. What are the issues influencing the successful implementation of energy efficiency?	Market failures: high cost of information, externalities, transaction costs	Lack of feedback or information processing capacity Lack of social pressure Lack of perceived self-efficacy Lack of skills & opportunities Habits Helplessness	Embedded in socio-technical systems: prevailing infrastructures, conventions, social organization of the market & institutions

5. How can actors be motivated and mobilized to save energy?	By correcting market failures: providing cheaper information, new institutions, incentives	By providing information, feedback and (social or economic) incentives in suitable formats & combinations	Through collective action Through negotiation and reorganization of sociotechnical networks
6. What interaction schemes and intervention instruments have been studied within this tradition?	Institutions that correct market failures Financial instruments Information (especially audits and feedback)	Innovative informative instruments Combinations of information & incentives	The same as the others, but from a more critical perspective Change in broader social systems Social movements Social innovations
7. How do the different traditions evaluate successful action/ successful interventions?	Cost-effectiveness Social welfare (Pareto-optimality)	Behavioural change (Social change)	Social change Social learning Legitimacy

Even though there are limits to how much scientific knowledge can be absorbed into practical work, academic research provides valuable conceptualizations of energy end-users and the issues that they encounter. Taken together, various disciplines have revealed a range of issues influencing actions to reducing our demand for energy. They include ‘market failures’ such as lack of information on the risks and benefits of new solutions, or lack of access to capital for investments. They also include psychological issues like information overload, lack of direct feedback and lack of perceived ‘agency’ and capability to make a difference. Finally, they include social system issues such as existing infrastructures and power relations and shared conventions and historically embedded social practices, i.e. conventional ‘ways of doing things’. Most of these are familiar to practicing programme managers, but practical work can also narrow one’s vision so that some of them are overlooked.

Some of the issues highlighted in D5 are not easily addressed by small-scale programmes operated by intermediary organizations. But others can provide useful insights also for the design and implementation of small-scale programmes. Thus, we suggest that practitioners need to analyse and try to overcome the ‘barriers’ to energy efficiency and behavioural change on the individual level by drawing on the latest research in economics and psychology and policy makers and investors need to appreciate the need for this knowledge gaining and create an environment for intermediaries in which these intermediaries can more easily and productively gain this info. We recognize that this a daunting task for the smaller practitioners, but in order to make a lasting difference, and indeed work on a more ‘strategic’ level, they need to look beyond individual end-users at the networks of actors influencing energy-related social practices (e.g. lighting, office work, renovating) and engage such stakeholders in their programme. Practitioners, policy makers and investors also need to be sensitive to the relationship between the programme and other ongoing changes in the context where they operate. They can benefit from examining the ‘fit’ between their own goals and ideals and the local practices that they are trying to change, which can also lead to the discovery of ‘bottom-up’ processes that can support the intermediaries’ goals. They also need to acknowledge the fundamentally social nature of human behaviour: people learn most of their knowledge and behaviour from other people around them – thus it is important that end-users involved in change can see that others are changing, too.

A review of existing guidelines and instruments

D5 also discusses several guidelines that are relevant for the design, implementation and evaluation of energy demand-side management programmes. The selection is not exhaustive but includes both guidelines that have been pointed out by practitioners (the pilot partners within the CHANGING BEHAVIOUR consortium) and some that have been published very recently. A review of six guidelines on energy demand-side management programmes resulted in quite some concrete lessons that are summarised in Table 1.2.

Table 1.2 *Relevant lessons for CHANGING BEHAVIOUR*

Issues	Relevant lessons
Context factors influencing success of interventions	<ul style="list-style-type: none"> • Various contextual factors can be identified on multiple levels. • Context factors may be within or outside the scope of influence of the intermediary. • Likewise, they may be within or beyond the scope of influence of the targeted people. • Interventions should be context-specific. • Energy demand-side management project should be context-sensitive.
Design & programme characteristics influencing success of interventions	<ul style="list-style-type: none"> • A good prior analysis of the problem and what & who influences is crucial. • Monitoring and evaluation should be planned from the start. • Assess the necessary changes in behaviour. • Addressing influential issues is important. • Address habits, not only norms. • Distinguish between conscious (active, choice) and unconscious (passive, habit) behaviours. • Unfreeze people from their unconscious behaviour - then convince them to change. • Refreeze the new behaviour into a (new, positive) habit. • Know the target group: learn about their interests, habits, social links and preferred communications channels. • Tailor the message to the target group. • Involve the targeted audience and other key stakeholders from the start in defining and redefining the problem through a continuous cycle of action and reflection. • Enable people to act: people want to do well. • Look further than 'the usual suspects' (look further than those people who already are open to climate change issues etc). • Recognise that change takes time.
Drawing on theory, background knowledge, learning and follow-up	<ul style="list-style-type: none"> • Draw lessons from theory and/or other projects. • Involve people that are knowledgeable on behavioural change timely. • Theoretical knowledge makes it possible to assess success and to determine if objectives have been achieved. • Ongoing and/or follow-up activities are important. • Learning and cross-fertilization is very important, but difficult. • Learning captured and fed back from the change process should influence subsequent policy/interventions.
Communication	<ul style="list-style-type: none"> • Two-way communication between intermediary and target group is important. <ul style="list-style-type: none"> - Messages and information should be simple, clear, specific, and consistent. - Choice for channels of communication depends on your target group.

	<ul style="list-style-type: none"> - Assess the benefits of connection to broader ‘climate change’ messages. - Make use of events like the All Gore effect to make your message more appealing, interesting and urgent. - Create continuous feedback to target group. - Address the benefits of new actions, but also the real losses people are suffering as a result of their current unsustainable behaviour. <ul style="list-style-type: none"> • Connect to positive aspirations like home improvement, self-improvement, green spaces or national pride. <ul style="list-style-type: none"> - Bring the programme and its objectives close to people. - Make solutions sound more heroic. - Use visual material (seeing is believing). - Reminders (repetition) are important. - Communications must be sustained over time to achieve lasting change. Partnered delivery of messages works- particularly for projects that are large, complex and have many stakeholders - Use a trusted, credible, recognised voice. - People do not learn or change alone but through social interaction.
Timing	<ul style="list-style-type: none"> • It is easier to influence an attitude that has not yet formed than changing an existing attitude. • Make use of 'windows of opportunity' - issues that are topical to people at the moment or linking up with broader policy initiatives or regional economic development programmes are an example. • Exploit change moments: getting married, moving, new job, having a baby or retiring.
Combining factors/instruments	<ul style="list-style-type: none"> • Combine tools and instruments in order to be able to address the variety and complexity of behaviour changes. • Feedback should always be part of the instrument mix.
Intermediaries	<ul style="list-style-type: none"> • Recognise the crucial role of intermediaries. • Intermediaries translate the scientific messages into practical and obvious advice. • Intermediaries are part of the context they try to influence.

In the discussion on instruments to influence behavioural change, it was emphasized that for individual projects, a much more detailed analysis of the specific context is always needed to tailor the instruments to that context. Otherwise, the instruments are likely to yield unexpected or unintended consequences. Table 1.3 provides a general summary of context factors that influence the implementation of the instruments discussed, as well as the behavioural context factors that are addressed by the instruments

Table 1.3 *Instruments and context*

Instrument	Main context factors of the instrument/programme influencing success	Main context factors of the target group addressed by the instrument	Targeted behaviour
Financial instruments	Availability and quality of technologies provided Knowledge of the target group about sup-	Availability of capital for investments Perceived risks and benefits of various courses of actions	Efficiency/investment behaviour

	port scheme		
Energy service companies, energy performance contracting and third-party finance	<p>Knowledge: Certification and training of service providers</p> <p>Institutions: Development of standard contracts as well as measurement and verification systems for savings</p> <p>Banking system, availability of credits</p> <p>Trust in service providers (values)</p>	<p>Lack of knowledge about opportunities</p> <p>Institutional rules that lead to split incentives</p> <p>Different priorities of energy users or unwillingness to incur debt (values)</p>	<p>Primarily efficiency/investment behaviour, but when instruments are combined curtailment behaviour is targeted as well</p>
General information and education campaigns	<p>Changes in the context of the target group that make them more open for information (institutional context, value context)</p> <p>Institutional context: Other programmes that the message can be linked up with.</p>	<p>Knowledge (why and how to change behaviour), values</p>	<p>Curtailment behaviour, although efficiency/investment behaviour can be targeted simultaneously</p>
Metering and feedback	<p>Technical infrastructure</p> <p>Institutional context: Payment systems, obligation to introduce smart-meters, status of metering market</p> <p>Value: Cultural differences in preferences for presenting information</p>	<p>Knowledge about one's own energy use</p> <p>Visibility of energy use</p> <p>Feedback on the effectiveness of various actions</p>	<p>Curtailment behaviour, although efficiency/investment behaviour can be targeted simultaneously</p>
Energy audits	<p>Institutions: Audit obligations</p> <p>Knowledge: Availability of qualified and trained auditors</p>	<p>Knowledge about one's own energy use and opportunities for improvement</p> <p>Visibility of energy use</p>	<p>Primarily efficiency/investment behaviour although auditing curtailment behaviour can be part of the audit</p>
Energy advice	<p>Institutions: Funding of advice</p> <p>Value: independent evaluation and establishing a robust evidence base for the value of advice</p> <p>Knowledge: Important for people to understand the role of ad-</p>	<p>Knowledge, values</p> <p>Personalised and context-relevant information delivered at an appropriate time and place</p>	<p>Curtailment behaviour, although efficiency/investment behaviour can be targeted simultaneously</p>

Negotiated agreements, voluntary programmes and commitments	<p>vice</p> <p>Institutions: Need for supporting instruments and regulations</p> <p>Ability to enforce participation by the signatory</p> <p>Social control to control the implementation of the programme</p> <p>Structure of the industry</p>	<p>Institutional context</p> <p>Social pressure and support</p> <p>Peer recognition</p>	<p>Curtailed behaviour, although efficiency/investment behaviour can be targeted simultaneously</p>
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On the basis of the meta analysis of 27 case studies we identified several relevant themes to be considered when preparing, designing, implementing and evaluating energy demand-side management programmes. These are summarised in Table 1.4.

Table 1.4 *Themes relevant for successful energy demand-side management programmes*

<p>Taking context on board</p> <ul style="list-style-type: none"> - Governmental support for energy demand-side management programmes (direct or indirect) - Opportunities to link up with prior or ongoing programmes and policies - Opportunity to link to other current problems (e.g. unemployment, economic downturn) - Not having to cope with mixed and irreconcilable policy goals - Tradition of active civic engagement - Market conditions that encourage or discourage the motivation and willingness to change energy behaviour
<p>Timing your intervention</p> <ul style="list-style-type: none"> - Making use of a window of opportunity (e.g. a neighbourhood reconstruction; making use of the 'Al Gore effect which created momentum for climate change issues) - A motivated target group. - Finding synergies with regional development initiatives
<p>Making the intervention meaningful to the target group</p> <ul style="list-style-type: none"> - Knowing the target group. - Tailored message - Communication channels and formats (in line with interest of target group) - Communicate a range of co-benefits if they resonate with the target group - Aligning expectations (of intermediary, target group members and other stakeholders) - Focus on/target a multiplicity of benefits (in line with notion of multiple identities and needs of target group members) - Closeness of programme manager and stakeholders to each other and to target group. - Trust - Peer-to-peer communication and social pressure
<p>Making use of the power of long-term networks</p> <ul style="list-style-type: none"> - Make use of existing networks - Reinforcement of existing networks - Build new networks - Sharing findings and lessons (during the programme and afterwards)

Balancing between central planning and bottom-up processes

- Learning by doing, interaction between users, programme developers and policy makers
- Continued monitoring and evaluation
- Taking the end-user as starting point
- Careful design/balancing
- Allowing adaptation of content and goal of the programme

In addition, the analysis highlighted several different interaction schemes. These schemes all have advantages and drawbacks, which are discussed further in Table 1.5.

Table 1.5 *Interaction schemes and their pros and cons*

Interaction scheme	Pros	Cons
Surveys and interviews	<ul style="list-style-type: none"> - Systematic approach to data collection - Surveys provide the possibility to poll representative samples 	<ul style="list-style-type: none"> - May not always feed into programme design - Surveys may be designed to confirm existing preconceptions, may fail to bring up new insights - Conducting good research may be expensive and require specialized skills
Prior research, particular theoretical perspectives	<ul style="list-style-type: none"> - Sound theoretical base can guide observations and help to make sense of energy-related behaviour and to identify factors potentially influencing it 	<ul style="list-style-type: none"> - Strong commitment to prior findings or theories may lead to overlooking contextual particularities - Overly theoretical background can lead to complex and confusing designs
Experience from prior projects and similar examples	<ul style="list-style-type: none"> - Sound experience-base creates confidence and practical skills/solutions that are difficult to codify 	<ul style="list-style-type: none"> - ‘Competence trap’: overconfidence and failure to learn new skills in new contexts
User-driven project (or pilot project)	<ul style="list-style-type: none"> - Users know about their needs and circumstances and can contribute to context-tailored and user-friendly designs - Users are motivated and engaged from the start, thus ‘less work’ is left for the programme manager 	<ul style="list-style-type: none"> - Users may not be fully aware of their behaviour and all the factors underlying it - ‘Up scaling’ from small user-driven pilots to broader groups of end-users can be difficult
Familiarity and informal interaction with the target group	<ul style="list-style-type: none"> - Informal interactions allow for a rich exchange of information (including non-verbal information) - Familiarity creates trust and mutual confidence 	<ul style="list-style-type: none"> - It can take a lot of time and commitment to build up the level of familiarity needed to execute a successful programme - Contacts may be biased: some users are more familiar than others

A general outcome of the meta analysis is that neither one particular approach nor combination of approaches will automatically deliver the desired outcomes. Combining approaches is useful to actually be able to address multiple relevant themes. The exact choice and ‘content’ of a programme’s overall approach has to be tailored to the specifics of the project context, the intermediary, the end users and other relevant stakeholders. The choice for a particular approach may also reflect the needs and resources of the programme: large-scale programmes addressing broad and heterogeneous target groups naturally need to gain representative data on characteristics of the target group (obtained through e.g. surveys), whereas smaller, more ‘local’ projects can build on more informal experiences – and in fact, must do so due to resource constraints. A continuum can be drawn between more ‘bottom-up’ types of projects that are grounded in user needs and experiences, and more ‘top-down’ projects that are grounded in preconceived goals and a more ‘distant’ approach to steering energy use. The ‘top down’ projects usually try to tackle large problems and address more ‘difficult’ end-users groups, whereas the more ‘bottom up’ projects build on, or at least interact more closely with end-users who are already motivated to change their energy behaviour, but merely require some support for this.

D5 further summarises the critical issues in developing and implementing successful energy efficiency programmes and projects from the points of view of a wide range of practitioners from across Europe. These practitioners are engaged in energy efficiency practice, often from very different positions and with varying motivations to be involved in the programmes and projects. This summary is based on the dialogue, discussions and group work sessions at four research-practitioner workshops held in Tallinn, Budapest Manchester and Athens, between November 2008 and March 2009. The practitioners’ workshops placed the practitioner intermediaries in the centre of attention, revealing their diversity in terms of type of organization, background, size, orientation, etc. The workshops highlighted that intermediaries’ roles are not given, but very much dependent of and embedded in the particular context they work in and dependent on the sort of resources they can draw on. These workshops highlighted a wide range of critical issues to consider in thinking about developing and implementing successful energy efficiency programme and projects. The analysis and summary of highlights is presented in 10 key points that are not isolated issues but interrelated, see Table 1.6.

Table 1.6 *Critical issues identified in the workshop meetings*

<ol style="list-style-type: none"> 1. There is no one single critical failure or success factor 2. Understanding, managing and balancing different combinations of issues 3. Beyond a one size fits all approach 4. Implementing on the individual level, working on the community level 5. Understanding your own organisational context and resources 6. Knowing your target groups 7. Engaging with a wide variety of diverse social interests 8. Making messages meaningful 9. Evaluating and learning 10. Situating the role of intermediaries in relation to policy landscapes
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Conclusions

To conclude, we would coin our overall perspective rather as sociotechnical. When addressing issues and considering how to motivate actors to save energy, we need to address both the individual and the social levels of change, while acknowledging that these changes also take place on different time-scales. Changing the behaviour of an individual by building on the most appropriate motivations, supplying facilitating conditions and reinforcing the change process through positive feedback is a kind of ‘social engineering’ intervention within a bounded time and space. Issues like securing the resources for this process, gaining social acceptance and support, and making sure that the change process continues after the intervention – and eventually becomes a part of the social structure and culture – are relevant on a broader and more political

scale. Additionally, they cannot be addressed without allowing for conflicts and diverse viewpoints, negotiation and ‘translation’ of energy conservation in terms of social interests, or the build-up of new social networks and institutions. Thus, the individual change process is nested within – and interacts with – a broader societal change process. When considering interventions and instruments, the interrelatedness of instruments is important to consider, seeing them as part of an overall strategy that addresses both the individual and the broader societal changes needed. Programme evaluations should address the issue of learning. Learning processes may take a long time and span across multiple consecutive programmes. It is important to try to capture processes of social learning, i.e. processes in which the intermediary learns in interaction with the end-users and other stakeholders, and in which this learning changes both the contents and context of the programme. When intermediaries are aware of the (explicit and implicit) theories that they base their projects on, they can also test whether the assumptions of these theories are valid in the contexts in which they operate. Another central thread running through our work is the acknowledgment of the need for a more interactive, user-oriented and contextual approach to demand-side management. Until now, the dominant approach has been based on a belief in the unproblematic transfer of self-contained expert knowledge on energy efficiency solutions into end-user practices. Information about end users’ needs is highly contextual, and tacit and therefore, interactions are needed between experts, designers, policy makers and end users. This notion has given rise to various methods and tools for user involvement - e.g. field studies, participatory design and user participation, etc. The empirical evidence presented in D5 only confirms the importance of interaction and learning - in order to arrive at energy demand-side management programmes that match with the context in which they are located, thus increasing the potential of actually becoming embedded. It also reveals that we need to take into account the context of the energy intermediaries delivering the programmes, pointing out that *adagio* ‘there is no one-size-fits-all’ applies not just for end users, but also for intermediaries. The discussion on relevant interaction schemes has highlighted the fact that neither one single approach nor any set combination of approaches will deliver the desired outcomes for sure. The final CHANGING BEHAVIOUR methodology is presented in Table 1.7.

Table 1.7 *Summary of CHANGING BEHAVIOUR methodology*

1. Key units of analysis in energy-related behavioural change	<ul style="list-style-type: none"> - Actors: these can be individuals (that may include ‘internalised others’, via social norms); in addition, these can be e.g. organizations, target groups. Actors can form networks. - Social practices: routinised behaviours enabling/constraining the scope of action for individuals. - Broader context in which behavioural change takes place: society at large; systems of provisions (including markets), institutions (formal and informal rules, norms); sociotechnical networks (configured around technologies).
2. Logic of action ¹ of intermediary practitioners/ programme managers	<ul style="list-style-type: none"> - Acknowledgement that programme managers come in different sorts: they may act according to rational calculation, or according to ‘rules of appropriateness’ (norms and conventions). They may be more or less reflexive. In any case, they are part of the society that they intervene in. Their choices and interventions are structured by the particular social-institutional context that makes part of.
3. Logic of action of end users	<ul style="list-style-type: none"> - End users are neither homogenous nor static in their logic of action. Multiple ways of thinking and acting can be distinguished, as well as multiple motivations for action (e.g. calculated self-interest, altruistic, rules of appropriateness’ (norms and conventions). In addition, their behaviour (and

¹ ‘Logic of action’ here refers to particular goals, strategies, and bases of evaluation that are common in a particular context (Friedland and Alford, 1991). A logic of action embodies certain goals or values, appropriate means to realise those goals or values, and criteria for judging success that appear to be mutually consistent to those following that logic. An economic logic of action, for example, involves utilitarian reasoning, efficiency and means-ends calculations.

	changes in this) is structured by the particular social-institutional context that they are part of. Through their actions, actors can influence this context.
4. Issues pertaining to energy efficiency	<p>Multiple issues:</p> <ul style="list-style-type: none"> - perceptions of risk, of long payback times; limited availability of capital. - Market failures: high information costs, externalities (e.g. when environmental costs are not reflected in current prices); transaction costs (e.g. costs of information), agency issues (e.g. tenants cannot force their landlord to install energy efficient applications). - psychological issues (lack of feedback or information processing capacity; lack of social pressure; lack of perceived self-efficacy; lack of skills & opportunities; habits; helplessness). - (social) system issues (discouraging energy efficient behaviour) that relate to the characteristics of our present system of provision: prevailing infrastructures, institutions and networks (and concomitant power relations), 'ways of doing', norms, culture.
5. How can actors be motivated and mobilized to save energy?	<p>By addressing issues at different levels.</p> <ul style="list-style-type: none"> - market failures: providing cheaper information, new institutions, incentives. - information, feedback and (social or economic) incentives in suitable formats & combinations. <p>By aiming a strategy at social interaction and mobilisation:</p> <ul style="list-style-type: none"> - collective action. - interaction, negotiation and reorganization of sociotechnical networks (networks around innovations and the technologies that are part of these innovations). - capacity building.
6. What intervention instruments (with relevance to energy demand-side management programmes) are relevant	<ul style="list-style-type: none"> - Measures that transfer risk or that address some of the transaction costs & agency problems (e.g. performance contracting, energy service contracting). - Instruments to correct market failures, e.g. financial instruments, information (audits and feedback) and combinations of instruments. - Instruments that address: <ul style="list-style-type: none"> - pre-disposing factors (motivation, knowledge, norms and self-efficacy). - enabling factors (providing means for change: resources & skills). - reinforcing factors (mobilization of resources and strengthening intentions - feedback). - Strategies that take account of the broader social system in which current practices are embedded and that aim at transforming current systems. Focus on interaction between promoters of solutions, end users and other stakeholders. - Learning from bottom-up alternatives (e.g. new systems of co-provision). - Encouraging processes of learning (group dynamic, user participation and flexible design). - Market transformation, transformation of urban infrastructures.

7. How to evaluate successful action/successful interventions?	Evaluate success by addressing: <ul style="list-style-type: none"> • Efficiency & effectiveness (energy saved, cost-effectiveness; ‘free-rider’ and rebound effects; social welfare). • Lasting behavioural change, potential for changes in the social system. • Learning processes.
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Further work and reporting

The outcomes of the theoretical review, the multiple case study analysis and the workshops have been discussed with the practitioner-partners of the consortium and were translated in a set of ‘activities’ intended to help intermediaries in addressing all relevant issues. These activities are tested and refined by the practitioner-partners in pilot projects. The next step is to formulate the CHANGING BEHAVIOUR conceptual framework which can be viewed in Deliverable 6. Furthermore, the practical elaboration of into a context-sensitive toolkit is underway and will be finalised the end of 2010. This toolkit will be made available online.

1. Introduction

1.1 Introducing CHANGING BEHAVIOUR

This document (Deliverable 5, D5) has evolved from the work done in Work Package 2 of the CHANGING BEHAVIOUR project. CHANGING BEHAVIOUR is a project that aims to support change in energy use and energy services. We do so by applying social research on technological change to practical use. CHANGING BEHAVIOUR is supported by the European Commission under its Seventh Framework Programme (contract number: 213217). The project is coordinated by NCRC (Finland), and other members of the consortium include Oeko Institute (Germany), SURF Centre (UK), Central European University (Hungary), Energy research Centre of the Netherlands (ECN), SEI-Tallinn (Estonia), Cowi Baltic (Lithuania), Enespa (Finland), Manchester Knowledge Capital (UK), Green Dependent Sustainable Solutions (Hungary), Ekodoma (Latvia), Verbraucherzentrale Nordrhein-Westfalen (Germany) and Centre for Renewable Energy Sources, CRES (Greece).

Work Package 2 is coordinated by Energy research Centre of the Netherlands (ECN). The overall aim of Work Package 2 is to develop a conceptual framework enabling an understanding of why demand management programmes succeed or fail. This is done in order to provide a theoretically rich yet practicable framework of the sociotechnical change involved in energy demand-side management programmes. The model will enable an identification of improvement needs in working models of social and technical change of energy demand-side management programmes and the ways in which programme managers use different interaction schemes to interact with and learn about energy end users.

D5 presents the comprehensive body of knowledge that has resulted from theoretical inquiry into relevant social scientific literature; interactions between the research-partners and practitioner-partners of the CHANGING BEHAVIOUR consortium²; outcomes of a quick scan of almost a hundred energy demand-side management cases in various parts of Europe; an in depth meta-case analysis on 27 D energy demand-side management cases and the outcomes of a number of workshops with practitioners from various EU countries that are not partners in the consortium. Particular attention will be awarded to the importance of interactions between intermediary practitioners and end users. D5 concludes by presenting the basic building blocks for a practice-oriented model on energy demand-side management and recommendations that are useful for both policy makers and practitioners.

1.2 Energy Demand Side Management: an interactive perspective

A definition of IEA-DSM (2006) on energy demand-side management is as follows: “An organised set of projects targeted towards defined market parties over a specific time period to achieve increased end-use energy efficiency or reduced use of energy services.” As the management of peak loads and load levels is a further motivation for demand-side management, the CHANGING BEHAVIOUR project defines energy demand-side management programmes as follows:

“Energy demand-side management is an organised set of programmes, and initiatives that primarily aim to change the quantity and patterns of energy consumption on end-user level, by ini-

² Identifying the knowledge base within the consortium during a workshop resulted in an initial inventory of conditions that influence success and failure of DSM programmes.

tiating interaction schemes between end-users and programme initiators to motivate and facilitate end-user energy demand reduction”³.

The definition in CHANGING BEHAVIOUR resembles the definition of IEA-DSM; our scope is in some respects broader, in others somewhat narrower. Our scope is broader than that of IEA-DSM in the sense that we consider some recent developments that have expanded the players and playing fields in which energy efficiency is promoted:

- CHANGING BEHAVIOUR places a particular focus on programmes involving intermediary organizations. Until recent years, the promotion of energy efficiency has mainly been the mandate of national governments and energy utilities. In several but not all European countries utility-driven energy demand-side management programmes have run into increasing problems as energy markets have increasingly been privatized and opened up to competition. In Central European and new Member states the utility driven energy demand-side management programmes are often still going strong. However, in all European countries new intermediary organisations have come up, such as specialized energy service companies (ESCOs), energy agencies, or specific organizations that get their funding from public benefit charges (Didden and d’Haeseleer, 2003). A closer look at who is promoting energy efficiency in different European countries today, however, reveals an even more diverse picture. The intermediary organizations working on energy efficiency include a variety of non-governmental organizations, public-private partnerships and regional or sectoral networks.
- Today, energy efficiency is promoted under a variety of headings, including climate change mitigation, sustainability, and eco-efficiency or energy self-sufficiency. While we focus on programmes to promote energy efficiency, energy conservation and load management, we also take into consideration programmes for end-user generation and energy self-sufficiency, as well as broader low-carbon, environmental or sustainable lifestyle, business or regional programmes provided there is a clear link to energy conservation.
- We distinguish two types of energy-related behaviour:
 - Efficiency or investment behaviour: one-shot behaviour, i.e. the purchase of energy efficient equipment and/or appliances
 - Curtailment behaviour: repetitive efforts to reduce energy useThis distinction is useful because different mechanisms underlie efficiency and curtailment behaviour. Purchasing of equipment or appliances is a rather discrete event, preceded by significant processing of information and the use of specific decision rules. Efforts to influence this process attempt at changing the decision-making process and the rules applied in it. Curtailment refers to types of behaviour that are much less the subject of conscious decisions, involving activities that are repeated frequently, often determined by habits. Such changes in behaviour, even when cheap for the end-user to implement, are more difficult to achieve. Many energy demand-side management programmes target both types of behaviour, for instance energy audits that make recommendations about investments as well as about changes in energy usage and management practices. Both types of behaviour change are necessary to reduce total energy consumption.
- We also acknowledge the need for a more interactive, user-oriented and contextual approach to demand-side management. Until now, the dominant approach has been based on what has been termed a ‘techno-economic’ model, i.e. a belief in the unproblematic transfer of self-contained expert knowledge on energy efficiency solutions into end-user practices (Guy and Shove, 2000; Wilhite et al. 2000). Changing end-user behaviour is much more complex than that. Firstly, we need to look at how the expert practices of energy demand-side management practitioners *interact* with the ‘everyday’ practices of energy end-users. Change is a process. Secondly, we need to shift the focus from isolated end-users to end-users in context, i.e.,

³ There has been a lot of critical discussion on the entire concept, due to several developments that will be discussed briefly in a later section, but we have chosen to use this term because it has gained increased resonance due to the Energy Services Directive and other related issues and it is a convenient concept that includes (a) energy efficiency (b) energy conservation (c) other ways to reduce demand for external energy services like distributed on-site generation (solar panels, ground-source heat, etc.).

embedded in a social environment that facilitates and constrains their behaviour and action. This means that we also address the interaction of energy demand-side management practitioners with the end-user contexts.

In some respects, the focus in CHANGING BEHAVIOUR is narrower than that defined by IEA-DSM:

- CHANGING BEHAVIOUR focuses exclusively on programmes targeted at small-scale energy users. Small-scale energy end-users are dispersed, heterogeneous users of energy that rarely have specialized expertise, in contrast to, for example, large industries. The small-scale users include households, schools, the building sector, municipalities and small and medium-sized enterprises (SMEs). Particular issues or barriers⁴ pertaining to these target groups are discussed in chapter 2.
- In recent years, market transformation has been emphasized as one of the key instruments for energy efficiency programmes (IEA-DSM, 2006). Nonetheless, we do not analyse experiences in market transformation in detail due to a number of reasons. One is that as the markets for many energy using products are today Europe-wide or global, such programmes are usually large in scale. From our perspective and focus on small-scale energy users, such large-scale programmes are ‘framework conditions’, similar to national policy developments that create conditions for targeted programmes, but are often beyond their influence of these programmes.

1.3 Aim and structure of this document

An important aim of D5 is to work towards an assessment of diverse modes of interaction between intermediaries (programme managers) and end users, discussing how various forms of interaction between the two affect the success and failure of energy demand-side management programmes. In all chapters this is awarded attention, but chapter 5 and 6 address this in depth. Chapter 6 concludes with recommendations on interaction schemes that are useful for both intermediary practitioners and policy makers.

D5 has several audiences: Our primary audience consists of intermediaries who are designing and implementing demand side management programmes and who want to learn more about either theories on energy behavioural change, who want to learn about what other intermediaries felt were interesting guidelines and what these peers feel are the most important issues to think about, or who want to know what makes current demand side management programmes (focusing on either efficiency behaviour or curtailment behaviour or both) successful or failures. D5 is also relevant for policy makers who want to learn more about the issues intermediaries face when trying to implement demand side management, and how policy can contribute to alleviating these issues.

The structure of the document is as follows:

- Chapter 2 presents a brief historical background of energy demand side management, discusses some current developments in Europe, and identifies energy saving potentials and issues connected to the various target groups addressed in this study.
- Chapter 3 presents a literature review and theoretical discussion of academic social science research on energy efficiency and energy conservation, with specific focus on the interaction schemes proposed within several relevant academic disciplines. After having discussed contributions from economics, psychology, social psychology and sociology to a better understanding of energy-related behavioural change, we conclude with a summary of the social scientific perspective adopted in CHANGING BEHAVIOUR.

⁴ Sociologists of energy use are often critical toward the concept of ‘barriers’ to energy efficiency (Guy and Shove 2000; Wilhite 2000). See for more explanation of the CHANGING BEHAVIOUR position on the notion of ‘barriers’ the explanatory text in Chapter 3, section 3.1.

- Chapter 4 reviews various instruments and the accompanying interaction schemes used in energy demand side management. It starts with a review of general guidelines for successful change programmes and continues with discussing various instruments (e.g. financial instruments, communication campaigns, instruments based on specific information such as audits, feedback and metering and energy advice). The concluding section discusses the lessons we take from these reviews for the CHANGING BEHAVIOUR project.
- Chapter 5 presents empirical findings from both a meta-analysis of 27 energy demand-side management case studies, and of workshops with in total over 150 participants from various parts of Europe. We discuss the themes that have appeared important to consider when setting up energy demand-side management programmes. Attention is drawn to the importance of learning about the target group/end users and their contexts as well as the intermediary within its context. Therefore, we discuss various approaches to learn about end users - on the basis of the meta-case analysis. These involve among others surveys, interviews; prior research, particular theoretical perspectives; experience from prior projects; having a user-driven project and informal interaction with the target group. Most approaches involve more or less direct forms of interaction and we discuss what sort of interaction schemes ‘work well in which contexts’. Here we arrive at a primary intention of D5, namely, drawing conclusions on how various forms of interaction between the two affect success and failure of energy demand-side management programmes - depending on the particular context.
- Chapter 6, the final concluding section of the present report, ties together the conclusions and findings from the previous chapter into a conceptual framework for understanding energy demand-side management practice (discussing the sociotechnical change involved in energy demand side management programmes highlighting conditions that are conducive to success and those that are problematic). In addition, it presents recommendations on different interaction schemes in context, which are useful for both intermediary practitioners and policy makers.

In the following flowchart the content of this deliverable is visualised.

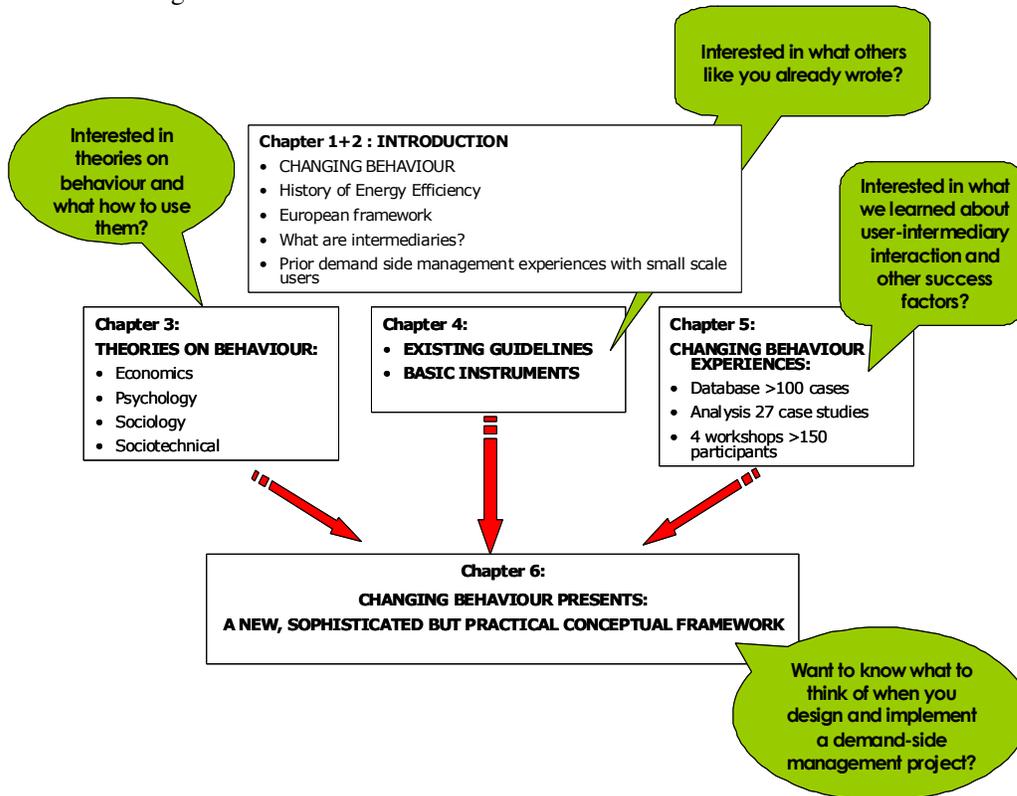


Figure 1.1 Flowchart of chapters in D5

2. Changing energy use patterns in Europe: policy context, experiences and emerging issues

This chapter presents the current background and subject matter of the CHANGING BEHAVIOUR project. We first review the historical role of energy efficiency in European energy policies (section 2.1) and present the major existing policy frameworks for energy efficiency and energy conservation (2.2). We also examine the need for new ways of organizing the promotion of energy efficiency, and discuss the emerging roles and functions of intermediaries in energy demand-side management (2.3). Finally, in section 2.4, we review the existing experiences in managing the energy demand of small-scale energy end-users: buildings in general, households, municipalities, small and medium-sized enterprises and schools.

2.1 Energy efficiency in European energy policies: historical overview

Energy efficiency entered the energy policy agenda in the 1970s in connection with the energy crisis. Most countries adopted RD&D policies, information and education, financial incentives and energy efficiency standards for buildings.

By and large, these policies are viewed as having been successful (Geller et al., 2006). Government funding for research, development and deployment has promoted a number of energy efficiency measures such as heat pumps and new building designs. Grants or tax incentives have been used to promote energy efficiency upgrades, such as home retrofits and lighting equipment replacement. Efficiency standards have been very effective in reducing energy consumption/floor area in some countries, like Germany. Market transformation programmes (e.g., labelling) have been used to promote the market penetration of energy efficient appliances. In the 1980s-1990s, voluntary agreements and sectoral commitments were adopted in a number of countries. All in all, it is estimated that ‘negajoules’, i.e. energy saved as compared to a ‘no-policy scenario’ have become the largest single energy source in Europe (Action Plan for Energy Efficiency, 2006).

The energy crisis in the seventies also provided the impetus for the first utility demand-side management programmes in the United States. They grew rapidly in the 1980s and 1990s due to government requirements and incentives for least-cost or integrated resource planning (Eto 1996). The logic here was that energy utilities should consider investments in energy efficiency in the same way as they considered investments into new production capacity. ‘Integrated resource planning’ by utilities (i.e., the requirement to invest in demand-side measures) has also been required in many European countries, even though fewer incentives have been provided, e.g., in the form of returns for lost revenue. Imposing such requirements on utilities was not difficult as long as they operated as near-monopolies with a clear public service function (i.e., were required to deliver energy to local customers) and were largely state-owned (Didden and d’Haeseleer, 2003).

Some of the early utility-driven energy demand-side management programmes were somewhat disappointing as business models, and with low energy prices in the 1990s, there was little interest. Voluntary agreements and market transformation measures gained more interest.

And, as energy companies have been increasingly privatized and markets opened up to competition, utility-driven energy demand-side management programmes have run into increasing problems. Private companies in a competitive market have a stronger incentive to increase their electricity sale, rather than to support political objectives such as energy efficiency. As there is no longer a supply monopoly and customers can switch their supplier at any time, the direct economic incentives for companies to invest in long-term energy-efficiency on the demand-side are reduced, too. Moreover, the production and distribution cost is today in Europe usually lower than the price charged to the customer, further reducing the direct financial incentive for utilities

to reduce energy consumption (Vine, 1996; Didden and d'Haeseleer, 2003). Thus, the incentives for utility-driven energy demand-side management programmes are today more related to customer retention (Vine 1996) or image-building (Didden and d'Haeseleer, 2003). New players are called for in the field of energy demand-side management, such as specialized energy service companies (ESCOs), government-funded energy agencies, or specific organizations that gain their funding from public benefit charges, like the Energy Saving Trust in the UK (Didden and d'Haeseleer, 2003). Kant (1995) argues that a shift in policy orientation from energy supply to energy demand implicates an even wider range of actors, including national and local authorities, energy auditing specialists, manufacturers of energy efficient products, financial specialists and non-governmental organizations.

2.2 Current European frameworks for energy efficiency and conservation

Today energy efficiency and energy conservation have gained renewed interest due to climate convention commitments and the rising concerns about prices and security of supply of imported fuels. They are the cheapest and most feasible way to meet climate change mitigation targets (as well as many other environmental objectives). Concern for security of supply and 'peak oil' and other resource shortages have added to the urgency of energy conservation (Geller and Attali, 2005). The Green Paper on Energy Efficiency (2005) placed energy savings at the centre of the Lisbon strategy. It argued that improving energy efficiency could cut at least 20% of its present energy consumption in the EU in a cost-effective manner. Moreover, energy efficiency could contribute to reducing Europe's dependence on imported fossil fuels and be the fastest and most cost-effective way to reduce greenhouse gases emissions and help the EU meet its Kyoto Protocol commitments.

The Energy End-Use Efficiency and Energy Services Directive (Directive 2006/32/EC) was approved in spring 2006, after many years of preparation. It seeks to increase energy efficiency throughout the supply chain right up to the end-users. It covers the retail, supply and distribution of electricity and natural gas, as well as other major energy services such as urban heating and transport fuels. The directive aims to serve as an 'umbrella' to complement existing EU energy efficiency legislation (Euractiv, 2007). The main provisions of the directive are that:

- Member States shall draw up National Energy Efficiency Action plans (NEEAPs) to achieve a total of 9% energy savings over nine years, starting from 2008 until 2017. Sectors covered are households, agriculture commercial and public sectors. The target is only indicative but the national action plans are to be submitted to the Commission for approval and reviewed every three years. Existing actions can also be taken into account.
- The public sector is obliged to take energy efficiency into account in public procurements related to the purchase of vehicles, buildings and other equipment.
- Energy distributors and retailers are obliged to offer efficiency improvement measures to their customers.
- There are also provisions concerning consumer information, certification schemes for energy services providers, as well as contractual, financial and legal instruments.

The Energy Efficiency and Energy Services Directive (ESD) also highlights the role of programme evaluation in Member States. The NEEAPs outline a number of measures planned and used to improve energy efficiency. Thus, governments have an increased interest in making sure that programmes are effective (to reach their targets) and that the savings can be attributed to energy efficiency and conservation programmes.

The ESD also addresses the issue of energy demand-side management and the role of energy utilities. The aim of the directive is to shift the European energy market toward efficient end-use services (e.g., thermal comfort or illumination). Thus, energy distributors and retailers are required to provide, contract or fund energy services or improvement measures. Moreover, the

limited incentives of conventional players in the energy sector to promote energy efficiency is implicitly acknowledged in the requirement placed on Member States to ensure a level playing field for new operators like ESCOs, installers, energy advisors and energy consultants to enter the energy market.

Another major European initiative is the Action Plan for Energy Efficiency (2006) of the European Commission. The plan identifies 75 specific actions in ten priority areas to be implemented over a six-year period (Action Plan for Energy Efficiency, 2006; Euractiv 2008), the most relevant ones for the current report being:

- Facilitating bank financing for investments in energy efficiency by SMEs and energy service companies
- Improving energy efficiency in urban areas through a "Covenant of Mayors" exchanging best practices
- Conducting awareness and education campaigns
- New energy standards for buildings and the promotion of low-energy buildings
- Boosting efficiency in New Member States
- New energy performance standards for a variety of appliances and heating equipment.

Other relevant European legislation includes the Directive on Energy Performance of Buildings (2002/91/EC), which sets minimum requirements on the energy performance of new buildings and large renovated buildings, the energy certification of buildings as well as regular inspections for boilers and air-conditioning systems. Mandatory energy labelling of household appliances has been in place since 1992. The Directive on Eco-Design for Energy-Using Products Directive (2005/32/EC) establishes a framework for setting Eco-design requirements (such as energy efficiency requirements) for all energy using products in the residential, tertiary and industrial sectors. The directive does not introduce directly binding requirements, but defines conditions and criteria for setting requirements, and will be followed by implementing measures which will establish the eco-design requirements. The new European Energy Star Regulation (EC No 106/2008) requires EU institutions and central Member State government authorities to use energy efficiency criteria no less demanding than those defined in the ENERGY STAR programme when purchasing office equipment.

The integrated resource planning concepts described above that were developed before European electricity markets were liberalised have found their way into the 2003 European electricity directive. As these concepts are difficult to implement for energy suppliers operating in a competitive environment, an integrated resource planning obligation has been placed on network operators (or 'distribution system operators/DSOs) that still run a monopoly business. The directive contains a number of tasks that DSOs are to fulfil, including the joint optimisation of the development of the network and distributed resources. The latter includes demand-side measures. In Article 14/7 the directive stipulates:

„When planning the development of the distribution network, energy efficiency/demand-side management measures and/or distributed generation that might supplant the need to upgrade or replace electricity capacity shall be considered by the distribution system operator“.

The scope of this provision is rather limited, as it only targets demand-side measures that entail benefits for the electricity network. At the same time, this opens up a new perspective on demand-side measures, focusing on load reduction and load shifting rather than energy savings only. The implementation of article 14/7 proves rather difficult and only few member states have implemented this obligation, at least in their legislation. The question arises how unbundled network operators, most of them operating under incentive regulation schemes, can be economically encouraged and enabled to implement it and how coordination between network and plant operator can be achieved.

As a final note on the current policy framework, we need to take into account the financial crisis that emerged on the top of the European agenda in the second half of 2008. While this urgent crisis naturally may divert attention from other issues, the overall consequences for energy efficiency policies appear to be mostly positive. The European Economic Recovery Plan (COM(2008) 800) includes a number of measures for clean energy projects, as well as projects to stimulate energy efficiency in buildings and to speed up the uptake of energy-efficient products. One of the concrete measures is to encourage member states to re-programme their Structural Funds Operational Programmes in order to devote a greater share to energy-efficiency investments in buildings.

2.3 The emerging role of intermediaries

Until recent years, the promotion of energy efficiency has mainly been the mandate of national governments and energy utilities. As utility-driven energy demand-side management programmes have run into increasing problems, new intermediary organisations are called for to tackle the demand side, such as specialized energy service companies (ESCOs), energy agencies, or specific organizations that gain their funding from public benefit charges. Energy efficiency is promoted under a variety of headings, including climate change mitigation, sustainability, and eco-efficiency or energy self-sufficiency. Moreover, the intermediary organizations working on energy efficiency include a variety of non-governmental organizations, public-private partnerships and regional or sectoral networks.

In this section we ask, what are intermediaries and why they are important in the context of energy efficiency and possible interaction schemes? We do this by drawing on an existing body of work (Hodson and Marvin, 2009; May, 2008) to do four things: First, to provide a general definition of intermediaries; second, to present a summary of ‘strategic’ intermediaries; third, to develop a characterisation of two different ‘modes’ of intermediation; fourth, to provide an overview of energy intermediaries.

2.3.1 What are Intermediaries?

A basic definition defines an intermediary as ‘action between two parties - mediatory’ or ‘situated or occurring between two things - intermediate’. The latter form refers more to a position within a process or level of achievement. The former, by contrast, refers to an intermediary as an agent in some form, as ‘one who acts between others - a do-between or mediator’, or as ‘something acting between things persons or things’. As actors then, what intermediaries do is mediate, they work in-between, make connections, enable a relationship between different persons or things. Indeed in common parlance the meaning implied by the concept intermediary tends to refer to a neutral player trying to mediate between different sets of interests. The assumption of neutrality is however problematic. Rather than focus on everything as an intermediary, the interesting question is to ask in what ways, where, when and how particular things, people, organisations etc. become defined as ‘intermediaries’. Further still, there is the question of the active role that intermediaries play in defining the relationship between other actors. In other words, intermediaries are not simply arbitrators; they create a new interaction scheme in which they play a role in ordering and defining relationships (see Medd and Marvin, 2007).

2.3.2 Strategic Intermediaries: new interaction schemes

Given the complexity of the organisation of socio-technical networks that typically cross ‘technical’, ‘social’ and ‘ecological’ boundaries and the difficulty of organising innovation, experiments or systemic transitions within – often privatised and liberalised – networks, we are particularly interested in actors’ capacities to position themselves as strategic intermediaries interacting between different sets of things and interests (see Hodson and Marvin, 2009; Marvin and

Medd, 2004). Strategic intermediaries are deliberately positioned to act ‘in between’ and with this particular interaction scheme they are able to bring together and mediate between different interests.

2.3.3 Modes of Intermediation and interaction schemes – Project vs. Systemic

Different modes of intermediation can be seen looking across the literatures. In some cases intermediation is bilateral, taking place between two sets of defined actors. This is the case, for example, in Van Lente et al’s (2003) project intermediaries that would work between a particular university and industry. By contrast, it is often the case that intermediaries operate through multi-lateral sets of relationships. The new forms of intermediaries in innovation, examined by Van Lente et al. (2003) see Table 2.1, act as network facilitators that bridge and facilitate multiple actors.

Table 2.1 *New forms of intermediaries in innovation*

	Role	Type of organization	Function/interaction scheme	Core relations
Project Intermediaries	Energy services	Commercial	Supporting the development of shared energy savings strategy	One-to-one support of small to medium enterprises
	Energy Technology Transfer	Public/Private	Forging linkages between universities and industry	Facilitation between particular universities and industrial manufacturers
Systemic Intermediaries	Energy Transition Facilitators	Public sponsored	Articulation of demand, alignment of actors, creating learning environments	Bridging and facilitating multi-actor networks
	Market Shapers	Eco-preneurs	Shaping demand, select configurations of actors	Realigning actors in multi-actor networks

Source: developed from van Lente et al. 2003

2.3.4 What are Energy Intermediaries?

Energy intermediaries seek to intervene on either a project or systemic basis in energy systems, through, for example, building energy efficiency; promoting low energy buildings, via replacement product programmes (e.g. energy efficient appliances), by raising public awareness, and through achieving the visibility of alternative ways of producing and consuming energy through, for example, pilot projects. By energy intermediary organisations we are encompassing a wide variety of organisations that includes government or semi-government energy agencies working at different scales of governance, Non Governmental Organisations (NGOs), agencies sponsored by utilities, ESCOs and so on who perform functions such as the provision of energy advice and advice centres; consultancy activities; energy audits; project initiation, management and coordination; demonstrations; technology procurement; installation; promotion; advocacy; lobbying, dissemination and awareness raising; organising campaigns; education; training and courses; and network-building. In doing this different intermediary organisations function over timescales that can vary from a short-term project or initiative (e.g. six months) to something that is much more long-term and programmatic (e.g. 10 years and upwards).

Though these organisations are frequently different in many respects, including the specificities of their function, they can be characterised in terms of three aspects of their mediating function.

1. Energy intermediaries mediate between production and consumption rather than focusing solely on production or consumption issues.
2. Energy intermediaries also mediate the different priorities (of different investors, ‘stakeholders’): across different levels (between householders and municipalities or between regional government and SMEs).
3. They also mediate not only between different priorities but also between the embodiment of these priorities in plans or policies and their ‘application’.
4. It is possible to identify a fourth, partly emerging form of mediation, too. As people and communities become increasingly aware of the importance of conserving energy, and initiate voluntary energy awareness and efficiency programmes (e.g. Carbonarium in Hungary, carbon rationing action groups, low-carbon housing estates, etc.), new organisations are created that in a way mediate needs emerging from the bottom-up (Heiskanen et al., 2009).

CHANGING BEHAVIOUR aims at involving and addressing the wide variety of intermediary practices visible today. The CHANGING BEHAVIOUR consortium includes seven intermediary organizations (and five research organisations). In addition, interaction has been sought with over a 150 organisations during various workshops across Europe (see chapter 5). The empirical inquiries and interactions with intermediaries address both smaller-scale intermediary initiatives that work on a project level, and intermediary practitioners that (can) fulfil a role on a more systemic level – e.g. being involved in policy making.

2.4 Prior European experiences with demand-side management of scale energy users

CHANGING BEHAVIOUR focuses on energy demand-side management programmes targeted at households, SMEs, the building sector and municipalities. In the following, some information is provided on the estimated energy efficiency potentials in each of these sectors. Moreover, an overview of previous research on the main energy demand-side management achievements and issues influencing the activities to improve energy efficiency in these sectors is presented.

2.4.1 Estimated energy efficiency potentials

Energy efficiency potentials are always estimates and subject to debate, and there are various ways to classify the potentials (see e.g. Neij, 1999; Janssen, 2004; Boonekamp, 2006). The technical potential refers to applying the best available technology (which, of course, also changes over time). Abilities to capture this potential also depend on the replacement rate of existing technology, e.g. equipment and the building stock. The economically achievable potential refers to measures that can be met at the "lowest life cycle cost for meeting foreseen energy investments" (Commission Staff Working Document, 2006). The difference between ‘economic saving potential’ and existing investment level defines the ‘policy potential’. Thus defined, the European Commission estimates the potentials for different sectors as presented in Table 2.2 (Action Plan for Energy Efficiency, 2006). This potential is mainly defined in terms of various technological opportunities, such as retrofitted wall and roof insulation and improved appliances and equipment, but the EC Action plan also refers to improved energy management systems in commercial buildings.

Table 2.2 *Estimates for full energy savings potentials per end-use sector (Action Plan for Energy Efficiency, 2006)*

Sector	Energy consumption 2005 [PJ]	Energy consumption 2002 (Business as usual) [PJ]	Energy saving potential 2020 [PJ]	Full energy saving potential 2020 [%]
Households (residential)	11723	14151	3810	27
Commercial buildings (tertiary)	6573	8834	2638	30
Transport	13900	16957	4396	26
Manufacturing industry	12348	15994	3977	25

Even though exact figures can be debated, there is evidently a significant proportion of energy efficiency improvement potential in all sectors that is not realized. This is often called the “energy efficiency gap”, i.e., the difference between the actual energy efficiency and the higher level of efficiency that would still be cost-effective. One major barrier is the price of the energy. Because energy costs are relatively small compared to other costs, energy issues are not considered of crucial importance and it’s easy for end-users and other decision makers to ignore them. There are also many informational issues in all sectors of society.

There are also particular issues in different end-use sectors. The following sections consider the *potentials, issues and achievements* in energy efficiency in four (partly overlapping) end-use sectors: buildings, households, municipalities and SMEs. Each section starts with an overview of the existing efficiency potential, outlines the major issues and where information is available, and evaluates the existing achievements in energy demand-side management practice. The section on buildings is longest, because buildings contribute to a large share of the energy use of households, municipalities and SMEs. The subsequent sections discuss particular features of these three groups of energy end-users.

2.4.2 Buildings

2.4.2.1 Potentials

Buildings are estimated to amount to 40% of the total energy use in Europe. It has been argued that more than 50% of the energy used in buildings of EU-15 could be reduced leading to an annual saving of approximately 400 million tones of CO₂ (Ecofys, 2005). Other assumptions vary from 12% up to 54% (Urge-Vorsatz and Novikova 2008). When considering the potential to reduce energy used in buildings, however, we need to consider the slow replacement rate of the existing building stock. It is easier to capture the energy savings potential in new than in existing buildings. In Europe, the annual rate of increase of the total building stock is rather low (between 0.8-2%), and thus, measures to increase the efficiency of existing buildings are important (Holopainen, 2007).

Among the different measures to reduce energy use in buildings, insulation (especially in cooler climates) has the potential to provide the highest return on investment (Ecofys, 2005). In most cases, it’s also the most logical solution. Interventions may involve windows, doors, walls, and roofs. Together, such measures can add up to reduce heating and cooling needs by up to 65% (IEA 2008). Heating system upgrades are another effective measure, e.g., the replacement of old boilers with new energy efficient ones (Holopainen, 2007). Efficient lightning technologies are also among the most promising measures in buildings, in terms of both cost effectiveness and the size of potential savings in almost all countries. For example, according to Bertoldi and Atanasiu (2006, residential lighting has a realistic saving potential of 16% compared to a ‘business-as-usual’ scenario, and commercial lighting has an even larger potential (36%).

2.4.2.2 Issues influencing the attempts to better energy performance in buildings

Issues influencing the attempts to better energy performance in buildings can be divided as follows (Holopainen, 2007; IEA 2008)⁵:

- Low priority of energy issues
- Lack of knowledge by owners, installers and advisers
- Large number of decision makers, complex ownership
- Split incentives
- Lack of financing mechanisms
- Lack of capacity by installers
- Tradition, inertia and lock-in into existing technologies
- Timing: after refurbishment, it is too late.

Lack of knowledge is a major concern not only among the building owners and tenants but also among the architects, consulting engineers and installers. These actors have, however, a significant influence on the investment decisions. The planners of the buildings often see only the total investment cost, not the life-cycle costs as a whole. On the other hand, the ownership structure of public buildings (e.g. schools, sports facilities, hospitals) is usually complex, and this makes it difficult to make decisions on the energy efficiency investments. In the private sector as well, the spending and benefits dilemma is common. The owner of the building does not want to invest in energy efficiency, being only the investor, not the winner (World Energy Council 2008). This phenomenon is often referred to by the term 'split incentives' (IEA 2008). Another difficulty is to arrive at a common decision in case of co-ownership (e.g. in multi apartment buildings).

The lack of financing mechanisms for energy efficiency relates to the fact that energy efficiency measures are profitable, but they involve an initial cost barrier (IEA 2008). Capital to finance energy efficiency measures may thus be difficult to gain, due to the uncertainties in quantifying energy savings. Thus, commercial bankers lack ways to calculate the returns and risks of such investments. Moreover, energy efficiency consists of many small projects and investments, and thus involves large transaction costs, which discourage investors. Finally, the financial sector lacks information and awareness of energy efficiency, for example of how energy efficiency investments improve the creditworthiness and risk profile of borrowers by increasing their net cash flow (IEA 2008). IEA (2008) has explored the potential of various traditional financial instruments such as leasing, loans and project financing, but has concluded that they usually require to be used on a larger scale and have to demonstrate more continuity than is today present in energy efficiency in buildings. Thus, there is great interest in new energy services such as ESCOs.

Moreover, many experts argue that the construction sector has traditionally been relatively conservative and not as prone to experiment with new solutions as some other sectors. This is partly due to the fragmented nature of the industry and the many players involved in construction projects (Janssen, 2004). Construction and refurbishment projects are large, complex and require large amounts of capital. It is important for the investors to complete the project rapidly, leading to a limited search for energy efficient alternatives. Moreover, energy efficiency projects in buildings are difficult to replicate because each building is unique (IEA 2008). Timing is an additional critical barrier: energy efficiency improvements are best made in connection with other planned renovations (which makes them cheaper and less disruptive for residents), yet decisions about renovations would require a more comprehensive planning process to integrate energy efficiency.

⁵ This is not a comprehensive list of all the issues, as there are numerous 'barriers' to various energy efficiency and energy conservation actions in buildings. These are major issues in the building sector that obstruct the accomplishment of even cost effective and quality-enhancing improvements.

2.4.2.3 Achievements

Energy efficiency in buildings has been promoted through a wide range of measures: regulatory measures, financial instruments, voluntary agreements and public-private partnerships, as well as information and capacity-building, which are reviewed in a study by the IEA (2008). Among these, regulatory measures such as building codes and thermal regulation standards and information and capacity building have had the largest impact. Financial instruments such as grants have had the advantage of filling an immediate financial gap, but have not always been well understood by potential beneficiaries, and they are difficult to maintain for long periods because they are tied to government budgets influenced by electoral cycles. Public-private partnerships have enabled access to capital via preferential loans, for example. According to the IEA (2008) report, the most successful are multi-policy packages, public private partnerships, and measures that in combination enable the creation of a market for energy efficiency (e.g., standards or labels that can be used as criteria for preferential loans).

The Energy Performance of Buildings Directive (EPBD) is a major recent measure to improve energy efficiency in buildings. It includes three main components – standards for new and renovated buildings, energy certificates for buildings (including large existing buildings) and regular testing of boilers and air conditioning systems. Whereas the standards will not necessarily go beyond existing national standards, the certificate is a new instrument that should improve information about the energy efficiency of buildings that are built, rented or sold (ODYSSEE-MURE 2007a and b). The effectiveness of energy certification is largely expected to depend on the other incentives for users to make use of the information (ODYSSEE-MURE 2007) as well as on information and capacity-building to ensure that the different players can implement and use the system (IEA 2008).

Policies for energy efficiency have had a clear impact in the building sector (Geller et al., 2006). However, the CHANGING BEHAVIOUR project focuses on smaller-scale programmes, where the overall policy framework and measures like the EPBD appear as framework conditions or 'context' rather than as instruments for local projects or programmes. More targeted programmes are discussed in the following section dealing with various end-user sectors.

2.4.3 Households

2.4.3.1 Potentials

Households consume about 26% of the energy used by final consumers in the EU-2 (ODYSSEE-MURE 2007b). Space heating contributes the largest share of household energy consumption (excluding the countries of Southern Europe, where space cooling taking an increasing large share of household consumption), accounting for 60% of household energy use in the UK and 75% in Germany and the Netherlands (ODYSSEE-MURE 2007a). Thus, the largest potentials for energy saving relate to insulation and heating systems, as discussed in the previous section on buildings.

The share of space heating in household energy consumption has been on the decline, however, whereas electricity consumption has been growing, due to the growing number of appliances (ODYSSEE-MURE 2007a). According to Bertoldi and Atanasiu (2006), the realistic savings potential related to standby electricity consumption is 20%, to residential lighting 16%, and to main domestic appliances 44%. This potential is dependent not only on household purchasing behaviour, but also on broader market transformation policies to improve the supply of efficient appliances.

In addition to energy efficient investments in housing refurbishment and appliances, there is also a potential in improved user behaviour. Studies show that households with otherwise similar structural features can display great variation in energy use patterns (Melasniemi-Uutela

1992; Becky et al., 2002). For example, Carlsson-Kanyama et al. (2005) found that age was a significant predictor of household energy use, with older generations having more energy-efficient behaviour patterns than younger ones in, e.g., laundry practices and indoor heat regulation.

2.4.3.2 Issues

A Norwegian survey (Thorne-Holst et al., 2006) investigated the issues pertaining to households and individuals concerning energy efficiency. According to their results and previous studies, six types of energy saving issues were identified:

1. Physical and structural issues
2. Political issues
3. Cultural-normative issues
4. Economic issues
5. Knowledge-based issues
6. Individual-psychological issues

Physical and structural issues arise because households are embedded in broader sociotechnical networks of provision, such as technological systems for urban planning, housing construction and energy distribution. Political issues relate to limited government support for energy efficiency, whereas households often expect such initiatives to come from government. Cultural-normative issues relate to cultural expectations about what one's home should be like. They also relate to unconscious routines that influence energy consumption (see also Gram-Hanssen, 2006). Economic issues relate to households' willingness and capacity to invest in energy efficiency – many studies show that short payback periods are expected from energy efficiency investments (see Section 3.1 for more details).

Knowledge-related and individual-psychological issues relate to households' limited understanding of why and how they should save energy. Thorne-Holst et al. (2006) also found that households lack knowledge on when they should make energy efficiency investments. A recent survey from the UK shows widespread 'gaps' in public understanding of energy efficiency (Public Understanding, 2007). Although the public debate of the environment problems has increased, many people do not connect their own lifestyle with energy consumption and the environment. Many people are usually unaware of how much energy they use, although there are exceptions, e.g. in the Central European and new member states many people follow their consumption closely because of financial constraints. Those unaware of their energy use often also do not know how much they actually pay for their household energy and are not usually particularly eager to invest in energy efficiency. A common assumption is also that modern appliances (e.g. plasma televisions) are automatically energy efficient. However, an increasing number of people is becoming more conscious of its consumption patterns, due to financial constraints or environmental concern.

2.4.3.3 Achievements

According to a recent European survey by the ODDYSEE-MURE (2007a) network, household energy efficiency progress was assessed as being slightly less than 0.4% per year in the EU-25 during the period 1996-2004. They conclude that this progress is partly due to policy measures implemented, which have raised the energy performance of new buildings and electrical appliances. Energy use per household follows very different trends in different countries, for example it is growing rapidly in the Baltic countries (with lowest initial consumption level) due to a catching up in equipment ownership (ODYSSEE-MURE 2007b). Nonetheless, the average energy consumption per m² is slightly less in the EU-10 than in the EU-15.

Household energy consumption is mainly driven by the growth in the number of dwellings, the number of which has increased 2.5 times more than the population since 1990 (ODYSSEE-MURE 2007b). This is due to the growing number of smaller households. Average energy consumption per m² has decreased in almost all countries, but has been largely offset by a trend towards larger dwellings and smaller households (ODYSSEE-MURE 2007b). It is expected, however, that in the medium and long term, such lifestyle dynamics will play a less determining role due to saturation effects for some equipment and a slowdown in the progression of the average size of dwellings (ODYSSEE-MURE 2007a).

According to ODDYSEE-MURE (2007b), it is still difficult to assess the effectiveness of energy efficiency measures in the New Member States because these measures have only been in place for a short period of time. ODDYSEE-MURE (2007a) has estimated the impact of policy measures on households in the EU-15. They find that standards and financial support have had the highest impact, whereas informational or educational measures have had the lowest impact on energy end-use. Moreover, they note that relatively few policy measures focus on daily energy use; most measures aim to promote investments in energy efficient systems or appliances.

While there are not Europe-wide estimations of the energy savings achieved through different instruments, some insights can be gained from a selection of the achieved or expected results of residential energy efficiency programmes in Germany and the UK (Table 2.3, calculated from IEA 2008). We can see from these figures that on the level of the whole population, any individual measure can have only a limited impact and that regulatory and financial measures have or are expected to have the largest impact. When considering the impacts of instruments on the specific target groups or beneficiaries, the impacts are of course larger.

Table 2.3 *Estimations of the impacts of various programmes for domestic energy consumption on total residential energy consumption (IEA 2008)*

Germany	Consumption in PJ
Total residential energy use (2004)	2670
<i>Calculated/evaluated impact:</i>	
• Energy Conservation Ordinance	20.6
• KfW CO ₂ Building Rehabilitation Programme	20
• Information and advisory centres	3.6-7.2
• Energy Performance Certificate EnEV	6
UK	
Total residential energy use (2004)	2197
<i>Expected savings in 2010:</i>	
• Building regulations England & Wales	46.5
• Fuel poverty schemes	9.7
• Billing and Metering	9.4
• Product Policy	23.8

2.4.4 Municipalities

2.4.4.1 Potential

Municipalities have many key roles in energy efficiency (e.g., MEELS 2003; CEMR 2006). They are often owners or co-owners of energy companies. They are large energy consumers via municipally owned buildings and facilities (e.g., street lighting and sports grounds) and they are also often owners of social housing stock. Moreover, municipalities are today expected to set a good example and show leadership in energy efficiency, as evidenced, for example, in require-

ments toward local authorities in the Energy Services Directive (Directive 2006/32/EC) and the European Commission's Action Plan for Energy Efficiency (2006). No particular estimates have been made of the overall potential for energy efficiency in European municipalities, but some indicative estimates can be given. The estimated mid-term (2020) economic energy efficiency potential for public buildings is 30-40%, and for office equipment 27-35% (Jochem et al. 2000). In countries in transition, EBRD (2003) has estimated that municipalities can cut their energy budgets by 25% through simple energy efficiency measures. While energy efficiency produces clear financial benefits, most municipalities have been slow to take advantage of the technically and economically possible energy savings (ICLEI 2008).

2.4.4.2 Issues

In addition to the common issues related to information, municipalities have a number of specific issues influencing the energy efficiency potential (Jochem et al. 2000; ICLEI 2008; World Energy Assessment 2008):

- Lack of funds and indebtedness (particularly in small municipalities)
- The pursuit of fast paybacks on investments, aversion to taking risks
- Bureaucratic fragmentation, separate budgeting for operating costs and energy investments
- Lack of trained staff, low status of energy or facility managers
- Lack of life-cycle cost considerations in public procurement criteria
- Need for verifiable savings: municipal managers and elected officials must be able to assure their electorate that funds are well spent and that programs are cost effective
- Attention is diverted to other, more pressing concerns than energy saving.
- In many municipalities, dependence on income from energy sales
- Projects need to deliver positive results within (the tight time frame) between two elections
- Municipalities are often not the (financial) beneficiary of projects in the private sector and hence less inclined to invest in such projects

Municipalities have a particularly large role in capturing the energy efficiency potential in countries in (economic) transition. According to Rezessy et al. (2006), one obstacle in many such countries is the vague definition of the tasks, powers and responsibilities of local government. Often, municipalities lack the full powers to capture energy savings potentials. Moreover, inadequate financial sources and the precarious financial situation overall are key issues towards more energy efficient municipalities. Thus, the role of ESCOs, third party financing and energy performance contracting have gained increased interest (Rezessy et al. 2006).

2.4.4.3 Achievements

Some municipalities have implemented energy planning for decades, but for many municipalities, energy efficiency has only recently become an urgent task. A number of local and European projects have been initiated to shape and disseminate best practices in, e.g., municipal energy management, new financial models for energy efficiency investments, encouragement for energy efficiency in public buildings, among others. A systematic evaluation of the results has yet to be undertaken, but there is anecdotal evidence of significant savings of both energy and costs (MEELS 2003; CEMR 2006). For example, optimising building operation can save more than 10% of energy costs in municipal buildings.

Studies of best practices have given rise to the following recommendations for actions to improve energy efficiency in municipalities (CEMR, 2006):

- Systematic energy management, including appointing a responsible energy manager, monitoring and evaluating consumption of public buildings, staff awareness, separate budget for energy saving investments and creation of a savings programme.

- Auditing and metering of public buildings, review of existing supply contracts, development of local energy standards approved by the council, and use of appropriate financial tools such as revolving funds and performance contracting.
- Review and improvement of outdoor lighting, including maintenance.
- Integration of energy efficiency into urban planning.
- The provision of advice and education, awareness-raising campaigns, and the development of partnerships with local residents and business, energy agencies and other government agencies.
- (regular) feedback to electorate

2.4.5 Small and Medium Sized Enterprises

2.4.5.1 Potential

There is little Europe-wide research available on the energy efficiency potential in small and medium sized enterprises (SMEs), even though it is generally believed to be large. A recent Eurobarometer (2007) survey indicated that comprehensive management systems for energy efficiency are much less frequently in place in SMEs (4%) than in large enterprises (19%). Less than one-third of European SMEs take even simple measures to save energy, as compared with almost half of the large enterprises. In the UK, the Carbon Trust (2006) has estimated that there is an economically achievable energy efficiency potential of 30% in SMEs, and some best practice businesses have achieved savings of up to 50%.

According to Jochem et al. (2000), the economic potential for reducing space and process heat demand in commercial buildings ranges from 15-25 per cent, while the efficiency of heat generation and distribution could be improved by 10-15 per cent. Nonetheless, also small and simple behavioural measures such as turning off lights and computers can produce significant cost savings in service-sector SMEs (Carbon Trust, 2009).

2.4.5.2 Issues

Issues influencing energy efficiency in SMEs include the following (Jochem et al., 2000):

- SMEs do not estimate energy efficiency investments as being profitable when considered from a traditional, short-term time scale. Energy saving investments are expected to have higher profits with a shorter pay-back periods than other investments.
- Due to time and knowledge constraints, installing new-energy efficiency equipment is far more complex than simply paying for energy
- Proper measures to evaluate the risks of the investments are lacking and comparable examples might be hard to find.
- Firms often lack trained, technical staff while external consultants are not always welcome.
- SMEs feel suspicious towards new energy efficiency technologies and want to avoid unexpected risks.

Similar findings have been gained from the BESS (2007) project, in which the main target group entailed SMEs and their employees. It seemed that the lack of time and human resources were the issues hampering to the implementation of energy management. Most of the pilot companies saw external consultancy as a necessity for implementation. Some measures were considered too complicated to implement among the employees. An overall problem was the low priority of energy saving. Energy is considered unimportant, while employees feel that programmers only work if there is a commitment from the top level management.

2.4.5.3 Achievements

Most of the energy demand-side management programmes targeted at the SME sector are voluntary programmes, such as audit programmes or energy management schemes. Examples of achieved energy savings are illustrated by results from a programme in Sweden resulting in 3.8% energy savings as compared to start of the programme, as well as a total of 8.8% expected from planned measures (Thollander et al., 2007). In the UK, the Carbon Trust has placed a special focus on energy efficiency in the SME sector by providing, e.g., interest-free loans, technology guides, employee awareness packs and advanced metering pilots. They have also stressed the possibilities to cut costs via energy efficiency, with a positive response from the SME sector. Examples of achievements include about 5% savings in the advanced metering pilot, and up to 20% savings in SMEs receiving advice services (Carbon Trust 2006; 2007).

An analysis of successful energy efficiency projects in the SME sector (InterSEE 1998) made the following conclusions:

- Key actors inside the companies play a crucial role and have to be addressed and motivated by potential policy interventions. The impact of policy programmes depends on the commitment of top management and the motivation of staff to work on energy efficiency.
- In most cases energy has minor economic importance. In order to increase the perceived priority of energy efficiency measures, they have to be promoted by a broad mix of motives and arguments.
- For most SMEs the implementation of energy efficiency requires organizational and behavioural change. Insecurity has to be overcome by clear, concrete and convincing proposals for action.
- In most cases external impulses are needed to trigger activities in energy efficiency. The integration of external support, especially in form of continued external networks served as a means to legitimise energy efficiency activities inside the SME.
- Company cultures or 'styles' can lead to success in different ways. Some are more top-down whereas others are more bottom-up and involve company-wide change processes. Programmes need to be tailored to various types of cultures and resources in SMEs.
- Factors promoting successful energy efficiency projects included both internal and external company influences. Therefore, mixes of policy instruments addressing various parameters over all process stages should be used to foster internal activities.

2.4.6 Schools

2.4.6.1 Potential

Schools are in many ways important in promoting energy efficiency and energy conservation. Schools make up a large share of the public building stock: For example, in the UK, they are the largest group of publicly owned buildings (Carbon Trust, 2009) and in Germany, more than 50 % of the energy consumption of all municipal buildings in Germany are caused by general-education schools (Kraus et al., 2008). More importantly, schools are where the youngest generation of current energy end-users are educated. Schools are also an important 'window' into families and communities: in 2006, there were almost 94 million pupils and students in the EU countries (Eurostat, 2009).

School buildings hold significant energy saving potential. Opportunities for energy efficiency and energy conservation relate to lighting, heating and cooling, computers and appliances (Carbon Trust, 2009). Best-practice examples of behaviour change programmes (no investments) have provided savings of about 5-10% (SenterNovem, 2007; Carbon Trust, 2009). Through energy renovation of school buildings, best-practice examples have generated savings of up to 80% savings in primary energy (Kraus et al. 2008).

It is more difficult to quantify the potential to influence energy use patterns of the general population through schools. However, it is obviously large. Children and young people represent the youngest energy consumers; the school building is their workplace, so the patterns that they learn in school have an influence on working life. Moreover, they in fact themselves use energy in the household (e.g. for various appliances), and are in the process of developing energy usage habits. Schoolchildren and young people can have a significant impact on energy use in their family (Joule et al., 2007; Gustafsson and Bång, 2008) and in wider surroundings. Finally, schools can have a wider educational impact on the entire community.

2.4.6.2 Issues

We have not identified any literature on the particular issues faced by schools, but as many of them are operated by municipalities, the same issues as were identified in the section on municipalities are also likely to be relevant for schools. As many different parties influence the energy use of school buildings, the daily activities occurring in the school and the final content of the education delivered to students (including the students themselves and their families), it is likely that lack of coordination and integration is a significant barrier for effective energy management and education.

2.4.6.3 Achievements

School energy saving programmes are of significant interest in Europe today. For example, a review of European and national programmes (e.g. Intelligent Energy Europe 2009; ManagEnergy, 2009) shows the following programme types:

- School building energy management and energy renovation programmes: These are programmes focusing on the school building, facility managers and the operating staff in the schools. In addition, school buildings are an interesting target for performance contracting and ESCOs (Bertoldi et al. 2007).
- School energy audits and metering schemes: Schools are increasingly audited and metered by professionals (Intelligent Metering 2009). Many schools, however, are also including energy audits into schoolwork done by pupils, which provides a way for students to learn about the impacts of energy-related behaviour (e.g. PEES, 2009; YEP, 2009).
- Active learning: Energy-related projects, at school or at home, can be part of an active learning curriculum. This means that children can be important resources in their own education rather than passive receivers of information. Examples include a project funded by Intelligent Energy Europe, Active Learning (2009).
- Energy issues in the curriculum: Many projects are working to integrate energy issues and energy saving more closely into school curricula (e.g. SAUCE, 2009). This also includes a number of projects working on educational materials (e.g. Energy Path, 2009; YES, 2009).
- Targeted awareness and behaviour change campaigns: The projects include campaigns focusing on particular issues in schools, such as lighting (Flick the Switch, 2009) and climate pledges (EC, 2006).
- Schools, pupils and students as ‘energy envoys’: A number of projects focus on the role of schools and students as central points in raising awareness in the wider community (e.g. EGS, 2009; SIEU, 2009).

The ultimate impact of these various ongoing activities on total energy use within and outside schools remains to be seen, but the ongoing efforts hold significant promise. Moreover, energy saving and energy education in schools is closely connected to a ‘whole school approach’ to environmental education (Mogensen and Mayer, 2005) and thus can be connected to a wider educational agenda.

3. The theoretical basis for energy demand-side management and interaction schemes

This chapter presents the theoretical background and state of the art in energy demand-side management, with a particular focus on the interactions between energy demand-side project managers and small-scale energy end-users. Although programme managers can act as intermediaries, not all programme managers do, as will become clear in the section on behavioural psychology. Therefore we use the term programme managers in this section. We outline basic research approaches – their assumptions and findings about energy end-users, and the achievements to date – within the field of economics, psychology and social psychology, and sociology and the sociology of technology. This review serves to position the work conducted in CHANGING BEHAVIOUR within existing literature, which will be discussed in the concluding section of this chapter.

3.1 Basic research approaches

This chapter summarizes three major approaches to studying energy-related behavioural change: economics, psychology and social psychology and sociology, including the sociology of technology. The boundaries between these disciplines are not clear-cut. Moreover, there is no room to give a comprehensive presentation of all research and the various approaches that exist within these disciplines. The focus is on research that is relevant for energy efficiency and the design and evaluation of energy demand-side management programmes. The purpose of this chapter is to identify the main ‘lessons’ for energy demand-side management programme design that can be drawn from these research approaches, and understand how the assumptions underlying the approaches influence the kinds of ‘lessons’ produced. The starting point is that all these disciplines have valuable contributions to the design and evaluation of energy demand-side management programmes. Yet each discipline examines energy issues from a partial perspective, whereas the reality of energy use and energy demand-side management practice cuts across the disciplinary boundaries.

What is important to mention here is that within the CHANGING BEHAVIOUR project we follow sociologists of energy use in their critical stance toward the concept of ‘barriers’ to energy efficiency (Guy and Shove, 2000; Wilhite, 2000). This is because the notion of ‘barriers’ originated from the techno-economic model of technology transfer, which implies a linear flow of knowledge from expert-driven R&D to energy-saving action by ordinary people. In this conventional view of linear progress, ‘social’ or ‘non-technical’ barriers are viewed as the main obstacles for the flow of energy efficiency knowledge into practice. In this model, the social scientist has an ‘end-of-pipe’ role of conducting attitude surveys to inform advertising campaigns to overcome ‘barriers’. Treating social and cultural conditions merely as ‘barriers’ to the diffusion of energy efficiency is not particularly helpful, as social scientists are discouraged from further analysis of the social organization of decision making on energy efficiency, for example, how the adoption of new solutions starts to ‘make sense’ in a specific context.

Therefore, in this report, when we use the notion of barriers, we put this term in brackets, and as such emphasize that we recognize the value of this concept that derives from a tech-economic perspective, and that the problem lies in its uncritical use. Thus, when we use the concept of ‘barriers’ we extend the concept to refer to contexts for action that delimit or enlarge types of responses and actions. This extended definition of ‘barriers’ follows from our more socio-technical approach (which will be discussed in detail towards the end of this chapter). In addition, the concept of ‘barriers’ has become conventional for practitioners and we are not dismissing the very effective programmes that aimed to tackle ‘barriers’ and that people do encounter obstacles or barriers when trying to change their behaviour/practices.

Table 3.1 *Key questions and a summary of the perspectives of each discipline (with reference to 'the mainstream' within each discipline)*

	Economics	Psychological and social psychological research	Sociological and socio-technical research
1. What are the key units of analysis in energy-related behavioural change?	Individuals Markets (Institutions)	Individuals (‘Internalised others’ – via social norms)	Society Social practices Sociotechnical networks Systems of provision
2. What is the logic of action of programme managers/policy makers?	Rational action (public choice)	Usually rational action (bounded by lack of psychological competence)	Reflexive: programme managers are part of the society they are trying to manage, and their action is influenced by social structures as is the action of the target group.
3. What is the logic of action of target groups?	Goal-oriented, self-interested Rational action or bounded rationality	Multiple motivations (self-interested and altruistic) Experience-, goal- and norm-oriented Bounded and multiple rationalities	Norms-oriented, driven by conventions and social structure Structured: actors can also change structures through action
4. What are the issues influencing the successful implementation of energy efficiency?	Market failures: high cost of information, externalities, transaction costs	Lack of feedback or information processing capacity Lack of social pressure Lack of perceived self-efficacy Lack of skills & opportunities Habits Helplessness	Embedded in socio-technical systems: prevailing infrastructures, conventions, social organization of the market & institutions
5. How can actors be motivated and mobilized to save energy?	By correcting market failures: providing cheaper information, new institutions, incentives	By providing information, feedback and (social or economic) incentives in suitable formats & combinations	Through collective action Through negotiation and reorganization of sociotechnical networks
6. What interaction schemes and intervention instruments have been studied within this tradition? (with relevance to energy demand-side management programmes)	Institutions that correct market failures Financial instruments Information (especially audits and feedback)	Innovative informative instruments Combinations of information & incentives	The same as the others, but from a more critical perspective Change in broader social systems Social movements Social innovations
7. How do the different traditions evaluate successful action/ successful interventions?	Cost-effectiveness Social welfare (Pareto-optimality)	Behavioural change (Social change)	Social change Social learning Legitimacy

3.1.1 Economics

3.1.1.1 Introduction

Economics is a broad field encompassing microeconomics and macroeconomics, as well as many specialized fields such as industrial economics, consumer economics, organizational economics, information economics, welfare economics, new institutional economics and evolutionary economics. These fields disagree on many fundamental issues, but they agree on one thing: society is made up of individuals and these individuals act in a goal-oriented fashion ('teleological action') aiming to promote their own interests in one form or another: utility maximization (neoclassical economics), rent-seeking (industrial economics) or survival (evolutionary economics)⁶.

Economic action is structured by markets (neoclassical economics), organizations (organizational and industrial economics), institutions (institutional economics) and/or the state (welfare economics), and the efficiency of these structures can be judged from a rational perspective. In welfare economics, the role of the state is to correct market failures (see below) and to steer markets to a Pareto-efficient state, i.e. a situation where no individuals can be made better off without making someone else worse off. So the welfare of society is the 'sum' of the welfare of all individuals in that society.

The basic neoclassical proposition is that competitive markets will steer resource use to the most productive purposes, thus maximizing total utility. If companies are using energy inefficiently, their products will be more costly than those of their competitors, and they will disappear from the market. Most economists, however, acknowledge a number of 'market failures', which lead to inefficiencies. The most well-known of these are *economic externalities* (e.g., environmental impacts like climate change), *imperfect competition* (monopolies, issues influencing entry, etc.), *transaction costs* (search and information costs, contracting costs, enforcement costs) and *agency problems* (contractors do not always act in the principal's best interests).

There are three basic approaches to energy efficiency within economics (Golove and Eto, 1996):

- Engineering economics: From an engineering and industrial accounting perspective, individuals and society consistently under-invest in energy-efficiency (see e.g. Lovins 2004). They thus demand much higher returns on investment in energy efficiency than on other investments. Whereas the cost of capital can be assumed to be about 7-11% (European Central Bank Statistics 2008), energy consumers often have an 'implicit discount rate' of about 25-80% (corresponding to payback periods of 4 to 1 years), in some cases even 800% (payback period 5 months), in their investment decision in energy efficient technologies (Geller and Attali, 2005)⁷. Individuals and society are thus not behaving rationally, and this is due to the existence of 'barriers' to energy efficiency'.
- Neoclassical economics argue that this (irrational behaviour) is not the case (because if such opportunities existed, market actors would invest in them), or at least not to the extent that engineers claim. They argue that the high discount rates are in fact warranted given the risk of the technologies (they may not provide the benefits promised in real-life situations, and

⁶ These assumptions are to some extent relaxed in such alternative strands of economics as humanistic economics that take a broader view on the purpose of economics and economic life. They focus on the human being and his/her needs and their satisfaction, and believe that the aim of economics is to increase human (rather than economic or social) welfare or well-being (Ekins and Max-Neef 1992; Lutz and Lux 1998). Such alternative economic approaches can contribute to explaining why people voluntarily reduce their energy consumption. Even though the underlying reasoning is somewhat different from that in economic sociology, the empirical subject matter is similar, so the findings are discussed under the heading of 'sociology', except from a final comment at the end of this chapter concerning economic well-being in society.

⁷ In fact, high implicit (i.e., 'informal') discount rates are typical in behavioural economics, especially for low-income people (Antonides, 1996). Thus, the unwillingness of firms to invest in energy efficiency partly suggests that energy decisions are not subjected to as rigorous accounting procedures as other investments, and there is evidence that extremely simple payback rules (e.g. 2 years) are often used ().

the future cost of energy is always uncertain⁸). The investments may also be difficult to turn back into cash (e.g. installed HVAC equipment vs. stocks and bonds). Information, search, maintenance and training costs for efficient products may be higher than for conventional ones). Some consumers or small businesses may have a very high cost of capital, or may not be at all eligible for loans. Moreover, the profitability of energy efficiency investments is only one of the attributes energy consumers consider when making investments (i.e., if it is not prioritized, then other attributes, e.g., comfort, obviously provide greater utility) (Golove and Eto, 1996).

- Institutional economics acknowledges that there are market failures that lead to underinvestment, most notably the failure to internalize the environmental cost of energy production into the price of energy. Nonetheless, they argue that transaction costs also explain a large portion of the underinvestment in energy efficiency (Golove and Eto, 1996; Praetorius and Bley, 2006). These costs relate to the costs of information and the costs of monitoring and controlling economic exchanges “Agency problems” or “mismatched incentives” are one example, e.g., tenants cannot force their landlord to provide the most efficient equipment, or managers cannot ensure that their employees use equipment in the most efficient way. The fragmented nature of the energy end-use market compounds such problems. There are also barriers to entry for new energy services, e.g., they may have a higher cost of capital than existing players in the market.

In addition, the costs of information and the risks of new technologies may be too high to be borne by individual players. In addition to the cost of obtaining information, there is also a cost to using information. Thus, economic players are in reality “boundedly rational”, i.e., they try to be rational, but in fact usually follow simple ‘rules of thumb’ (March and Simon 1958): a company may, for example, set a rule that it invests in projects with a payback period of less than a year, rather than perform sophisticated analyses of the net present value of various investments. To correct these many different market failures, institutional economists argue that new institutions are needed (e.g., government regulation, energy demand-side management programmes, mandated energy efficiency standards).

- Recent studies in behavioural economics have examined consumers’ preferences for particular energy-related products or energy-saving measures (Burkhalter et al., 2007; Belz and Billharz, 2005). The most popular technique in this context is the conjoint analysis⁹, a statistical procedure to determine the importance of particular characteristics of a product, service or measure for the consumer. In 2003 Poortinga et al. (2003) applied this approach for the first time to energy-saving measures. Since then, surveys on green electricity, heating systems and wet appliances have been carried out (e.g. Sammer and Wüstenhagen, 2006).
- A further barrier to energy efficiency is identified in evolutionary economics, which takes into account history and learning. History is understood as an “irreversible branching process” (David, 2000); once a ‘path’ has been taken, capital and knowledge accumulate around the selected path, and it is difficult to change to an alternative one (even if it may later appear to be more efficient). From this perspective, the economic organization and institutions of our times have emerged in an era of cheap and abundant energy (and ignorance of environmental problems). From this perspective, also the policy makers and programme managers are boundedly rational (Green et al., 1999), because they draw their knowledge and decision rules from the legacy of the dominant path.

⁸ Thompson (1997), however, argues that this is a flawed approach to accounting for risks, since risks are only considered for the investment and not for the status quo.

⁹ Economics usually does not study consumers’ preferences, as they are assumed to be revealed through their purchasing decisions. Conjoint analysis is based on a fundamental observation in consumer economics that products are actually bundles of characteristics, and it is these characteristics that the consumer has preferences for, not the entire product or service (Lancaster 1966). Thus, consumers’ choices in the market do not necessarily reflect their preferences if they are unable to accurately judge the characteristics of the product or service they are choosing. The utility of a product or service or measure is thus considered to consist of ‘part-worths’ which together add up to the total utility, and conjoint analysis is a technique to measure these part-worths.

All of these streams of economic thought assume that policy makers are rational – or are at least capable of being rational provided the correct information – but they have different advice for public policy. The engineering economists would argue for very forceful policies such as stringent energy efficiency standards, whereas the neoclassical economists would say that markets will solve the problem in time. Institutional economists argue that policies should be applied to the extent that they correct the existing market failures, and lead to socially optimal level of investment in energy efficiency.

3.1.1.2 Interaction schemes and instruments

From an economic perspective, the rationale for policy intervention is to correct market failures (Golove and Eto, 1996). Thus, the preference would be for broad-scale measures, such as increasing the price of energy via energy taxes to reflect its full cost, including externalities. Individual interventions (like target-group specific programmes) are viewed with more caution, because they run the risk of ‘policy failure’ (i.e., misplaced interventions that interfere with the efficient operation of the market).

Because the cost of energy efficiency information is prohibitively high, publicly funded information provision is a warranted instrument from an institutional economics perspective. Since it may be difficult for customers to judge the merits of energy efficiency claims, public energy labelling programmes deal with information asymmetries. Training and public support for energy auditing may reduce the cost of obtaining and managing energy-related information.

Institutional solutions can transfer the risk of energy investments or solve some of the transaction costs and agency problems hindering investments in energy efficiency (Golove and Eto, 1996). Performance contracting and energy service (ESCO) contracting are prime examples of instruments that aim to minimise the total cost of obtaining energy services. Energy service contracting aims to reduce the problems related to capital allocation (i.e., the difficulties in raising capital for energy efficient investments), as well as the transaction costs related to the cost of searching for trading partners, negotiating and writing contracts, as well as of monitoring performance and enforcing compliance (Sorrell, 2006).

Financial incentives are viewed as an effective instrument by economists, but not necessarily as an efficient one. They run the risk of distorting the market. Nonetheless, if the risks of adopting a new technology are high, especially for first movers, grants are deemed acceptable to start the diffusion process. R&D is another area in which policy intervention is acceptable, because in a neo-classical perspective new knowledge is a public good (i.e., a positive externality).

3.1.1.3 Effectiveness of instruments

The economic tradition has had a strong impact on energy demand-side management programme evaluation. From an economics perspective, programmes are effective if they are capable of eliminating market ‘barriers’ or market failures at minimal social cost and without distorting the market. They should be cost effective, i.e., the inputs should be as small as possible compared to the outputs gained. The costs of energy demand-side management programmes can also include indirect costs such as lost revenues or taxes. In most evaluations, however, only the direct programme costs are included (Vreuls 2005). Cost-effectiveness calculations can be made from various perspectives, e.g. those of the participants, the service providers, the programme administrators, total resource costs, of costs and benefits to society. There are quite sophisticated ways of evaluating the financial soundness of energy efficiency projects (see Jakob 2006), but the most commonly used effectiveness indicator is the Net Present Value of programme impacts, i.e., a sum of the benefits of the programme during its effective period divided by the costs of the programme plus the cost of capital (interest rate) (Vreuls 2005). Programme evaluations often also place a lot of emphasis on free rider or ‘deadweight’ effects, i.e., energy effi-

ciency effects that would have occurred even without the programme, for example grant recipients who make use of the grant even if they would have made the efficiency investment without it (Vreuls 2005).

Golove and Eto (1996) argue that direct calculations of the costs and benefits may not capture many of the social welfare impacts of an energy-efficiency promoting policy or instrument. At the very least, the benefits due to reduced environmental externalities (as well possible contributions to job creation) should be included (Tonn and Peretz, 2007). Moreover, programmes may have positive spin-off effects, and influence not only the direct target groups, but also provide “free” benefits to other target groups, for example by increasing the supply and reducing the costs and risks of energy-efficient products and services (Golove and Eto, 1996).

Another critique of the existing forms of effectiveness analysis arises from the fact that energy users value other features, as well as cost reductions, when deciding on energy efficiency investments. Many authors provide evidence that the co-benefits of energy efficiency (e.g. health, safety and quality improvements) can be equally large as the cost savings (Jakob, 2006), or even larger (Knight et al. 2006).

The rebound effect is a special issue in the analysis of the effectiveness of instruments from an economic perspective. This widely debated phenomenon is based on work by economists Brookes, Khazzoom and Saunders and is summarized and debated in a special issue of *Energy Policy* (Schipper, 2000). Rebound effects refer to the increased use of energy services caused by the reduction in their effective price due to greater efficiency. They can be divided into four categories of effects (adapted from Jalas 2001; Herring 2006):

1. Direct effects: consumers can use more of an energy service due to its lower price
2. Income effects: with smaller outlays for energy services, more income is available to spend on energy
3. Substitution effects: consumers use more energy services and less final consumption goods when energy services become less expensive than other goods; firms replace other factors of production (capital, labor) with energy services in the production of final goods
4. Transformational or ‘enabling’ effects: technological advances and concurrent increased energy efficiency enable new practices (e.g., second homes, long-distance travel, office work automation)

Thus, it is argued that energy efficiency at the micro level may in fact increase (or at least fail to decrease) energy consumption on the macro level by leading to the use of more energy services either directly, or via increased disposable income, or via overall economic growth and development. The magnitude of rebound effects is still subject to debate. Evidence from econometric studies (Greening et al., 2000) indicates, however, that the direct rebound effect is small for residential appliances and residential and commercial lighting (10%), less than 20% for industrial processes, and in the order of 10-40% for residential space heating and water heating.

There is also evidence that the magnitude of the direct rebound effect declines as incomes rise, energy costs take up an ever smaller share of total budgets, and demand for services such as lighting or heat saturates (Geller and Attali, 2005) – i.e., when people have ‘sufficient’ amounts of energy, they will not consume more even if it becomes cheaper. Thus, for example, Darby (2000) presents evidence that households in the UK with an average indoor temperature of 14°C will use much of the energy efficiency gains to have a warmer home, whereas when the indoor temperature is 18°C, a larger part of the gain will go to actually reducing energy consumption.

The indirect rebound effects (points 2, 3 and 4), however, are more evident causes for concern (see Dimitripoulos, 2007 for a review). In a growing economy, it is obvious that money saved in one place will be used for something else (consumption or investment) leading to a certain amount of related energy use, but because all other sectors are less energy intensive than the en-

ergy sector, reduced use of energy is bound to gradually decrease the energy intensity of the economy (Heiskanen et al., 2001; Geller and Attali, 2005).

A final point in the analysis of effectiveness concerns the goals of the economy. Mainstream economists believe that economic growth (broadly) reflects increased welfare. This notion has been challenged for years by alternative and humanistic economists (see Ekins and Max-Neef, 1992). More recently, alternative measures of welfare have gained ground also among mainstream economists (Easterlin, 2001; Layard 2005), who have suggested 'life satisfaction' or 'happiness' as better measures of societal welfare. If these notions are taken up more broadly, we may have very different measures for programme effectiveness in the future.

3.1.2 Psychological and social psychological research

3.1.2.1 Introduction

Many schools of psychological thought have contributed to the debate on energy efficiency and how to best promote it. The three most visible contributions to the field of energy demand-side management come from behavioural psychology, cognitive psychology, and social psychology (especially attitude-behaviour models)¹⁰. We first review the major assumptions about the key actors in and major 'barriers' or issues pertaining to energy efficiency as understood in behavioural psychology, cognitive psychology (including cognitive anthropology) and social psychology, especially attitude-behaviour and norm-value-behaviour models. Because many researchers apply eclectic models drawing on many different schools of psychology, the sections discussing preferred energy demand-side management instruments and effectiveness combine the different approaches.

While there are many differences in these approaches, they share a focus on individual behaviour. In the case of social psychology, this is modified by the inclusion of 'social norms', i.e., individuals' perceptions of how others expect them to behave. The preferred research approach in psychology is controlled laboratory experiments, but survey instruments are frequently used. Nonetheless, the research design is usually similar to a controlled experiment insofar as key variables are pre-defined and measured, preferably before and after an intervention (and ideally, for a 'treatment' and 'control' group). Thus, this type of approach implicitly assumes that the programme manager is rational and able to control the behavioural determinants of the research subjects (the target groups). The programme manager is also implicitly assumed to be 'invisible' to the target groups (in other respects than the intervention). Thus, researchers have not paid much attention to the interactions between the programme managers and the target groups, or to the broader political context of these interactions (see Kempton et al. 1992). As such, these interaction schemes greatly differ from the more mediation oriented ones described earlier when discussing the emergent role of intermediaries

Behavioural approaches are based on a once-popular approach to psychology, behaviourism, pioneered by B.F. Skinner in the 1950s on the basis of research conducted on animal behaviour and learning. This school wanted to make psychology a 'science' by focusing research only on visible, measurable behaviour and by conducting experimental research. People are assumed to react to stimuli in their immediate environment and learn from the immediate consequences of their action (positive or negative feedback). Learning is measured as changes in observable behaviour rather than by studying what people think or say. The major barrier to energy efficiency from this perspective is that there are not immediate stimuli for energy conservation today (e.g., electricity is very easy to use compared to collecting firewood). Moreover, feedback on the consequences of energy use or conservation is delayed (for some consequences like climate change,

¹⁰ There are many other fields of psychology and social psychology that are potentially relevant (such as humanistic psychology and symbolic interactionism), but which are not discussed here (see e.g. Czicksentmihalyi, 2000; Parnell and Larsen 2005; Martiskainen 2007).

very much so). Behavioural research in energy efficiency focuses on individuals' reactions to various antecedents (stimuli or 'triggers') or consequences of the behaviour (feedback). This is an approach to learning that is not based on cognitive processing but on direct behavioural modification. Various prompts (reminders) or rewards (financial incentives or feedback) are applied, and their influence on changes in behaviour is measured (Kurz 2002).

Cognitive approaches are interested in how people understand, diagnose, and solve problems. Energy users are thus understood as decision makers who solve complex problems when dealing with energy. They do so by drawing on existing cognitive structures and previous experience. In contrast to the behaviourist approach, users thus also retain, combine and process information and learn in more complex ways. In contrast to the neoclassical economic view, however, the customers' ability to make use of market information is limited by their cognitive capacity¹¹ and by the nature of the information environment. People are not motivated by price as such, but by their representations of price, on the one hand, and the social meaning of the costs and benefits of their current energy usage patterns (Kurz 2002)¹².

Most of the cognitive research on energy end-user decision making has stressed the cognitive difficulties in dealing with energy related information. Energy users have limited cognitive capacity for understanding, recognising, sorting, comparing, analysing, and acting on the information (e.g., Anderson and Claxton 1982). Others, however, stress the characteristics of the information environment: with information overload, attention will only be given to salient messages (De Young, 1983, 2000). Moreover, there has been criticism of the 'deficit' model in energy information which stresses the recipients' limitations, rather than exploring what they *do know* and how they *do process* energy related information (Devine-Wright and Devine-Wright, 2005). Research on 'folk models' of energy has been used, for example, to study how people understand energy usage (Kempton and Layne 1994) and the workings of the thermostat (Kempton 1987), as well as nature conservation, air pollution and climate change (Kempton et al. 1995). The barrier to energy efficiency from this perspective can be constructed, thus, in two ways. Either it is the limited cognitive capacity of the users of energy-related information, or the way in which energy information is communicated to lay people. Thus, research can focus on the information processing of energy users (Anderson and Claxton, 1982) or on the interactive communications between energy-users and experts (Parnell and Larsen 2005).

Attitude-behaviour models have been dominant for a long time in social psychology research on energy conservation. A variety of such models exist and they have evolved over the years (Table 3.2). The theory of reasoned action (TRA) is one of the first such approaches to predict (and influence) behaviour on the basis of attitudes, norms and behavioural intentions (Fishbein and Ajzen, 1975). It has been widely used in consumer health and environmental behaviour research, but results have been mixed, especially in the environmental and energy domain (Kurz 2002; Corbett 2005). An extension of this model is the Theory of Planned Behaviour (e.g., Ajzen 1985; 2002), which included an additional independent variable, "perceived behavioural control". This means the extent to which the behaviour is difficult or easy to perform, which can depend on practical skills and task knowledge needed to perform the behaviour, as well as on external factors such as available facilities and infrastructure. This extension has increased the predictive power of the model considerably (e.g., Kaiser et al. 1999).

Triandis (1977) has extended this model further by including emotions and the resulting affect as an independent variable, as well as the role of past behaviour and habits. There is strong em-

¹¹ Limited cognitive capacity refers to the information users' inability to attend to and process all the limited information in an ideal manner. The limitations derive from the information users' information processing resources, on the one hand, and from contextual factors, on the other. Experience and learning, for example, can help people to process larger amounts of information because they develop cognitive structures to deal with the information.

¹² Economic psychology, for example, has consistently found that people are more sensitive to losses than to gains (Kahneman and Tversky 2002). This is clearly reflected in energy related decisions where decision makers consistently value the investments higher than the gains from cost savings.

irical evidence in the field of energy and the environment that including ‘past behaviour’ and ‘habits’ improves the predictive power of attitude-behaviour models (Thøgersen, 2005). Macey and Brown (1983) found that for residential energy conservation, frequently performed behaviours were most strongly determined by habits and past experience, whereas infrequent behaviours were determined primarily by intentions. Infrequently performed behaviours, e.g. energy saving behaviour, can become frequent, habitual ones, but this requires extensive effort and time.

Attitude-behaviour models are based on a notion of goal-oriented behaviour and expectations about the outcomes of that behaviour. Another set of models are linked to moral aspects of behaviour, norms and values (Stern, 2000; Martiskainen 2007), and stress the altruistic aspect of pro-environmental behaviour. An example is value-belief-norm theory, which assumes a dominant role for values and norms in determining the results of behaviour (Stern, 2000). This model introduces altruistic values into the set of factors determining behaviour. Kaplan (2000) starts out with an altruistic model, but argues that it is when altruistic and individualistic goals support each other that the strongest motivation for environmentally oriented behavioural change is provided. In addition, a feeling of helplessness is the most severe obstacle to change and such helplessness is also engendered by “being told what to do”, rather than allowing people to process information at their own pace and participate in devising solutions. Thus, participation and the possibility to gain behavioural competence are mediating variables of behavioural change in what Kaplan (2000) has termed the “Reasonable Person Model”, which has also gained some empirical support (Corbett, 2005).

Table 3.2 *Determinants of behaviour considered in various attitude-behaviour models (in a very simplified form)*

Theory of Reasoned Action, TRA (Fishbein & Ajzen, 1975)	Theory of Planned Behaviour, TPB (Ajzen, 1991)	Theory of Interpersonal Behaviour (Triandis, 1977)	Value-Belief-Norm Theory VBN (Stern, 2000)	Reasonable Person Model, RPM (Kaplan, 2000)
Attitude towards the behaviour Social norms ↓ Behavioural Intentions	Attitude towards the behaviour Social norms Perceived behavioural control ↓ Behavioural intentions	Attitudes Social norms Affect ↓ Behavioural intentions Past behaviour ↓ Habits Facilitating conditions	Values Beliefs Pro-environmental personal norms Behaviours	Coincidence of self-interest and altruistic motives Personal control – including participation and behavioural competence as intrinsic values ↓ Behavioural intentions

Much of the psychological and social psychological research on energy has focused on energy conservation in households, whereas energy conservation in organizations or by employees has been examined less. When considering the behaviour of individual employees, similar models have been used as in consumer research (e.g. Siero et al., 1996; Payne 2000; Scherbaum et al., 2008). Many of the issues found in the residential sector are found in small business as well (Payne 2006). In organizations, however, energy-related behaviour is also structured by the organization – its way of managing information, its power relations and control structure, as well as its organizational culture, which captures collective beliefs, values and organizational iden-

tity. Even though many organizations today have made explicit commitments to environmental responsibility and the efficient use of natural resources, existing practices are often strongly entrenched (not only in attitudes, but also in structures, competences, responsibilities and performance evaluation systems).

3.1.2.2 Interaction schemes and Instruments

Psychological research acknowledges that self-interest (at least in a purely economic sense) is not the sole driver of behaviour, but that people have diverse and complex motivations, and that their behaviour is enabled and constrained by the available information. In addition to economic motives, recent psychological research has acknowledged other motives, such as environmental concern.

The different psychological schools of thought suggest some ‘preferred’ instruments on the basis of their conceptualization of human behaviour and the ‘barriers’ to energy conservation:

- Behaviourist psychology favours such instruments as triggers and stimuli, rapid feedback, and changes in the physical environment such as product design. These are instruments that are ‘close’ to the desired behaviour and aim to directly influence behaviour (actions) rather than people’s thoughts or attitudes. Geller et al. (1982) distinguish between the antecedent strategies for modifying behaviour and a type of influence that is called “consequence strategy for modifying behaviour”. While the announcement of a reward is an antecedent strategy, the reward or punishment itself is a consequence strategy. Most instruments include a combination of both. Behavioural interventions are often quite successful in the short term. Unfortunately, the change in behaviour is rarely lasting – the subjects usually revert to their original behaviour (i.e. “go back to responding to the original triggers of their old behaviour”) once the interventions are discontinued (Kurz, 2002), unless the interventions are embedded in the technology used in the home (e.g. Svane, 2007).
- Cognitive psychology focuses on structuring environmental information perceived, providing locally relevant information, vivid information, using peer-to-peer networks, as well as improving information flow between lay people and experts by increasing mutual understanding (Parnell and Larsen 2005) or by dividing information analysis tasks more efficiently between energy consumers and providers (Kempton and Layne 1994). These types of interventions are most suitable for rarely occurring behaviours that involve extensive decision making (e.g. large investments), where people indeed do plenty of process information (Kempton and Layne 1994). Routine behaviours, in contrast, are rarely the subject of cognitive processing or explicit decisions.
- Attitude-behaviour models, in their most basic form, suggest that knowledge about the object of the attitude (e.g., the importance of energy conservation), and the presence of social pressure (norms) should lead to behavioural intentions and then to behaviour. Extensions of such models additionally suggest that one should take measures aimed to increase the perceived self-efficacy of the subjects (i.e., to build up their confidence), secure conditions to facilitate the desired behaviour (e.g., provide infrastructure and facilities) as well as provide domain knowledge and skills (i.e., practical knowledge about how to accomplish the desired behaviour). The VNB and RPM models would also suggest that the facilitation of social cooperation and the formation of norms, as well as of participation and a sense of agency would support energy-related change.
- One could additionally note that behaviourist interventions (triggers, feedback) are more likely to influence routine, habitual and unthinking types of behaviour (frequent behaviours, curtailment behaviour), whereas cognitive, attitude-based and norms-based interventions are probably more likely to influence rarely occurring behaviours (e.g., efficiency-related investments). It is also possible to change routine behaviours by encouraging reflection about them (Darby, 1999, 2005, 2006), as well as by supporting new behaviour becoming a routine, but this is a process that requires significant effort.

- In between the cognitive models and the attitude behaviour approaches the model of observational learning might be of interest for long-lasting changes in energy behaviour. Bandura's (1986) social cognitive theory (SCT) explains how people acquire and maintain certain behavioural patterns through watching the actions of others. Observational learning refers to the factors environment, people and behaviour (Glanz et al., 2002). Discussing behavioural capabilities, Bandura (1997) points to the important aspect of self-efficacy, and argues that this can reinforce or weaken the aim of interventions.

Many studies of interventions draw on a number of different psychological approaches. In a review of intervention studies, Abrahamse et al. (2005) categorise the interventions into two categories:

- *Antecedent interventions*: commitment, goal-setting, information, workshops, mass media campaigns, audits and modelling (i.e., providing examples of recommended behaviour). The review found that information alone (e.g. mass media campaigns) is not generally an effective intervention. More specific information, like energy audits, resulted in energy savings. The antecedent interventions 'commitment' and 'goal-setting' were found to be successful in changing energy-related behaviour, especially when combined with feedback.
- *Consequence interventions*: feedback (continuous, daily, weekly or monthly, comparative) and rewards. Rewards were found to be effective, but indications were also found that the positive effect can disappear once the reward is removed. Feedback, especially when given frequently, was found to be an effective intervention, but it was also found to work differently for low and high energy consumers, with low energy consumers sometimes even consuming more as a result.

Stern (2000) argues that both attitudes and external conditions need to be positive for changes in energy behaviour to occur. He has found that combinations of information and incentives are more effective than either information or incentives alone. This is because different people have different 'barriers' to change and the more effective programme is the one that removes the largest number of 'barriers'.

As noted above, the psychological literature on energy efficiency and energy conservation has devoted limited attention to understanding the *interaction* between energy end-users and the interventions that aim to change their behaviours. Similarly, little attention has been devoted, for example in the attitude-behaviour models, to the *process* of change or to the factors restraining change (Schein, 1996). There is, however, a long history of research in psychology on change itself, starting with the seminal work of Kurt Lewin, on change as a process that involves dealing with force fields of driving and restraining forces on both the individual and the group level. Lewin's approach also directed attention to the need to maintain the change process and stabilizes the outcomes¹³. Thus, merely examining the drivers to change may be insufficient to achieve lasting change (Schein, 1996).

In the field of promoting energy efficiency and conservation, some attention has been given to the change process itself in work that draws on the PRECEDE-PROCEED model by Green and Kreuter (2005). This model was originally developed for health programme planning, and aimed to organise diverse existing constructs into a comprehensive model of relations among the variables that are important in the planning and evaluation of health programmes. It has since been confirmed as an explanatory model of programme success (Green and Kreuter, 2005), and has thus raised interest also among energy demand-side programmes (Egmond et al., 2006; Uitden-

¹³ Lewin (1947) conceptualised change as a process of *unfreezing* (breaking social habits or customs that support the status quo), *transition* to the new behaviour (often characterised by tensions and uncertainty), and *freezing* (supporting a new force field that maintains the new status). This model of change has been utilized and elaborated in many later approaches to change, in particular, in organisations (Schein 1996) and in the use of group processes to change behaviour (Kippenbergher 1998). Lewin was also one of the founders of the action research method, and while some of his work has been used to support quite top-down change programmes in organisations, others have used his legacy to support work in exploring the collective nature of social action (Snyder 2009).

bogerd et al., 2007; Dahlbom et al. 2009). The model advocates a comprehensive analysis of the problem in question and the factors influencing this problem when assessing factors influencing behaviour, it addresses three categories of behavioural determinants: (1) predisposing factors – e.g., attitudes, knowledge, norms and self-efficacy, (2) enabling factors – i.e., resources and skills and (3) reinforcing factors – i.e. feedback on actions taken. The predisposing factors form the intention to change, the enabling factors provide the means for change, and the feedback on achievements reinforces this process, leading to mobilization of further resources and strengthening of the intention.

Considering the suitability of various instruments for organisations, Egmond et al. (2006) have applied a model that has some features of attitude-behaviour models to examine the suitability of various policy instruments to different kinds of housing organisations. Egmond et al. (2006) use this framework to examine which policy instruments are suitable for ‘early market actors’ and ‘mainstream market actors’. For example, the early market actors were found to be more visionary and strategic, whereas mainstream actors drew more on standard operating procedures and were more risk-averse. Thus, early market actors are more amenable to knowledge transfer, stimulating communication and serving as demonstrators, whereas mainstream actors are more amendable to covenants and agreements, which share the risk among multiple players.

In general, there is more and more interest in examining combinations of instruments. Psychologists are also increasingly stressing the role of participation, social context and peer-to-peer networks (e.g. Olli et al. 2001), as well as macro-level factors contributing to energy use (e.g. technology, economy, demography, institutions and culture) (Abrahamse et al., 2005). As the motives for energy conservation are more frequently related to environmental impacts, there is also increasing discussion about the social dilemmas related to energy conservation: nothing that consumers could do as individual actors makes any difference for climate change, for example, it is the cumulative impact of all consumers’ behaviour that counts (Thøgersen, 2005). Thus, psychologists and social psychologists are extending their models beyond the traditional individualistic focus.

3.1.2.3 Effectiveness of instruments

Changes in the desired behaviour are obviously the preferred measure of effectiveness for psychology-based interventions. Often these are based on self-reported behaviour, but preferably naturally on measured energy use. An example of the types of results obtained is provided by Martiskainen (2007), with a focus on interventions with a feedback or social element. Her review found the following level of savings achieved:

- Goal-setting + feedback: households setting a ‘difficult’ goal of 20% saved about 15%, whereas those setting a 2% goal saved about 6%.
- Direct feedback monitor: savings of 4-5%.
- Feedback and focused advice: heating savings 5%; electricity 7-12%.
- Comparative feedback on gas and electricity use: comparison to previous consumption saved about 4%, low users increased with about 11%.
- EcoTeams (a form of social commitment with monthly meetings): gas savings about 20%, electricity savings about 5%.

Nonetheless, Abrahamse et al. (2005) argue that little is known about how the interventions influenced the determinants of behaviour and why they were effective. Other concerns relate to the fact that many studies are based on small and unrepresentative samples (Kurz 2002; Abrahamse et al. 2005), which also gives rise to concerns about whether the results are generalisable to other segments of the target group and other types of behaviour (De Young, 1983). A particular issue is the durability of behaviour change: often, short-term interventions will indeed have the desired effect as long as the intervention lasts and potentially for a short time after it, but once the intervention is discontinued, changes are rarely lasting or self-sustaining. This is espe-

cially the case for behaviourist-based interventions, which do not aim to provoke changes in cognitive structures, i.e., they ways in which we think about energy use (Kurz 2002).

Ideally, psychological research would evaluate interventions by comparing their effectiveness in a ‘treatment’ group receiving the intervention with a ‘control’ group that does not receive the intervention. Some researchers have also argued that experiment-type interventions are not feasible in real life, and that the ‘experimental’ focus in psychology and social psychology leads to results and prescriptions that are not necessarily valid in real life (Kurz 2002). For example, separating attitudes from infrastructure, situational factors and the social system fails to recognize the systemic and mutually interacting nature of these different factors. Interventions can have other effects than those intended – either positive or negative – but they are rarely studied in this type of research (Kurz 2002; Parnell and Larsen 2005). It is rare that programme managers could control all the variables that are relevant for behaviour, or even identify them on the basis of preconceived models. Also, if we recognize the social system as a relevant factor in supporting behavioural change, this system can rarely be subjected to controlled, ‘total’ interventions.

3.1.3 Sociological and sociotechnical research

3.1.3.1 Introduction

For sociology, the key units of analysis in energy conservation are not individuals, but society and social groups, or social practices. Further, the sociology of technology has stressed the role of sociotechnical networks: the kind of technology we use is shaped by social forces, but it in turn also mediates social action (for example, by enabling new kinds of interactions). So it is not only considered how individuals make a decision about whether or not to change their way of using energy, but also at how their possibilities are structured by infrastructural networks and other people’s decisions at other points in that network.

Traditionally, sociology viewed social structure – the norms, roles and institutions that govern the social order – as the key determinant of human behaviour. Most present-day sociologists, however, would view human behaviour as *structured* (e.g. Giddens, 1979). This means that while the social structure creates the limitations and opportunities for our choice of behaviour, actors can also change the structure through their actions. People, for example, can form new social movements that enable them to change the structure. Nonetheless, for sociologists, even economic behaviour is fundamentally social rather than individual: people cannot know about what they want or what they can do to get it unless they learn it from other people around them (Granovetter, 1985).

Practice theory is an approach that follows this line of thinking: *practices* are the main source of order in social life, and thus the key targets for changing energy related behaviour. Practices are routinised behaviours that consist of visible activities; mental activities, physical objects and social understandings (Reckwitz, 2002), and they enable and constrain the scope of action for individuals¹⁴. Thus, rather than targeting individuals or target group segments, we should target how social practices and expectations influence for example the frequency of showering, temperature control, etc. and examine how they are socially shaped and how they change (Shove, 2003; Guy and Shove 2000).

Policy makers and programme managers are not as a rule viewed as being ‘above’ or ‘beyond’ the social system they are trying to influence. Current sociological thought has largely discarded the old notions of ‘social engineering’, i.e., the belief in the ability of policy makers to control people’s behaviour ‘from above’ (Beck et al., 1994). Firstly, human behaviour in modern soci-

¹⁴ For more information see Spaargaren’s (2006) notion of social practices and the two different approaches from which they can be examined: the structural (systems of provision) and the actor (lifestyle) perspective.

ety is very complex, and attempts to control it usually have unintended consequences. Secondly, experts and policy makers are not followed blindly today: people want to know why they are expected to change their behaviour in a particular way. Finally, from a societal perspective, policy makers and programme managers are also part of the networks of actors shaping society – they cannot step ‘outside’ society or the shared base of knowledge, technology and institutions (Green et al., 1999; Wilhite et al., 2000; Rohracher, 2001). Thus, the focus is on reflexive, deliberative and participatory policy making and programme planning. This should involve the “relevant social groups” including users, producers, service providers and regulators (Russel and Williams 2002).

For sociologists, the ‘barriers’ to energy efficiency or conservation are not merely characteristics of individuals. Early sociological research on energy use focused on demographic patterns and lifestyles as key determinants of energy use (Lutzenhiser, 1993; Aune et al., 2002). Important points brought to the fore in this line of research include the following:

- People do not *consume* energy as an end in itself; energy use is a consequence of action with some other purpose, such as raising a family or running a business (Wilhite et al. 2000). As energy provision has historically become based on centralized systems, energy users have less involvement and – at least for the past decades - had limited responsibility in how they consume energy (Hughes, 1987; van Vliet et al., 2000).
- Energy use is thus socially invisible (Lutzenhiser, 2002). When we want people to become aware of their energy consumption, we are asking them to do something that they are not used to.
- There are large variations in energy use that cannot easily be explained by attitudes toward energy, but that are side-effects of other demographic and lifestyle factors. Declining household size, increasing mobility and variations in cultural expectations lead to markedly different patterns of energy use.
- We should not examine energy consumers in isolation; energy consumption (and conservation) is always a result of social processes on the family, community and institutional level (Lutzenhiser, 1993; Wilhite et al., 2000).
- Even though today there are many efforts to promote energy efficient practices, there are also counter-forces. Not all institutions in society are aligned to the cause of energy efficiency and reduced energy demand. Thus, policy makers and the institutional system are often sending ordinary energy users ‘mixed messages’ (e.g., Biggart and Lutzenhiser, 2007).

The sociology of technology has contributed to the discussion of energy consumption patterns by examining how technology and sociology interact in the development of wasteful or efficient practices of energy use. Individual choice is limited by the way cities, energy supply systems, housing designs and products are configured (Wilhite et al., 2000). Thus, change in energy-related behaviour is viewed as part of a larger change in the social and technical organization of ‘systems of provision’. The systems of provision define the opportunities and limits for individuals’ patterns of energy usage.

We can thus say that if habits, infrastructural possibilities and practical abilities to change behaviour are ‘intervening’ variables in social psychology, in sociological analyses of energy use they are the most important determinants. The attention then turns to how habits and conventions, infrastructures and users’ capacities are shaped, and what are the possibilities to reshape them. This suggests a collective, rather than an individual approach to steering energy use.

3.1.3.2 Interaction schemes and instruments

Some of the sociological and socio-technical research has been very critical toward existing approaches to energy demand-side management, which have focused on individual behaviour. They argue that this line of research and intervention has not led to much change in actual energy use in the past decades. They also argue against the notion of ordinary energy users (and

their irrational behaviour) as ‘barriers’ to energy efficiency (Guy and Shove, 2000). They stress that research should focus on the drivers of increasing energy use: how new ‘needs’ are constructed and how expectations of comfort and convenience evolve (Wilhite et al., 2000). These expectations are not created by energy users alone: they are also co-constructed by producers of energy-using equipment, such as air conditioning system manufacturers (Shove, 2003). Wilhite (2007) points to new technologies as even change agents: the introduction of these technologies may on the one hand increase efficiency “but at the same time create potentials for new energy intensive practices” (Wilhite, 2007, p. 23).

Sociologists of technology argue that effective means to change energy related social behaviour can only be found by examining the socio-technical networks that build up around new solutions, the way in which tacit knowledge¹⁵ about energy efficiency develops, and the way in which the adoption of new solutions starts to ‘make sense’ in a specific context (Guy and Shove, 2000). Here, it has been found that the introduction of innovative practices is often the result of long-term negotiations involving ‘relevant social groups.’

Rohracher (2001) provides an example from an Austrian project to promote sustainable refurbishment of buildings. Here, an orchestrating type of policy is suggested to retrieve relevant actors from the deadlock of lacking supply and demand by mapping the problems in the entire sociotechnical system. Because buildings and their infrastructures are increasingly complex, specialised service packages are needed, and can be created by encouraging service providers to network and by providing a certification scheme. Demand is increased by supporting institutional users (e.g., housing associations) to articulate and specify qualified demand and to turn this demand into procurement procedures. End-users are not forgotten: studies are needed of how they use the buildings as well as on user requirements and expectations.

There are, however, some preferences also for concrete instruments or features of instruments to promote energy conservation:

- *Transforming systems of provision:* Rather than examining the attitudes of energy users, sociologists argue that more focus should be placed on the interaction between the promoters of energy efficient solutions, energy users and other stakeholders such as service providers (Guy and Shove, 2000; Rohracher 2001). Sociological researchers thus give qualified support for programmes aiming at *market transformation*, i.e., the development of more energy efficient products and service systems, like energy labelling or technology procurement (Wilhite et al., 2000; Rohracher, 2001). Market transformation efforts, however, should simultaneously attempt to tackle problems on both the supply and demand side (Rohracher, 2001). The focus in STS is also on enabling factors and issues hampering (which together form the context for action for) the successful transformation or changes
- *Drawing on local and ‘alternative’ practices of frugal energy use:* Guy and Shove (2000) question whether energy efficient practices necessarily derive from the expert community, i.e., from outside the users’ context. Potentially innovative and valuable practices can also arise from the local context and from users’ everyday experiences. One way to identify such practices can be to examine the differences in the energy use practices of different households or organisations in order to identify alternative ways of ‘providing energy services’ (Wilhite et al., 2000). Another approach is to study and support user-driven attempts to develop alternative ‘systems of provision’, such as sustainable buildings or sustainable urban developments (van Vliet et al., 2005; Ornetzeder and Rohracher, 2006). A survey on UK households showed that those who had invested in a micro-generation system are also more aware of their energy behaviour in general (Dobbyn and Thomas, 2005)
- *Building on group rather than individual change processes:* Consumption is central in defining the consumers’ identity and social relations (e.g., Douglas and Isherwood 2002 for

¹⁵ Tacit knowledge is implicit rather than explicit knowledge. It is personal, context-specific, and therefore hard to formalize and communicate (Nonaka, 1991). Tacit knowledge is used by all people and it is an important component of many human skills and abilities.

environmental implications, see Jackson 2005). Thus, belonging to ‘greener’ social groups might influence people’s behaviour in the long run – this is also suggested by research conducted on intentional communities or car-free settlements (Mulder et al. 2006; Ornetzeder et al. 2007). This can also suggest programmes to support social lifestyle movements toward ‘voluntary simplicity’ or ‘downshifting’, i.e., communities choosing a simpler lifestyle with lower energy consumption (Hamilton, 2003; Hofstetter and Madjar, 2003; Jackson, 2005; Meroni, 2007).

- *Timing of interventions and critical thresholds:* A further point concerns the timing of change initiatives, because energy consumption is largely determined by historical decisions and routines, as well as national systems and infrastructures. Attention should thus be focused on moments and thresholds of change (Wilhite et al., 2000). These can relate to the individual level (changes in the course of family life or major refurbishments at home), but also to urban structure and national-level infrastructures. Schäfer and Bamberg (2008) focus on the opportunities presented by specific life events – like the birth of a child, severe diseases or the beginning of retirement – to change habits and routines to a more sustainable behaviour.
- *User participation and flexible design:* Because change is a process of negotiation of new systems of provision, a process of social learning is required. This learning is based on interaction between the relevant social groups. If experts develop new, energy efficient practices on their own, they may not take users’ needs into account. Moreover, it is known that users will use new solutions in various ways, and the solutions can be built to be flexible for such innovation in the process of diffusion. Thus, both user’s involvement and flexible design can promote the adoption and appropriation of new practices (Rohracher 2001; Rohracher 2003; Aune et al. 2002; Midden et al. 2007).
- *Focusing on ideas and social movements that mobilize and align the interests of different actors:* For example, Biggart and Lutzenhiser (2007) discuss the different impact of ‘energy efficiency’ and ‘green building’ ideas on building practices in the US. Energy efficiency is perceived of as a prosaic goal, whereas ‘green buildings’ (often with largely the same technical contents) have been able to mobilise business leaders, NGOs and federal agencies with moral (sustainability) as well as self-interested arguments.
- *Promoting and reinforcing change through intermediaries:* Existing players may not be the best parties to promote fundamental changes in energy systems. New ways of using energy need new organisations to champion them. Moreover, changes in energy use patterns need to be stabilized, and this can be promoted by intermediaries, as Brohmann (2006) discussed in the context of local programmes. On the one hand they create a trustful context, provide impartial information and ensure quality standards, on the other hand they support informal communication and social exchange that facilitates implementation and provides role models.

3.1.3.3 Effectiveness of instruments

Sociologists argue that traditional energy demand-side management programmes have not been effective because they have not reduced the overall demand for energy. In contrast, standards and conventions relating to comfort, convenience and cleanliness have risen, and have thus undermined the achievements in energy efficiency (Wilhite et al., 2000; Shove 2003). Thus, effectiveness is examined on the societal level, rather than among individual target groups.

One of the problems in existing policies is that the focus is only on policies and programmes targeted at increasing energy efficiency. Yet we know that many other policies, programmes and developments also have an impact on energy efficiency (e.g., land use planning, building codes, standards, etc.). Sociologists working in the field of energy argue that we should analyse these (often adverse) effects when planning energy saving initiatives (Wilhite et al., 2000).

On this level, few instruments have indeed been effective. It can be argued, however, that some ‘instruments’ or approaches to reducing energy demand have more potential than others, in terms of some early indications:

- *Emergence of new practices and new systems of provision.* For example, van Vliet et al. (2005) identify the restructuring of utility systems in terms of three models: ‘distributed generation’, ‘network integration’ and ‘co-provision’. Especially, they see promise in the emergence of new systems of co-provision that challenge the former linear view allocating responsibilities for energy provision either to large-scale providers or to decentralized users.
- *Social change (rather than change merely on the individual level).* This usually entails conflicts and negotiations, which need to be resolved before a new social order emerges. Emerging new concepts that represent energy efficiency could be one indication of social change (Rohracher 2001). Another indicator could be if we have new kinds of actors (e.g., intermediaries, NGOs or citizen groups) active in energy efficiency (e.g. Marvin and Medd 2004; Biggart and Lutzenhiser 2007).
- *Social learning:* Sociologists of technology have suggested that ‘social learning’ is a prerequisite for changes in sociotechnical systems. It refers to a long-term process in which developers, implementers and users learn from experience and interaction. The concept stresses negotiation and interaction among a wide range of actors, subject to conflicts and differences of interest and power. Social learning also entails the emergence of new routines, institutions and networks (Russel and Williams 2002).

All in all, a sociological analysis of the effectiveness of instruments would not only target their impacts on individual behaviour, but also examine the potential of changes in broader social systems, including those initiated through changes in individual behaviour. Such broader social change ensures that changes in energy use patterns become part of the social structure or social practices. They thus become durable and self-reproducing.

3.1.4 Summary

The purpose of this chapter has been to discover whether academic research on demand-side management and energy conservation can make a valuable contribution to practical work. We have reviewed the main lines of research in economics, psychology and social psychology and sociology. Each brings some new elements into our understanding of energy use. Because they define the units of analysis and the logic of action of both programme managers (those steering energy use) and of energy end-users (those whose energy use is being steered) differently, they also have different implications for approaches to change our energy-related behaviour (Table 3.1, rows 1-3).

Economic and psychological approaches have been dominant in the past. They primarily highlight factors that relate to information processing and the various aspects that influence energy related behaviour on the individual level. From these perspectives, the programme manager is usually perceived as rational and ‘outside’ the system that he or she is trying to manage. However, these two disciplines host a wide range of assumptions on how rational the energy end-users are. Mainstream neoclassical economics assumes that energy end-users are fully rational, but most economists today would acknowledge a concept of ‘bounded’ rationality, which means that there are limits to the amount of information we can sensibly deal with. This is close to the view embraced by cognitive psychology, which however focuses in particular on the problems in information processing. Other streams of psychological research have a quite different view of rationality, with behaviourists examining a very narrow but powerful form of learning through the direct consequences of our actions (without any explicit reasoning process), and social psychologists acknowledging the role of social influences on decision-making.

This is a picture of a rational programme manager, who is trying to change the behaviour of ‘less rational’ energy end-users. This picture is in many ways valid: it is safe to assume that our

programme managers (being full-time professionals) know more about energy use, energy efficiency and energy conservation than end users. The picture is less valid if we take it to mean that our programme managers know more about ‘everything’, including the everyday life and all the practical ‘barriers’ that particular end-users experience. It is also less valid if we assume that the programme managers are somehow ‘outside’ society and can steer it from ‘above’.

A more realistic view is that programme managers are part of society, and work within a certain social structure. As resources, they cannot merely draw on scientific facts (about energy use and behaviour): not only are there are limits to how much information programme managers can process but also because knowledge of these facts does not necessarily lead to successful programme implementation: network, actors, power relations, issues hampering actions towards energy efficiency, etcetera lead to a constellation that might make certain changes (related to a certain scientific fact) impossible,. Programme managers also have other resources, such as their relationships with energy end-users and other stakeholders, their own emotions and motivations, their familiarity with local contexts, and their ‘tacit’ skills and knowledge based on practical experience.

Even though there are limits to how much scientific knowledge can be absorbed into practical work, academic research provides valuable conceptualizations of energy end-users and the issues that they encounter. Taken together, various disciplines have revealed a range of issues influencing actions to reducing our demand for energy. They include ‘market failures’ such as lack of information on the risks and benefits of new solutions, or lack of access to capital for investments. They also include psychological issues like information overload, lack of direct feedback and lack of perceived ‘agency’ and capability to make a difference. Finally, they include social system issues such as existing infrastructures and power relations and shared conventions and historically embedded social practices, i.e. conventional ‘ways of doing things’ (Table 3.1, row 4). Most of these are familiar to practicing programme managers, but practical work can also narrow one’s vision so that some of them are overlooked.

The different disciplines suggest a range of approaches for reducing our demand for energy (Table 3.1, rows 5 and 6). Economics focuses mainly on removing ‘barriers’ to energy efficiency by correcting market failures. This includes providing information (e.g., audits, labels), securing capital for investments (e.g. grants, loans, ESCOs), and supporting research, development and dissemination of energy efficient solutions. Psychological research suggests a range of solutions for addressing psychological ‘barriers’. This can include behavioural interventions to change routines (e.g. triggers, feedback) and improvements in energy-related communications (making information more relevant, vivid and personal). Social psychology offers ways to address the gap between attitudes/values and behaviour through enabling conditions, increased self-efficacy and agency, and supportive norms and co-operation.

Sociological research additionally proposes that we should view change programmes in context. Systems of provision need to be transformed – it is not sufficient to deal with individual behaviour, but we also need to change the way energy is supplied and energy-using products are designed and distributed. We need to address issues of timing, because energy use is largely determined by historical decisions and routines – both on the individual and the societal level. We need, further, to focus on ideas and social movements that mobilize and align the interests of different actors. On a more ‘grassroots’ level, a sociological approach suggests focusing on group rather than individual change processes, drawing on local practices rather than merely expert knowledge, and involving users in design and allowing them flexibility to change the programme.

From a sociological perspective, our patterns of energy use are embedded in our social structure and culture. We need new players to change the way we use energy. Intermediary organizations, operating between energy supply and use (or energy policy and energy users) are important players in this respect. But they also work to change the relationships between the actors that

they connect (Hodson and Marvin, 2009). Intermediaries can operate on a ‘project’ level, providing practical advice and support to energy end-users, or ‘delivering’ policy programmes like campaigns or audits. But they can also aim for a more ‘strategic’ level by managing transitions in energy systems in particular places and actively seeking to re-shape social practices, institutions and infrastructures.

Some of the issues highlighted here are not easily addressed by small-scale programmes operated by intermediary organizations. But others can provide useful insights also for the design and implementation of small-scale programmes. Thus, we suggest that practitioners need to analyse and try to overcome the ‘barriers’ to energy efficiency and behavioural change on the individual level by drawing on the latest research in economics and psychology and policy makers and investors need to appreciate the need for this knowledge gaining and create an environment for intermediaries in which these intermediaries can more easily and productively gain this info. We recognize that this a daunting task for the smaller practitioners, but in order to make a lasting difference, and indeed work on a more ‘strategic’ level, they need to look beyond individual end-users at the networks of actors influencing energy-related social practices (e.g. lighting, office work, renovating) and engage such stakeholders in their programme. Practitioners, policy makers and investors also need to be sensitive to the relationship between the programme and other ongoing changes in the context where they operate. They can benefit from examining the ‘fit’ between their own goals and ideals and the local practices that they are trying to change, which can also lead to the discovery of ‘bottom-up’ processes that can support the intermediaries’ goals. They also need to acknowledge the fundamentally social nature of human behaviour: people learn most of their knowledge and behaviour from other people around them – thus it is important that end-users involved in change can see that others are changing, too.

The way in which we study energy demand-side management also has implications for what is perceived of as successful (Table 3.1, row 7). A conventional, economic approach evaluates public policy interventions from a cost-benefit perspective: programmes should be effective in reducing demand for energy and they should be cost-effective (provide a reasonable return in terms of energy saved compared to the cost of the programme). They should also not misuse public funds by, for example, providing funding for actions that would have been taken using private funds. What is less addressed in the economics literature is the ‘political’ nature of energy demand-side programmes: What sort of dynamics do they have, and do they change the nature and patterns of energy demand *permanently*? Do they mobilize people to continue and expand the changes on their own? Are they a step in a process towards a less energy-intensive lifestyle and society? A more contextual and socially oriented approach suggests the need for new evaluation metrics, which we discuss below.

What is noteworthy, moreover, is that the research rarely deals with or explicitly models the process of change. One perspective, which is grounded in Green and Kreuter’s Precede-Proceed model, has gained some influence in energy demand-side management practice. It focuses on analysing and then targeting the *predisposing*, *enabling* and *reinforcing* factors for end-users to change their energy-related behaviour. This is an approach that is grounded primarily in an individualistic view of change, but it also acknowledges the role of the social, physical and institutional environment in change.

A more contextualized and socially oriented approach to change is embodied in the notion of social learning adopted in the sociology of technology (Russel and Williams 2002)¹⁶. It is based on historical studies of how new technologies have been adopted in society. Here, change is

¹⁶ Russel and Williams (2002) define social learning as a "protracted process entailed in creating and appropriating new technologies, in which developers, implementers and users learn from experience and interaction. The process is seen not just in individual and cognitive terms but as necessarily social and political and entailing institutional change: the concept stresses negotiation and interaction among a wide range of actors, subject to conflicts and differences of interest and power. ... The concept serves to alert participants, managers and policy makers to the necessity of the process and what is required to facilitate it."

viewed as a process of negotiation among ‘relevant social groups’, which can involve debates and controversies, but when successful, results in the embedding of the new solutions in the social context of the energy end-users. In the field of energy, for example Rohracher (2001) has examined how energy efficient renovations can be promoted by engaging the relevant actors and networks (e.g. residents, facility managers, supply chains, etc.) and actively exploring and developing the social meanings and relations that relate to energy efficiency in buildings. The benefit of this type of change process is that it holds the potential to create a durable network that continues to exist and work also after the interventions.

We need to address both the individual and the social levels of change, while acknowledging that these changes also take place on different time-scales. Changing the behaviour of an individual by building on the most appropriate motivations, supplying facilitating conditions and reinforcing the change process through positive feedback (as suggested in the Precede-Proceed model) is a kind of ‘social engineering’ intervention within a bounded time and space. Issues like securing the resources for this process, gaining social acceptance and support, and making sure that the change process continues after the intervention – and eventually becomes a part of the social structure and culture – are relevant on a broader and more political scale. They cannot also be addressed without allowing for conflicts and diverse viewpoints, negotiation and ‘translation’ of energy conservation in terms of social interests, or the build-up of new social networks and institutions. Thus, the individual change process is nested within – and interacts with – a broader societal change process.

We also propose that programme evaluations should address the issue of learning, and in particular social learning, achieved through the programme (Table 3.1, row 7). Learning processes take a long time and span across multiple consecutive programmes. It is not easy to ‘measure’ learning while it is ongoing (it is easier to perceive in retrospect). However, we propose that it is necessary to develop indicators for learning, in particular social learning. Such indicators could enable us to see whether energy demand-side programmes contribute to long-term, wider and more durable changes (often called spin-offs in conventional evaluation). Here, it is important to try to capture processes of social learning, i.e., processes in which the programme or project manager learns in interaction with the end-users and other stakeholders, and in which this learning changes *both* the contents and context of the programme.

This chapter has tried to show that theory is always a simplification and looks at a certain part of reality. CHANGING BEHAVIOUR aims to provide a practically useful model of change, which makes full use of current theoretical insights. This does not necessarily mean that “more theory” leads to better practice. Rather, it suggests that practitioners should be more aware of the theories on which they build their projects, and should try to test whether the assumptions of these theories are valid in the contexts in which they operate. The most useful guidelines for practice arise from an interaction between theoretical conceptualizations and practical experiences. Such guidelines can mobilize existing knowledge in a way that is appropriate for the context in which it is used. This is why we apply action research in CHANGING BEHAVIOUR. This type of research develops and tests theoretical concepts in real-world conditions in cooperation with real-world actors (see, e.g., Hasu and Miettinen, 2006; Reason & Bradbury, 2001; Hamilton, 1998; Kemmis & McTaggart, 2000; Waterman, Tillen, Dickson, & de Konig, 2001). Through a close monitoring of processes and systematic reflection together with the actors involved, we aim to produce results that are both theoretically valid and practically actionable.

4. Guidelines and instruments to influence energy related behavioural change

Having discussed the main concepts that underlie the analysis of energy efficiency behaviour and the potential to change it, we now address the more concrete level of energy demand-side management practice. This chapter first discusses guidelines that have recently been published that are relevant for the design, implementation and evaluation of energy demand-side management programmes. The chapter then continues with discussing different instruments that can be used to change energy related behaviour and finally concludes with a discussion of the relevant lessons for CHANGING BEHAVIOUR.

4.1 Review of general guidelines for successful change programmes

4.1.1 Introduction

This section discusses several guidelines that are relevant for the design, implementation and evaluation of energy demand-side management programmes. Our selection is not exhaustive but includes both guidelines that have been pointed out by practitioners (the pilot partners within the CHANGING BEHAVIOUR consortium) and some that have been published very recently. The guidelines differ in topical scope (e.g. some have broader focus than energy efficiency), programmatic aim (e.g. some are mainly about communication, others are broader than that) and audience (some are more aimed at policy makers, others more at intermediary practitioners). We highlight ideas and advices from the guidelines - those considered useful and the ideas that we do not (fully) agree on. Next, we discuss the PROCEED-PRECEDE model (Green and Kreuter, 2005), as this model forms the backbone of several guidelines, and we address similarities and differences in the CHANGING BEHAVIOUR behavioural change model. We conclude with an overview of lessons that are based on the discussion of the guidelines. These lessons are taken aboard in the development of the CHANGING BEHAVIOUR conceptual framework and the development of the toolkit containing recommendations for best practices of programme implementation for intermediary organisations.

The following guides have been reviewed:

1. *The Guide to Change. Energy Related Behaviour* (Greer et al., 2001) reports the findings of a Europe-wide study on human behaviour in relation to energy efficiency behaviour, within the framework of the SAVE II programme¹⁷. This programme reviewed the outcomes and lessons learned of 50 previous projects and schemes targeting energy efficiency and translated the findings into a guideline for designing intervention programmes, consisting of 100 recommendations.
2. The *BEHAVE Report* (Dahlblom et al., 2009) which builds further on the *Guide to Change*. The aim of BEHAVE was to draw lessons from an evaluation of 41 energy behaviour change programmes from all over Europe, to combine them with insights from theory, provide an overview of best practices, and create guidelines to develop and implement successful policy interventions aimed at consumers. A network of National Energy Agencies carried out the project.
3. *The Art of Changing, behaviour of target groups* (Egmond, 2001) reports findings from a target group tailored programming approach project funded by the Dutch Ministry for the Environment within the broader programme “Kompas CO₂ reduction in the built environment”, and executed by the Dutch national energy agency Novem.

¹⁷ SAVE II is a project funded by the European Commission, aimed at the promotion of energy-efficiency.

4. A summary of the *Energy Saving Trust EST* study (EST, 2008) discusses 15 principles of climate change communication. The principles are intended for practitioners working at the Energy Saving Trust to “refine their approaches to the local marketing of environmentally-friendly energy-related behaviours”.
5. A report for the UK Environmental Department (Defra) entitled *Promoting Pro-Environmental Behaviour: Existing Evidence to Inform Better Policy Making* (Darnton et al, 2008). Overall aim was to establish how a government department like Defra can best encourage pro-environmental behaviour change among different audience groups. The report draws on both theoretical and applied research evidence, resulting in practical recommendations (eight key messages) to help policy makers in selecting the right instruments for encouraging the pro-environmental behaviours they advocate among specific audience groups
6. Two publications, *The Rules of the Game* and *New Rules, New Game*, on climate change communication (Futerra, 2005; 2006). The principles in these publications were formulated as part of the UK Climate Change Communications Strategy, an evidence-based strategy aiming to change public attitudes towards climate change in the UK. The *Rules* and *New Rules* focus on communication techniques that pull together “the most effective strategies for changing people’s behaviour”, based on psychological, sociological and marketing studies.

4.1.2 Evaluation of guidelines

Below, we address several relevant issues, categorized under the following themes¹⁸: context factors influencing success of interventions; design & programme characteristics influencing success of interventions; drawing on theory, background knowledge; communication; timing; combining factors/instruments; intermediaries. Comments from the CHANGING BEHAVIOUR project are added at the end of each issue discussed.

4.1.2.1 Context factors influencing success of interventions

The Guide to Change argues that factors like life situation, time availability and relative disposable income are more influential than contextual factors. Still, contextual factors can be very influential on successfulness. Context is elaborated as follows:

- Social context: endorsement of changed behaviour by the social environment of the target group members; importance of role models. The more endorsement from as many categories as possible, the greater the chance is that the changes will be long-lasting
- Social context also influences behaviour through the mechanism of competition - e.g. through feedback on results (energy use or behaviour changes) of others
- Availability of the necessary supplies, appliances, technology and infrastructure.

The Art of Changing argues that contextual factors are outside the scope of influence of the people whose behaviour is to change and can be categorized as follows:

- Economic factors (e.g. energy price, market situation, employment)
- Social factors (e.g. role models of other organizations, government)
- Policy factors (e.g. regulations and laws and the interaction of policies)
- Physical factors (e.g. infrastructure; availability of necessary technologies and supplies)

The *Defra report* argues that different audiences behave differently, and therefore require different interventions. To be effective, interventions need to be context specific. The *Defra-report* addresses the importance of policy incorporating considerations of equity and fairness; avoiding disproportionate financial and environmental impacts for the most vulnerable in society and

¹⁸ In part defined beforehand, in line with categorizations in other chapters, but also in part during the review of the guides.

where possible also reduce inequalities of income. Equity concerns are particularly associated with environmental taxes and charges, which can negatively impact on the competitiveness of small businesses, as well as on disadvantaged individuals. The *Defra report* furthermore sees individuals as having the potential to act as 'change champions' - within organisations and networks. Engaging and nurturing key individuals may be more effective in bringing about system-wide change than targeting the behaviour of all individuals.

The EST study focuses on context in the section: 'Context is King' which discusses how physical circumstances may limit or even rule out people's ability to undertake a desired behaviour.

The *Rules* simply state that context affects everything. *The New Rules* state that there is no one size fits all blueprint.

The CHANGING BEHAVIOUR consortium argues that

- contextual factors may also include factors that are within the scope of influence of the targeted people, e.g. they may be able to (collectively) influence local contextual factors relating to policy or the availability of resources.
- contextual factors need to be assessed as being either within or outside the scope of intermediaries.
- contextual factors also include political context, consistency of policies, as well as an overall 'fairness' of the interventions. Considering the limited individual inclination to save energy, a broader social norm should be drawn on, which will not work if people see that others are not 'pulling their weight'(not only neighbours but also businesses etc.).
- Contextual factors influence whether or not competition is a favourable mechanism. It is not generally applicable in all situations - it can also work counterproductive.

4.1.2.2 Design & programme characteristics influencing success of interventions

The Guide to Change and *BEHAVE* state the importance of conducting proper prior diagnosis or measurement of the problem, key factors and target groups, and formulation of objectives. A good prior analysis of the situation and the factors that determine if behavioural change can occur is essential. A main trap is the formulation of objectives around instruments instead of around the problem itself (or even choosing instruments before the problem has been defined and objectives formulated). In addition, it is crucial to formulate clearly what the objectives are and ensure that they entail measurable/monitored changes in behaviour. Because issues hampering actions aimed at change are more influential than positive incentives like financial incentives, the issues need to be addressed first effectively as part of the intervention; otherwise the intervention is likely to fail because issues may negate or prevent behavioural changes. Important is to tailor the message to a specific target group – instead of taking on a scattergun approach. *BEHAVE* argues for market segmentation in order to be able to tailor activities to specific segments of a target group. However, these segments need to be specific enough to allow for a good tailoring of activities. The programme should address specific predisposing/enabling or reinforcing factors/determinant. The *Guide to Change* furthermore states that the target groups most susceptible to being positively influenced toward behavioural change in the energy conservation field include young people and students; elderly and soon to be retired (these groups are interested in savings and in increase comfort levels); parents with children that are undergoing active energy education at school; persons taking care of others.

Both the *Guide* and *BEHAVE* state that monitoring and evaluation of programmes should be planned from the start, with adequate process and impact indicators and defined ways of measuring these – in order to be able to draw lessons that can be used in other instances.

As mentioned in the introductory section of this chapter, *BEHAVE* is a follow up of the *Guide to Change*. Both projects involved an analysis of multiple cases. This allowed for a comparison

between both projects and their case study analysis showing a progress between 2000 and 2008 in some areas, but not in others (see table 4.1). Improvement was found in terms of more careful planning of activities, better segmentation of target groups and increased continuity of activities. Evaluation of results has also improved, but using an overall planning and evaluation framework of behavioural change programmes has remained problematic, as well as tailoring of activities to the specific characteristics of target groups. Learning and the creation of a body of knowledge about these programmes also require further attention (see also table 4.1 Dahlbom et al, 2009).

Table 4.1 *Findings from the two similar case studies in 2000 and 2008 (Dahlbom et al, 2009:90)*

THE GUIDE TO CHANGE (2000) Behaviour change projects do work!	BEHAVE (2008)
Over 75% of the projects analysed showed significant positive results, in terms of objectives. However, objectives are often not clearly articulated, and results are often measured in something different than a lasting change in the targeted behaviour - making the results difficult to interpret.	Most cases show positive results. Goals and objectives are however still not specific enough to get a clear interpretation of the results.
Many projects favour the 'scattergun' or a 'one-size-fits-all' approach	
Fewer than 20% of all projects analysed used any form of market segmentation, and of those that did, only a handful employed a real segmentation of target groups. As a result, most projects applied a scattergun approach.	Almost 50% of the cases used some form of market segmentation. However, segments are not always specific enough to properly tailored activities.
Prior diagnosis is rare	
Less than one third of all cases examined were based on any real analysis or measurement of the ex ante situation. Even major programmes usually lacked this prior analysis.	This item has also improved: around 50% of the cases applied some form of preliminary research.
Behavioural evaluation and assessment is rare	
Most cases examined included some form of assessment of results, but the majority of this work did not include a proper measurement of the impacts of the intervention. This makes it very difficult to draw lessons from the intervention or to share these with other practitioners.	In 25% of the cases process evaluation was carried out; in 29 cases (of 41) an impact evaluation was carried out. This is a clear improvement over the 2000 situation.
Not many behaviour change projects lead to ongoing activities	
Most cases examined did not lead to further or ongoing activity, nor were these parts of a bigger framework that could have provided continuity. In those situations, it must be expected that there will be a slow decay in the results of an intervention.	Most cases are part of a larger cluster of activities and lead to further activities. This is also a clear improvement, leading to more continuity in activities and better chances of lasting success.

The Art of Changing argues that identifying the necessity to change a behaviour to reach an objective is a critical success factor (how much impact does a certain behaviour have on the expressed objective; how frequent is the behaviour).

The EST study argues for a need to address 'barriers' to changing energy behaviour. Information alone will not substantially impact behaviour. Habits are much more influential; norms come second in influencing behaviour, mainly through social pressure mechanisms (enforcing competition and commitment). The *EST study* argues for the importance of tailoring messages to the perspective of the target group, by segmenting the audience. The idea behind this is that different individuals adopt different behaviours, for different reasons. Moreover, different people experience different 'barriers' in doing so, and at different levels.

The *Defra-report* regards the targeted audience and other key stakeholders as 'actors' at the heart of the change process. A total partnership working approach is advocated, in which relevant actors are involved from the start in defining and redefining the problem through a continuous cycle of action and reflection. The *Defra-report furthermore* stresses that change takes time, so it is urgent that measures are put into place now, action needs to be taken now. The appropriateness and relevance of policies to encourage pro-environmental behaviour should be viewed in light of the massive and important global challenges. More far-reaching, targeted and effective policy action is needed than is currently evident.

The *Rules also* point out that there is a general need to create agency: when people know what to do, decide for themselves to do it, have access to the infrastructure in which to act, and understand that their contribution is important, and then they are more able and likely to actually change their behaviour. *The New Rules* stress that people want to be good, important and useful and therefore advice to help them understand and trust that they are making a difference. *The New Rules* distinguish between conscious (active, choice) and unconscious (passive, habit) behaviours. Accordingly, messages should be adapted to this. Moreover, *The New Rules* argue that once you have 'unfrozen' people from their unconscious behaviour, you can convince them to change. But once they have adopted the new behaviours, you need to find a way of 'refreezing' them, so the new positive behaviour becomes a habit again. The *Rules further* mention the importance of targeting specific groups. *The New Rules* argue to move beyond the usual suspects (who are already open to climate-friendly behaviour). In the *New Rules* the importance of 'knowing your audience' and the need to research the interests, habits, social links and preferred communications channels of the people you want to reach is emphasised.

The CHANGING BEHAVIOUR project argues that the susceptibility to change of the particular behaviour should be assessed prior to the intervention. A particular behaviour may have great impact on the objective, but if it is hardly susceptible to change, then targeting this behaviour should be reconsidered - it might be more effective to then target less important behaviours that are more easily changed. The CHANGING BEHAVIOUR team furthermore argues that making general comments on what target group is most suitable is problematic. In different cases, different target groups might be more suitable, depending on the problem and behaviour targeted and the behaviour of the targeted people. In addition, segmentation according to attitudes may not be useful because the notion of segmentation derives from mass marketing of consumer goods, basing marketing on non-local information like general attitude surveys. General attitude or 'lifestyle' based marketing segmentation models may not always be the most appropriate with respect to energy consumption. Lifestyle is often conceived of in a rather trivial way (e.g. "innovative explorers" vs. "traditionalists"), assuming that people necessarily have a consistent lifestyle across different consumption behaviours. Instead starting with identifying some of the practical problems that people have might be more useful. In cases where the market is very small, it might not make sense to segment because it is often not practically possible to tailor a programme to different segments within the overall (small) target group.

4.1.2.3 Drawing on theory, background knowledge, learning and follow-up activities

The Guide to change argues that drawing on theory and/or lessons learned in other projects contributes to success, as well as involving behavioural change professionals (who usually draw on theory) timely. *BEHAVE* also indicates that a clear theoretical basis is important to assess success and to determine if objectives have been achieved, but that most interventions have little or no basis in relevant theory and that in addition, lessons learned are hardly ever transferred to other or follow-up programmes. In addition, the importance of ongoing and/or follow-up activities was stressed in the *Guide to Change* and in *BEHAVE*. To achieve successful follow-up activities it is emphasised that learning and cross-fertilization between projects is very important, but difficult to achieve.

The *Defra report* argues that learning captured and fed back from the change process should influence subsequent policy/interventions. In order to facilitate this important reflective process, more effective and consistent data collection and collation is required. Appropriate formal evaluation structures should be put in place at the stage of policy-development. Table 4.2 highlights improvements assessed by the *Guide to Change* and *BEHAVE* with respect to the use of theory and background knowledge in programmes.

Table 4.2 *Findings from the two similar case studies in 2000 and 2008 (Dahlbom et al, 2009:90)*

THE GUIDE TO CHANGE (2000)	BEHAVE (2008)
2. Interventions have little or no basis in relevant theory	
Fewer than 20% of all projects examined used a theoretical framework to design their activities. This leads to a lack of projects building on past achievements, and little or no learning from past experiences.\	There is a significant increase in the use of theory, e.g. feedback mechanisms, but the use of an overall theoretical framework is still rare.
There is still little transfer of learning between projects	
It is quite clear from the analysis that Member States experience many similar problems in relation to CHANGING BEHAVIOUR. Cross-fertilisation between projects in different countries, however, is rare, and the wheel is re-invented over and over again.	There is little evidence that learning from previous projects has improved. To build up the ‘body of knowledge’ on energy behaviour changes will require specific attention in the future.

4.1.2.4 Communication

The Guide to Change argues that communication should go ways, enabling feedback from and direct links with the end-users/consumers. Furthermore this report states that messages and information should be simple, clear, avoiding jargon; length and detail should be tailored to the level of interest and commitment of the recipient (with more detail best provided after the initial phase); that message should not be buried in broader “climate change” messages, and that channels of communication should be diverse and preferably novel.

The *EST study emphasizes the importance of* using existing channels already open and known to the audience to communicate the message.

The *Defra-report* states that feedback is vital to achieve and sustain change. Instead of understanding behavioural change as a single event, it should be viewed as an ongoing process – in which learning is crucial. The *Defra-report furthermore* stresses the importance of government policy conveying a consistent message to targeted audiences and the public in general.

The *Rules* argue that policy and communication strategies should be mutually supportive, have consistent messages and explanations. Being clear and specific is mentioned as being of importance in the *New Rules*. Addressing the benefits of new actions, but also the real losses people are suffering as a result of their current unsustainable behaviour, is useful. The *Rules* argue against creating fear; attacking or criticizing home or family is unproductive. Instead, connections to positive aspirations like home improvement, self-improvement, green spaces or national pride should be communicated. In addition, climate change should be brought to the people (become a ‘home’, not an ‘away’ issue) and the status of climate change mitigation behaviours should be raised. Through the use of grander terms, and by making the scale of the solution sound equal to the scale of the problem, solutions sound more heroic, the *New Rules* add. In addition, visual material is important to get messages across (seeing is believing). Reminders (repetition) are important; pledges may create commitments, but only when personal and meaningful; try before you buy - let people trial, pilot and test behaviours in a safe setting. In addition, the communications must be sustained over time – to achieve lasting change. *The New Rules* mention feedback as crucial in reducing anxiety, reinforcing behaviour and increasing the belief that action makes a difference. Overall, a partnered delivery of messages will be more successful; partnered delivery is often a key component for projects that are large, complex and have many stakeholders, according to the *Rules*. The *Rules* argue for the use of a trusted, credible, recognised voice on climate change. In terms of messages, the use of emotions and visuals contributes to successfulness. It is pointed out that people learn through social interaction (social learning). *The New Rules* add that people don’t learn or change in isolation. The only way to change behaviour is to change what is socially acceptable: the so-called ‘social proof’.

The CHANGING BEHAVIOUR project states that many energy strategies and the related communication today are strongly and successfully linked to ‘climate change’ messages, e.g. the Al Gore effect. The climate change issue and an overall ‘environmental edge’ to energy saving has made it more appealing, interesting and urgent, not only in the media but also for organizations and ordinary people. On the other hand, people may grow tired of that message, perceiving climate change as a runaway train they won’t be able to stop or slow down alone anyways. Open connection of programmes to climate change should be done with care. Sometimes it is much more useful to link a programme to emphasise other co-benefits (safety, comfort, health etc). *The CHANGING BEHAVIOUR project* furthermore argues that diverse, novel or already-known channels to communicate the message are all appropriate, the choice for a channel depends on the target group, and e.g. youngsters may be better approached with new media channels like YouTube, whereas elderly tenants may be best reached through local newspapers.

4.1.2.5 Timing

The Guide to Change states that the best moment to influence people is before they have consciously made up their mind about energy-related behaviour. It is easier to influence an attitude that has not yet formed than changing an existing attitude. According to the *Guide for change*, timing is mainly a constraining factor (limited time span; starting without proper prior research complicates measuring of results, because the baseline is not known).

The Rules point out positive effects of timing, when making use of change moments: getting married, moving, new job, having a baby or retiring. People are far more open to change in these ‘transition zones’, because their habits are all in flux. Less significant times of personal change work as well (e.g. approaching people on payday).

The CHANGING BEHAVIOUR project argues that timing can be enabling and strengthening as well: making use of 'windows of opportunity' - issues that are topical to people at the moment or linking up with broader policy initiatives or regional economic development programmes are an example. However, actually implementing a project does take time, and in that time, the timing might have become less favourable due to contextual changes beyond the control of programme managers, such as the financial crisis.

4.1.2.6 Combining factors/instruments

BEHAVE state that while advertising and promotional campaigns are a useful element of behavioural change programmes, these elements hardly ever lead to behavioural change on their own. They should be complemented with social marketing activities tailored to inducing behavioural change in target groups. *BEHAVE* argues that behavioural change activities are also needed when introducing new regulation or new technology. In fact, changes in consumer behaviour are almost always needed to reap the full benefits of new legislation or technology. Policy makers are advised to consider the full mix of instruments (legislative, financial, communicative instruments and infrastructural provisions) when introducing new policy.

The EST study emphasizes the need to combine tools and instruments in order to be able to address the variety and complexity of behaviour changes. Feedback should always be part of this mix

The *Defra-report* emphasises how each behaviour is determined by various (often inter-related) factors, many of which need to be addressed simultaneously to facilitate change. Therefore, interventions should combine multiple types of instrument in a 'package' of measures (e.g. infrastructure, fiscal measures, and information). The report furthermore suggests that interventions first address external factors (understood as infrastructure and pricing) and then internal factors (e.g. psychological or attitudinal). In addition to working on multiple factors, interventions also need to work on multiple levels, ultimately addressing society as a whole in order to achieve sustained change.

The CHANGING BEHAVIOUR project argues that while agreeing on the need to combine instruments, the underlying distinction between internal and external factors is debatable (see below, section 4.3). Basically, interventions always work via the context, also when aiming at influencing psychological or attitudinal dimensions.

4.1.2.7 Intermediaries

The Guide to Change stresses the role of intermediaries as vital to ensure success.

The New Rules argue for the need of common-sense and likeable intermediaries to translate the scientific messages into practical and obvious advice.

The *Defra report* stresses that in order to be able to design and implement tailor-made programmes, it is important that the programme manager has the relevant skills and resources.

The CHANGING BEHAVIOUR project argues that there is a great diversity among intermediaries, so it is difficult to presume intermediaries as demonstrating all desired characteristics. Moreover, an intermediary is not an external agent, but part of the context that it tries to influence. While learning about the problem, the needed behaviours, the contexts, the intermediary becomes more and more part of this context, which is important to be able to influence.

4.1.2.8 Planning models

Both the *Guide to Change* and *BEHAVE* argue for the importance of a proper planning and evaluation model: interventions aiming at behavioural change are only effective if set up systematically and according to a planning model. The *Art of Changing* also reports the importance of using planning models. It recommends identifying the behavioural change you want to achieve, but also the factors determining that behaviour. This refers to factors/ determinants that influence (in positive or negative sense) the willingness to change, the capacity to change and determinants that strengthen this willingness or capacity to change. A second recommendation from both reports is to identify how these determinants can be changed or what determinants are required to make the behavioural change achievable. If these determinants are not identified and interventions directly target the behaviour sec, it is impossible to assess the actual success or failure of the instruments in changing the behaviour, since other factors might have had an influence, such as economic circumstances or regulations. But in addition, directly targeting behaviour and not also the context determinants makes it unlikely that the intervention will be successful in the first place.

According to the *Art of Changing*, a good planning model targets both the behavioural determinants and the behavioural change, and begins with determining the desired effect, than analyses the determinants influencing the behaviour and identifies necessary changes and requirements to realize change in those determinants, and finally chooses the necessary interventions to target the determinants. These instruments can be legal, economic and communicative.

The model that all these guidelines refer to is the PRECEDE-PROCEED model by Green & Kreuter (2005). The motto of this model, as adopted in *BEHAVE* (Dahlbom et al, 2009) is to begin at the end. It starts with a clear definition of the problem and the desired solutions, asking what outcome would be needed. Next, factors that influence the process are addressed. The model involves two main phases (planning and evaluation):

1. Planning
 - 1: Problem orientation, specification of goals and objectives
 - 2: Analyses of determinants and target groups
 - 3: Design of the intervention
2. Evaluation
 - 4: Implementation of the intervention and start of the monitoring: Has the intervention been carried out as planned? What were the issues that had to be dealt with?
 - 5: To what extent has there been a change (improvement) in the determinants of change? Among which target groups?
 - 6: To what extent were the ultimate and intermediate goals achieved? (impact evaluation)

The CHANGING BEHAVIOUR project states that this PRECEDE-PROCEED planning model is clear and structured. It pays attention to contextual influences on behavioural changes as well (understood as enabling factors). The term ‘determinants’ however, suggests a rather linear relationship between one of these factors and behavioural change. Moreover, a distinction is made between those behavioural determinants that are internal, and those that are external to the individual.¹⁹ While we would not disagree that some of these factors may be internal²⁰, efforts to exert influence on any of these factors is always through external means - addressing the context of the individual. The relationship between individual behaviour and context is a reciprocal one:

¹⁹ In the PRECEDE/PROCEED model, the predisposing factors are individual and internal drivers of behaviour; the enabling factors are understood as external constraints on behaviour; while reinforcing factors are also external, in that they involve feedback on actions to individuals.

²⁰ i.e. particular to each individual; not necessarily known to outsiders (e.g. a person’s life history, his/her idiosyncratic routines)

while individual action is structured by context, context can also be changed by the actions of individuals. We can only (partially) control and influence what an individual sees and reads, and not at all what this individual makes of it. In this understanding, information and persuasion will have an influence on how people talk about these issues and what they see others doing - and as such it will transform the context.²¹ We can furthermore try to make the intervention more effective by influencing multiple aspects of the context.

4.1.3 Conclusions and lessons learned from existing guidelines

What follows from our arguments in the sections before, is that influencing behavioural change always is indirect, namely via the context that subsequently influences individual change. We can distinguish certain factors that are unique to each individual (including determinants of particular behaviours) but they can only be influenced by influencing the context in which the individual operates. Context refers to the physical, social, cultural, economic, institutional and political environment (including various actors) in which the individual operates. It spans from the immediate context of the family, household, workplace and everyday surroundings to national media and policies and to the global economy. The planning model assumes the change agent to be an external actor. In contrast, CHANGING BEHAVIOUR would like to stress that the intermediary (the change agent) is part of the context that it is trying to influence.

The CHANGING BEHAVIOUR behavioural model differs from other models in the following:

- it addresses specific behaviours (instead of general behaviours)
- it addresses behaviours in context (instead of decoupled from contexts)
- it has a particular interest in the social context surrounding and influencing the targeted energy behaviour (instead of focusing on the programme characteristics)
- it explicitly addresses the social (and institutional) context as a source of predisposing, enabling and reinforcing factors for change (instead of distinguishing between external and internal factors, delegating external factors to the context and the internal to the individual)

Next to these considerations that will inform our conceptual framework and toolkit-development, the more concrete lessons learned from the review of guidelines are summarised in Table 4.3. We have identified many issues in the guidelines that we would agree with. However, we also have specified and added some issues. Most important is that we emphasise how a choice for doing something in a certain manner needs to be grounded in the particular context from which it arises. We would place more emphasis than existing guided on anchoring advice in a particular context. In other words, a particular advice could be very good for a particular type of project under certain conditions, but not perhaps for another.

Table 4.3 *Relevant lessons for CHANGING BEHAVIOUR*

Issues	Relevant lessons
Context factors influencing success of interventions	<ul style="list-style-type: none"> - Various contextual factors can be identified on multiple levels. - Context factors may be within or outside the scope of influence of the intermediary. - Likewise, they may be within or beyond the scope of influence of the targeted people. - Interventions should be context-specific. - Energy demand-side management project should be context-sensitive.
Design & programme characteristics influencing success of interventions	<ul style="list-style-type: none"> - A good prior analysis of the problem and what & who influences is crucial. - Monitoring and evaluation should be planned from the start. - Assess the necessary changes in behaviour. - Addressing influential issues is important. - Address habits, not only norms.

²¹ This means that we depart from the often-made proposition to target individuals with information and persuasion in order to change their behaviour (hence attempting to directly target internal factors), whereas context is to be targeted by e.g. legislation and economic instruments.

	<ul style="list-style-type: none"> - Distinguish between conscious (active, choice) and unconscious (passive, habit) behaviours. - Unfreeze people from their unconscious behaviour - then convince them to change. - Refreeze the new behaviour into a (new, positive) habit. - Know the target group: learn about their interests, habits, social links and preferred communications channels. - Tailor the message to the target group. - Involve the targeted audience and other key stakeholders from the start in defining and redefining the problem through a continuous cycle of action and reflection. - Enable people to act: people want to do well. - Look further than 'the usual suspects' (look further than those people who already are open to climate change issues etc). - Recognise that change takes time.
Drawing on theory, background knowledge, learning and follow-up	<ul style="list-style-type: none"> - Draw lessons from theory and/or other projects. - Involve people that are knowledgeable on behavioural change timely. - Theoretical knowledge makes it possible to assess success and to determine if objectives have been achieved. - Ongoing and/or follow-up activities are important. - Learning and cross-fertilization is very important, but difficult. - Learning captured and fed back from the change process should influence subsequent policy/interventions.
Communication	<ul style="list-style-type: none"> - Two-way communication between intermediary and target group is important. - Messages and information should be simple, clear, specific, and consistent. - Choice for channels of communication depends on your target group. - Assess the benefits of connection to broader 'climate change' messages. - Make use of events like the All Gore effect to make your message more appealing, interesting and urgent. - Create continuous feedback to target group. - Address the benefits of new actions, but also the real losses people are suffering as a result of their current unsustainable behaviour. - Connect to positive aspirations like home improvement, self-improvement, green spaces or national pride. - Bring the programme and its objectives close to people. - Make solutions sound more heroic. - Use visual material (seeing is believing). - Reminders (repetition) are important. - Communications must be sustained over time to achieve lasting change. Partnered delivery of messages works- particularly for projects that are large, complex and have many stakeholders - Use a trusted, credible, recognised voice. - People do not learn or change alone but through social interaction.
Timing	<ul style="list-style-type: none"> - It is easier to influence an attitude that has not yet formed than changing an existing attitude. - Make use of 'windows of opportunity' - issues that are topical to people at the moment or linking up with broader policy initiatives or regional economic development programmes are an example. - Exploit change moments: getting married, moving, new job, having a baby or retiring.
Combining factors/instruments	<ul style="list-style-type: none"> - Combine tools and instruments in order to be able to address the variety and complexity of behaviour changes. - Feedback should always be part of the instrument mix.
Intermediaries	<ul style="list-style-type: none"> - Recognise the crucial role of intermediaries. - Intermediaries translate the scientific messages into practical and obvious advice. - Intermediaries are part of the context they try to influence.

These lessons are still rather general. Chapter 5 introduces an in depth discussion on themes and issues that are relevant to develop a practicable approach towards the preparation, design, implementation and evaluation of energy demand-side management programmes. However, first the next section gives an extensive review on various instruments that can be taken up to encourage energy efficiency. After having presented various types of instruments separately, they are placed in perspective by discussing the importance to contextualise and combine interventions and to address those contextual surroundings that have an influence on the targeted behaviour.

4.2 Basic instruments to influence energy related behavioural change

4.2.1 Introduction to basic and systemic instruments

Having discussed some general guidelines for successful change programmes, we now turn to concrete instruments that can be used to try and address behavioural change. We first discuss separate instruments. These can generally be split into regulatory command-and-control instruments, financial instruments, instruments based on information and instruments that involve some kind of voluntary agreement or commitment. In general the regulatory command-and-control instruments and the financial instruments are instruments that target efficiency/investment behaviour, although they can of course stimulate actual long lasting behaviour change in use practices. Instruments that involve information, voluntary agreement and or commitment in principle target curtailment behaviour. Since we focus our attention on instruments that can and usually are applied by intermediaries, instruments based on information and commitment play an important role (general information and education campaigns, metering and feedback, energy audits and energy advice), energy service companies, energy performance contracting and third-party finance, and we therefore discuss them in more detail. Regulatory command-and-control instruments, on the other hand, are generally not set up by intermediaries, although they can be used by them, and we do therefore not discuss this type of instrument in detail. This is not to say that regulatory command-and-control instruments do not represent an important context element influencing the activities of intermediaries.

In chapter 3 we have presented different research approaches to energy efficiency and have argued that the more traditional analysis rooted in economics and psychology needs to be complemented by a socio-technical perspective. Therefore, after the discussion on separate instruments, we continue discussing instruments that aim more at systemic change and market transformation. As discussed in chapter 3, systems of provision need to be transformed, issues of timing need to be addressed, and we need, further, to focus on ideas and social movements that mobilize and align the interests of different actors. In addition, we need to look at instruments and interaction schemes that focus on group rather than individual change processes, drawing on local practices rather than merely expert knowledge, and involving users in design and allowing them flexibility to change the programme. Although these interaction schemes and the accompanying instruments are in many cases beyond the scope of action of intermediaries, they can play an important role in the social level of change.

For most of the instruments we discuss the different programme, context and process characteristics that influence the success and impact of instruments and issues pertaining to the expected impact and their evaluation. However, for some of the instruments this structure was less relevant and was therefore abandoned.

4.2.2 Economic instruments

4.2.2.1 Introduction

Economic incentives include financial instruments to promote energy efficiency (e.g. subsidies for energy audits or investment, soft loans), as well as fiscal incentives (e.g. tax credits). Finan-

cial instruments aim to encourage investment in energy efficient equipment and processes by reducing the investment cost; they thus mainly apply to investment (efficiency) behaviour rather than to curtailment behaviour. Economic incentives, either subsidies or fiscal measures, are often part of packages of measures: they are for instance combined with audit schemes or voluntary agreements with energy end-users (World Energy Council, 2008).

Energy efficiency investments are usually profitable to the end-user, at least in the long term, yet they are obstructed by a number of issues such end-users' lack of attention to or information on energy efficiency, as short expected payback periods, lack of end-user attention or information, end-users' limited access to capital, and principal-agent problems (see chapter 3.1.1). Thus, there has been increasing interest in energy service companies (ESCOs) and energy performance contracting, which are new business models to organise and finance energy efficiency investments. This section presents conventional financial incentives such as grants, rebates and tax incentives, while the next section turns to energy service companies and energy performance contracting.

Economic incentives fall into two broad categories: investment subsidies and soft loans. Investment subsidies to energy end-users were among the first measures to be implemented in the 1970s and early 1980s. Many countries developed schemes to retrofit existing buildings and industrial equipment. In principle, these incentives apply to actions that are cost effective from the collective point of view, but which would not otherwise be undertaken by the end-users (World Energy Council, 2008). Many of the countries offer investment subsidies to some sector (industry, services, household or transport), but some countries seem to prefer to offer soft loans or accelerated depreciation or some other form of tax deduction. Countries offering investment subsidies to one of the sectors include Austria, Belgium, Finland, Germany, Greece, Italy, Malta, the Netherlands, Portugal, Spain, Sweden, Czech Republic, Estonia, Hungary, Lithuania, Slovakia, Romania, Serbia, Switzerland and Turkey.²²

Soft loans are loans offered at subsidised interest rates (i.e. lower than the market rate) to end-users who invest in energy efficient technologies. Soft loans have the advantage of being easily implemented by banking institutions. (World Energy Council, 2008).

Fiscal incentives include measures to reduce the tax paid by consumers who invest in energy efficiency. They include tax credits and tax deductions, as well as accelerated depreciation rates for businesses. VAT reductions on energy efficient equipment or on energy efficiency investments have also recently been introduced in many countries. In some European countries, there are tax concessions on labour costs to reduce the investment cost in building renovation, or tax concessions for companies that make concrete commitments to energy efficiency gains/ CO₂ reduction (World Energy Council, 2008).

Another fiscal mechanism adopted recently in the field of energy efficiency is public benefits charges. The essence of this mechanism is collecting funds from the operation of energy market and redirecting them into the energy efficiency projects and improvements. The mechanism is believed to be cost-effective and simple for raising funds but probably not so effective in the GHG reduction (UNEP and CEU, 2007).

Finally, in order to overcome the disadvantages of direct subsidies (which are associated with limited amount of finances available and inability to be provided to each and every project), the public-private partnerships (PPP) mechanism has been introduced to the field of energy efficiency and climate change mitigation. In this respect, the use of the PPP mechanism is an innovative approach, as such projects are normally financed by the government through direct subsidies or loans (Metreau and Lopez, 2005). The idea behind this partnership is to boost the private

²² Results of the survey that this statement draws on are presented here:
http://www.worldenergy.org/documents/annex_2_wec_report.pdf (p. 19).

investment into the energy efficiency projects by involving private investors into various forms of financing (such as preferential loans, equity for setting-up ESCOs, convertible debts, granting soft loans and sharing the interest rate subsidy between the government and the investor, etc) with the back-up on behalf of the government.

The benefits that follow from using this mechanism are the following. First of all, unlike traditional subsidies, loans are renewable and the generated profit can be reinvested in other projects. Secondly, this mechanism solves the problem of limited financing available from government sources, which permits to broaden the scope and number of eligible projects. Finally, the PPP mechanism is advantageous in terms of reaching both public and private goals: for the public sector, it is the environmental aspect that matters (solution to climate change and energy security), while the private sector is interested in the profitability of the projects, i.e. return of investments (Metreau and Lopez 2005). Thus, the PPP mechanism is mutually attractive and beneficial, as it on the one hand reduces financial risk for the private investors, and on the other hand provides sufficient funding that can be reinvested and used for multiple projects.

4.2.2.2 Programme and context factors influencing success

The early experiences with grant programmes revealed a number of problems (Geller and Attali, 2005; World Energy Council 2008):

- Subsidies schemes often attracted consumers who would have carried out the investments even without the incentive, the so-called "free riders" (e.g. high income households or energy intensive industries). This can even lead to the diminished legitimisation of an entire grants programme because many of the changes and investments would have taken place without the subsidy as well, making the subsidy obsolete in a certain way (Van der Laar and Vreuls, 2004).
- The small and medium-sized companies and low-income households that were the actual targets of the programmes did not take advantage of using them because they were unaware of their existence. This demonstrates the challenges of informing a multitude of consumers adequately about the existence of the incentives.
- Procedures for grants applications were often found to be too bureaucratic (complex forms to be completed and long delays in obtaining approvals).
- Concerns have been raised that subsidy schemes may lead to an increase in the cost of equipment or to the deployment of equipment with a poor quality.

Today, grant programmes are increasingly, but still not always used more carefully. In some cases grants are limited to those that cannot make the investment themselves (e.g. low income households, SMEs). They may also be restricted to certain types of investments with a long payback time but high efficiency gains, or to innovative technologies. Subsidies for energy audits (see chapter 3.1.1) have also become a popular measure for promoting energy efficiency in Europe (World Energy Council, 2008). Subsidies are usually viewed as a temporary measure to mobilise energy end-users or to promote energy efficient technologies by speeding up the market expansion and eventually lower the cost of energy efficient technologies.

Importantly, there are also a number of contextual features influencing the effectiveness of financial instruments (World Energy Council, 2008). Their effectiveness depends on the availability and quality of technologies provided and on the ability of policy makers and programme administrators to inform the target groups of the subsidy scheme. The effectiveness of soft loans and fiscal measures like tax deductions can also depend on a number of contextual features. These include the prevailing interest rate (if it is low, a soft loan is not so attractive). Tax credits and deductions, on their part naturally work better if the tax rate is high. Other contextual factors that can influence the successfulness of financial instruments include energy price levels, the degree of market development for energy efficient technologies and services and the level of integration between energy efficiency policy and other sectoral policies (transport, buildings

etc). Moreover, the successfulness of financial instruments is influenced by demography (age of the population, size of households, and growth rate of the dwelling stock). For example, even favourable financial incentives may not be sufficient for ageing households to invest in residential energy efficiency measures with a long payback period.

4.2.2.3 Design and process factors influencing success

Programmes building on financial incentives have shown highly variable success rates, which are largely attributable to design factors. Design factors influencing success relate to:

- *Good combination of financial incentives and other support measures:* Stern (2000) stresses the potential complementarities between financial and informational incentives. Otherwise similar financial incentive programmes have shown very different participation rates depending on how they were marketed to end-users (see also Vreuls 2004). End-users need to understand the benefits of the programme and to be convinced of the trustworthiness of the information provided. Stern (2000) also argues that the stronger the incentive is, the more difference the non-incentive factors like information and marketing make, because they raise awareness among end-users who might otherwise not pay attention to the programme. Moreover, end-users may require other forms of assistance, such as technical and organisational support to make use of the financial incentive (Kazakevicius et al. 2002).
- *Understanding the decision-making process of the target group:* the effectiveness of economic incentives depends on how well the designers understand the decision making processes of various target groups. The following are some examples from the residential sector: Vreuls et al. (2005) found that soft loans have often been unsuccessful because households are reluctant to take on additional debt simply to save energy. Joelsson and Gustavsson (2007) found that lock-in by existing home heating investments may lead to a situation where very significant incentives are needed to ‘tip’ the decision. Moreover, even though operating costs and investment costs are significant factors influencing households heating system decisions, other factors play a role as well, such as the perceived reliability of various technologies, issues related to perceived comfort and indoor air quality, as well as the perceived influence of investments on property values and real estate taxes (Joelsson and Gustavsson 2007).
- *Attention effects:* Subsidies can heighten awareness of the technologies of solutions that they aim to promote (Vreuls, 2004) and trigger information search on new solutions (Joelsson and Gustavsson 2007). Thus, they can have impacts that are purely informational, beyond their impacts on financial decision-making and even beyond the targeted group (spill-over or free-driver effects, see Geller and Attali 2005). The provision of financial support by the government may also have a signalling effect about the importance of the targeted energy efficiency measures (IEA 2008).

Process factors relate largely to the administration of the programme and to the stakeholders involved. Simple and easy application and administration procedures are obviously important. Moreover, the stakeholders involved in the programme and its administration are also important, and the extent to which they are perceived of as trustworthy and fair (Stern 2000). As concerns sources of information (and potential marketing channels), Joelsson and Gustavsson (2007) found that homeowners gain most of their information from installers and sellers, as well as homeowner’s associations and friends and neighbours. Thus, communication via stakeholder networks can also be important for subsidy or loan schemes.

4.2.2.4 Expected impacts and their evaluation

The main objective of financial incentives is to raise the financial return rates of energy efficiency investments to a level that makes them attractive to energy end-users. The IEA Evaluation Guidebook (Vreuls, 2005) suggests criteria for evaluating the outputs, outcomes, impacts and cost-effectiveness of such programmes:

- Outputs can be evaluated in terms of, e.g., the number of loans or guarantees, amount advanced or the ration of investment/loan (or subsidy)
- Outcome indicators include, e.g. awareness of energy efficient products and changes in future decision-making processes.
- Impact indicators include, e.g., energy savings achieved by the measures applied

Some of the benefits may be non-energy related, such as reduction of fuel poverty or improvement of living conditions. Moreover, because public funding is involved, there has been much attention to making careful cost-benefit analyses, taking into account the rebound effect (see chapter 3.1.1) as well as the free rider effect (clients using the subsidy who would have made the investment even without it), as well as attention or spill over effects (effects on non-subsidised clients).

Table 4.4 *Financial Instruments*

Financial Instruments:	Temporary measure to mobilise energy end-users or to promote energy efficient technologies by speeding up the market expansion and eventually lower the cost of energy efficient technologies
Context factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Availability and quality of technologies • Ability to inform the target groups of the subsidy scheme. • Prevailing interest rate (e.g. soft loans and tax deductions), investment cycles • Energy price levels, degree of market development for energy efficient technologies and services • Level of integration between energy efficiency policy and other sectoral policies • Demography (age, size of households, growth rate of the dwelling stock)
Programme characteristics influencing successfulness of instrument	<ul style="list-style-type: none"> • Prevent free riders; grants for those who cannot make the investment themselves (e.g. low income households, SMEs). • Adequate information to target groups about the incentives • Care should be taken to prevent too complex and lengthy application procedures • Care should be taken to restrict grants to types of investments with a long payback time but high efficiency gains, or to innovative technologies. • Subsidies for energy audits to promote energy efficiency
Design factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Fruitfully combining financial and informational incentives (information should be understandable, trustworthy); in addition other assistance (technical and organisational support) may be needed to make use of the financial incentive • Designers should understand the decision making processes of various target groups • Attention effects: subsidies may heighten awareness and trigger information search (spill-over or free-driver effects)
Process factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Administration of the programme (simple & easy) and to the stakeholders involved
Expected impacts and their evaluation	<ul style="list-style-type: none"> • Main aim is to raise the financial return rates of energy efficiency investments to a level that makes them attractive to energy end-users.

	<p><i>Criteria for evaluation:</i></p> <ul style="list-style-type: none"> - Outputs: in terms of, e.g., the number of loans or guarantees, amount advanced or the ratio of investment/loan (or subsidy) - Outcome indicators include, e.g. awareness of energy efficient products and changes in future decision-making processes. - Impact indicators include, e.g., energy savings achieved by the measures applied • Some of the benefits may extend beyond energy use, e.g. reduction of fuel poverty or improvement of living conditions. Account should be taken of rebound effects, free rider effects, attention and spill over effects.
Primary behavioural target (efficiency or curtailment)	Financial instruments are cognitive, attitude-based and norms-based interventions and mostly target to influence rarely occurring behaviours, e.g. investment. They thus mainly apply to investment (efficiency) behaviour

4.2.3 Energy service companies, performance contracting and third-party finance

4.2.3.1 Introduction

Energy service companies, energy performance contracting and other forms of financing energy efficiency investments have gained increasing attention in Europe. They hold the potential to overcome, or at least alleviate, some of the issues pertaining to energy efficiency identified in chapter 3 by providing a new way to organise and finance energy efficiency investments. Conventional energy utilities do not necessarily have the incentive to provide energy services at least cost and environmental burden, whereas end-users usually lack the means to contract such services. The emergence and expansion of specialised energy service companies (ESCOs) and energy performance contracting services is expected to move the energy market more toward a more efficient provision of energy services (Directive 2006/32/EC).

Different terms are used to refer to such services in different countries (see Bertoldi et al. 2005). The Energy Services Directive (Directive 2006/32/EC) uses the following terms and definitions:

- Energy service company (ESCO): a natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises, and accepts some degree of financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on the achievement of energy efficiency improvements and on the meeting of the other agreed performance criteria.
- Energy performance contracting: a contractual agreement between the beneficiary and the provider (normally an ESCO) of an energy efficiency improvement measure, where investments in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement.
- Third-party financing: a contractual agreement involving a third party – in addition to the energy supplier and the beneficiary of the energy efficiency improvement measure – that provides the capital for that measure and charges the beneficiary a fee equivalent to a part of the energy savings achieved as a result of the energy efficiency improvement measure. The third party may or may not be an ESCO.

According to a recent European survey by Bertoldi et al. (2007), European ESCOs today include both public organisations and private companies. Many of the providers of ESCO services are multinational companies, most of which have a background in heating and building control equipment sales, but there are also many smaller companies working in this area. Many old and new EU Member States have well developed ESCO markets, but some have no ESCOs at all,

either because energy efficiency is addressed with other tools, or because the market is only emerging.

Energy efficiency is often a good financial investment, yet energy users often fail to invest in energy efficiency. This can be because end-users fail to recognise the opportunities, because of split incentives, because energy users have different priorities, or because they are unwilling or unable to incur debt or make capital investments. Thus, there is an opportunity for an external company to make the investment and share the eventual profits with the end-user. From the client's perspective, this is an opportunity to gain energy efficiency upgrades without any up-front outlay.

ESCOs usually offer the following services: development and design of energy efficiency projects; installation and maintenance of energy efficient equipment involved; as well as measurement, monitoring and verification of the energy savings from the project (World Energy Council, 2008). Financing for the investment can either be provided by the ESCO from its internal funds or by the customer, or by third party funding, in which a financial institution allows a credit either to the ESCO or directly to its client; the loan is then backed by a guarantee for the projected energy or cost savings given by the ESCO.

The savings in energy use are thus used to pay for the necessary investments in energy efficiency, and the remaining savings are shared between the facility owner (end-user) and the ESCO under the terms of the agreement (Westling, 2003). There are two main models for energy performance contracting: the shared savings model and the guaranteed savings model (World Energy Council, 2008). Under the first model, the cost savings are shared by the ESCO and the client at a pre-determined percentage for a fixed number of years. In the guaranteed savings model, the ESCO guarantees a certain level of energy savings to the customer: this model has the advantage that interest rates are usually much lower. In contrast, in the shared savings model, the ESCO assumes both the performance and the credit risk.

4.2.3.2 Programme and context factors influencing successfulness

ESCOs and performance contracting are business models, rather than programmes. But many countries have attempted to promote the emergence of these business models because they are important vehicles to capture energy-efficiency potentials and overcome market 'barriers' to energy efficiency (Vine, 2005; Bertoldi 2007). Programmes to promote ESCOs and performance contracting include such actions as awareness raising, certification and training of service providers, finance and funding development, the development of standard contracts and measurement and verification systems for savings, demonstration projects as well as public procurement (Vine, 2005).

ESCOs and performance contracting are more amenable for some energy end-user types than others. In very small projects (e.g., the residential sector and small businesses), the transaction costs can be too high for ESCOs (i.e., it is too costly to assess the savings potential), and high turnover rates of facility occupancy can be a problem. Very large companies may not need the services of ESCOs (Bertoldi et al., 2007), even though keeping energy efficiency investments out of the balance sheet may be a motive to use the financial services provided by ESCOs (Halme and Heiskanen, 2001). The public sector has been a particularly interesting target group due to problems in financing energy efficiency investments and because government and municipalities represent very 'stable' organisations (Vine, 2005). Also, the type of banking system in the country might play a significant role. For example, in the countries with a conservative lending system, banks may be unwilling to lend money for ESCOs (UNEP and CEU, 2007). Lack of confidence in ESCOs and possibility of a win-win situation for the client and the company can also be a contextual factor. The introduction of accreditation system and standardization of procedures can help in gaining trust of banks and clients (UNEP and CEU, 2007; World Energy Council 2008). Energy Service Contracting (ESCO), performance contracting and 3rd

party financing target both forms of behaviour. ESCOs and 3rd party financing in principle focus on rarely occurring behaviours, e.g. investment. However, the combination of ESCOs with performance contracting also targets repetitive and often even increased saving and thus targets curtailment behaviour.

According to Bertoldi et al. (2007), ESCOs and other forms of performance contracting have developed very differently across different European countries. Important context factors influencing the successfulness of ESCOs and energy performance contracting include market conditions, general government strategies, as well as specific support measures. The following market factors were identified as important by Bertoldi et al. (2007):

- High energy prices and the presence of energy taxes make ESCO projects more attractive
- Liberalisation of the energy sector has ambiguous effects: on the one hand, it lowers the price of energy; on the other, competition can encourage energy utilities to provide ESCO services to retain customers

Bertoldi et al. (2007) also identified a number of government support measures that have influenced the development of the ESCO market in the past few years, including:

- Awareness-raising, trust- and capacity building measures
- The development of a legal framework for ESCOs, including standard ESCO contracts and the provision of accreditation for ESCOs
- The availability of subsidies or finance from state funds for ESCO projects
- The regulatory environment, including mandatory audits (providing a ‘free’ knowledge base for ESCOs on clients’ savings potential), as well as the introduction of White Certificates requiring energy suppliers to provide energy conservation measures
- General government and private-sector attention to energy saving due to climate change policies and strategies

4.2.3.3 Design and process factors influencing success

Under design and process factors, we here discuss the provision of ESCO and performance contracting services – how they are designed and provided, and how the service providers interact with their clients. ESCOs need a number of skills in marketing their services both to clients and to the financial sector (Bertoldi et al., 2007). They need to market their services to increase clients’ awareness of the benefits, as well as enhance trust and overcome customer scepticism. ESCOs also need to find or circumvent organisational ‘barriers’ in the client organisations, such as procurement and budgeting rules, split incentives or administrative hurdles, which are particularly problematic in the public sector. Small companies that are independent from energy utilities or equipment manufacturers are in principle the most capable of providing impartial services (Halme and Heiskanen, 2001), but they also face a number of challenges, such as higher cost of capital than larger companies that can use equity funding (Bertoldi et al., 2007). It is easier for larger companies with a variety of services and an existing customer base to gain access to customers and attractive potential ESCO projects (Bertoldi et al. 2006).

Müschen (1999) has identified a number of success factors for performance contracting in the well-developed German public facility market:

- indisputable definition of the baseline (the energy performance before the start of the project)
- systematic controlling
- clear definitions of the measures, investments and outcomes
- co-operation with decision-makers, facility maintenance staff and building users (see also Tisch and Kaltenecker, 2008).

4.2.3.4 Expected impacts and their evaluation

The impacts of ESCO programmes can be evaluated from various perspectives. These can include the client's perspective (connected to the client's expectations and the agreements made with the ESCO), the expectations of the ESCO company itself (does the ESCO business provide the expected source of income?) or from the perspective of government or society at large (are ESCOs an effective way to provide capital for energy efficiency investments that would otherwise remain not financed?). In general, government expectations toward the development of the ESCO market have been high. However, the European ESCO market has developed unevenly, and there appear to be many 'barriers' to its expansion (Bertoldi et al., 2007).

Table 4.5 *Energy Service Contracting (ESCO), performance contracting and 3rd party financing*

ESCOs, energy performance contracting and 3 rd party financing:	Aim at overcoming or alleviating some of the 'barriers' to energy efficiency by providing a new way to organise and finance energy efficiency investments.
Context factors influencing successfulness of instrument	<ul style="list-style-type: none"> • High energy prices & energy taxes make ESCO projects more attractive. • Liberalisation energy sector: may lower the price of energy; competition can encourage utilities to provide ESCO services to retain customers. • Government and private-sector attention to energy saving due to climate change policies and strategies • Government support measures that have influenced the development of the ESCO market in the past few years: <ul style="list-style-type: none"> - Awareness-raising, trust- and capacity building measures - Development of a legal framework for ESCOs - Availability of finance from state funds for ESCO projects - Regulatory environment, incl. mandatory audits and certificates.
Programme characteristics influencing successfulness of instrument	<p>Programme actions involve e.g. awareness raising, certification and training of service providers, finance and funding development, the development of standard contracts and measurement and verification systems for savings, demonstration projects as well as public procurement.</p> <p>Very small projects may have too high transactions costs for ESCOs; in addition high turnover rates of facility occupancy can be a problem; very large companies are often not a suitable target group. The public sector <i>is</i> often a particularly interesting target group due to problems they have in financing energy efficiency investments and because government and municipalities represent very 'stable' organizations.</p>
Design & process factors influencing successfulness of instrument	<ul style="list-style-type: none"> • ESCOs need to market their services to increase clients' awareness of the benefits, to enhance trust and to overcome customer scepticism. • ESCOs need to overcome organisational 'barriers' in the client organisations, e.g. procurement and budgeting rules, split incentives, administrative hurdles (particularly problematic in the public sector). • Small companies, independent from energy utilities or equipment manufacturers, are in principle best capable of providing impar-

	<p>tial services, but they also face challenges, such as higher cost of capital than larger companies that can use equity funding. In addition, larger companies may have the advantage of their existing customer base that they can offer ESCO services to.</p> <p>Success factors for performance contracting based on a study in Germany:</p> <ul style="list-style-type: none"> • Indisputable baseline definition (energy performance before the project starts) • Systematic controlling • Clear definitions of the measures, investments and outcomes • Co-operation with decision-makers, facility maintenance staff and building users
Expected impacts and their evaluation	<p>Outcomes should be evaluated with attention for:</p> <ul style="list-style-type: none"> • The client's perspective: are client expectations met? • The ESCO perspective: does the project provide the expected income? • The governmental or societal perspective: do ESCOs stimulate energy efficiency investment?
Primary behavioural target (efficiency or curtailment)	<p>Energy Service Contracting (ESCO), performance contracting and 3rd party financing target both forms of behaviour. ESCOs and 3rd party financing in principle focus on rarely occurring behaviours, e.g. investment, but the combination of ESCOs with performance contracting also targets repetitive and often even increased saving and thus targets curtailment behaviour.</p>

4.2.4 Information and education campaigns

4.2.4.1 Introduction

Many programmes that aim at changing consumers' behaviour are based on providing information and education via communication channels as intervention methods. Still there are a lot of examples of situations in where providing information did not lead to the sought after changes in behaviour. The complexity of the combination of aspects founding and influencing behaviour is key to these different outcomes reactions on information and education campaigns.

Typical for information and education campaigns is that they are only based on information supply via different communication channels. They attempt to change behaviour without altering incentives or authority systems (Weiss, 1994). They can be designed in different forms with different foci that can be organised in a hierarchy of effects: raising awareness, education and providing knowledge, influencing behaviour through attitude change and maintaining behaviour change (Maibach, 1993). Information and education campaign can be used to trigger energy/investment behaviour, but in principle they target curtailment behaviour, focusing on motivation and capacity to undertake long lasting behavioural changes in terms of energy consumption.

The target groups of information and education campaigns can vary from very broad, i.e. the whole population of a country or region, to very specifically defined target groups, i.e. children at a specific school, house-owners, women in a specific neighbourhood, etc.

Several overviews of do's and don'ts in relation to information and education campaigns exist. These overviews are mostly based on literature reviews, on an analysis of large amounts of case studies or both (for example Weiss, 1994, Maibach, 1993 and Townsend, 2005, focusing specifically on communication programmes and Smits et al, 2007 and Jackson, 2005, focusing on demand side management programmes in general). Although different in focus, large overlaps exist in the core messages of these overviews and conclusions can be drawn on several aspects of the campaigns: the design and content of the message, the context, the use and choice of communication channels, the definition of and adaptation to the target group, etc. It must be noted that many of the below aspects are not only typical for the success of information and education campaigns but are also applicable to communication aspects in other intervention types that are discussed more in detail in other sections of this chapter.

4.2.4.2 Programme and context factors influencing success

Behavioural change can also occur without the use of a specific communication message. In these cases contextual factors influencing the consumer are key to the changed behaviour, for example a general growing awareness of climate change, a behaviour change of a neighbour or other nearby person or the birth of a child (Jackson, 2005) but also macro-social elements as existing policy, laws and regulations, subsidies, taxes, etc (Maibach, 1993). These contextual factors also influence the successfulness of an intervention based on communication and education and therefore it is the challenge of the programme initiator to *use this context* to improve the content, method and outcome of information and communication instruments. One way of linking to context is to make use of or link to a subject that is positively valued in society, e.g., a growing environmental awareness. According to studies, another way of making use of the context to increase the potential of communication and education interventions is to *link to other existing programmes* aiming at the same kind of behavioural changes, for example other energy efficiency programmes. By working together, mutual learning takes place, a larger public can be reached, more communication channels are used, the cost-efficiency rises, etc. When making use of these advantages of linking programmes, it is important that the messages of the programmes are similar in scope and content (Smits et al, 2007, Townsend, 2005).

Behaviour scientists and practitioners agree that three characteristics can be identified for successful information and education campaigns: *simple, fun and easy*²³. To be successful, these three basics must be translated in the programme: the message itself must be simple, fun and easy but also the behavioural change must be simple, fun and easy to undertake. To achieve these different programme elements that also influence the outcomes of the communication or education campaigns must be thought through thoroughly. These are i.e. the messenger, the definition of the goals, research on and approach of the target group, the design and content of the message, the choice and use of communication channels. These must form a mutually reinforcing programme.

4.2.4.3 Design and process factors influencing success

The messenger

When using persuasion as an intervention model, at first glance it could be said that the success of this intervention is based on the credibility of the speaker (the source), the persuasiveness of the arguments (the message) and the responsiveness of the audience (the recipient) (Jackson, 2005). A characteristic that has a large influence on the success of information and education campaigns is the messenger. The *credibility and commitment of the messenger* is the starting point of a successful campaign. In general it is better to have a neutral intermediary organisation bringing the message than for example the government which might not be trusted by the public

²³ During the first BECC (Behaviour, Energy and Climate Change) conference in Sacramento, USA in November 2007 several speakers emphasized the need for fun, simple and easy messages. In the different practical cases that have been presented, this was one of the most important success factors.

(Smits et al., 2007). In education campaigns the messenger is the teacher. He or she has an important role to enact and consequently has great influence on the results of the campaign. Practice shows that the commitment and enthusiasm of the teacher has a positive effect on the success of the education campaign (Smits et al., 2007).

The receiver of the message: the target group

In general studies demonstrate that to be successful, the consumer/target group should be at the centre of the information and education campaign and not the product or the message strategy. A consumer or target group orientation is achieved by taking into account the sensibility (or concern) of the target group towards the topic, recognition of the problem by the target group, knowledge about the topic by the target group, past experiences and expectations with the topic by the target group, social norms regarding the topic by the target group, time available of the target group and values and mores concerning the topic existing within the target group (Maibach, 1993). These data can be collected by means of formative research: concept development, message development and message testing (Maibach, 1993). In general it is also concluded that participation of the target group in information and education campaign has a positive effect on the outcome and results (Jackson, 2005). By this you can adapt your communication more precisely to your target group (as the target group is helping in designing it).

It is crucial for successful information and communication campaigns that the target group is clearly *defined and researched in advance* and that the communication is adapted to the target group. When the target group of an information or education campaign is not homogeneous, further segmentation based on geographic, demographics, psychographics, target behaviour, etc needs to be done (Maibach, 1993). Then further research on the different segments can be done by collecting data via focus groups, surveys, interviews, literature, etc. It is for example crucial to investigate the current behaviour of the target group and identify whether you want to change conscious, active behaviour based on choice or unconscious, passive behaviour based on habits. When addressing children at a specific school to make them turn off the lights when leaving the classroom a specified message and communication channel should be used which is completely different than for example the message and communication channels used when addressing all households in the city to shower one minute less.

Another important design recommendation is that the consumer orientation of the campaign should be accompanied by acknowledgment of the relevance provided by the *exchange theory*. Every behaviour change has costs and benefits for consumers. These can take many forms ranging from financial investments or profits to spending or gaining time, social contacts, etc. It is crucial to know what costs consumers are willing to pay or what minimum level and what kind of benefits they would like to receive as a result of changing their behaviour (Maibach, 1993).

Also the message should not be based on the *rational choice* of the target group. Behaviour theories and practice show that people in many cases do not follow the rational choice model. This means that when you know that your target group wants to save money and the message would be “washing at 30 degrees instead of 60 will save you money” this would not automatically make your target group change its behaviour.

The message

Providing information and education to consumers is effective in changing their behaviour. Still practice and theory also show that providing too much information has a negative effect on the outcomes of the campaigns. This negative effect is related to the fact that people do not like to feel helpless. When providing too much information they might get the feeling that they are not capable of making their own decisions and that they are depending on the information and are thus helpless (Jackson, 2005).

All reviews agree that to create a successful information or education campaign the message of the campaign must be very *consistent and accurate*. Changing messages or having different

messages through different channels influence the credibility of the message negatively. Another aspect influencing the outcome of the campaign is the *tone* of the message. The message should be positive and preferably linked to desires and aspirations (Townsend et al, 2005). The message should not be moralising (Smits et al, 2007), criticizing or attacking home or family (Townsend et al, 2005) which might create negative feelings within the target group.

The *length of the campaign* has an influence on the outcomes as well. In general Maibach (1993) concludes that campaigns aiming at long term behavioural change should also last for a longer period (minimal a year) to be effective. The length of the campaign is also related to the incorporation of local empowerment and institutionalisation as goals of the campaign, which takes time and the campaign should last as long as it takes to reach local empowerment and institutionalisation. Reaching local empowerment has a largely positive effect on the outcome of the campaign and on achieving lasting behavioural change (Maibach, 1993).

To improve the effect of the message, both *peripheral and central processing* must be addressed (Jackson, 2005 and Townsend et al, 2005). This means that the message must be brought to the target group directly for example by leaflets to tell everybody to use the bus instead of parking in the centre of town, but also via peripheral ways by for example showing celebrities waiting for or sitting in a bus.

When designing the message the *style and language* should be adapted to the target group. To achieve this, from practice it follows that *involving several parties* and especially the target group in the design of the message has a positive effect on the effect of the message (Smits et al., 2007). In general it is also recommended that using *emotions, bright coloured visuals* (seeing is believing), *humorous and modern language* in the message have a positive effect on the successfulness of the communication and education campaigns.

During the information and education campaign the effect of the message must be evaluated continuously and the communication methods adapted when needed. The target group might change its reaction towards different communication channels and/or the effect of the message is different than expected.

The above shows that enough attention must be paid to both the content and design of the message. All communication actions must therefore be planned carefully (Smits et al., 2007).

Communication channels: which and how

No communication channel is consequently superior to another and each campaign needs a unique combination of communication channels. Each communication channel has three dimensions which play a role in its effectiveness: reach, specificity and rate of influence (Maibach, 1993). To choose the right communication channels first *research* must be performed on how the target group is responding to different media. At what time is your target group watching television, does your target group read newspapers or magazines, does your target group listen to morning shows at the radio, etc. This media research is the basis for the decision which communication channels to use for disseminating the message of the campaign (Smits et al., 2007).

Practice has also shown that the effect of the message increases when *repeated over time* via different communication channels in different settings. It is thus better to have five times a one minute advertisement on the television and five advertisements in the newspaper spread over several weeks, than one 10 minute television reportage (Maibach, 1993 and Townsend et al, 2005). In general interpersonal channels are an effective complementary channel to mediated channels; and printed media are an effective complementary channel to electronic media (Maibach, 1993).

Using *television* to convince the target group to change behaviour is in general very effective. This is however only the case when your target group is indeed watching the broadcasting of the message (Smits et al, 2007). Another effective communication channel is using likeable well known public figures as *spokespersons* for your campaign. Recognizing the voice of a ‘person the target group knows’ increases the trust in and credibility of the message (Smits et al, 2007 and Townsend, 2005).

To increase the chances for successful information and education campaigns, the design of the campaign should be based on theories of human behaviour and communication processes. These theories can help in explaining and predicting the outcomes of the campaigns. The behavioural theories that are relevant in these campaigns according to Maibach (1993) are explaining the outcomes at different levels: individual level, network level, organisational and institutional level and societal level.

Maibach (1993) also describes the different theories that exist on each level that are relevant for the programme manager in the design of the programme. On the individual level theories on social learning, information processing, expectancy, risk perception and decision making can be applied. On the network level theories on innovation diffusion are relevant. On the level of organisations and institutions diffusion theories can also be applied. On the societal level again a number of theories are relevant for the programme designers: agenda setting, spiral of silence, theories about public opinion and the effect of information.

Apart from the theory Maibach also states that the marketing mix plays a role in the successful outcome of information and education campaigns. This second foundation for the design of the campaigns is a combination of: products, prices, placement and promotion. The social marketing forces programme manager to think of their ideas and social programmes as they are products that have to be sold to the target group (Maibach, 1993).

4.2.4.4 Expected impacts and their evaluation

One way to improve the impact and effect of the message and to create lasting behavioural change in reaction to information and education is to give *positive feedback* to the target group about their behavioural change so far to the campaign. This decreases the anxiety surrounding new behaviour and encourages the ‘refreezing’ of the new behaviour into daily life. Theories on social learning in relation to sustainability projects also underwrite the positive effect of feedback on the learning of the target group learning (Loeber et al, 2007)

Finally, monitoring and evaluating the outcome and the process of the communication and education campaign is important (Maibach, 1993). For the evaluation of the process detailed monitoring is needed to collect the necessary data to tell whether the message has reached the target group in the right means and with the right effect. Monitoring the outcomes of the evaluation can provide the answers to the questions whether the programme has been effective both in terms of behavioural change and costs, how large the impact was and what causal effects occurred.

Table 4.6 *General information and education campaign*

General information and education campaigns	Based on information provision through different communication channels. They can be designed in different forms with different foci, organised in a hierarchy of effects: raising awareness, education and providing knowledge, influencing behaviour through attitude change and maintaining behaviour change.
Context factors influencing successfulness	The challenge is to use the context to improve the content, method and outcome:

of instrument	<ul style="list-style-type: none"> • Make use of a topic that is positively valued in society • Connect to other existing programmes aiming at similar behavioural changes • Collaboration: mutual learning, a larger public can be reached, more communication channels are used, the cost-efficiency raises, etc.
Programme characteristics influencing successfulness of instrument	<p>The message and the behavioural change must be simple, fun and easy to realise.</p> <p>Attention needed for: messenger, definition of the goals, research on and approach of the target group, the design and content of the message, the choice and use of communication channels. These must form a mutually reinforcing programme.</p>
Design & process factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Design should be based on theories of human behaviour and communication: <ul style="list-style-type: none"> - individual level: theories on learning, information processing, expectancy, risk perception and decision making - network level: theories on innovation diffusion - level of organisations and institutions diffusion theories - societal level: agenda setting, spiral of silence, theories about public opinion and the effect of information. • Marketing mix: products, prices, placement and promotion. Have programme managers think of their programme as products that to be sold to the target group. <p>Design characteristics influencing the success or failure:</p> <ul style="list-style-type: none"> • <i>Messenger</i>: credibility and commitment of the messenger • <i>Receiver/target group</i>: should be at the centre of the information and education campaign. A target group orientation is achieved by: <ul style="list-style-type: none"> - a large sensibility (or concern) of the target group towards the topic - recognition of the problem by the target group - knowledge about the topic by the target group - past experiences and expectations with the topic by the target group - social norms regarding the topic by the target group - time available of the target group - values and mores concerning the topic existing within the target group. <p>Participation of the target group has a positive effect on the outcome and results.</p> <p>When the target group is not homogeneous, further segmentation may be needed.</p> <p><i>Exchange theory</i>: know what costs consumers are willing to pay or what minimum level of benefits they would like to receive as a result of changing their behaviour.</p>

- *The message:*
 - avoid sense of helplessness caused by information overload;
 - message should be *consistent and accurate*;
 - the *tone* should be positive and link to desires and aspirations;
 - the *length of the campaign* should fit with the aims;
 - both *peripheral and central processing* must be addressed
 - *style and language* should be adapted to the target group;
 - involving the target group in the design of the message
 - use *emotions, bright coloured visuals, humorous and modern language*
- *Communication channels:* reach, specificity and rate of influence.
 - Prior research to know how the target group responds to different media.
 - Effects of a message increases when *repeated over time* via different communication channels in different settings.
 - In general interpersonal channels are an effective complementary channel to mediated channels; and printed media to electronic media.
 - Using *television* to convince the target group is in general very effective.
 - -Also effective channels: well known figures as *spokespersons*

Expected impacts and their evaluation

To improve the impact and effect, giving positive feedback to the target group about their behavioural change so far is useful to the campaign.

Detailed monitoring collect the necessary data to tell whether the message has reached the target group in the right means and with the right effect. Monitoring the outcomes of the evaluation can provide the answers to the questions whether the programme has been effective both in terms of behavioural change and costs, how large the impact was and what causal effects occurred.

Primary behavioural target (efficiency or curtailment)

Information and education campaign can be used to trigger energy/investment behaviour, but in principle they target curtailment behaviour, focusing on motivation and capacity to undertake long lasting behavioural changes in terms of energy consumption.

4.2.5 Energy audits

4.2.5.1 Introduction

Energy audits are mostly provided by third parties (like ESCOs, energy agencies) and sometimes NGOs provide simple audits (see e.g. energy mapping or eco-mapping). In this context, the availability of reliable and qualified third-party information is key to success of an audit or advice programme. The definition of audits varies widely between different countries and contexts (Väisänen et al., 2003). While energy advice is always part of an energy audit the audit might be classified as an institutionalized process of personal exchange between the customer and the auditor and an on-site inspection by the auditor (energy rating) following national or international standards. Even though Bartiaux et al. (2006) differ from this view in introducing

and labelling an advice tool as “electrical audit” (within the Belgian SEREC project), the common understanding is the previous one (e.g. RESNET 2008). In the following both aspects are discussed separately.

Basically an energy audit consists of an evaluation or review of the existing infrastructure (building and appliances), energy-users’ activities, an identification of savings potentials and measures, and recommendations for alternate investments. As such, primarily energy audits target investment behaviour, by calculating the most cost-effective savings measures. Curtailment behaviour is only a secondary target of audits, and relates to an audit of the activities of the target group. The audit findings are compiled in a report. Energy audit models can be narrow or wide in scope (i.e., focusing on a specific system or area or on the entire site), they can vary in thoroughness, resulting in a general or in a detailed potential assessment, and the aim can vary from pointing out ‘general savings areas’ to ‘specific energy saving measures’.

In connection with the SAVE programme, a project called AUDIT II created a *Guidebook for Energy Audit Developers* (Väisänen et al., 2003). The guidebook suggests 12 basic elements of a government-sponsored audit programme: (1) programme goals, (2) legislative framework, (3) promotion and marketing, (4) subsidy policy, (5) key players, (6) administrative structure, (7) monitoring and evaluation, (8) energy audit models, (9) training of energy auditors, (10) authorization of energy auditors, (11) quality control and (12) auditors’ tools. Details on how these 12 elements support successful implementation of energy saving behaviour and a more sustainable consumption is discussed in the sections below.

4.2.5.2 Programme and context factors influencing success

At the time of the AUDIT II project (2001), there were 29 governmental energy audit programmes in 15 European countries. Audit programmes were at a pre-launch phase in many Central and Eastern European countries (e.g. Latvia and Lithuania), whereas audit programmes were in operation in Estonia and Hungary. Energy-related audit programmes can also exist under environmental management system certification schemes. At that time, energy audit activities had not always been developed in a systematic manner, and programme developers did not share experiences. Whereas many energy audit programmes have been quite successful, public support had often been terminated due to changes in government policies (Väisänen et al., 2003).

The AUDIT II programme stressed the importance of policy-level goals and a legislative framework for a successful government-sponsored energy audit programme. Goals pertain to the sectors to be included in the audits (e.g., SMEs, commercial buildings, and residential buildings), the desired numbers of energy users to be audited, and the intended concrete effects of the audits. These goals can be supported by legislation mandating audits for certain users, or voluntary schemes, often with the support of a certain level of subsidies (Väisänen et al., 2003). In some countries, energy audit programmes have been linked to sector-level voluntary energy efficiency agreements.

Whereas energy audit programmes usually involve a certain level of subsidies from government, they also require the availability of qualified and trained auditors. This depends on the availability of a qualified workforce, and also on the other job options available for energy professionals. Thus, for example, the Finnish energy audit programme benefited greatly from the fact that it was first launched in the early 1990s, during an economic downturn, when many engineering companies were eager to train as energy auditors due to a lack of other business (Khan 2006). Economic cycles (life-cycle and phase out) as well as the development of energy prizes are influencing clients’ interests in audits.

The discussed audit programmes have usually targeted larger energy users, such as large and small industrial companies and commercial, public or residential buildings. Public or utility

support for energy audits is also provided for households in Germany and has a long tradition in the US (and possibly in other countries). These are the *clients* of the energy audit programme. The energy audits are provided by *service providers (auditors)*, which can be energy professionals in various fields. Energy audits are usually provided for a charge in Europe, whereas the US Department of Energy has provided audits free of charge to SMEs (Anderson and Newell, 2002). In the Netherlands as well as in Germany households are asked for a fee of between 150 and 500 euros per audit - depending on the type and context of the audit, but it is often possible to get refunds from the (local) government of the whole payment if (part of) the advised technologies/services are implemented (this is the case in the NL).

The AUDIT II programme stressed the importance of a long-term framework programme with clearly defined target groups and clear decisions of the goals of the programme. The goals should be realistic: it takes a number of years to reach visible volumes, and targets should be set for 3-5 years. Targets are also important for budgeting for the necessary subsidies. The AUDIT II project found that the cost-efficiency of the public money invested increases with the length of the programme (Väisänen et al., 2003).

The availability and training of qualified energy audits is crucial for a successful audit programme (Väisänen et al., 2003). A study on energy audits in Germany by Schleich (2004) found that audits conducted by engineering firms were more effective than those carried out by utilities or industry sector associations, because they were more detailed and client-specific. Schleich (2004) suggested that a free-of-charge initial audit, with a chargeable follow-up could be an effective way to engage SMEs in audit programmes. The AUDIT II project also argues for the importance of the authorization of energy audits and the quality control of energy auditing programmes; Väisänen et al., (2003) claim that without quality control, about 10-15% of the money spent on audits is wasted.

4.2.5.3 Design and process factors influencing success

The energy audit model is usually a face-to-face procedure with well grounded and calculated recommendations summarized in a written document. Also supplementary services can be provided, such as energy management, staff training or financial services (Väisänen et al., 2003). Different audit models are suitable for different target groups and their design depends on the aim and occasion (context) of needed information. The former so-called 'home energy audit' for example includes the recording of the building envelope and the heating (and cooling) system; furthermore aspects of local climate or solar orientation were taken into account. Due to the European building directive (EPBD) a broader discussion occurred in the MS on the implementation of the energy certificate for buildings and how comprehensive the recording should be. In Germany and in the Netherlands a consultant comes to the client's home, inspects it, and then calculates different saving options. In the end the client receives a tailored report with options and potentials (see for most appropriate form the section on feedback).

Auditors' inspection skills and communication skills may influence the way in which audit results are received by the clients (e.g., Dyr-Mikkelsen & Bach 2005). Moreover, different clients may have different capacities to act on the audit results. There may be no experiences or routines to deal with energy saving recommendations, responsibilities may be unclear, or due to timing, recommendations may compete with other priorities (Saele et al., 2005). If the auditors understand the decision-making process of the client, they may be better placed to have their recommendations implemented.

4.2.5.4 Expected impacts and their evaluation

Outcome characteristics typically monitored for government-sponsored energy audit programmes include the following (Väisänen et al., 2003):

- Expenditure by recipient of subsidies
- Energy audit volumes – number of energy audits or share of audited facilities in a sector
- Savings potential – what measures have been identified and the savings in energy and corresponding financial costs and savings
- Theoretical savings potentials of implemented measures – what measures have been undertaken and estimate of energy savings thus achieved
- Measured savings at the site level – shows whether implemented measures actually reduce the energy consumption as expected
- Verified results – usually a statistical study of results of implemented measures

A crucial factor in energy audit programmes is whether the recommended energy saving measures are actually implemented. Studies from the US, for example, indicate that only about half of the recommended measures were taken, even with relatively short (< 2 years) average pay-back periods (Anderson and Newell, 2002). The Finnish energy audit programme has resulted in about 61% implementation of the recommended measures in the service and SME sector (Heikkilä et al., 2005).

The AUDIT II project argues that energy audit programmes are a very cost-effective public policy measure for energy saving: at the lowest, the cost can be about 0.18 cent/kWh. Moreover, they argue that 5 to 6 years after launching a programme, the cost of reducing CO₂ emissions can be brought down to 6-8 Euro/ton of CO₂.

Table 4.7 *Energy audits*

Energy audits:	Evaluation or review of the existing infrastructure (building and appliances), energy-users' activities, identification of savings potentials and measures, and recommendations for alternate investments. The audit findings are compiled in a report.
Context factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Availability of impartial and qualified auditors • Supportive policy framework • Subsidies/refunds for investment
Programme characteristics influencing successfulness of instrument	<ul style="list-style-type: none"> • Most feasible to provide for larger energy users (organizations) • Also available to households in some countries • Subsidies for audit costs • "One-shop-stop" (auditor provides multiple services)
Design factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Training and certification of auditors • Standardized process
Process factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Communication and involvement of end-users (and key decision-makers) • Identification of target groups and specific needs (private households/SME) • Marketing efforts • Evaluation of success (outcome)
Expected impacts and their evaluation	<ul style="list-style-type: none"> • Number of audited facilities and reports • Number of clients • Effects measured as: <ul style="list-style-type: none"> ○ Share of recommended investments made

	<ul style="list-style-type: none"> ○ Energy consumption before/after ○ CO₂ emissions / greenhouse gas emissions
Primary behavioural target (efficiency or curtailment)	<ul style="list-style-type: none"> • Primarily energy audits target investment behaviour, by calculating the most cost-effective savings measures. Curtailment behaviour is only a secondary target of audits, and relates to an audit of the activities of the target group.

4.2.6 General energy advice

4.2.6.1 Introduction

A European project called SErENADE has made a review of current practice in advice on sustainable energy in the EU-25. They define ‘advice’ as being guidance that is specific to situation and actions that can be taken, and that advice involves some level of interaction with the client (SErENADE, 2007). According to this definition, advice can be provided over the telephone, visits to the customer’s home/business premises, or via specific recommendations in written material, workshops, training days, social groups as well as via internet (on platforms or virtual groups). If we talk about information given in specific advice centres or energy agencies this is in most of the cases already represents an energy audit, because people have to bring detailed information and a personal check-up by the adviser is mostly following (Timpe, Brohmann, Roos en Voss, 2001).

4.2.6.2 Programme and context factors influencing success

The SErENADE (2007) project has pointed out that there is great potential for a wider geographical availability of energy advice services, as there are many European countries where little personalized energy advice is provided. Impartial energy advice is particularly important in markets in which a number of different solutions compete, yet where product and service providers only provide information on their own solutions. Clients may also need advice on how to combine different technologies.

Energy advice is important to reach energy saving policy goals, but it is also important for energy users as rising fuel prices are leading to increasing fuel poverty. According to the SErENADE (2007) report, some sort of energy advice is provided to households in most of the EU-25 countries, and many also provide energy advice for SMEs. Moreover, the regional energy agencies established under the SAVE programme provide some advice. Nonetheless, funding is often very limited in many countries.

The SErENADE (2007) report also identified a number of issues pertaining to effective advice, many stemming from the operating context. In countries *with established energy advice networks*²⁴, insufficient funding, lack of independent evaluation and difficulties in establishing a robust evidence base of the value of advice were perceived as problems. Moreover, narrow advice programmes following ‘funding silos’ by different government agencies were a barrier, as well as vested interests in the format and delivery of existing services. In countries with *little or no provision of energy advice*²⁵, the main issues include a lack of understanding of the role of advice in energy policy, and a dismissal of the ‘soft science’ of communication in energy sectors that are dominated by ‘techno-hierarchies’. It was noted that policy makers do not always understand the skills required to deliver advice (closeness to the client), and they may be complacent about the achievement of policy objectives without special attention to advice needs.

²⁴ These are identified in the Serenade report as Czech, Denmark, France, Germany, Slovakia, Slovenia, Sweden, the UK, Upper Austria and Wallonia (Belgium).

²⁵ It is not explicitly mentioned in the report which countries these are, but we can implicitly assume they are the remaining EU-25 countries.

Moreover, utilities charged with providing advice may have a conflict with the desire to sell more energy, especially where utilities have been privatized and the market is highly concentrated.

Publicly funded energy advice is typically provided to households and SMEs, which cannot afford to hire or contract energy professionals. The Serenade (2007) report stresses the importance of impartial advice provided by a third party not linked to an energy utility or a specific technology provider.

Green et al. (1998) have identified four different modes of advice provision: (1) client-led, where clients seek for advice for problems they perceive, (2) opportunistic, where advice is given at an opportune moment such as when installing a new piece of equipment, (3) energy-efficiency led, i.e., based on messages that energy efficiency practitioners want to deliver and (4) research-led, where advice is provided as part of an experimental research design. The first two categories, which are based on the clients' needs, have been found to be the most effective (Green et al., 1998; Broadman and Darby 2000). Thus, client-centeredness is a characteristic of successful advice programmes, which also distinguishes them from general information campaigns (SErENADE 2007).

4.2.6.3 Design and process factors influencing success

The SErENADE (2007) report identifies a number of strengths and weaknesses of European advice programme designs, some of which are presented below:

Strengths:	Weaknesses:
<ul style="list-style-type: none"> • Impartiality and neutrality • Provided free of charge to the user • Ability to advise clients on all relevant technologies and their combinations • Practicality • Multiple benefits to clients: financial, comfort, health, environment • Interpretation of technical information at the right level for different clients • Combining communication skills with technical, social and market knowledge • Personalised advice and 'one-stop-shop' • Closeness to the client and the local administration. 	<ul style="list-style-type: none"> - Lack of resources – limited funding - Lack of accessibility due to centralization - Limitations in the advice approach permitted/funded by funding regime - Insufficient knowledge exchange between advisers - Installers/suppliers not able to provide the measures recommended - A tendency for clients to seek advice only when they have a problem, which can limit the scope of advice they will act upon.

Overall, we can conclude that personalized energy advice is potentially very effective, but also quite expensive. The SErENADE (2007) project reports costs ranging from 15-450 EUR per client. It is crucial to design features thus relate to effectively combining communication skills and up-to-date technical knowledge, but also to the funding and other resources needed for personal advice are critical, too. Organising an effective advice programme is thus also importantly a matter of mobilizing sufficient resources, including networks of relevant stakeholders.

In an analysis of the effectiveness of energy advice for low-income households in the UK, Boardman and Darby (2000) argue that advice can be very effective, and provide energy savings of up to 10% via behavioural changes alone. Likely reasons for any lack of impact include overly formalized or mechanistic advice, too much reliance on written information and inadequately trained or inexperienced advisers.

In the field of energy investments, there is often a gap between the given advice and the customer's investment is often complained about. The evaluation of a German advice program showed that only 35 % of the clients have realized the recommended measures of energetic modernization (ProKlima 2006). Complementing advice and information by additional funding or subsidies is therefore an important instrument to support a successful advisory process (Timpe, Brohmann, Roos and Voss, 2001).

Boardman and Darby (2000) also argue that the role of awareness-raising has been underestimated in previous programmes. Energy advice experts should work together with other social service workers, and they should have adequate communication skills. Brohmann (2000) underlines that energy advice has to be offered as an integrated activity of a well-structured communication process which includes four phases: the status-quo analysis, the preparation of a targeted concept, the implementation and the evaluation phase. Within the preparation phase awareness-raising is seen as an important element of integrated advice programmes. Referring to Kirkpatrick (1971), Boardman and Darby (2000) describe advice as a process that follows a model of 'conscious competence'. It starts with a state of 'unconscious ignorance', which through a 'moment of awareness' is transformed into 'conscious ignorance'. This provides the foundation for giving 'expert advice', which leads to 'conscious competence'. Through 'feedback as reinforcement', the 'conscious competence' is routinised into 'unconscious competence', i.e., the clients' *durable capability to deal efficiently with energy use*. It follows from the above that energy advice mostly targets curtailment behaviour, although raising awareness and increasing motivation to invest in energy efficiency measures as an element of the change in behaviour is often part and parcel of energy advice.

The SErENADE (2007) report identified several number of generic process factors for European energy advice providers:

- the need to find the balance between quantity and quality (depth)
- the need to tailor the method of delivery to the client (e.g., accessibility at different times of day, locations, and media)
- the need to tailor advice to a varied audience
- the importance of reaching energy users at the right time
- the importance of developing the right partnerships to reach the target audience and maintain the consistency of the message
- the need for effective adviser training and continuous updating of knowledge
- the importance of not relying entirely on written materials and making them understandable and interesting for the reader.

4.2.6.4 Expected impacts and their evaluation

According to the SErENADE (2007) report, advice centres (and agencies) need to show a good track record and robust evidence of energy savings achieved in order to stay in business. Nonetheless, much of the evaluation is based on quantitative information, whereas qualitative criteria are also called for by the advice providers. Due to the different reasons for demanding energy advice and the context of information (electricity, heating, energy investment, energy behaviour, single issue advice, integrated audit, campaign) a multitude of products and outcome characteristics can be found.

Darby (1999) argues that governments, individuals and communities can have different agendas related to energy advice, and thus expect different outcomes. Central governments may focus on reductions in CO₂ emissions, local government may be concerned about the state of the building stock for which it is directly responsible, whereas individuals aim for affordable warmth and comfort. A further outcome criteria identified by Darby (1999) could be the long-term aim of "the building up of confidence and understanding of householders [...] constructing a store of 'folk wisdom' on domestic energy use that is transmitted to friends, neighbours and children."

Table 4.8 *Energy advice*

Energy advice:	Guidance specific to situation and actions that can be taken, involving some level of interaction with the client (media: phone, visits to the customer's home/business premises, specific recommendations in written material, workshops, training days, social groups as well as via internet (on platforms or virtual groups).
Context factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Availability of local (impartial) institutions for advice provision • Supportive policy framework
Programme characteristics influencing successfulness of instrument	<ul style="list-style-type: none"> • Impartial expertise, third-party, • Technology independent advisors • Grounding in clients' needs • Integrated versus single issue advice (and measure)
Design factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Multiple benefits to clients • Personalised advice and closeness to the client • Well-trained communicative and technical skills, • social and market knowledge
Process factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Tailoring advice and delivery to the client • Reaching energy users at the right time • Developing the right partnerships to reach the target audience • Effective adviser training and continuous updating of knowledge • Bridging the gap between information and implementation
Expected impacts and their evaluation	<ul style="list-style-type: none"> • Evidence of effectiveness needed to maintain funding • Initiated investment • Need for qualitative criteria like of clients' energy knowledge
Primary behavioural target (efficiency or curtailment)	<ul style="list-style-type: none"> • Energy advice mostly targets curtailment behaviour, although raising awareness and increasing motivation to invest in energy efficiency measures as an element of the change in behaviour is often part and parcel of energy advice.

4.2.7 Metering and feedback

4.2.7.1 Introduction

This group of instruments aims to overcome some of the practical information issues related to energy efficiency and energy saving. Metering and feedback (e.g., informative billing) aims to provide target groups with more detailed, comparable and comprehensible information on their energy use. Metering and feedback routine, habitual and unthinking types of behaviour (frequent behaviours, curtailment behaviour) are targeted.

Metering and feedback are related to audits and advice programmes. Energy audits provide detailed information on energy use and savings potential by identifying cost-effective ways to save energy. Advice programmes aim to provide target groups with skills and solutions for energy related problems. These different instruments have broadly related goals and can also be linked together (e.g., billing feedback can be more useful if linked with advice on how to reduce energy, and audits usually provide not only data on energy use, but also advice on how to reduce it). Nonetheless, they also involve different organizational features and are thus discussed below under separate headings. Table 4.5, 4.6 and 4.7 provide a summary of the main characteristics and successful framing of the three instruments.

Knowing how much one consumes and at what costs is a crucial first step towards a more efficient and sustainable everyday life. Besides the costs additional information on the environ-

mental impact is of interest for several target groups. Fischer and Duscha (2008) point to the important aspect of individual control of consumers can gain and the chance to eliminate electricity-intensive activities by linking information with concrete action items.

Informative metering and billing feedback is an old topic in energy demand-side management (Arvola et al., 1993; Wilhite et al., 1993), and was implemented by US utilities in the early 1980s (for a detailed description of the ‘innovation journey’ of feedback via electricity bills see Fischer and Duscha, 2008). Regarding innovative billing feedback, legislation can be meanwhile found in Denmark, Sweden and Australia and in the UK legislation is planned. Volunteer efforts were made in UK, Germany, the Netherlands and USA (see Fischer and Duscha, 2008).

An enhanced billing feedback is – inter alia – based on the observation that households, and even smaller businesses, often cannot make sense of their energy bills (Payne 2000) and that the information given by the electricity meter is not systematically used to reduce the energy consumption (Fischer and Duscha, 2008). Apart from that focus, further types of feedback systems were developed within climate protection campaigns in the mid 1990s. Here feedback was given in a competitive manner with the objective to realize the highest amount of CO₂ reduction. Participants were refunded by attractive prize money or other gains (Brohmann, 2000).

Improved feedback, in particular when combined with advice on how to reduce energy use, can trigger up to 20% electricity savings. Usually savings between 5 and 12% were found depending on how the feedback is provided. The more personalized the feedback is, and the more this is combined with advice on how to reduce consumption, the better the results (Wilhite et al., 1993; Darby 2006; Fischer, 2007). Besides the ecological rationale to reduce energy consumption there may also be social policy reasons to make energy billing more transparent or smart metering may be seen as an instrument to promote liberalized markets.

Fischer and Duscha (2008) point out that the existing electricity conventional meters already could provide continuous feedback but in most cases it is not used as a tool for controlling consumption because of invisibility and bad presentation. Various forms of informative energy bills have been developed during the past decade, providing comparative information (e.g., to other similar energy users, to previous use). Also, progress has been made in installing individual heat consumption meters, e.g., in apartment blocks, in regions where this has not been the prevailing practice, enabling customers to monitor their energy use and gain the financial incentive to save energy. Nevertheless little empirical data is available, for example on the effects of different bill formats.

In recent years, there has been a growing interest in metering and feedback due to the advance of information and communication technologies, and due to electricity utilities’ heightened interest in variable energy pricing and load management. For example, the United Kingdom and the Netherlands are launching a large-scale programme on smart metering (BERR, 2007; Energy Efficiency Plan of the Netherlands, 2007). Interest in the topic is growing throughout Europe, as the Energy Efficiency and Energy Services Directive includes requirements on metering and informative, understandable billing practices (Directive 2006/32/EC). Recently, provisions on intelligent metering systems have also been added by the European Parliament to the European Commission’s “Third Energy Package” on energy market liberalization.

There is a sound logic underlying the use of metering and feedback. One of the issues pertaining to energy efficiency is that energy use is ‘invisible’, difficult to monitor, and that feedback is extremely delayed. This logic is supported by comparative research showing that energy users who produce their own energy, e.g. via micro-generation, are more aware of their energy use (Martiskainen 2007), most likely due to the attention and affinity with the issue (Arvola et al. 1994).

There are different technical concepts, ranging from automated meter reading to smart meters with bi-directional communication and full in-house communication between the meter and the appliances. Automated meter reading with one-way communication between the meter and the supplier removes the need for meter readings and ensures entirely accurate bills with no estimates. More advanced concepts include two-way communication and allow the supplier to communicate directly with their customers, enabling interactive feedback to tell people about their energy use through either linked display units or other ways, such as through the internet or television²⁶. On top of giving consumers more and better information on their overall consumption, there are also concepts to provide them with an appliance specific breakdown of their consumption, establishing a more direct link between the way people use appliances and the resulting energy use.

4.2.7.2 Programme and context factors influencing success

Advanced metering to give consumers improved feedback on their electricity consumption is part of a broader effort to better integrate consumers into electricity market operation and make consumption more controllable. There are two main rationales for this: reducing energy consumption and shifting load, e.g. through variable load pricing. The latter can have positive environmental impacts, which do however not rely on demand reduction, but rather on increasing the efficiency on the generation side. Another driver to increase the ICT capabilities of private houses can be home automation or assisted living concepts (ref.?).

In economic terms, there is a trade-off between the additional costs of advanced metering and feedback on the one hand and the savings that can be achieved on the other hand. It can generally be said that the value of advanced metering and feedback increases if it can be used for multiple purposes. Advanced metering that can be used to stimulate demand reduction is more likely to be introduced, if it can also be used for load-shifting purposes. The value of the latter depends on a number of characteristics of the electricity system at hand. For example, an important driver of the growing interest in smart metering has been the increasing share of intermittent and distributed generation that requires customers to be more closely integrated in electricity system operation. There can potentially be important synergies between these developments and providing customers with more and better information in order to enable them to reduce their consumption. At the same time, however, technologies that enable load shifting may also increase electricity consumption. (Stamminger et al., 2008).

Previous studies, conducted on informative billing and metering, provide a range of different results (e.g., Darby 2006). While Smart Metering is an already well implemented tool in Australia and the US, Europeans still have little experience with this technology - apart from model cases. In Europe we deal with a fragmented energy market regarding heat and electricity. There are less innovative utilities in most of the Member States because of a still missing competitive situation. Besides that a slow implementation of data processing technologies for the use in Home Automation has to be considered (Franz et al., 2006). There still is a lack of evaluation and quality standards at Member States level even though the EU directive (Directive 2006/32/EC) demands clear and understandable information on consumption, costs and comparative standards within bills or contracts.

While energy companies may have an interest to shift their customers load, e.g. to avoid high-price peak periods, they are less likely to promote demand reduction through new billing procedures – inter alia because of additional costs —, so progress will rely on consumer interests or political intervention. While utilities often lack trust and credibility, contractors and other third

²⁶ On the other hand the introduction of smart meters can offer the option of a remote closing down of energy supply. This is a very severe measure affecting everyday life. The European Parliament and the Council reclaim to stop this possibility (Directive 2003/54/EC of 26.06.2003, Kap. II Art.3 Nr. 5).

party services which are independent of selling electricity might influence the implementation positively (Franz et al., 2006).

The importance of the legislative context is indicated by Swedish experiences where the legal obligation to introduce monthly bills provoked the introduction of smart meters (Fischer and Duscha, 2008). Cultural differences regarding the acceptance of feedback systems were pointed out by Fischer and Duscha (2008) referring to empirical data: While normative comparisons seemed to be welcomed by Japanese consumers (Ueno et al., 2005), British and Swedish studies indicate a more reluctant reaction on this type of instrument (IEA 2005, p.10, Sernhed et al., 2003). Another example is how people have reacted to graphic designs for presenting a between-household comparison in the US and Norway respectively. The very design that was successful in the US was a complete failure in Norway, being characterized as both childish and difficult to interpret. Overall, however, it can be noted that there is still a lack of international comparative studies of cultural differences in preferences and the effectiveness of different kind of information in influencing demand (Fischer, 2008).

Beside utilities, metering companies and customers another key player has to be mentioned: housing associations and building companies. As they hold an important share of the apartment market, it is important to gain their acceptance regarding smart metering and home automation. The national implementation of the EU directive on Energy Performance of Buildings (EPBD) in Germany for example showed that the resistance against consumer information and transparency as part of the landlord-tenant-dilemma hinders innovative instruments (Gruber, Erhorn and Brohmann, 2005).

Additionally the dissemination of knowledge is key for the success of implementing energy demand-side management measures: A category of energy programmes related to metering, feedback, audits and advice, that is typical in Europe (today, especially in New Member States) is the provision of training on energy conservation measures for various kinds of professionals, such as engineers, construction professionals, facility managers, etc. There are also training schemes for consumers, so that they can act as advisers / role models for others. Since the mid 1990s even school-kids were involved in specific programmes promoting energy management by different feedback systems in schools and at home (in Germany called Fifty-fifty programme). These models have realized an integration of training and educational efforts (Timpe, Brohmann, Roos and Voss, 2001).

Most informative metering and billing programmes are operated by electric (and in some cases gas or district heating) utilities. Usually, the target groups in studies on informative billing feedback are households (Abrahamse, 2005 Darby 2006; Martiskainen 2007), which are perceived of as being in the greatest need of this sort of information. This is not necessarily the case, because small businesses can have similar difficulties in interpreting and acting on their energy bills. Larger businesses with professional energy managers usually analyse their energy bills systematically (Payne 2000). Some utilities offer informative billing to all customers. Moreover, more sophisticated forms of informative billing are sometimes offered to larger business customers (Darby, 2006), which are also often the most interesting targets for various load management programmes.

Modern direct feedback tools (i.e. smart metering and direct displays or displays via PC) have been found to be more effective than indirect feedback via utility bills (Darby, 2006; Martiskainen 2007), but these forms of feedback are naturally much more expensive to provide and need a specific infrastructure, which might cause new hindrances (e.g., landlords-tenants dilemma, see Franz et al. 2006) whereas information provided in the utility bill can be provided at a relatively low cost (e.g. Bruhns and Lowe ,2008).

4.2.7.3 Design and process factors influencing success

Darby (2006) has identified a range of different forms in which informative metering and billing can be provided. Firstly, we can distinguish between (1) direct feedback, which is available on demand via meters, displays or pay-per-use devices and (2) indirect feedback, which is based on data processed by the utility and sent to customers. Moreover, indirect feedback can be provided in various forms:

- More frequent bills
- Frequent bills based on readings plus historical feedback (comparison to the customers' prior energy use)
- Frequent bills based on readings plus comparative/normative feedback (comparison to other similar customers)
- Frequent bills based on readings plus disaggregated feedback (data on consumption per end-use, e.g. appliances, lighting, etc.)
- Frequent bills plus detailed annual or quarterly energy reports.

While a different cultural context may affect the acceptance of various feedback systems, Fischer and Duscha (2008) underline the importance of information given frequently and over a long-term and based on actual consumption. Furthermore the involvement of interaction and choice for households as well as appliance specific breakdown and the presentation in an understandable way is of importance for a successful feedback. They define success in the means of stimulating conservation and satisfying consumer needs.

When considering the type of information provided in informative utility bills, some differences have to be taken into account. Disaggregated feedback, i.e., providing information on the share of different end-uses, is still in its infancy but shows promise (Darby, 2006). There is also evidence on the acceptability of historical vs. comparative feedback. In some studies, consumers (Darby, 2006) and business customers (Payne, 2000) have found comparative feedback offensive, feeling that they should not be compared to other customers (they are too unique, or do not belong to the same reference group).

There are not many actual 'process' factors involved in metering and billing in their traditional form. However, when informative metering and billing is linked to some sort of wider change programme, we can identify some factors that can be considered 'process-related'. For example, Abrahamse et al. (2005) found that when feedback on energy consumption was linked to the setting of targets for reduced consumption, it was more effective. In general, feedback without advice or education on how to change behaviour is not really effective.

A new market for third party suppliers is developing to respond to the need for technical infrastructure and institutional changes and modern tools of informative metering. Franz et al. (2006) mention service companies which cover the measurement and billing of the heating sector to be interested in operating electricity measuring as well. In this regard another process factor gets important, namely: the matter of data collection and protection. The individual customers' data are just allowed to be used to create transparency for the consumer himself to motivate the reduction of energy costs or energy use. Individual data should be used in anonymous and aggregated form. The collected data should not be transferred between different third parties or used for advertising matters. Only for scientific or empirical reasons a pooling is possible - after a defined period of time the data have to be deleted. To create better acceptance it might be helpful to involve independent, credible organisations and for example a public data security engineer may be involved. Additionally it might be useful to provide a committee of dispute resolution in case of severe conflicts.

4.2.7.4 Expected impacts and their evaluation

There are a variety of ways of measuring the impact of informative billing and metering: the extent to which it is perceived of as useful and interesting by the recipients, and its effect on energy use. There is also some evidence on the persistency of savings, showing that savings often persist as long as the information is provided (Darby, 2006). In this regard the metering provides an everyday routine of information access and promotes the durability of saving activities. Nevertheless, metering as a stand-alone-instrument is generally not sufficient to alter energy behaviour, but must be accompanied by awareness raising, audits and alternate activities for consumers (Fischer and Duscha, 2008).

Smart metering and related new technologies can also be considered from the perspective of long-term change. In the short term, they seem to be a relatively expensive way to save small amounts of energy. If such meters and displays become more popular, even compulsory, they may have significant effects as they become embedded in everyday life. This technology helps embody energy saving routines by providing the necessary feedback over a longer time period or even continuously, but is not sufficient. The feedback needs to be accompanied by advice and or education on how to change the behaviour and achieve savings. As such behavioural change can be fostered and sustained by means of a supportive (technological) infrastructure.

Table 4.9 *Metering & Feedback*

Metering & feedback:	Aim is to provide target groups with more detailed, comparable and comprehensible information on their energy use.
Context factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Existing systems of energy metering and billing (technical infrastructure or organizational prerequisites) • Innovative utilities • Existing payment system • Legal requirements (regulation) • Use of smart-meters, their value in a given system (e.g. value of load shifting) • Status of metering market (liberalization) • Culture differences in preferences for presenting information
Programme characteristics influencing successfulness of instrument	<ul style="list-style-type: none"> • Informative billing and (advanced) metering for residential customers and businesses • Related to actual consumption, potentially with details on the energy intensity of different applications (e.g. appliance-specific breakdown of consumption) • Comparative standards
Design factors influencing successfulness of instrument	<ul style="list-style-type: none"> • (Interactive) media and mode of presenting energy use information • Written material (text, load curves, bar or pie charts, curves) • Electronic meter or interactive tools via internet • Timing and control of information
Process factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Frequency • Combining feedback with incentives or targets for energy conservation • Link to individual activities of consumers (?)
Expected impacts and their evaluation	Effects measured as: <ul style="list-style-type: none"> • Interest in and use of the information • Effects on energy consumption
Primary behavioural target (efficiency or	Metering and feedback target routine, habitual and unthinking types of behaviour (frequent behaviours, curtailment behaviour). This in-

curtailment)

strument helps embody energy saving routines by providing the necessary feedback over a longer time period or even continuously.

4.2.8 Negotiated agreements, voluntary programmes and commitments

4.2.8.1 Introduction

Commitments, agreements and voluntary action cover a wide range of instruments, and can also be part of some other type of instrument. This chapter discusses some of the literature on these types of instruments, exclusively concentrating on programmes targeted at energy end-users. As opposed to these, most programmes involve energy suppliers or the manufacturers of energy-using products and can be considered as market transformation instruments aiming at market transformation, but this is not the focus of the present review. Moreover, we focus, where possible, on experiences from programmes targeted at households, SMEs, municipalities and other building users in Europe.

One way to categorise this group of instruments is to distinguish between negotiated agreements, public voluntary programmes and unilateral commitments (Börkey et al., 2000). We discuss negotiated agreements and voluntary programmes separately, even though there are a number of overlapping elements. Moreover, the boundary between public voluntary programmes and unilateral commitments is not very distinct: for example, many European programmes support agreements that are primarily organized by associations or networks of actors like municipalities. Unilateral programmes are thus discussed as included under the heading “voluntary programmes”. Personal commitments have also been used as part of a number of residential energy conservation programmes. Moreover, there has been a recent interest in soliciting various forms of climate commitments from individual citizens or consumers. These instruments are discussed under the heading “commitments by individuals and households”.

One reason for regulators to use voluntary approaches is that they enable them to bypass the legislative process (Leveque 1998: 4). The increasing duration of the process of environmental legislation leads regulators to consider voluntary approaches. These approaches can also be more flexible and may be more easily adapted (for a review of European experiences with energy efficiency agreements see Bertoldi (2007)).

One reason why it is difficult for public authorities to adopt and enforce regulatory measures is the lack of information about companies (their cost structure, the properties of the technology they use etc.) and the information asymmetry between public authorities and industry. As for negotiated agreements, the negotiation process may lead to greater co-operation by companies in defining feasible and effective efficiency targets and encourage them to disclose information (Crocì, Pesaro 1997: 20, 25). Furthermore, public authorities may need less information because the agreement leaves it up to companies to find a solution that fits best. Voluntary approaches can be particularly useful when there is great uncertainty and not enough information available, making it difficult to impose regulation.

A further advantage of voluntary approaches can be that they are based on higher consensus than regulation imposed by the government. It is likely that *"in order to attain a consensus, government accepts a downward correction of goals"* (Rennings et al. 1997: 247). Yet on the other hand, a higher consensus may lead companies to be more committed, making it more likely that the goals are actually implemented.

Basic models of negotiated agreements, voluntary programmes and commitment

Negotiated agreements involve commitments for energy saving (or other environmental measures) developed through bargaining between a public authority and industry. They are frequently signed at the national level between an industry sector and a public authority, but

agreements with individual (large) firms are also possible. In Europe, such agreements are usually enforced with the threat of legislation should the agreement fail to reach its targets, as well as concessions and support for participants (e.g., tax deductions or grants). They are often used as a first step in exploring a new policy area (Börkey et al., 2000).

Voluntary programmes are different from negotiated agreements insofar as they target individual organizations, which voluntarily make a commitment to join the programme. They are offered support services, and usually some kind of public recognition or endorsement in the form of a certificate, label or award for their participation – i.e., they are identified as front-runners in the field. Voluntary programmes can be organized or sponsored by governmental bodies or by third parties (e.g., industry associations, standards bodies or NGOs). Examples of recent voluntary programmes for energy end-users include the European Green Lights programme and the European Energy Award:

- The GreenLight Programme is a voluntary initiative encouraging non-residential electricity consumers to make a commitment to the European Commission to install energy-efficient lighting technologies in their facilities (<http://www.eu-greenlight.org/>). It is designed on the basis of a number of successful programmes in various countries (Berutto et al., 1999, for a review of the Green Lights programme in the US see Howarth et al. 2000). Participants make their commitment by signing a registration form together with the Commission, making a commitment to upgrade at least 50% of all the eligible existing spaces owned or on long term leases, or to reduce the total aggregate lighting electricity consumption by at least 30% where lighting upgrades are profitable, as well as to choose the most energy efficient lighting installations for new spaces. Moreover, participants report on progress every year and appoint a responsible manager for the programme. The programme is totally voluntary. The Commission and local authorities support the programme in the form of information resources, free publicity and public recognition (e.g., advertisements, exclusive use of the logo, awards).
- The European Energy Award® is a programme for municipalities. It offers participants a quality management system for municipal energy-related services and activities, as well as certification and an award for energy-related achievements and control of success through regular audits. Participants make a commitment to set up an Energy Team, review energy-related activities, identify potentials for improvement, set goals and establish an energy policy work programme, and monitor and report on results (<http://www.european-energy-award.org/>).

These are examples of programmes that have detailed procedures for making a commitment and for monitoring the energy savings achieved. Unilateral commitments (e.g., by universities, municipalities or interest networks) can have various levels of stringency, and it depends on the organisations themselves how they chose to enforce the commitment and monitor results.

Commitments by households and individuals are only now emerging as a systematic instrument for climate change mitigation and energy conservation. Citizens' climate commitment programmes have recently proliferated in the UK and other European countries. The idea is to raise citizens' awareness of habitual behaviours and to increase people's sense of responsibility for changing their behaviour (Retallack et al. 2007). These instruments target curtailment behaviour, although investment behaviour can also change as a result. Unlike voluntary programmes with industry, commitments by households and individuals are unlikely to be put in place instead of regulation, but rather as a complementary instrument. Their role seems to still be more part of an overall communications programme or local climate strategy programme than as an independent instrument. It seems that they may have a role in ensuring that information and communication efforts lead to actual changes, analogously to a model called Commitment to Change (CTC), which has been used as an instrument in professional development, where it has been found to increase the likelihood of classroom learning to transfer into durable changes in professional practice (Overton and McVicar 2008).

4.2.8.2 Programme and context factors influencing success

In general, negotiated agreements are considered to be more effective if they include supporting instruments and regulations (Worrell and Price, 2001). Moreover, they are considered to be more suitable for pro-active industries, small numbers of participants, and mature sectors with limited competition. They are thus considered less effective in light industries with large numbers of companies (Worrell and Price, 2001). It is important that the signatory (usually an industry association) is able to enforce participation among its members, which has not always been the case (e.g. Böde et al. 1999). As long as the participation of individual members is voluntary, there should be sufficient incentives (rewards such as grants or technical assistance, or potential penalties such as the threat of taxes and regulations) to make sure that a large number of members participate (Worrell and Price, 2001; Geller et al. 2006). In the case of commitments by households and individuals, positive incentives will be most important, as individuals will not participate due to regulatory threat, not the least because of the free-riding problem.

Negotiated agreements more commonly target large industries, whereas SMEs are more often engaged through voluntary programmes or agreements that have many features of voluntary programmes (BESS, 2007). This is not always the case, however, as the Finnish negotiated agreements for energy saving (the most important energy efficiency policy instrument in the country) have also targeted municipalities and the service sector – however, with less success than in the case of large industries (Heikkilä et al., 2005).

Voluntary programmes are targeted more at front-runners. Thus, programme administrators usually target visible and admired organisations (‘social role models’) to join, which is then expected to attract other organisations to follow. Moreover they serve as a baseline to keep the issue “alive” (in the media) and to attract people’s attention. Many voluntary programmes involve the introduction of some sort of energy management scheme, including goal-setting, measures to reach the goals, and monitoring and reporting schemes, and they can also be connected to audit programmes (Thollander et al., 2007) (see chapter 3.4).

Commitments by households and individuals have not yet been extensively studied. Some evidence from commitment-based programmes can be gained from programmes that have combined goal-setting and commitments with other instruments such as feedback, which indicate that a commitment to goals increases the effectiveness of information-based instruments like billing feedback (e.g. Kurz 2002; Abrahamse et al. 2005). Moreover, some evidence exists from group-based voluntary commitments by households, such as the Global Action Plan (GAP) Eco-teams (Hargreaves and Restorick, 2006). Here, households make reviews of their own energy and resource use, set goals and monitor achievements in facilitated groups. There are also GAP Ecoteams for organisations and schools. Similar to the monitoring by Ecoteams is a so-called energy diary which has been elaborated in Germany (Cames and Brohmann, 2003) and has also been transferred to a Belgian context (Bartiaux et al., 2006). In both approaches, the participants were already highly motivated and were involved in a supportive local context (Local Agenda 21 working groups).

There seems to be a great contextual variation in the success and achievements of negotiated agreements, voluntary programmes and individual commitments (Börkey, 2000; Price 2005; Hargreaves and Restorick, 2006). In this case, however, it is very difficult to separate context characteristics from programme and design features. Such programmes obviously need to be adapted to local conditions in order to make them attractive, and thus the same programme is rarely repeated in exactly the same way in a different context.

One contextual feature that is likely to support the success of such programmes, however, is the existence of social pressure or systems of social control (i.e., ‘clan control’, see Ouchi, 1979). All these programmes variants are based, in one way or another, on the existence of social (or in the case of negotiated agreements, political) ‘pressure’ or extrinsic motivation and social norms that support participation. While they may involve some contractual responsibilities, joining up

is voluntary and it may be difficult to enter into contracts that are 'water-tight'. It is thus important that the participants take their commitments seriously – explained by Bruppacher (Bruppacher, 2001) as self-modification in the context of local identity. Serious commitment is likely to be supported by a sense of urgency about energy conservation and climate issues, and an operating context where the participants' peers will monitor achievements and respect participants that stick to their commitments.

4.2.8.3 Design and process factors influencing success

A number of design and process features have been found to influence the successfulness of negotiated agreements and voluntary programmes for organisations:

- The target setting process has to be open and transparent. Credible and reliable monitoring and sanctions for non-compliance are relevant for both negotiated agreements and voluntary programmes in order to ensure effectiveness and credibility (Börkey et al., 2000). One of the incentives for companies to participate in voluntary schemes is to avoid regulation. Yet in order to make these programmes work, the government has to maintain the threat of future regulation (Menanteau 2003)
- At least in the case of negotiated agreements, the potential for and benefits of being a 'free-rider' must be limited by imposing conditions which ensure that there will generally be no advantage in remaining outside an agreement. In the case of voluntary programmes and commitments by households and individuals, this problem is less severe, as some of the benefits for the participants result directly from joining the programme.
- It needs to be clear what the commitments are on both sides: what programme administrators can expect from the participants and vice-versa. This relates, among others, to commitment by top management in participating organisations to actually implement the agreed energy saving measures, and commitment by the administrators to provide the promised public recognition campaigns (Linden and Carlsson-Kanyama 2002)
- Voluntary programmes require the adoption of new roles and responsibilities. Programme administrators have important roles as initiators, advisors and evaluators. They need to combine marketing and training skills with sound administrative capabilities. Administering programmes that engage individual participants can be quite time-consuming and require new communications skills from administrators. Moreover, participating organisations need to adopt new responsibilities and roll them out into the organisation. Evidence from Swedish and Danish voluntary programmes indicates that the participating companies asked for an increasing amount of personal advice and contacts as the programme unfolded (Linden and Carlsson-Kanyama 2002). In the context of voluntary programmes the role of impartial intermediaries on the local level is highly relevant for the success and durability of change (Bruppacher, 2001; Brohmann, 2006).
- Good communication channels need to be established and maintained (Linden and Carlsson-Kanyama 2002). Networks among participants are important sources of learning, information exchange and motivation, and thus support the success of the programme (Timpe, Brohmann, Roos and Voss, 2001; Brohmann et al., 2001; Gutscher, Mosler and Artho, 2001).

Evidence from Global Action Plan Ecoteams suggests some design and process features that can support voluntary commitments by individuals or households (Hargreaves and Restorick, 2006; Bruppacher, 2001):

- Group interaction supports a questioning of existing practices and the learning about new, alternative practices. Groups also create a social support network and empower participants to come up with new solutions. Other group members are also more trusted sources of information than distant experts.
- Communications are tailored to the specific needs of participants, and based on their concerns. Communications are local, relevant, positive and practical, thus avoiding guilt and providing encouragement.

- Measurement serves as a source of motivation and feedback provides participants with a sense of self-efficacy.
- The programme should support a long-term process of change through prolonged interaction and support throughout the duration of the programme.

4.2.8.4 Expected impacts and their evaluation

Numbers and shares of participating end-users are important outcomes in all types of voluntary agreements and commitment programmes. The share of participating organisations is most important in negotiated agreements, which aim at full coverage of the targeted sector. Because they are, in a way, an alternative to regulation, it is important to try to avoid ‘free riders’ in the form of non-participating members of the sector. Participant numbers are also important in voluntary programmes and commitments, but not necessarily as important, because these programmes usually aim to go significantly beyond what is required by legislation.

Voluntary programmes should be beneficial both for the participants and for the organisers; otherwise the parties do not have an incentive to continue their commitment (Linden and Carlsson-Kanyama 2002). Participants should gain benefits in the form of energy savings, new competencies and enhanced reputation. The organisers should gain ambitious achievements in energy saving and the adoption of energy efficient technologies and practices. Thus, continued commitment to the programme by both parties could be considered one of the successful outcomes of voluntary agreements, programmes and commitments.

All programmes naturally aim to save energy. The energy savings achieved are easiest to establish in negotiated agreements and voluntary programmes that involve well-organised monitoring of savings achieved. Many of the voluntary programmes have been reported to not have reached their targets or to have been unable to evaluate them (Price 2005). It is probably even more difficult to establish the amount of energy saved in self-commitments by organisations, households or individuals. Some examples of energy savings achieved include:

- From a long-term negotiated agreement with the Danish trade and industry: 2.6 % (1996-1999) and 1.9% (200-2003) reduction in energy consumption (Ericsson, 2006). According to Reitbergen et al. (2002, referenced in Price 2005), the Dutch long-term agreement achieved significantly larger savings.
- From an SME-targeted programme in Sweden (47 firms): 3.8% energy savings as compared to start of the programme, as well as a total of 8.8% expected from planned measures (Thollander et al., 2007)
- From GAP Ecoteams (about 30 000 households): about 7% reduction in electricity use within about 3-4 months (Hargreaves and Restorick, 2006).

Moreover, voluntary programmes and negotiated agreements are argued to have a range of ‘soft effects’ such as capacity building and increasing awareness (Börkey et al., 2000; Price 2005; Ekins and Etheridge 2006), as well as empowerment and transfer of responsibilities from authorities and experts to energy end-users themselves (Vatter, Gessner and Wittwer, 2001). The involvement of participants in searching for solutions in a ‘bottom-up’ process may also lead to the discovery of a larger range of improvement options (Linden et al. 2006). Voluntarily made commitments are also expected to have psychological effects that increase the durability and sustainability of changes in behaviour and practices achieved in the programme. This is because people tend to stick with decisions they have once made (especially in public) – and contribute to their fulfilment – in order to justify those decisions and their own abilities as decision-makers and to maintain the consistency of their self-image (Overton and MacVicar 2008).

Table 4.10 *Negotiated agreements, voluntary programmes and commitments*

Negotiated agreements, voluntary programmes	• Negotiated agreements: commitments for energy saving through bargaining between a public authority and industry.
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and commitments:	<ul style="list-style-type: none"> • Voluntary programmes target individual organizations, which voluntarily make a commitment to join the programme. • Unilateral commitments depend on the organisations themselves how they chose to enforce the commitment and monitor results. • Commitments by households and individuals are only now emerging
Context factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Social pressure or systems of social control.
Programme characteristics influencing successfulness of instrument	<ul style="list-style-type: none"> • Negotiated agreements are more effective if they include supporting instruments and regulations • Commitments by households and individuals: positive incentives are essential; and combining goal-setting with feedback • Voluntary programmes: goal-setting, measures to reach the goals, and monitoring and reporting schemes, and they can also be connected to audit programmes.
Design & process factors influencing successfulness of instrument	<ul style="list-style-type: none"> • Target setting process has to be open a transparent. • At least in the case of negotiated agreements, free-rider behaviour should be countered by ensuring that there is no advantage in remaining outside an agreement. • Clarity on what the commitments are on both sides • Voluntary programmes require the adoption of new roles and responsibilities. The role of impartial intermediaries on the local level is highly relevant for the success and durability of change • Good communication channels need to be established and maintained. • Networks among participants are important sources of learning, information exchange and motivation, and support the success of the programme. <p>Individual and household level:</p> <ul style="list-style-type: none"> • Group interaction, creating social support network. • Communication: tailored to needs of participants • Measurement: motivation and feedback • Programme should support a long-term change process
Process factors influencing successfulness of instrument	
Expected impacts and their evaluation	<ul style="list-style-type: none"> • Next to energy saving, voluntary programmes and negotiated agreements are argued to have a range of ‘soft effects’ like capacity building, increasing awareness, empowerment and transfer of responsibilities from authorities and experts to energy end-users themselves.
Primary behavioural target (efficiency or curtailment)	<ul style="list-style-type: none"> • Commitments and voluntary agreements are systematic instruments that aim to raise awareness of habitual behaviours and to increase people’s sense of responsibility for changing their curtailment behaviour, although they might also change their efficiency/investment behaviour as a result.

4.3 Conclusions: from individual instruments to a socio-technical perspective

In this section we conclude with some general lessons and discuss the need to go beyond the narrow perspective of individual instruments that can be taken from a tool-box. For this purpose, we discuss the potential to combine individual instruments and link the discussion of instruments with the socio-technical perspective presented in chapter 3.

4.3.1 General lessons

The experiences of practical approaches indicate that a programme design should start with a definition of targets and an analysis of the factors determining the behaviour that has to be changed. The design and implementation of the programme instruments then have to be adequately shaped to the specific targeted goals and the actors addressed. In addition, the design and implementation of the programme instruments also have to be shaped to the intended intermediary practice or approach. The project-based approach focuses more on individual instruments and the strategic/systemic approaches go beyond individual instruments to look at the change process and ideally use then the most appropriate mix of instruments to help the process.

While the combination and bundling of instruments seems to be a successful strategy for the different kind of interventions, a well structured planning of programmes is crucial, including the measurement of impact by evaluating the outcomes.

Furthermore different factors of influential context have to be considered:

- the aspects of timing need a broader attention by programme planners and managers when considering windows of opportunity for behavioural change
- a participatory phase of preparation and the integration of consumers into the design of programmes is mentioned a successful strategy
- the social-institutional setting defines the challenges of successful learning processes and the sustainability of change.

4.3.2 Combining individual instruments

The guidelines and the discussion of the different instruments indicate the need of looking at instruments as a combined set of options or – if they follow a common target – of policy strategies. If we talk about strategies or integrated programmes, three aspects are of importance:

1. a process of (participatory) goal setting has to be initiated by programme planners or programme managers to choose target groups adequately
2. determinants of target groups' behaviour have to be addressed to design the different steps of a programme
3. instruments of different kind have to be combined to build a policy or a programme (instrument bundles).

Recent literature points to the importance of structured planning and an exactly targeted combination of interventions (instruments) when it comes to the design stage of a future programme. Abrahamse et al. (2005) found that when feedback on energy consumption was linked to the setting of targets for reduced consumption, it was more effective. A review (Martiskainen 2007) on the level of savings achieved by different types of combined feedback instruments indicated that the combination of instruments was relatively successful: while the feedback system combined with an ambitious goal setting of 20% realized savings of 15%, those with a less ambitious goal of 2% saved about 6%. The combination of feedback and focused advice results in heating savings of 5% and electricity savings of 7-12%.

The *Guide to change* recommends the identification of determinants at different stages of the behavioural change process: determinants that influence (for positive or negative) the willingness to change, the capacity to change and determinants that strengthen this willingness or ca-

capacity to change. Furthermore the authors recommend identifying how these determinants should be changed or what determinants are required to make the behavioural change achievable.

Depending on the type of instrument and the target of the programme a combination of instruments is mostly expected and described as success. For example, Abrahamse et al. (2005) point to the finding that general information measures (e.g. campaigns) alone are not effective, but were found to be successful in combination with more specific information or implementation tools. Some evidence from commitment-based programmes can be gained from programmes that have combined goal-setting and commitments with other instruments such as feedback, which indicate that a commitment to goals increases the effectiveness of information-based instruments like billing feedback (e.g. Kurz 2002; Abrahamse et al. 2005). Moreover modern tools of informative metering need technical infrastructure and institutional changes – here a new market for third party suppliers is developing.

In general, there is more and more interest in examining combinations of instruments. Psychologists are also increasingly stressing the role of participation, social context and peer-to-peer networks – at a meso level - (e.g. Olli et al. 2001), as well as macro-level factors contributing to energy use (technology, economy, demography, institutions and culture).

The different guides and examples in the sections on individual instruments stress the importance of social context and networking as well as the combination of different instruments. They serve as an umbrella for a bundle of activities. The literature review of CHANGING BEHAVIOUR explicitly points to three types of instruments which should be designed in combination with other supportive interventions.

- **Financial Instruments**

Stern (2000) stresses the potential complementarities between financial and informational incentives. He points to the aspect that end-users need to understand the benefits of the programme and to be convinced of the trustworthiness of the information provided. Stern (2000) argues that the stronger the incentive is, the more difference the non-incentive factors like information and marketing make, because they raise awareness among end-users who might otherwise not pay attention to the programme. Moreover, end-users may require other forms of assistance, such as technical and organisational support to make use of the financial incentive (Kazakevicius et al. 2002).

- **Metering and feedback**

Metering and feedback are related to audits and advice programmes. Energy audits provide detailed information on energy use and savings potential by identifying cost-effective ways to save energy. Advice programmes aim to provide target groups with skills and solutions for energy related problems. These different instruments have broadly related goals and can also be linked together (e.g., billing feedback can be more useful if linked with advice on how to reduce energy, and audits usually provide not only data on energy use, but also advice on how to reduce it).

- **Negotiated agreements and voluntary commitments**

In general, negotiated agreements are considered to be more effective if they include supporting instruments and regulations. Moreover, some evidence exists from group-based voluntary commitments by households, such as the Global Action Plan (GAP) Ecoteams (Hargreaves and Restorick, 2006). Here, households make reviews of their own energy and resource use, set goals and monitor achievements in facilitated groups.

4.3.3 Putting separate instruments into context

It is important to note that the discussion of instruments to a certain extent represents a de-contextualised perspective of tools that can be used to influence society. In the previous sections, we presented context factors that can influence the successfulness of instruments. How-

ever, this is still at a rather general level (e.g. national preferences). For individual projects, a much more detailed analysis of the specific context is needed to tailor the instruments to that context. Otherwise, the instruments are likely to yield unexpected or unintended consequences different from the ones presented in the previous sections. The following table provides a general summary of context factors that influence the implementation of the instruments discussed, as well as the behavioural context factors that are addressed by the instruments

Table 4.11 *Instruments and context*

Instrument	Main context factors of the instrument/programme influencing success	Main context factors of the target group addressed by the instrument	Targeted behaviour
Financial instruments	Availability and quality of technologies provided Knowledge of the target group about support scheme	Availability of capital for investments Perceived risks and benefits of various courses of actions	Efficiency/investment behaviour
Energy service companies, energy performance contracting and third-party finance	Knowledge: Certification and training of service providers Institutions: Development of standard contracts as well as measurement and verification systems for savings Banking system, availability of credits Trust in service providers (values)	Lack of knowledge about opportunities Institutional rules that lead to split incentives Different priorities of energy users or unwillingness to incur debt (values)	Primarily efficiency/investment behaviour, but when instruments are combined curtailment behaviour is targeted as well
General information and education campaigns	Changes in the context of the target group that make them more open for information (institutional context, value context) Institutional context: Other programmes that the message can be linked up with.	Knowledge (why and how to change behaviour), values	Curtailment behaviour, although efficiency/investment behaviour can be targeted simultaneously
Metering and feedback	Technical infrastructure Institutional context: Payment systems, obligation to introduce smart-meters, status of metering market Value: Cultural differences in preferences for presenting information	Knowledge about one's own energy use Visibility of energy use Feedback on the effectiveness of various actions	Curtailment behaviour, although efficiency/investment behaviour can be targeted simultaneously
Energy audits	Institutions: Audit obligations Knowledge: Availability of qualified and trained auditors	Knowledge about one's own energy use and opportunities for improvement Visibility of energy	Primarily efficiency/investment behaviour although auditing curtailment behaviour can be part

		use	of the audit
Energy advice	Institutions: Funding of advice Value: independent evaluation and establishing a robust evidence base for the value of advice Knowledge: Important for people to understand the role of advice	Knowledge, values Personalised and context-relevant information delivered at an appropriate time and place	Curtailment behaviour, although efficiency/investment behaviour can be targeted simultaneously
Negotiated agreements, voluntary programmes and commitments	Institutions: Need for supporting instruments and regulations Ability to enforce participation by the signatory Social control to control the implementation of the programme Structure of the industry	Institutional context Social pressure and support Peer recognition	Curtailment behaviour, although efficiency/investment behaviour can be targeted simultaneously

4.3.4 Linking instruments and socio-technical approaches

In chapter 3 we have presented different research approaches to energy efficiency and have argued that the more traditional analysis rooted in economics and psychology, upon which the instruments presented above are originally based, needs to be complemented by a more socio-technical perspective. Therefore, after the discussion on separate instruments, we now want to briefly highlight a socio-technical perspective on the instruments. This includes a brief summary of the market transformation approach that aims at more systemic change, but is beyond what can be achieved in the pilot projects carried out in this project, and includes a discussion on urban multistakeholder programmes. We continue with a discussion on the need to apply the socio-technical approaches presented in chapter 3 to instruments, and how this approach and the instruments can be linked.

4.3.4.1 Market transformation

On top of looking at the demand-side, in the past two decades there has also been growing interest in the interaction between supply and demand and how this can be shaped to reduce energy consumption, in other words market transformation. Market transformation is not a single instrument, but rather an objective for which various instruments can be used. It aims at removing market failures and ‘barriers’ as originally discussed in the context of neo-classical economics (see chapter 3). As opposed to this static view, there is also a more dynamic view of “markets as complex systems of supply-demand interactions undergoing evolutionary change” (Blumstein et al., 2000: 143).

The market transformation approach shifts the focus upstream from the consumer to the market. Yet it would be misleading to simply equate market transformation with supply-side product policy (see e.g. Boardman, 2004). Market transformation is rather about “the workings of markets for energy-using goods and services” (Blumstein et al., 2000: 139). Supply-side measures play an important role in this, but end user behaviour is also still a relevant aspect.

The instruments discussed in the previous sections that are about promoting changes on the demand side, can thus also contribute to market transformation. An example would be labels as an informational instrument that make the energy efficiency of an appliance more transparent for consumers and can thereby help change their buying behaviour. At the same time, labels can induce producers to develop and offer products that score well under a label and may therefore gain a competitive advantage. Hence, the instrument influences both the supply and the demand side, thereby transforming the market.

As market transformation broadens the focus from the demand-side to the market, a wide variety of actors that participate in the market come into view, from producers and distributors, to vendors, regulators and providers of secondary market services (Blumstein et al., 2000: 139).

4.3.5 Urban Multi-stakeholder Programmes

Introduction

This section presents a short review of relevant literature in relation to urban multi-stakeholder energy demand-side management programmes²⁷. Urban energy demand-side programmes are a generic term for a variety of different initiatives: from pledge campaigns, to ESCOs, to planning guidance and so on. These are aimed at various social groups and ‘targets’ including citizens, householders, business, local authorities’ own employees, estates and buildings. Urban energy demand-side management initiatives are programmes which have a view of systemically reconfiguring energy production and consumption, and as such differ from projects which have a more modest and limited ambition in intervening in energy systems of production and consumption (Hodson and Marvin, forthcoming 2009). These urban energy demand-side management initiatives need to be understood in context, thus it is helpful to characterise them in relation to governance models. We have developed a six-fold typology which does this. The six different types of urban multistakeholder programmes discussed below show how various existing instruments can be combined and employed in a new - maybe more effective - way.

Different types of urban energy demand-side management programmes

Type 1: ‘Internal Governing’

Local authorities have a degree of influence and duties to promote the social, economic and environmental well-being of their community and also play a significant part in achieving the national environmental, including energy efficiency, goals. National governments provide guidance on the need to reduce energy use in urban areas through, for example, mixed-use development, energy conservation in design, through increased standards of energy efficiency and so on (Bulkeley and Betsill, 2005). As a result, local authorities increasingly have aims to reduce carbon emission and promote energy efficiency within their own estates or buildings. Various national programmes embody the expectation that local authorities will measure energy use in their own buildings and offer technical and change management support and guidance from national agencies order to improve energy efficiency. Similar expectations are voiced in the European Directive on Energy Efficiency and Energy Services. Internal governance programmes (see for example Energy Saving Trust, 2008) aim to reduce emissions from areas under the control of the local authority such as buildings, street lighting and landfill sites and also provide practical support such as workshop support, management training and so on. This ‘internal governing’ model is emblematic of the influence of national governments in shaping the actions and initiatives of local authorities on energy demand-side management. Evaluation of these ‘internal governing’ type of programmes in the first instance relies on monitoring and reviewing energy

²⁷ The urban programmes draw on academic literatures and, to address significant gaps in the literature, examples from UK urban programmes were analysed. The cultural and institutional background of UK specific conditions has to be kept in mind when we think about the transferability and generalisability of conclusions drawn from the following examples of urban energy demand-side management programmes.

performance for all local authority buildings, to measure progress against targets and performance and ensure the policy remains focused on the original goals.

Type 2: Governing by Authority/Guidance

Governing by Authority/Guidance is best exemplified by the ways in which local authorities utilise planning processes as a means of asserting authority or influencing through guidance and supporting the use of national codes and standards to ensure local developers achieve national standards. Across Europe local authorities are afforded very different capabilities in respect of their ability to influence planning processes. Although energy efficiency and climate change policy and planning processes are often managed by national government and may be dependent on institutional and political conditions at higher government levels, there is a certain level of authority through planning and regulating roles for local authorities. However, within Europe there are very different national frameworks within which local authorities operate. In addition, in some countries, such as the UK, an increasing city-level and local authority involvement in climate change measures generally and energy efficiency specifically, gradually transforms the nature of central government involvement in the planning process is (see Tedwr-Jones, 1997). In addition, the European Commission has launched an initiative called the Covenant of Mayors, which invites cities in Europe to go beyond European targets and commit to deeper carbon dioxide reductions. Intelligent Energy Europe also supports a number of initiatives for European local authorities to draw up sustainable energy plans and involve local residents in such processes. As would be expected, evaluation of this type of initiative is still often based on a mixture of national criteria and measures and also more locally developed indicators, often detailed in annual reports.

Type 3: Governing through Third Party and Contracting Out

Governing through Third Party or Contracting Out can be found when local authorities act as a service provider through the provision of certain social housing and through facilitating the retrofitting of energy efficiency measures in either the public and private housing stock often with the support of national or European funding. A prominent example would be Energy Service Companies (ESCOs), which may be adopted by local authorities to provide social housing, communities and small businesses with energy service through a 'contracted out' model. There is limited research on evaluating (the opportunities of) these types of programmes. Evaluation can take the form of workshops for and feedback from stakeholders where it is apparent that there has been a serious lack of understanding of ESCOs, even though the term is often used. This links to other 'barriers' including: Lack of interest in ESCO-type projects; capacity issues; time constraints; and the commercially sensitive aspects of engaging the diversity of stakeholders required (Manchester Knowledge Capital and TNEI, 2007).

Type 4: Governing through Enabling

Governing through Enabling entails direct involvement of local governments in promotional activities, public-private partnership and the provision of financial incentives or subsidies to encourage action by other actors. Several 'enabling mode' activities have been initiated to promote energy awareness and impacts or creating partnerships through alternative practices for delivering infrastructures and services (Bulkeley and Kern, 2006) at an urban scale. Domestic energy efficiency advice centres, for example, are an expanding area of activity, which provide fuel savings and aim to alleviate fuel poverty (Darby, 2005). Such initiatives are often developed as part of wider national government commitments to reduce carbon emissions in line with international environmental agreements (Goepfert, 2006). This type of energy advice programme can produce significant benefits to individuals and to the environment by fulfilling the wishes of householders and of governments (Darby, 2005), but the evaluation of the effectiveness of these type of programmes can be extremely difficult to assess (Darby, 2005).

Evaluating Governing through Enabling requires a focus at two scales: the national and the local and the relationship between the two. Local programmes operate in chasing targets for energy

efficiency cascaded down from the national level. These targets often primarily concern energy efficiency advice to households or small businesses and are measured in terms of customer contacts and carbon savings (Serenade 2007). The assessment of carbon savings can be based upon: (1) annually produced details of the customers that have been advised; (2) a very limited characterisation of the forms of advice given; (3) the distribution of carbon savings through the allocation of amounts of 'carbon savings' to particular forms of advice. It is an evaluation which is based on monitoring advice rather than the actions and results of that advice. The evaluation only assesses the energy advice given to customers and omits other aspects and issues that can be learned about best practice, increasing awareness, but particularly the lessons and views of those whose expertise is utilised on a day to day basis. This type of evaluation is target driven and inevitably focuses first on meeting the targets – to achieve and maintain often insecure streams of funding – rather than necessarily the quality of advice. This ignores the importance of building relationships at the expense of episodic or one-off contacts with customers. It also sees the advice giving intermediary acting as a conduit for national priorities which in many ways are 'place-blind'. National targets often operate at the expense of developing a common understanding of local priorities rather than in concert with them.

Type 5: Governing through Pledges

In recent years, a number of on-line pledge schemes have been set up which often focus on awareness campaigns and the generation of pledges to in some unspecified way 'change behaviour'. However, the concept of 'Governing through Pledges' is relatively new. There has been very limited academic research on pledge campaigns in relation to energy efficiency activities.

Fifth, although climate change pledge campaigns aim to promote 'behavioural change' activities the evaluation, if one takes place, is often through quantifiable measurement of the numbers of pledges and, for instance, the number of visits and visitors to the website and the average number of pages visited on the site (DEFRA, 2008). Such website measure can provide the minimum level of quantified measurement that should be implemented to evaluate the scheme. There is a 'gap' here between evaluation and a qualitative understanding of behavioural change. Evaluation could also measure to what extent the pledge campaign has actually impacted upon the lives, and carbon footprint, of those that haven't taken the pledge in order to understand to what extent increased awareness has led to behavioural change. There are, though, resource issues in doing this kind of evaluation and the evaluation should be built into the scope of the campaign.

Type 6: Self-Governing Localisation

The Self-Governing Localisation mode has been critical in placing climate protection and energy efficiency on local agendas (Bulkeley and Kern, 2006). This type of model is usually practiced at the community or neighbourhood level and includes environmental initiatives that aim to reform local communities and their reliance on oil resources. Programmes e.g. can be community led, and set out to build a co-operative network where people can share practice and assist the energy planning process to transform oil dependent lifestyles. The implementation of climate protection and energy efficiency measures are comparatively simple in areas in which the municipality or community has the freedom to make its own decisions and can directly control its own consumption (Bulkeley and Kern, 2006).

One of the issues in assessing and evaluating Self-Governing Localisation is that due to the frequent reliance on volunteer efforts and limited funding formal evaluations often do not take place. That said, much informal learning takes place and is communicated as to why these initiatives often struggle due to issues related to lack of funding, human resources and other capacity issues.

Urban energy demand-side management programmes - success factors

These different 'types' constitute variable attempts to design and undertake energy demand-side management programmes. How these programmes are evaluated is often unclear and at an ur-

ban scale there is a very limited academic literature. Where there is literature available it was mentioned but we have also utilised our understanding of policy documentation. From this, the evaluation and understandings of success of the ‘types’ of urban energy demand-side management programmes can be characterised as follows:

These programmes highlight the potential influence of local authorities in defining the context of energy use of individuals and their ability to change the immediate context of individuals in such a way that this context facilitates new energy-related practices and behaviours. This potential influence is in turn dependent on the policy context in which cities and towns sit in. This means that different energy demand-side management priorities are developed at European (European Commission, 2006), national (e.g. BERR, 2007), regional, urban (e.g. Mayor of London, 2007) and community scales. Within this multi-level framework, cities can be ‘recipients’ of European, national and regional programmes ‘cascaded’ down onto them (Bulkeley and Betsill, 2005). But energy demand-side management programmes can also be developed and initiated (Hodson and Marvin, forthcoming 2009) within cities. There is also scope for city authorities to work in partnership with European and/or national priorities to co-construct energy demand-side management programmes.

4.3.6 Applying socio-technical approaches to the instruments

The socio-technical approaches presented in chapter 3 can be applied to the instruments presented above. As discussed in chapter 3, issues of timing need to be addressed, we need to look at instruments and interaction schemes that focus on group rather than individual change processes, draw on local practices rather than merely expert knowledge, and involve users in design and allowing them flexibility to change the programme. The following table summarises some examples as to how the socio-technical approaches can come to bear on these instruments.

Table 4.12 *Applying a socio-technical perspective to instruments*

Instruments	Examples of a sociotechnical approach to applying the instrument
Economic instruments and energy service companies	<ul style="list-style-type: none"> - Understand (various) end-user groups’ problem framings and decision rules - Take into account the symbolic/signalling role of economic instruments - Take into account social (user-to-user) diffusion of information and opinions on the instrument - Consider how broad uptake of the instrument increases trust and decreases uncertainty for individual end-users (network effects) - Make sure the encouraged solutions (including the necessary competences and support services) are easily available - Allow for local variation and tailoring of solutions
Information and education	<ul style="list-style-type: none"> - Understand (various) end-users’ practices, tailor messages to end-users’ practices - Take into account the agenda-setting role of campaigns - Make use of changes in the context of the target group that alert them to information - Make sure information sources are trusted by the target group - Do not place all the burden on individual end-users, show what others are doing - Make sure people can follow-up on the information provided (solutions available) - Build on participation, successful local practices, local ‘multipliers’, ex-

	isting social networks and peer-to-peer communications
Metering and feedback	<ul style="list-style-type: none"> - Understand cultural and physical context of the end-users - Design metering and feedback systems on the basis of user needs and practices - Consider providing feedback on the cumulative achievements of all participants - Consider how feedback and metering helps to make energy use ‘visible’ and ‘actionable’ - Make metering part of a broader effort to integrate energy users into electricity market operation
Energy audits	<ul style="list-style-type: none"> - Understand (various) end-user groups’ problem framings and decision rules - Design audit model to meet the needs and practices of the target group - Consider how audits help to make energy use ‘visible’ and ‘actionable’ - Consider timing of audits (vis-à-vis other priorities) - Involve users and stakeholders in the audit process - Make sure qualified auditors and service providers (for follow-up) are available
Energy advice	<ul style="list-style-type: none"> - Understand end-user practices (what advice is needed and in what form) - Provide advice at an opportune moment (when topical for the user) - Involve users in the development of advice formats (successful user practices, discovery of user needs) - Consider how advice helps to build a culture of energy competence (through peer-to-peer forwarding of advice received) - Provide advice through intermediaries and peer-to-peer networks that are close to the users
Negotiated agreements, voluntary commitments	<ul style="list-style-type: none"> - Allow users scope to decide on actions, but provide sufficient advice - Ensure peer-to-peer support and pressure, group empowerment and rewards for participation - Use the right timing considering the capacity of the end-users and the development of more binding regulations - Adapt programmes to local conditions - Use local intermediaries to anchor the programme and ensure durability of changes

4.3.7 Operationalising the socio-technical approach

In the table above the importance of the user and relevant interaction schemes between users and instruments are often identified. To make effective economic instruments and ESCOs, it is important to understand the end users and their needs, problems and decision making rules to allow for local variation and tailoring of solutions and messages. The importance of building on participation, successful local practices, local ‘multipliers’, existing social networks and peer-to-peer communications is recognized as important success factor for communication and education campaigns. Metering, feedback, energy audits and energy advice are dependent on a good understanding of the cultural and physical context of the end-users. And finally, the importance of involving end-users in the design of metering and feedback systems, advice formats and negotiated agreements and voluntary commitments is often mentioned.

Change is a process of negotiation of new systems of provision, and a process of social learning is required on how best to achieve this, and with what (combination of) instruments. This learning is based on interaction between the relevant social groups. If experts develop models for new, energy efficient practices on their own, they may not take users' needs into account. Moreover, it is known that users will use new solutions in various ways, and the solutions can be built to be flexible for such innovation in the process of diffusion. Thus, both user involvement and flexible design can promote the adoption and appropriation of new practices (Rohracher 2001; Rohracher 2003; Aune et al. 2002; Midden et al. 2007).

5. Outcomes of the CHANGING BEHAVIOUR meta-analysis and the workshops

5.1 Introduction

Having reviewed and discussed the existing literature-based body of knowledge on behavioural change related to energy efficiency, this chapter presents outcomes of three extensive empirical inquiries. First, we start with an analysis on the approaches adopted by intermediaries when trying to learn more about end users – based on 27 cases (energy demand-side management programmes). Different forms of interaction between intermediaries (programme managers) and end users are identified and assessed (section 5.3). We address a primary aim of D5, namely a discussion of how various forms of interaction – interaction schemes - between intermediaries and end users may affect success and failure of energy demand-side management programmes - depending on the particular context. In addition, the discussion will show the important role of stakeholders other than the prospective end users. These 27 cases are part of a broader multiple-case analysis of 27 energy demand-side management programmes, implemented over the past 10 years in 13 different European countries. The separate case studies were conducted by various research partners of the CHANGING BEHAVIOUR team²⁸, and subsequently collected and compared by ECN. The second empirical investigation involves this meta-analysis, of which the outcomes are presented in section 5.4.1, in the form of five major themes. Third, the outcomes are presented of four workshops with intermediary practitioners, involving in total over 150 participants.²⁹ We zoom in on the critical issues in designing and implementing successful energy demand-side management programmes and projects, according to wide variety of practitioners. The outcomes of both the meta-analysis and the workshops - in the form of five major themes (meta-analysis) and ten critical issues (workshops) which turned out to be very relevant to consider when planning, implementing and evaluating energy demand-side management projects are jointly discussed. In a concluding section, the outcomes are discussed and connected to the conclusions of previous chapters (section 5.6).

In the following section (5.2), we first present the method adopted in the analysis of the multiple case studies (case selection, indicators of success and failure, single case study format, data collection, comparison), and we present the method adopted in the workshops.

5.2 Methodology

5.2.1 Meta-analysis of the case studies

On the basis on an initial hundred quick-scan-type of case studies and the knowledge base within the CHANGING BEHAVIOUR consortium, several criteria were developed for the selection of more in depth case studies. These cases should reflect the diversity available in terms of target groups, countries, initiators, scale, scope, technologies implemented, behavioural change targeted and intervention methodologies used.

- **Target groups:** to compare cases involving similar and different target groups, a minimum of 3-5 ‘similar’ cases involved schools, municipalities, households, offices and/or Small and Medium Enterprises (SMEs).
- **Geographical and cultural context:** a balance was sought between cases that differ and cases that have similarities, geographically and culturally. At least three cases should share a similar target group but differ in context. Reflecting the geographical

²⁸ The extensive meta-analysis document is available as Deliverable 4 at www.energychange.info.

²⁹ The workshop reports are available at the www.energychange.info

coverage of the consortium members, the cases involve both Old and New EU Member States.

- **Variety in size of the target group:** varying from some thirty persons to tens of thousands of inhabitants whereby the smallest programmes could be termed projects
- **Stage of the programme:** some in an initial stage, others had been running for over a decade.
- **Variety of initiators and investors:** most programmes and projects were partially or fully funded by local, national government, the European Commission or a combination of these. In addition, many received additional funding from participating organizations, banks, apartment owners and other end-users.
- **Focus on behavioural change:** the selected cases focus on changing energy-related efficiency and curtailment behaviour.
- **Variety in basic instruments adopted:** see the variety discussed in chapter 4. Most cases involved combinations of two or more instruments.
- **Level of innovativeness** defined here as the ambition to realise big changes, or to operate in a new context, or to explore new intervention instruments, or new combinations. Most cases selected can be described as ambitious³⁰ either in terms of the methodology used, the (size of) targeted group or the level of behavioural change aimed for.
- **Variety in terms of expertise of programme managers:** this proved difficult to realise. Most cases were operated by experienced programme managers, be it in the form of an institute, NGOs or by consultancy firms. Only in few cases, not project implementers but members of the target group (who had received some training) were experienced.

On the basis of all these selection criteria, we ended up with the selection as presented in Deliverable 2 and 4.³¹ The single case studies were based on programme reports and statistics, including long-term statistical and documentary data on the continued impacts of early programmes. Moreover, interviews with programme managers and policy makers as well as key programme stakeholders have been conducted. All partners in the CHANGING BEHAVIOUR project have participated in the data collection and analysis of the single case studies. The case study reports had a pre set format, to facilitate comparison. This format for analysis was based on a six-step framework tracking the evolution of goals, design and process solutions and outcomes as well as the influence of context factors and stakeholder networks. The meta-analysis involved a cross-comparison, in order to identify core issues influencing the success and failure of energy demand-side management programmes targeting energy behaviour.

This selection led to the following 27 cases to be selected for further analysis:

Country	Programme	Aim of the programme
C1. Netherlands	Green Energy Train The Hague	Reduce the energy, heat and water use in apartment houses by 5% through a specific education and communication approach
C2. Netherlands	Green Energy Train Leidsche Rijn	Reduce the energy, heat and water use in apartment houses by 5% through a specific education and communication approach
C3. Hungary	Social Housing Energy Efficiency Renovation	Implement energy renovations in apartment blocks
C4. Finland	Green Office programme	Certification and management scheme to reduce CO ₂ and resource consumption in offices
C5. Finland	Ilmari Climate Change Campaign for	School climate change awareness campaign implemented by environmental and youth NGOs

³⁰ Ambitious at that time - nowadays (only a few years later) many of these are regarded more common.

³¹ On the Changing Behaviour website (www.energychange.info), all case studies are accessible and searchable in a database.

	Schools	
C6. Latvia	EnERLIn - Efficient Residential Lighting Initiative	Increase the efficiency of residential lighting by 50% increase in CFL penetration via promotion campaign and quality charter
C7. Germany	EcoTopTen initiative	Nation-wide information and rating service for energy efficient products
C8. Europe	Energy Trophy	Competition for saving energy in office buildings through change in employee behaviour.
C9. UK	CIS Co-operative insurance Society Solar Tower	Renovate a landmark building using solar panels
C10. Finland	Energy Expert programme	Training of volunteer residents promoting energy efficiency in housing associations
C11. Germany	Contracting Rommerskirchen	Implementation of energy performance contracting for municipal buildings
C12. Lithuania	Multi-apartment buildings modernisation programme	Promote energy modernisation of multi-apartment buildings via demonstrations and subsidies
C13. Lithuania	Taupukas Residential Awareness Campaign	Communicate the benefits of energy and water consumption efficiency and stimulate energy and water saving
C14. Germany	Off. Really Off?	State-wide campaign to create awareness of standby energy among consumers and retailers
C15. UK	Metropolitan Police Energy Efficiency Programme	Improve energy efficiency in existing buildings and practices of the Metropolitan Police Service
C16. Hungary	Climate Watch	Educational and award programme for school groups to reduce CO ₂ emissions
C17. Hungary	Carbonarium Association	Produce information on participants' personal climate change impacts and promote public awareness
C18. Denmark	Samsø	Creation of a renewable, energy self-sufficient island municipality
C19. Finland	Municipal Energy Efficiency Agreements	Negotiated agreement to promote energy audits and investments in municipalities
C20. Latvia	Building Energy Audits	Energy audits of apartment blocks
C21. Germany	Sanit	On-site advice service for energy efficiency renovations provided by consumer NGO
C22. UK	MiMP Climate Change Pledge	Attract citizens in Greater Manchester to sign up to a Climate Change Pledge, with information and marketing to encourage a switch to less carbon-intensive lifestyles.
C23. Estonia	KredEx Energy Saving Competence Centre	Promotion and knowledge networking on energy saving measures in apartment buildings
C24. UK	Manchester is My Planet (MiMP) programme	Increase policy development/implementation on Climate Change among Greater Manchester local authorities
C25. Europe	Eco n' Home	Reducing energy use and CO ₂ emissions in 940 households in Europe via personal energy advice
C26. UK	Warmzone Kirklees	Free cavity-wall and loft insulation in the Borough of Kirklees
C27. Greece	Active Learning	Energy education at 10 primary schools in Attica and on Crete

5.2.1.1 Evaluating the successfulness of cases

Efficiency and effectiveness were taken as indicators for success or failure. In addition, *learning* was considered important in judging the successfulness of energy demand-side management practices.

Effectiveness refers to the actual success of the programme in reaching intended goals, realizing benefits in a broader energy context and in a way that is lasting. A highly effective energy demand-side management project:

- has an effect in the broader energy context, a positive (reducing) effect on total energy consumption. Effectiveness is measured by means of the share of energy saved/total energy consumption or energy conservation potential (not always a relevant criterion). This measure should help us identify the relevance of the programme for overall energy conservation goals.
- has reached the desired effect (behavioural change and energy savings) aimed for in the target group (achieving the goals as set out). In cases where no evaluation was available that showed the extent to which these goals had been achieved, the researcher would identify the initial objectives from the programme proposal and investigate the extent to which these matched with the results of the programme (e.g. through interviews).
- However, as we will discuss below, there may be legitimate reasons to change the goals so this should be considered as well when using this indicator.

Efficiency is usually measured in terms of cost-effectiveness: the ratio of inputs to the outputs gained. Cost-effectiveness calculations can be made from various perspectives, e.g. those of the participants, the service providers, the intermediaries, total resource costs, of costs and benefits to society. The International Energy Agency (IEA) recommends cost-effectiveness to be measured by the Net Present Value of programme impacts: a sum of the benefits of the programme during its effective period divided by the costs of the programme plus the cost of capital (interest rate) (Vreuls, 2004). Efficiency assessments often emphasise free rider or 'deadweight' effects - i.e. energy people and or organisations that undertake energy efficiency behaviour and efficiency effects that would have occurred without the programme (Vreuls, 2004).

Measuring cost-effectiveness is not uncontroversial. Golove and Eto (1996) argue that direct cost-benefit calculations may not capture many of the social welfare impacts of an energy-efficiency promoting policy or instrument. At the very least, benefits due to reduced environmental externalities (and possible contributions to job creation) should be included (Tonn and Peretz, 2007). Moreover, programmes may have positive spin-off effects and influence not only the direct target groups, but provide benefits to other target groups, e.g. by increasing the supply and reducing the costs and risks of energy-efficient products and services (Golove and Eto, 1996). Another criticism on current forms of effectiveness assessments concerns the fact that energy users value other features next to cost reductions. Many authors provide evidence that the co-benefits of energy efficiency (e.g. health, safety and quality improvements) can be valued by end users as equally important or even more important than the cost savings (Jakob 2006; Knight et al. 2006). Assessing effectiveness in a physical measure of energy use and cost effectiveness as a ratio of inputs to outputs requires measurements, or at least estimates, of impacts on energy use. Such measures may not be available for all types of programmes. Communication campaigns, for instance, rarely focus on particular types of behaviour or clearly bounded target groups. This makes measurements of impacts on energy consumption impossible.

Within CHANGING BEHAVIOUR, efficiency refers to the efficiency of the programme in achieving its goals and effects. A highly efficient energy demand-side management project is:

- Cost-effective: (financial, human and knowledge) resources used for the programme are taken into consideration. This cost-effectiveness can be measured by identifying the ratio of resources used to the energy saved/other desired outcomes achieved: programme fund-

ing/energy saved. In addition, operating with relatively low government funding can also be taken as a sign of cost- effectiveness.

- Efficient in that goals have been met within the intended time-scale and within budget.
- Again, however, there may be legitimate reasons to change the goals, which may also result in adaptations to time-scale and budget.

Effectiveness and efficiency assume clarity, lack of ambiguity and consensus regarding the goals. In the practical field of energy demand-side management however, objectives may (in part) change or have some ambivalence, as well as the instruments adopted. In addition, no single actor controls the whole process. Interaction between different actors (the intermediary, end users, and other stakeholders) with different ideas may result in partial changes in objectives. Hence, before judging a project that has not met all the intended goals as being unsuccessful, the evaluator should first ask why these goals have not been met and whether that is necessarily an indication of failure. Changing the goals along the way to meet changing demands from the operating context can be conducive to a longer-term success of the programme and this may even entail that the budget and time-scale are reconsidered. A programme should be flexible to adapt and learn. This *learning* – the ability to anticipate on or adapt to the specific and changing circumstances – therefore qualified as an important indicator of successfulness as well.

Chapter 2 discussed the notion of *social learning* as a process in which the programme/project manager learns in interaction with the end-users and other stakeholders, and in which this learning can change *both* the contents and context of the programme. For the case analysis, we made a distinction between single loop learning and double loop learning, whereby the above definition of social learning includes both single and double loop learning. We furthermore limit focus in particular on whether the project manager (intermediary) has learned.

- Single-loop learning: about the effectiveness of a technology, measure, instrument, arrangement to achieve pre-defined goals. It is instrumental in that it addresses issues like efficiency or effectiveness
- Double-loop learning: learning about goals and questioning the prevailing norms and rules underlying these. Double loop learning can lead to new ways of how intermediaries frame problems, solutions and their own role.

Evaluating whether *a priori* set goals have been met effectively and efficiently is in line with single-loop learning, involving instrumental learning about a given set of measures and goals - see the above elaboration on efficiency and effectiveness. This learning is relevant as part of the goals of energy demand-side management programmes will always involve reducing energy use by target group members. It furthermore can concern learning about instrumental issues such as i.e. the solution to a technical problem or the effectiveness of an incentive.

While effectiveness and efficiency assessment are concerned with short-term indicators of success, double loop learning addresses the longer term: it consists of a critical assessment of the existing situation and processes (also in terms of institutional power relations) and the role the intermediary organisation in achieving systemic transitions. Existing behaviours are not isolated but embedded in broader sociotechnical systems and strongly shaped by existing infrastructures, conventions and social structures. Therefore, systemic changes are needed to support change on the individual level. The external environment needs to change to sustain the new behaviour - through new infrastructures, institutions, knowledge, attitudes, frames of thinking. If a change is achieved that does not affect these broader systems, it is difficult to make it last or spread it. Learning is needed to understand how behaviour is embedded in broader socio-technical systems, and what these systems are constituted of and how they can be changed. Indicators for double-loop learning could enable us to see whether energy demand-side programmes contribute to long-term, wider and more durable changes (spin-offs).

As for double-loop learning among the intermediaries/programme managers in each case, we were interested in the extent to which they learned about their own assumptions, norms and be-

liefs - as a result of interactions with the end users or others. Ideally, to see if double loop learning has taken place, you should compare the perspectives of the intermediaries before and after a project, to see if any reframing has occurred. In addition, participating observation would be useful during the course of these projects. Unfortunately, such direct measurements fall outside the reach of our case studies, which involved historical (ex-post) case studies. The best we could do was to propose indirect indicators, whereby we distinguished between *process* and *content* indicators (see table 5.1). As for the *process*, indicators address whether conditions as facilitated by the project team members were conducive to double loop learning. We admit that this does not give us evidence on whether double loop learning actually took place. In addition we have indicators on *content*, to indirectly assess the occurrence of situations that can be argued as being an outcome of double loop learning (we cannot know exactly for sure however). Learning is an inter-subjective, discursive and social process and some of the developments that we would define as the outcome of double loop learning could also be the outcome of broader societal developments and not related (only) to the particular design of the project or the approach of the project manager.

However, in a later phase of the CHANGING BEHAVIOUR project - the pilot-testing - there is ample opportunity to actually identify double loop learning processes among pilot partners. During these pilot projects where intermediaries and researchers collaborate closely, an effort is taken to compare a 'baseline situation' (in terms of initial project ideas and intermediary perspective) to a 'pilot project process' (when the intermediary has learned and in accordance made changes to the project and to the original perspective it had). Then we will be able to see if our indicators and hypotheses on their relevance make sense.

Table 5.1 *Indicators for evaluating successful learning processes*

Learning	Evaluated by addressing:
Single-loop Learning	Efficiency (high efficiency leading to successful and low efficiency to unsuccessfulness) <ul style="list-style-type: none"> • Cost-effectiveness Effectiveness (high effectiveness leading to successful and low effectiveness to unsuccessfulness) <ul style="list-style-type: none"> • Goals reached within given time and budget allocated • Reaching the intended goals • Realizing reduced effect on total energy consumption (benefits in broader energy context)
Double loop learning	Process indicators (conditions as facilitated by the project team that are conducive to learning) <ul style="list-style-type: none"> • Building a heterogeneous set of actors in the network of the intermediary • Interaction with and/or participation by the target group (learning about own behaviour and consequences for energy consumption) • Interaction with and/or participation with the heterogeneous set of stakeholders, starting in the design phase • Learning as an explicit aim of the programme³² • Recording lessons for future use; making use of lessons learned previously Content indicators (outcomes that can be argued as being an outcome of double loop learning) <ul style="list-style-type: none"> • Alignment of diverse expectations of stakeholders • Learning translated into (re)design of programme or project • Enhancing the capacity of own or similar organizations to perform successful energy demand-side management programmes • New networks and institutions to support the new behaviour and its outcomes³³ • Durable changes (e.g. lasting behavioural change)

³² Vreuls, H. (2006). *Evaluating Energy Efficiency Policy Measures & DSM Programmes*. Volume II Country Reports and Case Examples Used from the Evaluation Guidebook. IEA DSM. <http://dsm.iea.org/>

³³ e.g., Heiskanen et al, 2007; Marvin and Simpson, 2007; Raven, 2007.

5.2.1.2 Limitations of the case study methodology

A limitation of the kind of ex-post case studies that we use is that they tend to treat conditions in isolation as having either a positive or negative influence on the outcome of an energy demand-side management programme - while in practice they are often intertwined with other conditions. Whether a condition that potentially is conducive to achieve an outcome also *will* be conducive, depends on how it interacts with other conditions present or absent at that time. However, we attempted to formulate the relevant conditions as we identified them in such a manner that they capture relational and process characteristics as well - the additional analysis on forms of interaction contributes to this as well. We tried to formulate themes that help us understand how diverse practices have become constituted in different contexts and how these shaped actual responses from target group members. Furthermore, the case study method requires its writers (and programme managers when interviewed) to develop a narrative of what happened. Processes might be depicted as if they occurred chronologically or following an inherent logic, while this might not capture the ‘messiness’ of the real life situation. Decisions made might only be attributed to certain issues or theories or knowledge about the target group in hind-sight, but at the time of making them they might have resulted due to other reasons or resulted from other circumstances or are just based on which actors were present at which meeting.

5.2.1.3 Additional analysis of interaction schemes

Having argued the importance of learning (and having tried to formulate indicators - see table 5.1 above) for successful energy demand-side management practice, a next step is to investigate what approaches various programme managers have adopted to learn. Such an inquiry can provide insight into what works in which contexts. To learn more about how project intermediaries have gone about interacting with end users, an additional analysis has been done on the various approaches or interaction schemes that intermediaries have adopted when trying to learn about the end users.

Information about users’ needs tends to be highly contextual, tacit and difficult to transfer from one site to another (Von Hippel, 2005) and therefore, multiple rounds of information exchange are needed in order to establish facts and clarify perspectives. The case comparison examined the interactions between the programmes/projects and the targeted energy end-users, focusing on how information was gained about the needs, capacities and interests of the energy-end users, and how this information fed into the design of the programme. During this inquiry - based on all case study data - a variety of ways in which programme managers have learned about the needs of the end-users were identified and classified into five categories. These will be discussed in section 5.3.

5.2.2 The workshop methodology

Four workshops were held in 2008 and 2009 (one each in Tallinn, Estonia; Budapest, Hungary, Manchester, UK, and Athens, Greece). Elaborate background and reports of the workshops can be found on the CHANGING BEHAVIOUR website³⁴. For each workshop, we invited a ‘regional’ audience of practitioners active in the field of energy demand-side management and over 150 people participated in total. The purpose of the workshops was to provide a forum for a critical and constructive interaction between the emerging findings of the CHANGING BEHAVIOUR project and a broad constituency of energy intermediary organisations and practitioners - participants included practitioners that are not partner of the CHANGING BEHAVIOUR consortium. More specifically, the principal aim of the workshops was to develop a critical engagement between the factors and issues identified by our research as contrib-

³⁴ <http://www.energychange.info/>

uting to more and less successful energy demand-side management programmes and the rich, everyday experiences garnered by a range of practitioners. In doing this, a critical and constructive engagement would inform the mutual refinement of research issues and practitioners' own understandings of their practices. In short, the workshops created the context for an effective sharing of the knowledge available amongst the researchers and practitioners. This was achieved through a mix of methods. In sub-groups, the participants discussed constraints and opportunities they experience in preparing, designing, implementing and evaluating energy demand-side management programmes/projects. Each sub-group would then present their findings in a plenary session, where similarities and difference between subgroups could be further discussed. Afterwards, participants were asked to comment and add things if needed to the four workshop reports, which were subsequently published online on the website of the project (www.energychange.info). We furthermore invited all participants to stay involved and to attend a final project meeting in 2010.

5.3 Findings from the case studies: interaction schemes and learning

Energy demand-side management programmes have been criticised for a failure to address the needs and perceptions of energy end-users. It has been argued that they follow an overly 'techno-economic' approach that fails to grasp the social meanings and the contexts of energy consumption (Guy and Shove, 2000; Parnell and Popovic-Larsen, 2005; Guy, 2006). Thus, interaction with and engagement of end-users is today stressed as an important task for programmes that aim to change energy end-use practices (Stern, 1999).

As we saw in chapter 3, research on the context of energy end-users has pointed at some of the key problems in a purely 'techno-economic' model of energy related change. This research has also shown the limits of a purely psychological approach to behaviour change, such as attitude-behaviour models, and called for a more socio-technical approach. A shift from a 'techno-economic' to a 'socio-technical' approach to energy consumption and conservation suggests a more appreciative approach to end-users – they are not merely passive recipients of pre-designed solutions (Rohracher, 2003; Guy, 2006). Rather than viewing end-users and their contexts as 'barriers' to energy efficiency, energy demand-side management practitioners are challenged to understand how and why end-users' energy practices are socially shaped (Wilhite et al., 2000; Shove and Guy, 2000; Guy, 2006), and thus, how they can be reshaped.

Socio-technical research on the role of users in the adoption of new solutions has shown that the ways in which end-users are *represented* in the design process are important for the way in which the innovation is adopted (e.g. Akrich, 1995; Oudshoorn et al., 2003). For example, designs may draw on prior research about users, on direct input by users, or on the designers' beliefs about users. Whatever the case, designs always embody some assumptions about the user. Considering that the interaction between the experts (programme managers) and energy end-users is an important factor influencing the adoption of energy saving practices in energy demand-side management programmes, our meta-analysis of previous programmes involved a designated analysis of how the programmes learned about end-users' needs (see also Heiskanen et al. 2009). In the following, we first describe the interaction schemes used in our case studies, and then examine the pros and cons of particular schemes in particular contexts.

5.2.3 Investigating interaction schemes to learn about end-users

In our analysis, we were particularly interested in how information was gained about the needs, capacities and interests of the energy-end users, and how this information fed into the design of the programme. When examining the case study data as a whole, we identified a variety of ways in which programme managers learned about the needs of the end-users, which could be classified into five categories of interaction schemes. Table 5.2 shows the categories as well as the number of cases in which each type of scheme has been adopted.

Table 5.2 *Approaches to learning about end-users applied in the case projects*

Approach to learning about end-users	Number of cases applying this approach*
1. Surveys, interviews or group meetings	6
2. Prior research, particular theoretical perspectives	9
3. Experience from prior projects and similar examples	7
4. User-driven project (or pilot project)	8
5. Familiarity and informal interaction with the target group	7

* NB: the number of cases is larger than the total number: some projects used multiple approaches

1. Surveys, interviews or group meetings:

Surveys are a conventional way for learning about end-users. In some cases, the surveys were comprehensive and sophisticated, and used extensively and thoughtfully in the design of the project. Focus group discussions furthermore contributed to gaining better insight into the programme development. In some cases, however, the main purpose of the surveys was to identify a baseline for evaluation, or to help the formulation of messages for a communication campaign. Thus, the surveys or interview data did not always have a large influence on the programme design.

2. Prior research and/or particular theoretical perspectives:

Several programmes/projects built on prior research or particular theoretical perspectives, yet of very different kinds. In some cases, a particular theory of human behaviour and behaviour change was very dominant while in other cases, the social science perspectives used was less specific. Some of the prior research was more empirical than theoretical, addressing e.g. energy use and opportunities for change in commercial or residential buildings. In the UK, *The Rules of the Game* guideline (DEFRA) that combine theoretical insights and findings from current surveys, was mentioned as a key resource for understanding end-users.

3. Experience from prior projects and similar examples

Some of the cases built strongly on experience from prior projects or similar examples - programme managers had been working previously with the same end-users in similar – or even partly different – projects and had thus accumulated experience or even formal research and statistics in that previous context. They had thus gained impressions of the end-users’ needs, capacities and culture that helped them design their programmes.

4. User-driven project (or pilot project)

Some cases were completely or partly initiated and designed by (at least part of) the users. In three of these cases, these users were organizations (municipality, municipal department, company). In one case, the project was designed and implemented completely by private citizens. In the remaining cases, users were involved at an initial stage, but later the programme grew to address users not involved in its design. In some cases, early user involvement was explicitly used to pilot programmes that were later expanded to a broader user base.

5. Familiarity and informal interaction with the target group

Even where the users were not the initiators of the programme, and no formal pilot phase was organised, user experience could be transmitted into design in more informal ways. Some of the projects modified their design as a result of feedback and experiences gained during the course of the programme. Programme design elements could be discussed with stakeholders representing various user groups. Implementation responsibilities could be given to longstanding members of the user community, or the programme managers and delivery staff could have prior personal experience of being ‘one of the users’.

5.2.4 Pros and cons of different interaction schemes

Our analysis revealed that even though understanding end-users is very important for designing a successful programme, none of the approaches to learning about end-users automatically leads to success. The end-users and their contexts are only one of the factors influencing success – as will be shown later in section 5.4. However, we did find that programmes that used multiple approaches – in a thoughtful way – were more likely to reach their goals (see also Heiskanen et al., 2009).

It is clear that the different approaches have their benefits and drawbacks (Table 5.5). This serves to emphasize the fact that different approaches are more suitable for particular types of programmes in terms of goals, scale and resources.

Table 5.3 *Pros and cons of particular approaches to user interaction in energy demand-side management programmes*

Approach to learning about end-users	Pros	Cons
Surveys and interviews and group meetings	Systematic approach to data collection Surveys provide the possibility to poll representative samples	May not always feed into programme design Surveys may be designed to confirm existing preconceptions, may fail to bring up new insights Conducting good research may be expensive and require specialized skills
Prior research, particular theoretical perspectives	Sound theoretical base can guide observations and help to make sense of energy-related behaviour and to identify factors potentially influencing it	Strong commitment to prior findings or theories may lead to overlooking contextual particularities Overly theoretical background can lead to complex and confusing designs
Experience from prior projects and similar examples	Sound experience-base creates confidence and practical skills/solutions that are difficult to codify	‘Competence trap’: overconfidence and failure to learn new skills in new contexts
User-driven project (or pilot project)	Users know about their needs and circumstances and can contribute to context-tailored and user-friendly designs Users are motivated and engaged from the start, thus ‘less work’ is left for the programme manager	Users may not be fully aware of their behaviour and all the factors underlying it ‘Up scaling’ from small user-driven pilots to broader groups of end-users can be difficult
Familiarity and informal interaction with the target group	Informal interactions allow for a rich exchange of information (including non-verbal information) Familiarity creates trust and mutual confidence	It can take a lot of time and commitment to build up the level of familiarity needed to execute a successful programme Contacts may be biased: some users are more familiar than others

Formal, dedicated research involving surveys and interviews is obviously useful - providing a systematic format for data collection. Representative samples of end-users can be surveyed and thus there is at least a chance of learning the views of 'less enthusiastic' members of the end-user population³⁵. However, surveys do not always feed into programme design, e.g. if they are conducted at a relatively late stage when programme design features are already fixed; or when surveys are designed to confirm existing preconceptions, or they may be read tactically for the same purpose (see e.g. Akrich 1995). Conducting high-quality surveys or interviews may also require specialized skills that are expensive to gain for small-scale projects and programmes.

There is also obvious merit in building one's programme on a sound theoretical base of prior research, as this can provide useful concepts that help to make sense of seemingly irrational user behaviour (see e.g. Kempton et al. 1992; Stern 2000; Dahlbom et al. 2009). Yet there are many - often competing and contradictory - theoretical perspectives on energy-related end-user behaviour and behavioural change (see chapter 3). Our analysis of multiple case studies revealed that an overly theory-driven programme can end up being too complex and confusing for end-users. Moreover, most social science theories are 'middle-range' theories that apply to a certain social context, but may not help to explain behaviour another context (Pawson and Tilley 1997). Hence, use the theory, but hide the theory, make programme elegant.

Previous experience, especially with the same end-user group, is obviously useful and speeds up the learning phase. This is evidenced in our data. A sound experience base also creates confidence and provides an arsenal of practical skills and solutions that are difficult to learn in any other way. Experience does not only help in understanding the users, but also provides routines for interacting and working with them. Yet we can also speculate that there might be drawbacks from relying too much on prior experience, especially in the long term (see Levinthal and March 1993 on 'competence traps'). Experience can be helpful as long as the programme manager stays in a familiar context, but when the context changes, it may be dangerous to rely too much on prior experience.

User-driven programmes are ideal in many ways. Users know about their needs and circumstances and can contribute to context-tailored and user-friendly designs (Stern 1999; 2000). Small-scale user-driven programmes can also serve as pilots to refine the design of later, larger programmes (see MacKenzie-Mohr 2000). On the other hand, we can also ask whether users are always aware of their behaviour and all the factors influencing it (e.g., Riquelme, 2001). Energy-related behaviour, in particular, is often habitual and not subject to conscious decisions. On the positive side, it is much easier to work with 'volunteer' users who are highly motivated and willing to invest their own efforts in designing a programme that can help them save energy. However, such users only represent a small part of the energy-using population. So the programmes in our dataset that were user-driven were usually small or at least started out small. Scaling up and 'growing' the programme into a large one involving 'ordinary' users may be difficult³⁶, as it often requires new resources and more formal ways of organizing.

User interaction and learning about users can also be informal, based on face-to-face contacts or longstanding membership in the user community. Informal interaction allows for a rich exchange of information (including non-verbal information), and familiarity creates trust and mutual confidence. However, this approach is not always feasible: it can take a lot of time and commitment to build up the level of familiarity needed to execute a successful behaviour change programme. Moreover, programme managers' personal contacts may not be entirely representative of the target group as a whole - usually centring around the more active and positive people

³⁵ However, survey respondents usually participate on a voluntary basis (i.e., even in a mail survey, some people will respond and others will not). This can lead to what is known as 'voluntary response bias': people with strong opinions, or people who are more positive toward the topic are more likely to respond than others.

³⁶ This same phenomenon has been found in product design projects working with 'lead users', i.e., users who face needs before the mass of the market and innovate in order to discover solutions to their own problems (von Hippel 1988; 2005). Christensen et al. (2003) have argued that lead user innovations are rarely appealing to 'non users'.

in the target group - and may thus obscure more marginal, but also more critical voices (see Heiskanen et al., 2007).

5.2.5 What influences the choice for a particular interaction scheme?

The approaches selected also partly reflect the needs and resources of the programme: large-scale programmes addressing broad and heterogeneous target groups naturally need to gain representative data on characteristics of the target group, whereas smaller, more 'local' projects can build on more informal experiences – and in fact, must do so due to resource constraints.

Yet the different approaches to learning about the users partly reflect a slightly different approach to programme planning and design. The programmes building on more 'distant' resources, such as surveys, prior theoretical concepts and previous research are designed more from 'top down'. This type of planning approach implies a clear separation between research, design, implementation and evaluation. Other programmes build more on practical experiences, informal contacts and initiatives taken by the users (or some of the users) themselves. Here, the planning approach is usually more 'bottom up' and less tightly planned. Small pilots or feedback and ideas gained from stakeholders can change the course of the programme, and research, design, implementation and evaluation occur more concurrently.

Few of the case programmes fall clearly into one or the other category. However, we could place the case programmes on a continuum between more 'bottom-up' types of projects that are grounded in user needs and experiences, and more 'top-down' projects that are grounded in pre-conceived goals and a more 'distant' approach to steering energy use. It is perhaps not entirely fair to compare such projects with partly different goals and objectives. The 'top down' projects usually try to tackle large problems and address more 'difficult' end-users groups, whereas the more 'bottom up' projects build on, or at least interact more closely with end-users who are already motivated to change their energy behaviour, but merely require some support for this.

5.2.6 Isolated users – or embedded in context?

Addressing the interaction between programme managers with the energy end-users is not enough because the energy end-users are not the only parties influencing their energy usage behaviour. But as we saw in Chapter 3, energy consumption (and conservation) is always a result of social processes on the family, community and institutional level (Lutzenhiser 1993; Wilhite et al. 2000). Moreover, individual choice is limited by the way cities, energy supply systems, housing designs, service networks and products are configured (Wilhite et al. 2000). Thus, change in energy-related behaviour is part of a larger change in the social and technical organization of 'systems of provision'. The systems of provision define the opportunities and limits for individuals' patterns of energy usage (Rohracher 2001). Even though the systems are the result of earlier human action, individuals can do little to change such systems in the short term.

Some of these issues are obviously beyond the reach of individual energy demand-side management programme managers. Yet we found in our meta-analysis that the ability of programmes to reach their goals was often dependent on the engagement of not only users, but other relevant stakeholders in the user context. For example, many of our case studies dealt with energy use by people living in multi-apartment dwellings. Here, households are usually the target group for behavioural interventions and additionally, more technical interventions can be addressed to facility owners and managers. Many of our case studies, however, indicated that these two types of interventions are often addressed separately, which makes the programmes less effective and can even reduce participants' motivation in the long term. Moreover, many larger energy related decisions require concerted action by residents – here boards (e.g. condominium boards in owner-occupied housing) and committees are important decision making forums, but also informal interaction between residents (especially 'opinion leaders') can be im-

portant. The ability to change energy-related practices may also depend on the availability of suitable service providers (e.g., banks, contractors, retailers and suppliers).

Another example can be taken from cases dealing with energy use at the workplace. The possibility to change energy-related practices is essentially conditioned on the relations and responsibilities of management and employees. Successful programmes need to engage employees and empower them to act. There are also particular groups of staff who have an impact on procurement and management decisions that influence others' possibilities to save energy. The organisations' motivations, capacities and the availability of positive feedback on change also depend on how the organisations' clients value energy efficiency. Co-operation with facility owners and managers influences the possibilities to change business premises to accommodate energy-conserving practices, and suppliers and service providers are naturally crucial for access to more energy-efficient equipment and services.

Our analysis suggested that stakeholder networks can provide communication and information channels to the targeted end-users. Often, however, programme managers did not perceive this kind of networking as an explicit way of interacting with end-users. Stakeholder interaction was often informal and done on an ad hoc basis. It could, for example, include involving various stakeholders in the design and implementation of the programme (e.g. housing associations, different types of staff members). Some programmes could select multiple target groups, each with dedicated messages and interventions. Successful programmes often actively thought about and addressed the social environment of end-users by engaging, e.g. schools and opinion leaders within the target group. In some cases, however, it appeared to be difficult to engage some relevant stakeholders because they failed to see how getting involved would serve their interests.

Our analysis thus indicated that the ability to engage diverse stakeholders and align their interests was a critical factor for success in many cases. As will be shown in more detail in the following chapter, understanding existing stakeholder networks and building on them was shown to be one of the crucial factors for gaining access to the different parties whose participation and resources was needed for completion of the change programme.

5.4 Findings from the case studies: factors conducive to success

This section provides a summary of the overall results of our meta-analysis of factors influencing the success or failure of energy demand-side management programmes. Our focus is on particular factors that influence the success of programmes managed by intermediary organisations, and especially, on factors that have hitherto not gained sufficient attention in the literature as factors improving the success of bringing about lasting change in energy-related behaviour.

5.2.7 Basic conditions for successful energy demand-side management programmes

Our meta-analysis, firstly, identified a number of factors influencing success that are already quite well-known- but not less important for that matter. However, since they are either self-evident or discussed elsewhere extensively (Greer et al., 2001; Dahlbom et al. 2009) it is sufficient here to merely give a summary:

- Sufficient finances and resources
- Clear focus and goal
- Sound background in energy and technical data
- Continuity and sufficient time for change
- Regular monitoring and feedback to participants
- Good collaboration with other projects and institutions

5.2.8 Less known conditions further improving success

In addition to the basic conditions for designing successful programmes, several issues were highlighted in the cases, which are less often discussed in the literature. For analytical purposes and to be able to present some clarity in our overview, we have grouped the conditions under the themes discussed below. Addressing these themes can help intermediaries to improve the success of their project.

5.2.8.1 Taking context on board

The operating context of a project or programme was in most cases acknowledged to be of significant influence on the outcome of an energy demand-side management programme. Many political, institutional, cultural and socio-economic factors were identified as influential. Overall conducive to success were considered national issues such as high energy taxes, limited domestic energy resources, energy dependence, media coverage, the presence of environmental debates, an open cultural attitude to new ideas, especially new technologies, a positive public attitude to energy conservation, availability of necessary technologies, energy poverty, and the presence of norms and regulations.

Constraining conditions were a low public level of environmental awareness, inadequate access to environmental information, reluctance to adopt new technologies on the level of individuals; geographical and or demographical circumstances impeding energy savings or increasing heating energy demand - e.g. cold climate, low population density; negative historical experiences with similar programmes. The following contextual factors stood out in terms of importance:

- Governmental support for energy saving in general and/or energy demand-side management programmes in particular: identified as conducive to success in many case studies. This support can include subsidies; environmental regulation; norms and standards for new buildings; or voluntary agreements with the private building sector. At the same time several case studies demonstrated that other influences can very much weaken the positive effect of governmental support, e.g. the level of trust of citizens in the government. In addition, the impact of the support depends on the choice of instruments. Fragmentation, lack of continuity and volatility of governmental support was furthermore identified as constraining in many cases. Governmental support can hence be regarded as a necessary but not sufficient condition.
- Links to prior or ongoing programmes and policies ³⁷ can be conducive to success. Such linkages can strengthen the message. Using existing communication schemes and channels and repeating a similar message can strengthen the potential impact of a new campaign. However, this need not always work out positively, e.g. when messages communicated in parallel campaigns are different from (or even contradictory to) the programmes' message, this poses a problem.
- Mixed and irreconcilable policy goals being communicated to the public can create confusion and undermine the willingness to change energy behaviour - e.g. arguing for the struggle against climate change while at the same time striving for the lowest possible energy price.
- Tradition of active civic engagement: can enhance public acceptance of and commitment to change energy behaviour. Cooperative municipal ownership of projects, requirements to facilitate participation in decision-making can also contribute to success.
- Market conditions that discourage the motivation and willingness to change energy behaviour: low national energy consumption compared to other European countries; low energy prices; socio-economic crises and decreasing living standards both may distract attention from environment and sustainability issues. Another discouraging trend found was that energy savings are offset by trends towards augmenting rate and size of equipment.

³⁷ This factor is also part of timing and networking issues but is discussed under this heading.

5.2.8.2 Timing your intervention

Timing is about linking a programme to contextual circumstances, trends, turning points or addressing themes that are at that moment of particular importance for participants. Timing follows from our cases to be of outmost importance.

- Making use of a window of opportunity was very often identified as a factor conducive to success. This can involve taking account of ongoing developments; addressing specific user needs; the ability of a programme to address gaps (knowledge, human resource or energy-related needs) in a sector; taking account of specific regulations in place; making use of moments of change such as a renovation of a neighbourhood; linking to ongoing activities (other campaigns and programmes).
The ‘climate change boom’ that occurred in many countries around 2005-2006, following the Stern Report, Al Gore’s film and other highly visible initiatives, made everything related to climate change mitigation ‘newsworthy’. This triggered motivation and provided media visibility for programmes that explicitly link to climate change mitigation.
- A motivated target group or even better: a target group demanding and or in need of a programme is a perfect entrance. On the other hand, assuming a target group that fits your programme goes against the notions stressed above, namely that an intermediary should engage with a target group in order to tailor the programme to the targeted audience (instead of the other way around).
- Finding synergies with actions to support regional development is another factor conducive to success.

5.2.8.3 Making the intervention meaningful to the target group

A great number of identified factors dealt with the importance of making the intervention meaningful to the target group, so that the target group would feel the need and motivation to act and would have the means to do so.

- Knowing the target group. As discussed in section 5.3, many programmes drew on lessons learned in prior similar projects, or programme managers invested time to get to know the target group. Investigating and addressing the target group as a heterogeneous group, with multiple roles, needs and demands, and subsequently tailoring the message and content of the programmes accordingly were found key to success.
- Tailored message. The message and information and communication material used should focus on user needs, which is only possible if you know your target group.
- Communication channels and formats should take consider the specific characteristics of the user. Identified as important were the use of personal, individual, face to face approach and/or the use of trained envoys and or trained experts from the target group.
- Aligning expectations. Many projects appreciated (either beforehand or along the way) the need to create opportunities to negotiate expectations, and align the expectations of end-users of projects with the aims of the projects. End-users can have different needs and expectations depending on their local circumstances, and often the expectations of the end-users are different from those of the programme managers. Alignment refers to an attempt to find solutions that meet different expectations and solutions.
- Focus on/target a multiplicity of benefits. The cases demonstrated that programmes are more likely to resonate with a target group if they bring multiple benefits next to energy saving in areas like comfort, property value, sense of being in control, income, safety, social cohesion etc, because these programmes will address the target group as being heterogeneous in terms of identities, interest, values, goals, preferences, needs.
- Closeness of programme manager and stakeholders to each other and to target group. If the programme manager can relate to the problems, values and norms or the end users, the programme is more likely to target the users in the most meaningful manner.
- Trust. There are many ways to build trust. Examples are the use of role models and celebrities, or references to other similar projects that went well (e.g. conducted by the same programme manager with a similar target group). Volunteers from the target group who become

proponents of the programme can help create trust, if they are perceived as trustworthy themselves. Other factors that can be helpful include reputation, expertise, networking skills, commitment, neutrality and familiarity of the project manager.

- Peer-to-peer communications and social pressure. Reaching end-users in a way that is meaningful to them can be facilitated by promoting peer-to-peer communications, i.e., communication among the end-users themselves. Moreover, programmes can draw on people's desire for social recognition and on social pressure by peers, for example by the use of role models.

5.2.8.4 Making use of the power of long-term networks

What follows from almost all case studies is that successful programmes typically made use of networking in multiple forms. This can involve existing networks to convey the message and to create commitment and social pressure. The networks can be part of the programme management process, or networks among the energy end-users. Networks are cheap and (once established which is not an easy task) easy multipliers. They can help to tackle issues hampering behaviour change. Successful programmes can make use of existing networks; they can reinforce existing networks, or create new networks.

- Make use of existing networks. for instance to disseminate information, materials and advice and as such to make the programme (approach) more widely known.
- Strengthening existing networks. Involving new actors in a network to broaden the basis in terms of expertise, capacities and competences ensures a strong basis for double loop learning.
- Building new networks. Continuation of changes initiated in the programme is key for success of a programme in the long term and a necessary condition for wider system change. Creating opportunities to continue what was started in the programme is supported by networks, it can also follow from the co-operation of the programme with other programmes and likeminded stakeholders, to both widen the scope and the pool of resources to draw from.
- Sharing finding and lessons: dissemination of findings and lessons learned is crucial. Follow-up programmes that draw on knowledge and experience from previous programmes is yet another important step in creating systemic change since systematically following through on previous programmes and building up 'history' and 'momentum' helps to break our current energy use patterns. This is insufficiently done at present.

5.2.8.5 Balancing between central planning and bottom-up processes

The case analysis shows that finding the 'right balance' involves basing the goals of a energy demand-side management programme (at least in part) on 'user needs' - the sort of problems and solutions that users perceive - and on 'user capacities' - focusing on what issues need to be tackled to make a behavioural change possible. This requires an interactive approach. What follows from several cases is that one of the success factors (more or less independent of context) is the user orientation. This means that the programme managers need to first learn about the needs, capacities and motivation of the users, after which the programme intervention method and objective are adapted to meet these (at least to a certain extent). Usually, the users are not able to influence the ultimate goals (e.g. the target for emission reduction) which have been set prior to their involvement. However, there are still many ways of taking the user into account, taking the user perspective as a starting point, involving them in developing the programme.

- Learning by doing, interaction between users, programme developers and policy makers Programme managers often stress the role of issues which they cannot influence, but that are hindering the successful outcome of their programme. This observation suggests that if policy makers are involved in the design and implementation of these programmes, they would be in the position of knowing the issues and being able to influence them.
- Continued monitoring and evaluation: bottom-up programmes require constant monitoring and evaluation of context, behaviour and intervention instruments to assess the outcome and to be able to react to changes in the needs and requirements of users, and a changing con-

text. Evaluation guidelines in many projects emphasise quantitative effects and 'free-rider effects'. However, if programmes are designed more as learning processes, what traditionally are called 'spin-off-effects' and 'multiplier effects' are potentially more important than direct effects.

- Taking the user as starting point: instead of segmentation approaches which segment people based on “ideal types” such as lifestyle, attitude and as such denies the multiple and sometimes conflicting identities people have. A more bottom-up approach that finds a target group localized around a shared problem could alleviate many of the communication problems since the target group would in principle not have to be made aware of the problem, and would not need to be (externally) motivated to change their behaviour. They would in the best situation only need to be empowered to act. In addition, when involving the participants in defining the problems, goals, solutions, they should be enabled and assisted in doing this.
- Careful design/balancing: a possible compromise between planning and learning could be found in the size and role of a programme. One could start with a small pilot and/or some fieldwork, and develop the programme in interaction with participants and in reaction to learned lessons and changes in user needs, behaviour and context.
- Allowing adaptation or even committing to adaptation of content and goal of programme in accordance to target group learning, expectations and demands/learning by doing can contribute to success.

Most if not all attempts at developing a guide or toolkit for designing more successful energy demand-side management programmes follow a “planning model” approach. Goals are formulated a priori and the programme is designed around them in such a manner that they can be met. However, this can result in a top-down approach in which the social context is seen mainly as a 'barrier' for energy efficiency. Although such an approach has advantages, it limits the opportunities for designing and implementing a programme that is sensitive to the context, actors and technology. In contrast, opportunities for ex-durante interactive learning processes between the target group, context and project manager may lead to better outcomes. Bottom-up approaches also have their cons, however. Because they often attempt to combine diverse interests, they are more liable to a loss of focus, unclear responsibilities or mixed messages.

The five themes discussed above involve many conditions that partly overlap and that connect to each other as well - e.g. making the project meaningful to the target group and balancing your approach are clearly related to one another, because the approach you take will affect the possibilities to be able to address target group needs and expectations. In addition, all themes relate to the importance of contextualizing changes. Identifying how programmes can actively engage with contexts - rather than just 'drop' programmes into contexts is a recurring theme. In the next section, we present what practitioners at several workshops pointed out as important issues.

5.3 Findings from the workshops: critical issues

This section summarises the critical issues in developing and implementing successful energy efficiency programmes and projects from the points of view of a wide range of practitioners from across Europe, engaged in energy efficiency practice, often from very different positions and with varying motivations to be involved in the programmes and projects. This summary is based on the dialogue, discussions and group work sessions at four research-practitioner workshops held in Tallinn, Budapest, Manchester and Athens, between November 2008 and June 2009. These workshops highlighted a wide range of critical issues to consider in thinking about developing and implementing successful energy efficiency programme and projects. The analysis and summary of highlights is presented in 10 key points that are not isolated issues but inter-related.

1. *There is no one single critical failure or success factor*

Energy efficiency programmes and projects are informed by a range of critical failure and success factors – there is no one single critical failure or success factor. Many of these issues – financial, staffing, communication, knowledge base - are not isolated issues, rather they are inter-related. According to one practitioner ‘this is quite obvious’ and to another practitioner, who echoed the views of many across the workshops: ‘All of the factors were more or less important’. That is to say, many issues were identified as significant, critical, key and important in the workshops but it was strongly apparent that they should not be seen as isolated issues but as inter-related.

2. *Understanding, managing and balancing different combinations of issues*

Understanding, balancing and managing of different combinations of these issues is the critical challenge. This raises its own challenges: combinations of these issues means that a variety of actors are implicated and involved, e.g. practitioners, policymakers, funding bodies, different users etc. Not only this but these combinations of issues and actors may look different in different places and where various agencies and ‘intermediaries’ are involved.

3. *Beyond a one size fits all approach*

This highlights the issue of diversity – behavioural change strategies can often involve different people, with different motivations, in different local contexts of practice – which highlights a need to move beyond a one size fits all approach whilst at the same time not reducing our understanding to specific contexts. Consequently, rather than creating universal recipes for success, combinations of issues need to be understood in relation to different projects/programmes and the local contexts of their ‘targeting’ and ‘implementation’. Whether an issue is important or not depends on the ‘intermediary’ context.

4. *Implementing on the individual level, working on the community level*

In getting beyond looking for single success and failure factors informing effective behavioural change it is important to understand better the work of ‘implementation’ of behavioural change programmes. Getting beyond single issues requires developing mixed methods approaches which do not reduce success to individual factors. Related to this, another issue that was frequently raised in the workshops can be characterised as the tension between the individual change process and the importance of seeing behavioural change not in these reductionist terms but as interrelated with the wider social system that creates the possibilities for changing the behaviour on the individual level.

5. *Knowing your own organisational context and resources*

Many practitioners at the workshops outlined the importance of understanding clearly their own organisational context and the resources available to them, including funding streams. In particular this included:

- a. Developing an understanding of the double-edged nature of *financial resources* and the opportunities and constraints it brings to the organisation.
- b. The double-edged nature of *partnerships and relationships*, where it is important to have a good network behind you but where collaboration may be overrated and connections to other ongoing programmes may not be so important.
- c. *Continuity of staffing* where the staff and manager may benefit from working from the early stages and throughout a project at developing relationships with users.

6. *Knowing your target groups*

A further theme that was frequently raised was the importance of ‘knowing a target group’, understanding a target group prior to the project and understanding their goals in relation to your organisational goals. As one practitioner pointed out: ‘all the programmes started and lost their target groups along the way’. To counter this, another practitioner pointed out that you ‘always have to start from the target group’. As well as being consistently and constantly target group

focused there was the recognition that a ‘target group’ is not homogenous and there needs to be involvement of the ‘right’ stakeholders.

7. Engaging with a wide variety of different social interests

There are significant consequences of this for practitioners in terms of their practice and the need to engage with a wide variety of different social interests. Different forms of knowledge and expertise need to be mobilised in bringing together the knowledge necessary for change, often in a context of habitual actions and entrenched institutions. In doing so there is a need to understand who the ‘target’ of energy efficiency projects and programmes is and how to effectively communicate and work with this target group.

8. Making messages meaningful

This further challenges the one size fits all message on energy efficiency and simple top down communications. It also challenges practitioners to adapt their language to be tailored to different local contexts. This raised the issue: how can energy efficiency and behavioural change be communicated effectively in a way that resonates with different interests? Particularly in a way that challenges the dominant rhetoric of high energy, high carbon behaviour? One strong view was that there was a need for new narratives, challenging the ‘runaway train’ messages or the ‘do-nothing’ messages and devising different motivating narratives to underpin engagement in productive behavioural change. These narratives need to be broader than energy efficiency and encompass climate change messages or to build on to the back of other agendas as a process of making energy efficiency messages meaningful for ‘target groups’.

9. Evaluating and learning

A crucial issue relates to how ‘intermediary’ organisations and practitioners are able to understand, learn about and adapt their practices in a more systematic manner. There is a need for more appropriate and effective evaluation and learning that allows for understanding of who is doing the intermediary work and how they are resourced. There is a need for a better understanding of the intermediary context itself including relationships, resources, and communications with target groups and how particular issues become defined as important. Evaluation should help practitioners learn about what the key issues are in relation to different intermediaries and target groups. But, we need also to acknowledge the very immediate and resource limited context within which many intermediaries operate. As one practitioner pointed out: ‘success is survival and keeping our head above water’. The question of success and what it would constitute and how would we know frequently lingered throughout the workshops. This was hardly a surprise given the wide variety of issues and agendas being promoted by different participants as part of contributing to something called energy efficiency and behavioural change.

10. Situating the role of intermediaries in relation to policy landscapes

Energy intermediaries in Europe are today under increasing pressures to support national states and local governments in the active reconfiguration of energy systems in response to issues like climate change and energy dependency. Critically, there are likely to be intensified requirements for the capacity to develop managed and purposive transitions in the social and technical organisation of energy systems. Intermediaries are thus expected to accomplish more than isolated projects; they are expected to promote energy systems transitions by co-ordinating and integrating diverse local actions. Demands for more coordination and integration are not, however, always accompanied by more resources and institutional support for intermediary organisations working ‘on the ground’.

The ten critical issues discussed above very much emphasise the need to understand the diversity of energy demand-side management practices in their contexts. For the intermediary, it points out the importance to actively engage with contexts. Below, we discuss both the five themes and the ten critical issues.

5.4 Summary: conditions for successful energy demand-side management

We now continue with a discussion of both the themes and the critical issues from the meta-analysis and the workshop respectively, in order to draw some conclusions on the conditions that are relevant to consider for intermediaries. Tables 5.3 and 5.4 summarise the five themes and the ten critical issues respectively.

Table 5.4 *Themes relevant for successful energy demand-side management programmes (meta-analysis)*

<p>Taking context on board</p> <ul style="list-style-type: none"> - Governmental support for energy demand-side management programmes (direct or indirect) - Opportunities to link up with prior or ongoing programmes and policies - Opportunity to link to other current problems (e.g. unemployment, economic downturn) - Not having to cope with mixed and irreconcilable policy goals - Tradition of active civic engagement - Market conditions that encourage or discourage the motivation and willingness to change energy behaviour
<p>Timing your intervention</p> <ul style="list-style-type: none"> - Making use of a window of opportunity (e.g. a neighbourhood reconstruction; making use of the 'All Gore effect which created momentum for climate change issues) - A motivated target group. - Finding synergies with regional development initiatives
<p>Making the intervention meaningful to the target group</p> <ul style="list-style-type: none"> - Knowing the target group. - Tailored message - Communication channels and formats (in line with interest of target group) - Communicate a range of co-benefits if they resonate with the target group - Aligning expectations (of intermediary, target group members and other stakeholders) - Focus on/target a multiplicity of benefits (in line with notion of multiple identities and needs of target group members) - Closeness of programme manager and stakeholders to each other and to target group. - Trust - Peer-to-peer communication and social pressure
<p>Making use of the power of long-term networks</p> <ul style="list-style-type: none"> - Make use of existing networks - Reinforcement of existing networks - Build new networks - Sharing findings and lessons (during the programme and afterwards)
<p>Balancing between central planning and bottom-up processes</p> <ul style="list-style-type: none"> - Learning by doing, interaction between users, programme developers and policy makers - Continued monitoring and evaluation - Taking the end-user as starting point - Careful design/balancing - Allowing adaptation of content and goal of the programme

Table 5.5 *Critical issues in designing and implementing successful energy demand-side management programmes (based on workshop meetings)*

1. There is no one single critical failure or success factor
2. Understanding, managing and balancing different combinations of issues
3. Beyond a one size fits all approach
4. Implementing on the individual level, working on the community level
5. Understanding your own organisational context and resources
6. Knowing your target groups
7. Engaging with a wide variety of diverse social interests
8. Making messages meaningful
9. Evaluating and learning
10. Situating the role of intermediaries in relation to policy landscapes

The practitioners' workshops placed the practitioner intermediaries in the centre of attention, revealing their diversity in terms of type of organization, background, size, orientation, etc. The workshops highlighted that intermediaries' roles are not given, but very much dependent of and embedded in the particular context they work in and dependent on the sort of resources they can draw on. Both the context of the practitioner and the context of the end-user was highlighted, the latter more in the case analysis. Both the meta-analysis and the practitioners' knowledge point out (to a certain extent) similar important themes that we will briefly discuss.

Interdependent conditions: when talking about critical conditions, it is clear that factors or conditions do not operate in isolation but affect one another (e.g. finance, staffing but also government support and extent to which government is considered trustworthy by citizens). In the workshops it was emphasized that there is no single critical condition (no silver bullet). Moreover, practitioners continued on this point by emphasizing how each new project presents them with different combinations of issues, conditions and actors that are relevant in the context of that particular project. In other words, a one-size-fits-all approach is not desirable. This is supported by the case-analysis that concludes that taking contexts into account is important. Further, it suggests that considering bottom-up approaches, alongside top-down ones, can help intermediaries to learn about this context in interaction with relevant stakeholders and target group members.

The attention for the end users/target groups is apparent both as an outcome of the case-analysis and as an outcome of the workshops. Emphasis was placed on the fact that the target group should be addressed in its diversity of roles and identities, not as a homogenous group, which can e.g. be achieved by communicating a range of co-benefits. Making messages meaningful, an issue discussed frequently in workshops, relates very much to the issue 'meaningful to the target group' (a theme from the meta-analysis, but also reflected in theory). The former is more specifically about communication - e.g. the need for new (multiple) narratives to replace negative messages - while the issue of making your project meaningful to the target group adds to that the need to align expectations, enable multiple benefits (acknowledging multiple identities of target group members), and the issues of building trust and closeness in the network around the energy demand-side management project.

The workshop pointed out the need to engage with diverse 'things', which has to do with network building - whereby a project engages with and builds on existing networks and/or builds new networks to support the behavioural changes. Through these networks, different knowledge and competences can be engaged in the project, learning can be facilitated, and resources from different social arenas can be mobilised.

The issues of evaluation and learning were brought up during the workshops as essential. Particular attention was given to the possibility to make learning a more structural routine, whereby the need was expressed for more effective and appropriate evaluation and learning about intermediary practices and about the intermediary context (e.g. networks, resources, communication). The importance of learning was also evident from the case-analysis, where sharing findings and lessons (part of issue of networks) was emphasized. The problem, both in various cases and according to practitioners in workshops, however is the immediate and resource limited context within which many intermediaries operate. How to trigger learning processes, taking account of the time and resource limitations, remains a difficult question that needs to be addressed.

The issue of the broader institutional and policy landscape in which intermediaries operates was discussed in various workshops and summarized in point nr. 10. In the case studies, attention was awarded to the broader national and local contexts as well –which demonstrated the need for fine tuning programmes to fit ongoing developments and trends. The practitioners’ workshops were particularly helpful to set out how different and sometimes contradicting trends affect the operating environment for intermediaries. The difficulty is of course how to operate in and anticipate on this. Learning and reflection appear crucial again here. The workshop discussions addressed interdependencies and showed once again how intertwined (and difficult to disentangle) various conditions are.

Overall, these empirical findings resonate with the socio-technical theoretical angle as discussed in section 2.1. Attention for end users, intermediaries, other stakeholders and contextual variables stood out as crucial in the empirical findings as well. In addition, the empirical work has furthermore proved to be helpful in the formulation of themes or issues that we need to address in concrete situations in order to arrive at more successful energy demand-side management practices.

5.5 Conclusions: interaction schemes crucial to success

Information about end users’ needs is highly contextual, tacit and difficult to transfer from one site to another (Von Hippel, 2005). Therefore, interactions are needed between experts, designers, policy makers and end users. This notion has given rise to various methods and tools for user involvement - e.g. field studies, participatory design and user participation, etc. The empirical evidence presented in this chapter only confirms the importance of interaction and learning - in order to arrive at energy demand-side management programmes that match with the context in which they are located (so that they can actually become embedded). It also reveals that we need to take into account the context of the energy intermediaries delivering the programmes, pointing out that adagio ‘there is no one-size-fits-all’ applies not just for end users, but also for intermediaries. The discussion on relevant interaction schemes has highlighted the fact that neither one single approach nor any set combination of approaches will deliver the desired outcomes for sure. Although it is clear that a combination of interaction schemes is useful - to actually be able to address multiple relevant themes - the exact choice and ‘content’ of the overall approach of a programme has to be tailored to the specifics of the project context, the intermediary, the end users and other relevant stakeholders.

The contours of a CHANGING BEHAVIOUR model on energy-related behavioural changes are becoming visible now. For instance this model addresses specific behaviours (instead of general behaviours), within context (instead of decoupled from contexts), while explicitly taking account of the social context surrounding and influencing the targeted energy behaviour (instead of focusing on the programme characteristics). In addition, this model placed intermediaries central, acknowledging how they are part and parcel of the context in which and with which they work.

When recalling the themes and critical issues discussed, as well as the findings regarding the uptake of intermediary approaches to learning, a central concept that stands out is interaction:

- interaction between the intermediary and the end users
- interaction between the intermediary, end users and other stakeholders
- interaction between the intermediary and other contextual variables to learn about the specificities of the context

The outcomes of the multiple case study and the workshops have been discussed with the practitioner-partners of the consortium and were then translated in a set of ‘activities’ intended to help intermediaries in addressing these themes. These activities are tested and refined by the practitioner-partners in pilot projects, and subsequently further developed into a context-sensitive toolkit for designing and implementing energy demand-side management programmes. The final tying together of building blocks discussed in the previous chapters is done in the next and final chapter.

6. Building blocks for a practical energy demand-side management model

6.1 Introduction

This document (Deliverable 5, D5) has evolved from the work done in Work Package 2 and 3 of the CHANGING BEHAVIOUR project. CHANGING BEHAVIOUR is a project that aims to support change in energy use and energy services, by applying social research on technological change to practical use. By energy demand side management we mean an organised set of programmes and initiatives that primarily aim to change the quantity and patterns of energy consumption on end-user level, by initiating interaction schemes between end-users and programme initiators to motivate and facilitate end-user energy demand reduction.

CHANGING BEHAVIOUR has a particular interest in programmes involving intermediary organizations (which include a variety of non-governmental organizations, public-private partnerships and regional or sectoral networks). In addition, CHANGING BEHAVIOUR focuses on small-scale energy users: households, schools, the building sector, municipalities and small and medium-sized enterprises (SMEs).

The overall aim of Work Package 2 is to develop a theoretically rich yet practicable model of the sociotechnical change involved in energy demand-side management programmes. The chapters 1-5 presented the comprehensive body of knowledge that so far has resulted from theoretical investigation and empirical research, the latter involving case studies and a variety of interactive encounters between researchers and intermediary practitioners. This chapter presents the basic building blocks for a practice-oriented model on energy demand-side management and concludes with general recommendations for intermediaries and policy makers. The building blocks consist of the main lessons learned from the preceding chapters and give a concise overview of the knowledge in which the conceptual framework and toolkit are grounded. A full-fledged conceptual framework is presented in Deliverable 6 and the practical context-sensitive toolkit will be available online by the end of 2010.

6.2 Notions central to CHANGING BEHAVIOUR

A central thread running through our work is the acknowledgment of the need for a more interactive, user-oriented and contextual approach to demand-side management. Until now, the dominant approach has been based on a belief in the unproblematic transfer of self-contained expert knowledge on energy efficiency solutions into end-user practices (Guy and Shove, 2000; Wilhite et al., 2000). Changing end-user behaviour is much more complex than that. Change is a process. Firstly, we need to look at how the intermediaries and their practices *interact* with the 'everyday' practices of energy end-users. Secondly, we need to shift the focus from isolated end-users to end-users in context, i.e., embedded in a social environment that facilitates and constrains their behaviour and action. Thirdly, other stakeholders are also part of the context that intermediaries have to work with and in. Particular attention is thus awarded to the interactions between intermediary practitioners, end users and other stakeholders.

6.2.1 Intermediaries

Energy intermediaries seek to intervene in energy systems, through e.g. building energy efficiency; promoting low energy buildings, via replacement product programmes (e.g. energy efficient appliances), by raising public awareness, and through achieving the visibility of alternative ways of producing and consuming energy (e.g. pilot projects). They encompass a wide variety

of organizations, including government or semi-government energy agencies working at different scales of governance, Non Governmental Organisations (NGOs), agencies sponsored by utilities, Energy Service Contracting (ESCOs) etc. Intermediary practitioners perform functions such as the provision of energy advice and advice centres; consultancy activities; energy audits; project initiation, management and coordination; demonstrations; technology procurement; installation; promotion; advocacy; lobbying, dissemination and awareness raising; organising campaigns; education; training and courses; and network-building. Different intermediaries function over timescales that can vary from a short-term project or initiative (e.g. six months) to something that is much more long-term and programmatic (e.g. 10 years and upwards). Intermediaries can be characterised in terms of three aspects of their mediating function:

- They mediate between production and consumption rather than focusing solely on production or consumption issues.
- They mediate the different priorities (of different investors, stakeholders) across different levels (e.g. between householders and municipalities)
- They mediate not only between different priorities but also between the embodiment of these priorities in plans or policies and their application.

6.2.2 End users, target groups and stakeholders

CHANGING BEHAVIOUR focuses on four different (partly overlapping) end-use sectors: households, small and medium sized enterprises (SMEs), the building sector and municipalities. In each of these sectors, a significant proportion of energy efficiency improvement potential is not realized. This is often called the “energy efficiency gap”, i.e. the difference between the actual energy efficiency and the higher level of efficiency that would still be cost-effective. Overall, each of these end use sectors has its particular issues which may encourage or constrain opportunities for energy efficiency and behavioural change. The target group involves people from these end use sectors. Other stakeholders can furthermore be identified which may affect the opportunities, constraints, chances on success of a programme, such as local or regional government, banks, housing corporations, etc.

6.2.3 Context

Apart from various stakeholders and end users, the context in which a energy demand-side management project is going to be started involves a wide variety of physical (geographical, technical), institutional (policies, regulations), cultural (norms, values, traditions), political (ideological, local political), economic and social (e.g. existing social networks) conditions which may influence the energy demand-side management initiative for the better or the worse. This environment spans from the local and immediate context of a project or programme, to the larger regional, national and global context.

Understanding the context is central for a successful programme because the effectiveness of various intervention instruments is dependent on particular features of the context that make them effective (Pawson and Tilley 1997). Moreover, changing the context of the end-users is the central medium for programme managers to change end-users’ energy related behaviour. This can imply changing the information environment of the end-users, changing the financial incentives of the end-users, or changing the social environment by introducing new support mechanisms or pressures.

6.3 Building block 1: Lessons learned from theory

From the review of academic research on energy demand-side management and energy conservation, the main lines of research in economics, psychology and social psychology and sociology all bring some new elements into our understanding of energy use. We highlight the most important conclusions of our theoretical discussion from chapter 3 – summarised by Table 6.1.

In the current literature, economic and psychological approaches have been dominant. They primarily highlight factors that relate to *information processing* and the various aspects that influence energy related behaviour on the *individual level*. We would however argue for taking seriously the broader social and institutional context in which these individuals are embedded (table 6.1, row 1). From these perspectives, the intermediary is usually perceived of as being rational and ‘outside’ the system that he or she is trying to manage. The picture of a rational programme manager, who is trying to change the behaviour of ‘less rational’ energy end-users is problematic in that it would mean that intermediaries know more about ‘everything’ (not only energy efficiency issues), including the everyday life and all the practical issues that particular end-users experience. Our view contextualises an intermediary as part of society and working within a certain social structure. As resources, an intermediary can draw on scientific facts (about energy use and behaviour), but also on resources such as their relationships with energy end-users and other stakeholders, their own emotions and motivations, their familiarity with local contexts, and their ‘tacit’ skills and knowledge based on practical experience (table 6.1, row 2). In addition, we consider end users as heterogeneous (table 6.1, row 3).

While including understandings from economics and psychology, we would coin our overall perspective rather as sociotechnical. When addressing issues and considering how to motivate actors to save energy (table 6.1, row 4 and 5), we need to address both the individual and the social levels of change, while acknowledging that these changes also take place on different time-scales. Changing the behaviour of an individual by building on the most appropriate motivations, supplying facilitating conditions and reinforcing the change process through positive feedback is a kind of ‘social engineering’ intervention within a bounded time and space. Issues like securing the resources for this process, gaining social acceptance and support, and making sure that the change process continues after the intervention – and eventually becomes a part of the social structure and culture – are relevant on a broader and more political scale. Additionally, they cannot be addressed without allowing for conflicts and diverse viewpoints, negotiation and ‘translation’ of energy conservation in terms of social interests, or the build-up of new social networks and institutions. Thus, the individual change process is nested within – and interacts with – a broader societal change process. When considering interventions and instruments (table 6.1, row 6), the interrelatedness of instruments is important to consider, seeing them as part of an overall strategy that addresses both the individual and the broader societal changes needed. Programme evaluations should address the issue of learning (Table 6.1, row 7). Learning processes may take a long time and span across multiple consecutive programmes. It is important to try to capture processes of social learning, i.e. processes in which the intermediary learns in interaction with the end-users and other stakeholders, and in which this learning changes *both* the contents and context of the programme. When intermediaries are aware of the (explicit and implicit) theories that they base their projects on, they can also test whether the assumptions of these theories are valid in the contexts in which they operate.

Table 6.1 *Summary of CHANGING BEHAVIOUR methodology*

1. Key units of analysis in energy-related behavioural change	<ul style="list-style-type: none"> - Actors: these can be individuals (that may include ‘internalised others’, via social norms); in addition, these can be e.g. organizations, target groups. Actors can form networks. - Social practices: routinised behaviours enabling/constraining the scope of action for individuals - Broader context in which behavioural change takes place: society at large; systems of provisions (including markets), institutions (formal and informal rules, norms); sociotechnical networks (configured around technologies)
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2. Logic of action ³⁸ of intermediary practitioners/ programme managers	<ul style="list-style-type: none"> - Acknowledgement that programme managers come in different sorts: they may act according to rational calculation, or according to ‘rules of appropriateness’ (norms and conventions). They may be more or less reflexive. In any case, they are part of the society that they intervene in. Their choices and interventions are structured by the particular social-institutional context that makes part of.
3. Logic of action of end users	<ul style="list-style-type: none"> - End users are neither homogenous nor static in their logic of action. Multiple ways of thinking and acting can be distinguished, as well as multiple motivations for action (e.g. calculated self-interest, altruistic, rules of appropriateness’ (norms and conventions). In addition, their behaviour (and changes in this) is structured by the particular social-institutional context that they are part of. Through their actions, actors can influence this context.
4. Issues pertaining to energy efficiency	<p>Multiple issues:</p> <ul style="list-style-type: none"> - perceptions of risk, of long payback times; limited availability of capital - Market failures: high information costs, externalities (e.g. when environmental costs are not reflected in current prices); transaction costs (e.g. costs of information), agency issues (e.g. tenants cannot force their landlord to install energy efficient applications). - psychological issues (lack of feedback or information processing capacity; lack of social pressure; lack of perceived self-efficacy; lack of skills & opportunities; habits; helplessness) - (social) system issues (discouraging energy efficient behaviour) that relate to the characteristics of our present system of provision: prevailing infrastructures, institutions and networks (and concomitant power relations), ‘ways of doing’ , norms, culture
5. How can actors be motivated and mobilized to save energy?	<p>By addressing issues at different levels.</p> <ul style="list-style-type: none"> - market failures: providing cheaper information, new institutions, incentives - information, feedback and (social or economic) incentives in suitable formats & combinations <p>By aiming a strategy at social interaction and mobilisation:</p> <ul style="list-style-type: none"> - collective action - interaction, negotiation and reorganization of sociotechnical networks (networks around innovations and the technologies that are part of these innovations) - capacity building
6. What intervention instruments (with relevance to energy demand-side management programmes) are relevant	<ul style="list-style-type: none"> - Measures that transfer risk or that address some of the transaction costs & agency problems (e.g. performance contracting, energy service contracting) - Instruments to correct market failures, e.g. financial instruments, information (audits and feedback) and combinations of instruments - Instruments that address <ul style="list-style-type: none"> - pre-disposing factors (motivation, knowledge, norms and self-

³⁸ ‘Logic of action’ here refers to particular goals, strategies, and bases of evaluation that are common in a particular context (Friedland and Alford 1991). A logic of action embodies certain goals or values, appropriate means to realise those goals or values, and criteria for judging success that appear to be mutually consistent to those following that logic. An economic logic of action, for example, involves utilitarian reasoning, efficiency and means-ends calculations.

	<p>efficacy)</p> <ul style="list-style-type: none"> - enabling factors (providing means for change: resources & skills) - reinforcing factors (mobilization of resources and strengthening intentions - feedback) <ul style="list-style-type: none"> - Strategies that take account of the broader social system in which current practices are embedded and that aim at transforming current systems. Focus on interaction between promoters of solutions, end users and other stakeholders. - Learning from bottom-up alternatives (e.g. new systems of co-provision) - Encouraging processes of learning (group dynamic, user participation and flexible design) - Market transformation, transformation of urban infrastructures
7. How to evaluate successful action/ successful interventions?	<p>Evaluate success by addressing:</p> <ul style="list-style-type: none"> - efficiency & effectiveness (energy saved, cost-effectiveness; 'free-rider' and rebound effects; social welfare) - lasting behavioural change, potential for changes in the social system - learning processes

6.4 Building block 2: Relevant lessons from existing guidelines and instruments

A review of the six guidelines on energy demand-side management programmes resulted in quite some concrete lessons that are summarised in Table 6.2.

Table 6.2 *Relevant lessons for CHANGING BEHAVIOUR*

Issues	Relevant lessons
Context factors influencing success of interventions	<ul style="list-style-type: none"> - Various contextual factors can be identified, relating to social, political, economic, cultural and physical dimensions on multiple levels - Context factors may be within or outside the scope of influence of the intermediary. Likewise, they may be within or beyond the scope of influence of the targeted people. - Interventions should be context-specific. - Energy demand-side management project should be context-sensitive.
Design & programme characteristics influencing success of interventions	<ul style="list-style-type: none"> - A good prior analysis of the problem and what & who influences is crucial - Monitoring and evaluation should be planned from the start - Not only need to assess the necessary changes in behaviour but also how susceptible to these type of changes the targeted people are - Addressing influential issues is important - Address habits, not only norms - Distinguish between conscious (active, choice) and unconscious (passive, habit) behaviours. Unfreezing people from their unconscious behaviour - then convince them to change; once the new behaviour is adopted, this needs to be 'refrozen' again into a (new, positive) habit. - Knowing the target group: learn about the interests, habits, social links and preferred communications channels of the people that you want to reach. - Tailoring the message to the target group

	<ul style="list-style-type: none"> - Targeted audience and other key stakeholders are at the heart of the change process and should be involved from the start in defining and redefining the problem through a continuous cycle of action and reflection. - Enable people to act: people want to do well; enabling them, and helping them to understand and trust that they are making a difference. - Look further than 'the usual suspects' (look further than those people who already are open to climate change issues, etc). - Recognise that change takes time
Drawing on theory, background knowledge, learning and follow-up	<ul style="list-style-type: none"> - Draw lessons from theory and/or other projects - Involve people that are knowledgeable on behavioural change timely - A project clearly grounded in a (theoretical) knowledge base makes it possible to assess success and to determine if objectives have been achieved. - Ongoing and/or follow-up activities are important: learning and cross-fertilization is very important, but difficult. - Learning captured and fed back from the change process should influence subsequent policy/interventions
Communication	<ul style="list-style-type: none"> - Two-way communication between intermediary and target group is important. - Messages and information should be simple, clear, specific, consistent - Choice for channels of communication depend on your target group - Assess the benefits of connection to broader 'climate change' messages carefully. - Make use of events like the All Gore effect to make your message more appealing, interesting and urgent. - Create continuous feedback to target group - Address the benefits of new actions, but also the real losses people are suffering as a result of their current unsustainable behaviour. - Connect to positive aspirations like home improvement, self-improvement, green spaces or national pride - Bring the programme and its objectives close to people - Make solutions sound more heroic. - Use visual material (seeing is believing). - Reminders (repetition) are important. - Communications must be sustained over time to achieve lasting change. Partnered delivery of messages works- particularly for projects that are large, complex and have many stakeholders - Use a trusted, credible, recognised voice. - People do not learn or change alone but through social interaction.
Timing	<ul style="list-style-type: none"> - It is easier to influence an attitude that has not yet formed than changing an existing attitude. - Make use of 'windows of opportunity' – issues that are topical to people at the moment or linking up with broader policy initiatives or regional economic development programmes are an example. - Exploit change moments: getting married, moving, new job, having a baby or retiring.
Combining factors/instruments	<ul style="list-style-type: none"> - Combine tools and instruments in order to be able to address the variety and complexity of behaviour changes. Feedback should always be part of this mix.
Intermediaries	<ul style="list-style-type: none"> - Recognise the crucial role of intermediaries - Intermediaries translate the scientific messages into practical and obvious advice - Intermediaries are part of the context they try to influence

Several guidelines discussed refer to and build on the PRECEDE-PROCEED model on behavioural change by Green & Kreuter (2005). Although the CHANGING BEHAVIOUR understanding of behavioural change has some similarities with this model, there are also some differences that relate to the explicit sociotechnical approach we take – which awards an important role to the context in which energy demand-side management practices takes place. We understand the relationship between individual behaviour and context as reciprocal: while individual action is structured by context, context can also be changed by the actions of individuals. We can only (partially) control and influence what an individual sees and reads, not what this individual makes of it – so influencing behavioural change always is indirect. Another crucial difference is that we do not take the intermediary as an external change agent, but as an actor with its own characteristics (that vary) that is part of the context it is working in and with.

The CHANGING BEHAVIOUR behavioural model addresses:

- specific behaviours (instead of general behaviours)
- behaviours in context (instead of decoupled from contexts)
- the social context surrounding and influencing the targeted energy behaviour (instead of focusing on the programme characteristics)
- the social (and institutional) context as a source of predisposing, enabling and reinforcing factors for change (instead of distinguishing between external and internal factors, delegating external factors to the context and the internal to the individual)

In the discussion on instruments to influence behavioural change, it was emphasized that for individual projects, a much more detailed analysis of the specific context is always needed to tailor the instruments to that context. Otherwise, the instruments are likely to yield unexpected or unintended consequences. Table 6.3 provides a general summary of context factors that influence the implementation of the instruments discussed, as well as the behavioural context factors that are addressed by the instruments

Table 6.3 *Instruments and context*

Instrument	Main context factors of the instrument/programme influencing success	Main context factors of the target group addressed by the instrument	Targeted behaviour
Financial instruments	Availability and quality of technologies provided Knowledge of the target group about support scheme	Availability of capital for investments Perceived risks and benefits of various courses of actions	Efficiency/investment behaviour
Energy service companies, energy performance contracting and third-party finance	Knowledge: Certification and training of service providers Institutions: Development of standard contracts as well as measurement and verification systems for savings Banking system, availability of credits Trust in service providers (values)	Lack of knowledge about opportunities Institutional rules that lead to split incentives Different priorities of energy users or unwillingness to incur debt (values)	Primarily efficiency/investment behaviour, but when instruments are combined curtailment behaviour is targeted as well
General information and education	Changes in the context of the target group that	Knowledge (why and how to change be-	Curtailment behaviour, although effi-

campaigns	make them more open for information (institutional context, value context) Institutional context: Other programmes that the message can be linked up with.	haviour), values	ciency/investment behaviour can be targeted simultaneously
Metering and feedback	Technical infrastructure Institutional context: Payment systems, obligation to introduce smart-meters, status of metering market Value: Cultural differences in preferences for presenting information	Knowledge about one's own energy use Visibility of energy use Feedback on the effectiveness of various actions	Curtailed behaviour, although efficiency/investment behaviour can be targeted simultaneously
Energy audits	Institutions: Audit obligations Knowledge: Availability of qualified and trained auditors	Knowledge about one's own energy use and opportunities for improvement Visibility of energy use	Primarily efficiency/investment behaviour although auditing curtailed behaviour can be part of the audit
Energy advice	Institutions: Funding of advice Value: independent evaluation and establishing a robust evidence base for the value of advice Knowledge: Important for people to understand the role of advice	Knowledge, values Personalised and context-relevant information delivered at an appropriate time and place	Curtailed behaviour, although efficiency/investment behaviour can be targeted simultaneously
Negotiated agreements, voluntary programmes and commitments	Institutions: Need for supporting instruments and regulations Ability to enforce participation by the signatory Social control to control the implementation of the programme Structure of the industry.	Institutional context Social pressure and support Peer recognition	Curtailed behaviour, although efficiency/investment behaviour can be targeted simultaneously

Overall, a combination of instruments is often conducive to success. When combining instruments into a strategy or integrated programme, three aspects are important:

- a process of (participatory) goal setting is needed to choose target groups adequately
- determinants of target groups' behaviour have to be addressed to design the different steps of a programme
- instruments of different kind need to be combined into a policy or programme (instrument bundles)

Chapter 4 pointed out three types of instruments which should be designed in combination with other supportive interventions.

- **Financial Instruments:** in combination with informational incentives. End users need to understand the benefits of the programme and to be convinced of the trustworthiness of the information provided. In addition, end users may need other forms of assistance, such as technical and organisational support to make use of the financial incentive.
- **Metering and feedback:** metering and feedback are related to audits and advice programmes. Energy audits provide detailed information on energy use and savings potential by identifying cost-effective ways to save energy. Advice programmes aim to provide target groups with skills and solutions for energy related problems. These different instruments have related goals and can be linked together (e.g., billing feedback can be more useful if linked with advice on how to reduce energy, and audits usually provide not only data on energy use, but also advice on how to reduce it).
- **Negotiated agreements and voluntary commitments:** in general, negotiated agreements are considered to be more effective if they include supporting instruments and regulations.

6.5 Building block 3: lessons learned from our meta analysis and workshops

On the basis of chapter 5, we propose the following relevant themes to be considered when preparing, designing, implementing and evaluating energy demand-side management programmes:

1. Context and timing: the project is not going to be implemented in a ‘void’, so it is important that the context and timing issues are addressed and understood. These involve predisposing (e.g. what motivations people have at a certain time), enabling (e.g., what they are capable of doing), reinforcing (are there context/timing issues that can support the change, like the Al Gore effect?) factors. The last point relates to durability of the intended changes.

2. User orientation (meaningful to the target group) is about understanding the target group and building up a meaningful relationship with them. It is about engaging the end-users (‘target groups’) as active players, who may also have their own opinions of what is meaningful. Predisposing, enabling and reinforcing factors are all addressed.

3. Set goals vs. flexibility (bottom-up vs. top down), relates both to the target group and other stakeholders. By involving users, intermediaries may need to change their original plans to adapt to needs and existing initiatives among relevant stakeholders. Working together with stakeholders that are influencing the target group may lead to better results. Flexibility to adapt to target group needs and requirements is accomplished through an ongoing process of learning about the (changing) determinants of behaviour and adapting the project to these. Predisposing, enabling and reinforcing factors are all addressed.

4. Creating networks. Interventions or programmes usually have a fixed duration but the aim is to create networks and social structures that support the new behaviour and make it durable also after the programme ends. Creating networks refers explicitly to making the change durable by supporting the evolution of existing structures, networks and institutions. So in that sense it is primarily about reinforcing change. But in other ways networks can also be predisposing and enabling (e.g. providing resources, including more competencies).

5. Learning in interaction with stakeholders: programme managers need to learn, the target groups need to learn, both need to mutually adjust, and society as a whole needs to learn and adapt to the new behaviour (in order to accomplish ‘systemic change’). This kind of learning is a prerequisite for the introduction of any durable new practice. This theme relates more to rein-

forcing than to other determinants, but it can also involve predisposing factors like knowledge and self-efficacy and enabling factors like skills.

The discussion on different interaction schemes resulted in the formulation of general pros and cons (table 6.4).

Table 6.4 *Pros and cons of particular approaches to user interaction in energy demand-side management programmes*

Approach to learning about end-users	Pros	Cons
Surveys and interviews	<p>Systematic approach to data collection</p> <p>Surveys provide the possibility to poll representative samples</p>	<p>May not always feed into programme design</p> <p>Surveys may be designed to confirm existing preconceptions, may fail to bring up new insights</p> <p>Conducting good research may be expensive and require specialized skills</p>
Prior research, particular theoretical perspectives	<p>Sound theoretical base can guide observations and help to make sense of energy-related behaviour and to identify factors potentially influencing it</p>	<p>Strong commitment to prior findings or theories may lead to overlooking contextual particularities</p> <p>Overly theoretical background can lead to complex and confusing designs</p>
Experience from prior projects and similar examples	<p>Sound experience-base creates confidence and practical skills/solutions that are difficult to codify</p>	<p>‘Competence trap’: overconfidence and failure to learn new skills in new contexts</p>
User-driven project (or pilot project)	<p>Users know about their needs and circumstances and can contribute to context-tailored and user-friendly designs</p> <p>Users are motivated and engaged from the start, thus ‘less work’ is left for the programme manager</p>	<p>Users may not be fully aware of their behaviour and all the factors underlying it</p> <p>‘Up scaling’ from small user-driven pilots to broader groups of end-users can be difficult</p>
Familiarity and informal interaction with the target group	<p>Informal interactions allow for a rich exchange of information (including non-verbal information)</p> <p>Familiarity creates trust and mutual confidence</p>	<p>It can take a lot of time and commitment to build up the level of familiarity needed to execute a successful programme</p> <p>Contacts may be biased: some users are more familiar than others</p>

As mentioned earlier, neither one particular approach nor combination of approaches will automatically deliver the desired outcomes. Combining approaches is useful - to actually be able to address multiple relevant themes - the exact choice and ‘content’ of a programme’s overall ap-

proach has to be tailored to the specifics of the project context, the intermediary, the end users and other relevant stakeholders.

The choice for a particular approach may also reflect the needs and resources of the programme: large-scale programmes addressing broad and heterogeneous target groups naturally need to gain representative data on characteristics of the target group (obtained through e.g. surveys), whereas smaller, more 'local' projects can build on more informal experiences – and in fact, must do so due to resource constraints.

Yet programmes building on more 'distant' resources, such as surveys, prior theoretical concepts and previous research are usually designed more from 'top down'. This type of planning approach implies a clear separation between research, design, implementation and evaluation. The other type of programmes builds more on practical experiences, informal contacts and initiatives taken by the users (or part of the users) themselves. Here, the planning approach is usually more 'bottom up' and less tightly planned. Small pilots or feedback and ideas gained from stakeholders can change the course of the programme, and research, design, implementation and evaluation occur more concurrently.

A continuum can be drawn between more 'bottom-up' types of projects that are grounded in user needs and experiences, and more 'top-down' projects that are grounded in preconceived goals and a more 'distant' approach to steering energy use. The 'top down' projects usually try to tackle large problems and address more 'difficult' end-users groups, whereas the more 'bottom up' projects build on, or at least interact more closely with end-users who are already motivated to change their energy behaviour, but merely require some support for this.

6.6 Further work and reporting

This chapter has presented the basic theoretical and empirical knowledge in which the CHANGING BEHAVIOUR conceptual framework is grounded:

- background theory and general concepts & notions
- lessons learned regarding:
 - o useful guideline-advice
 - o instruments for energy demand-side management practice
 - o general themes that are crucial (but often neglected) to consider
 - o Interaction schemes specifically addressing interaction between intermediaries, end users and other stakeholders.

The next step is to formulate the CHANGING BEHAVIOUR conceptual framework – which can be viewed in Deliverable 6. Furthermore, the practical elaboration of into a context-sensitive toolkit is underway and will be finalised the end of 2010. This toolkit will be made available online.

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