



WP3: Specifications of the empirical studies

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"Domestic Energy Use" **Main barriers and drivers towards an energy-related behavioural change**

by

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1. General introduction of the WP3

The BARENERGY Project is developed within the seventh Framework Programme of the European Union, Theme 5: Energy. The objective of the BARENERGY Project (BARriers for ENERGY changes among end consumers and households) is to develop methods to identify the relevance and strength of various barriers for energy behaviours changes among end consumers and households, and to discuss how activities from political authorities, energy producers and NGOs can overcome these barriers.

The Work Package 3 consists in “Specifications of the empirical studies”.

1.1. Objectives of the WP3

The objective of WP3 is to collect the most relevant results provided by social sciences which have already shed some light on these barriers and levers in the field of energy-related behavioural changes so as to propose some “analysis dimensions” (“empirical specifications”) for the three next Work Packages (WP4-5-6, empirical studies).

To do so, the teams taking part in WP3 carried out a collaborative review of empirical case studies on energy-related behaviours, barriers and levers toward reducing the energy consumption, and the initiatives already taken to reach this objective.

This empirical state-of-the-art document will serve as a base for the next work packages (qualitative stakeholder interviews, quantitative survey and consumer focus groups), in that it helps designing protocols for empirical studies, by defining some assumptions, asking appropriate questions, giving specific results for each country, suggesting which people to meet and identifying sample groups.

The state of art is defined as follows:

- on the 6 countries of the contributory teams (France, Hungary, Netherlands, Norway, UK and Switzerland);
- as regards the three following fields/topics: PP1: Domestic energy use (in particular heating and cooling of accommodations) ; PP2 : Household appliances (energy efficiency, turn down and shift off); PP3: Fuel consumption of cars (energy efficiency, drive less or more economically and renewable resources);
- more specifically, focusing the attention on the three following behavioural dimensions: energy saving within households (turn down/switch off), improvement of energy efficiency within households (purchase and use of energy-efficient appliances), changes to more sustainable and renewable energy technologies (shift energy carrier). => USE – PURCHASE – SHIFT;
- and focusing on the end-users behaviours (domestic consumers and households);
- integrating data from several social science disciplines, to have the best overall analysis on the energy-related behaviours;
- analysing the behaviours into three items: energy-related behaviours in general (practices and social representations of energies in each country), the energy-saving behaviours (who already saves energy, why, what kind of, with which current limits?), and the behaviours linked to specific initiatives (local trials), to understand if they have led to any behavioural changes.

This state of the art provides some specifications for the implementation of the empirical studies, for instance:

- Identify the barriers and drivers to assess their strength and relevance in the empirical studies;
- Propose some “windows of opportunity”, in the life-cycle to be tested in the empirical studies;
- Identify some social and demographic characteristics, some lifestyles that support or slow down the behavioural changes and to investigate in the studies (strategic groups);
- Investigate the “gender questions”;
- Identify the stakeholders that households relate to the energy savings.

To do so, we proposed a collaborative work divided up into four stages:

- Each contributory team makes the review of the scientific literature it considers the most important and the most relevant for its country and makes a summary (one-page document) [April-May, 2008];
- The Leading team of the WP3 studies and analyses these documents and proposes a general outline for each position paper [May-June, 2008];
- The contributory teams meet for a mid-course workshop to debate on the outline, on the first results and validates the state progress [June 26th, 2008];
- The leading team writes down the three position papers, asking contributions to the contributory teams [July, 2008], and then subject these documents to the latter for rereading, comments and validation [August, 2008].

It was decided to work in a collaborative way between teams, to make the review of the documents. As a matter of fact, the objective is not to get an exhaustive state of the art per country, but rather a variety of approaches and of study purposes, to provide action points for the teams involved in the studies/surveys. The contributory teams have focused on disciplinary competences, and therefore covers a large social sciences research field. Moreover, for language reasons and to prevent the "duplications", we decided that each country made the review in a priority way of the literature of its own country.

We thus analysed 125 "one-page documents", proceeding from 7 partners. [Refer to the references table in annex]¹.

1.2. Objectives of each position paper

Work package 3 is divided up into three "deliverables":

- Domestic energy use (D14)
- Household appliances (D15)
- Fuel consumption of cars (D16)

Deliverables D14 and D15 are complementary: in the project, it is specified that the first one concerns "the energy use in the built environment" (heating, cooling and renewable energies), and that the second one concerns the "use and purchase of appliances". We will see that the analysis of the documents led us to change the boundaries of this sharing-out: D14 concerns the main and general barriers and drivers towards energy-related behavioural change; D15 concerns the barriers and drivers per activity.

D16 concerns "fuel consumption of cars" (purchase, use of cars and change to renewable energy resources).

The three deliverables are focused on behaviours, to understand:

- What factors determine energy-related behaviours in Europe;
- What are the barriers preventing a behavioural change towards a reduction of household energy consumption;
- What are the drivers to promote energy reductions.

However, these behaviours are embedded in the political, economic, social, and material institutions, and we try to understand how this institution-individual interaction comes in variety of forms. [Refer to WP2, D11, *Theoretical and methodological clarifications*].

¹ These documents are mentioned in square brackets, with the name of the author, the publication date, and the team code. Moreover, we used additional references, which are not directly in the purpose of the request, but they help to specify it. The latter are mentioned in parenthesis. All the bibliographical references are at the end of this document.

1.3. Thread of the D14 and D15 position papers

D14 and D15 position papers have been implemented together, and the analysis shows that they seem to be very complementary.

The "one-page documents" underline two analysis levels of the energy-related behaviours:

- A "global" level describing what factors determine energy consumption, through social-anthropological, psychological and economic mechanisms allowing to explain the main tendencies of the current energy consumptions: this analysis shows why energy consumption is in the centre of definition of contemporary societies;

- However, to understand the barriers and the drivers for reducing (household) consumption, scientists suggest to disaggregate "energy behaviours" notion as well as "energy consumer" notion:

- * As a matter of fact, all the energy consumption behaviours are not determined by the same mechanisms, do not refer to the same barriers and to the same drivers. Which leads to the conclusion that there are behaviours easier than others which can be facilitated and consumption fields where the energy savings are more taken into account than in some others.

- * Moreover, there is not only ONE energy consumer, we have to "segment" the populations into social groups (depending on the social-demographic characteristics, on their values, on their lifestyles, etc.). The barriers and the drivers are also different according to these populations.

- * Finally, the behaviours of the energy consumers are not only due to the people themselves, but also to the cultural and political environment and to the infrastructures, to the technologies and to the information available in their environment.

All these reasons lead us to a systemic vision on the "energy-consuming behaviour" notion, that is to say which dissects the components of the system and makes the links between each other.

We thus chose to divide up the results into two parts:

- D14: general energy behaviours and main scientific theories related to them ;

- D15: disaggregation by social activities allowing to go more deeply in the barriers and in the drivers for each initiative and for each life field.

2. Understanding and explaining the energy behaviours as an issue

Today, the energy behaviours are considered by numerous researchers and politicians as an important research and action stake. As a matter of fact, they are still badly known, some people qualifying them as a "black box":

"The analysis of the individual behaviours thus remains the blind aspect of the prediction models of the national energy consumption" [Dujin, Poquet, Maresca, 2007/EDF-08]

But, energy consumption of European households (direct and indirect energy) related to housing and to transport are in the centre of major political concerns, in particular "the Environmental protection and the EU Kyoto obligations". Moreover, "the new energy price rise on the world markets and especially the oil prices, stimulated renewed interest in management demand". Finally, there is the question of the "supply security" (EU, 2005).

The understanding of household energy behaviours is thus an important scientific and political stake. There are several "fragmented" investigations, on a practice, on a social group, on a technology, on a legislative and regulation device, etc. But there is not yet an overall AND in-depth view at the European level of energy behaviours.

2.1. A necessary cross and multidisciplinary analysis

The question of the “behavioural changes” is an important issue. We are not going to solve this question in this report, but we’d like to define the limits of the state-of-the-art carried out.

First of all, an energy behavioural change may refer to several mechanisms: which of these could be said to influence change?

We have made the review of four main ways through which it may be possible to change energy consumption patterns:

- Decrease the global level of energy consumption. This refers to the problem of the carbon emissions, but also to the supply safety at the local level (some people are ready to change their daily habits in order to avoid the building of a very high voltage line next door). This behavioural change may appear through energy saving gestures (switch off the appliances), purchases of efficient energy appliances or more important investments (insulation and renovation works of the accommodation). These gestures and purchases may be more or less constraining (we will evoke this later on) but also meet political values (“de-growth” and “voluntary simplicity” movements, for instance);
- Consume renewable energy sources: this can be done buying green energy (the renewable energies are then centralised), or setting up at home equipment consuming renewable energy (microgeneration). The energy consumption is not necessarily low, but it is renewable, which refers to the short and long-term pollution problems;
- Change the structure, the consumption rhythm, while preventing the energy consumption when there are consumption peaks (load management). According to the countries, these peaks are more or less carbon emitters, this problem thus refers to the “energy mix” of each country. These changes are supported by offers of energy suppliers (tariffs) and by technical devices allowing a remote load management;
- Compensate one’s energy consumption financing projects aiming at decreasing the carbon emissions (carbon offset).

The two first issues are much more developed in the available social sciences researches. But the two last develop rapidly with new initiatives. Because of our methodology (literature review given by each team), we will mainly analyse the two first mechanisms in this report.

It is important to notice that the objective of change (that is to say the social-political context emitting a behavioural change “demand”) leads to different types of behaviour, “equipped” with different technologies or messages. For the different investigations to carry out, it is important to disentangle the different behavioural changes (with their political, technical, market implications, etc.) to try to have the channel of the barriers and of the drivers.

A recurrent question of the initiatives in favour of energy reduction is the durability of the behavioural changes. We will discuss this issue when we will refer to the barriers, the drivers and the initiatives (Part 3).

Wallenborn (2007) analyzes the link between behavioural changes and the concepts used by various disciplines of social sciences, by showing in particular that “theories are not politically neutral”. With this intention, he analyzes “the different ways of defining consumers and the powers that may consequently be attributed to them. A scientific discipline is a way to exhibit certain relations and to neglect others”. In particular, “power distribution differs in each approach.”

Wallenborn proposes a summary table (the first 4 lines of Table 1) taking up the principal concepts of the social sciences analyzing the behaviours and the capacities of action of the individuals. How do various disciplines “attribute power to consumers?”. By taking up elements of his demonstration, we added the two last lines to the initial table.

Table 1: Four ways of defining consumers and their consequences for sustainable consumption (Wallenborn, 2007)

| | Economy | Psychology Psycho-sociology | Sociology Anthropology | Sciences-Technology- society |
|----------------------------|---|---|---|--|
| Consumer attributes | Rational seeks to maximise his/her profit | Motivations Behaviours Attitudes Desires (conscious and unconscious) | Practices Narratives More or less coherent identities Rationalities are plural | Lifestyle determined relative to objects |
| Market | Supply and demand adaptation | Acting on supply | Acting on demand | Making the market branch off |
| Instruments | Information Prices | Information (marketing) Images Education | Regulations (including social norms) Empowerment of associations | Infrastructure Planning Strict norms |
| Capacities | Cognitive | Cognitive, emotional, behavioural | Reflexivity/routines Agency | Production of meanings, symbol and practices |
| Unit | Individual | Individual | Co-actors relationship | Objects-actors relationship |

Wallenborn, following Jackson and Michaelis, 2003 and Shove, 2003, proposes 3 levels of analysis for behaviours:

- The age and society in which consumers live, the socio-technology system and lifestyles (i.e., context level);
- Consumers' social situation, where they live, social standards, territorial constraints (i.e., social level);
- Consumers' personality and motivations, their attitudes and behaviours (i.e., individual level).

2.2. The context level : mainstream energy-related behaviours and new pathways

The energy consumption of the households is embedded in legislative, historic, cultural, market, infrastructure contexts explaining its current level and its evolution.

It is important to separate different energy sources (electricity, gas and oil), because the market, the infrastructures, the regulations as well as the historic and cultural relation with these sources are very different from each other. Nevertheless, this distinction is not always possible in this document, because the word "energy" is often used in a global way. Moreover, each national situation refers to differences on energy use in the accommodation (percentage of gas and electricity use, for cooking, for example, percentage of domestic fuel use, of gas, electricity, or wood, etc. for heating or sanitary hot water) as well as to differences in the electricity production (coal, gas power plants, nuclear, hydraulic, wind power plants, etc.). Thus, according to the countries, the electricity produces more or less CO₂, which explains a part of the differences of the public policies, according to the countries, the sharing-out of the heating energies will be very different, which explains the decreased or important number of the investigations on a kind of energy in each country.

Think to correctly separate the types of energy sources in the interviews and in the studies/survey.

In this general deliverable (D14), we are going to separate energy sources whenever possible. In D15, regarding the appliances, heating will refer to different energy sources, whereas other appliances refer to "specific" electricity uses.

2.2.1. A political context of high level of energy consumption, in spite of some ruptures

A major determinant of the current energy consumption is the increasing place of energy use in our daily lives, which refers at the same time to infrastructure elements (the places and ways to produce energy and the distribution systems), to political and economic history in Europe and in the member states (a very strong link between economic increase and energy consumptions), as well as the link with these elements, to the building of an abundant energy "culture", which was implemented since the industrial revolution, at the end of the 19th century ("an energivorous civilisation" (Laponche, 2004)).

Consumerist society: pressures are numerous to consume more goods, to heat homes more during a longer period around the winter and to cool them during the summer, to travel more... Convenience is particularly valued. [Bartiaux et al., 2006/EDF-15]

Moments of rupture appeared in the political and economic structures within which conventional energy use was deployed, in particular during war periods, and then in the 70's: the oil embargo caused momentary rations, questionings of the consumer society (report by the Rome Club, 1970), an increase in the oil price and threats on its supply. All this led to public policies aiming at widening the range and scope of conventional energy sourcing methods (extension of oil prospecting, researches on renewable energies and recourse to nuclear energy in some countries) and public policies aiming at acting on the energy consumption, with other notions such as "energy conservation", "demand side management", "rational use of energy", etc.

In the 80's, the oil counter-crisis caused an increase in economic growth and a decrease in energy management efforts.

But since the 90's, the environmental concerns and more specifically the concerns regarding the global warming/climate change are once again in the political agendas (RIO Earth Summit, 1992 and Kyoto protocol, 1997) which are progressively implemented at the national level.

In spite of this political agenda setting, at the world level, the energy consumption increases in an important way, not only in relation with the increase in the population but also per inhabitant.

The energy policies in the different countries can be a variable in the explanation of energy behaviours differences:

Energy policies: some important differences between Belgium and Denmark explained by different energy policies: Danish policies are more focused on savings than in Belgium. [Bartiaux et al., 2006/EDF-15]

2.2.2. A technical context evolving to more energy efficiency but exceeded by the uses

At the European level, the energy efficiency of equipments/appliances and of buildings improved, but the increase in equipment and in the number of households tends to minimise progress which may have been achieved.

The residential consumption increases at the same rhythm as the total energy consumption:

In France, "the residential consumption, which depends on the characteristics of the housing and on the households' behaviours increased at the same rhythm as the total energy consumption" between 1973 and 2005. [Dujin, Poquet, Maresca, 2007/EDF-08]

It is noticeable that research on residential energy consumption is mostly focused on electricity consumption which increases the most:

"Electricity consumption in the EU-27 Member States and Candidates Countries has continued to grow in the last years despite numerous energy efficiency policies and programmes at EU and national level. Total electricity consumption in the residential sector in the EU-25 has grown by 10.8% in the period 1999-2004, at almost the same rate as the economy (GDP)." (Bertoldi, Atanasiu, 2007)

Increases in electricity demand is due to many different factors, including [Bertoldi, Atanasiu, 2007]:

- More penetration of "traditional" appliances (e.g. dishwashers, tumble driers, air-conditioners,

personal computers, which are all still far away from saturation levels);

- Introduction of new appliances and devices, mainly consumer electronics and information and communication technology (ICT) equipment (Set Top boxes, DVD players, broadband equipment, cordless telephones, etc.) many with standby losses;
- Increased use of "traditional" equipment: more hours of TV watching, more hours of use of personal computer, more washing and use of hot water;
- Increased number of double or triple appliances, mainly TVs, fridges, and freezers;
- More single family houses, each with some basic appliances, and larger houses and flats (more lighting, more heating and cooling).
- When new appliances are set up for a household, the previous ones are only moved away in an other place of the house, and not replaced, leading to an increase in the electricity consumption [Dujin, Poquet, Maresca, 2007/EDF-08].

If we refer to the JCR report (2007), the main energy consumption criteria of the households are:

- increasing housing surfaces and comfort equipment;
- decreasing the number of people per accommodation;
- ageing of population.

Thus, even if in France the average energy consumption per accommodation remained stable between 1973 and 2000, "the consumption per people significantly increased, the average number of people per accommodation having decreased regularly" [Dujin, Poquet, Maresca, 2007/EDF-08].

These datasets inform us that two opposed phenomena are developing in parallel:

- Improvement of the energy efficiency of the buildings and of the household appliances
- But search for more comfort leading to the appearance of new uses

This creates a stagnation of the energy intensity in the residential sector (Dujin, Poquet, Maresca, 2007/EDF-08).

We assume that these conclusions can be generalized in other European countries.

Double political and social standard: economic increase = energy consumption on the one hand, energy consumption = environmental problems, on the other hand. To be analysed with the stakeholders and the households.

2.2.3. The context of the markets: possible incentives when the actors find an interest

Energy market liberalisation is a very important context for energy consumption, the offer partly determining the demand. We will refer to the D15 deliverable on the acceptance of the "green" offers of the energy suppliers or on the green offers as supplier change criterion.

The energy intensity (energy use per unit of gross domestic product) of the different countries involved in the Barenergy Project is variable. Therefore, we have to understand the context of the European countries. For example, European newcomers have a problem of purchasing power (related to the energy price) leading to a policy more directed to the energy efficiency rather than to the renewable energies:

The (further) improvement of energy efficiency can typically be regarded as the highest priority goal for sustainable energy pathways in this region [Hungary, Poland, Czech Republic, Slovakia, Slovenia, Estonia, Latvia and Lithuania]. This is due to the still high prevailing energy intensities, the economic and other side-benefits of improved energy efficiency for the region outlined above, the gap to EU levels of specific energy consumption figures in production, the profitability of many energy efficiency related investments, and the relatively lower costs of such measures compared to some other areas, such as renewable energy. [Ürge-Vorsatz et al., 2003b/CEU-04]

The argument for energy consumers to benefit from a decrease in financial costs is more important than other arguments requiring some investments:

Structural changes of economic transition and EU accession in the energy sector, and especially

the climbing energy prices, give rise to pressing social problems. The most highly recommended solution to this problem is to use the funds for social compensation for the improvement of energy efficiency, thereby investing in long-term solutions to reduce energy bills rather than continue (cross-) subsidisation or direct payments to affected households. [Urge-Vorsatz et al., 2003b/CEU-04]

However, the market is not systematically virtuous in terms of energy efficiency and in terms of environment, and the public policies presented to regulate this market whose actors have their own interests:

The research argues that the market will facilitate energy efficiency improvements within certain conditions: when energy efficiency gains are in the best interests of manufacturers or where demand from the customer is strong. All other conditions for energy efficiency gains are led by incentives created by policy-makers. This is particularly true for many household energy efficiency measures. The implementation of roof or cavity wall insulation measures, for instance, are often installed with the aid of government grants or through building regulatory requirements. While technology provides the potential means for reducing energy use and stimulating efficiency gains, the research argues that things such as 'standby' functions as opposed to 'off' facilities direct particular behaviours and practices rather than encourage efficient energy use. Thus, the current framework for sustainable development encourages what economists have termed 'the rebound effect'. Policy developments such as the new energy label would be more effective if governed by minimum standards and not the voluntary agreements that exist at present. [Boardman, 2004/RESOLVE-10]

Market also defines the price of the energy and this price may have an influence on the behaviours even if the link is not mechanical according to what the households say:

Market pressures: High prices on energy can either push people to pay attention or they can not change their behaviours at all. Only 8% of the respondents to the large-scale survey estimate that to increase energy prices would be "the principal solution to reduce energy consumption". [Bartiaux et al., 2006/EDF-15]

Thus we can also find differences of capacities to decrease one's energy consumptions depending on the towns. The differences are often related to the energy price in the countries and to the infrastructural possibilities to decrease the consumption:

For energy behaviour in households, there are also differences among the cities. The tendency to save energy is stronger in Padua, Groningen and Guildford, than in Fredrikstad and Stockholm. We need two different explanations for these differences. For Fredrikstad we have to use economic explanations, electricity is much cheaper in Norway than in the other countries. In Stockholm the possibilities to reduce temperature is not an option in many flats. The steering system for heating is centralised. [Stø et al., 2002/SIFO-11]

2.2.4. The context of the public opinion: environmental awareness which remains discontinuous and not enough for a behavioural change

Another paradox seems to be that many European people have an environmental increasing awareness, but the energy behaviours do not seem to "follow". Why this gap?

- The state of the environment (global level) and the domestic practices and the consumption practices (local and individual level) are not always correlated in the social representations ;
- The practices and the opinions correspond to two different levels ;
- The practices may be motivated by argumentations different from the environment ;
- The environment has not always priority in the domestic practices.

We will thus start by considering energy-related (and not environmental) attitudes, practices and social representations as the entering point of the state of the art.

First of all, we have to notice that the level of environmental concerns and environmental knowledge are variable from an European country to another one. Moreover, the social-demographic profiles of the "aware" people may also vary.

Thus in Hungary the awareness and the environmental knowledge seems to be rather weak:

With regard to SMEs and residential consumers, the determining factor is the extremely low environmental awareness and literacy. While there are no representative studies on this question, the author projects that the vast majority of the Hungarian population does not understand the connection between their electricity consumption and global climate change (and a large share is not even aware of the climate change problematic). The same applies to the understanding of what Carbon-dioxide is, and why it is bad. [Ürge-Vorsatz et al., 2003a/CEU-04]

Moreover, the profile of the people who are more aware of the environmental problems in Hungary have not the "typical" profile of the European people sensitive to the environment:

There is an interesting socio-psychological phenomenon in Hungary not favouring environmentally friendly consumerism. While in the EU education and age segments the society into groups favouring post-modern values including environmental consciousness (the younger and more educated), the same groups in Hungary, according to a representative study carried out in 1996, favour technocentric, therefore often anti-environmental, values. [Ürge-Vorsatz et al., 2003a/CEU-04]

In addition, the economic difficulties of the population and the difficulty to pay the electricity bill lead to different environmental priorities than in Western Europe:

It is also important to note that when the environmental implications of electricity consumption are considered, Eastern Europe may have more immediate priorities for addressing these other than renewable sources (as raised by the regulator). Since the state of energy efficiency is much lower in CEE than in EU, conserving electricity through the improvement of energy efficiency offers a financially more attractive measure to reduce the environmental implications of electricity generation. Therefore, when limited resources need to be allocated for making electricity supply more sustainable in Hungary, energy efficiency and conservation should enjoy a higher priority than renewable resources, unlike perhaps in the EU. [Ürge-Vorsatz et al., 2003a/CEU-04]

On the contrary, it seems that in Switzerland environmental awareness is stronger, but there are still knowledge gaps Thus:

The environmental problems (79%) are at the third place in terms of emergency in the mind of the interviewed people, behind the AVS financing² (88%) and the health costs (88%). [Schweizer Umweltsurvey/UNISG-12]

It could be argued that the majority of Swiss people are prepared to start changing some of their energy behaviours:

66% of the population think that if "we continue as we did it till now, we seem to be heading towards an ecological catastrophe. The people polled are only 29% to consider that the environmental problems are exaggerated, and little more than 60% think that the "politicians go on taking not enough measures to protect the environment". 68% of the polled people state to be ready to decrease their life level to protect the environment [Schweizer Umweltsurvey/UNISG-12]

Industrialists and politicians are also considered responsible and many feel that they should act in favour of the environment, even if they implement constraining measures for the households:

We also asked their opinion to the people on the potential measures within the framework of the individual traffic: at the rate of 95%, the approval of the "particles filter for the new cars equipped with a diesel motor" was particularly high. A net majority (61%) said also to be in favour of the introduction of a "compulsory tax on oil and on diesel to decrease the greenhouse gases", measure that rallied a majority of the French-speaking Switzerland. [Schweizer Umweltsurvey/UNISG-12]

However, there seems to be a deficit in "environmental knowledge":

The great majority of the people interviewed (89%) is aware that the combustion of the heating oil, of coal and of gas contributes to the greenhouse effect, but to the question "which gas mainly causes the greenhouse effect?" only 42% of them gave the correct answer (CO₂). The Swiss people are numerous to mix up the greenhouse effect and the ozone hole in the terrestrial atmosphere". [Schweizer Umweltsurvey/UNISG-12]

² Swiss retirement system based on the retirement insurance called AVS (Retirement and Survivors Insurance).

In terms of profiles, people with high education levels perceive less risks and the women perceive more:

Except the global warming and the car traffic, the awareness of the risks associated to the other techniques decreases when the training level increases. In general, the women are more sensitive to all the risks than the men. [Schweizer Umweltsurvey/UNISG-12]

However, whatever the country is, the researchers show that the link between environmental values (growth and environmental awareness) and effective practices of "energy conservation" is not at all obvious:

For an effective consumer energy policy, it is important to know why some households require more energy than others. The aim of the study described here was to examine whether there is a relationship between the total household energy requirement, on one hand, and value patterns, the motivation to save energy or the problem perception of climate change, on the other. To examine these relationships, we held a consumer survey among 2304 respondent households. We did not find significant differences in the energy requirement of groups of households with different value patterns, taking into account the differences in the socio-economic situation of households. Only for the 'motivation to save energy' we did find that the least motivated group requires 10 GJ more energy than the average and most motivated groups; this is about 4% of the total household energy requirement. This means that a self-regulating energy policy, solely based on the fact that a strategy of internalizing environmental responsibility will not be effective in saving energy. [Vringer, Aalbers, Blok, 2007/RUG-05]

If environmental values can lead to some behaviours, this is not systematic. Moreover, other drivers as the infrastructure are at least as important. The case of waste illustrates it. This practice has for instance increased in France from the moment on the collections have been institutionalised in the towns, where dustbins have been distributed to the households, that is to say from the moment when the daily gestures have been replaced by a political and technical organisation:

The research identified four main lifestyle clusters:

- Committed environmentalists: this group were found to regularly engage with the majority of the behaviours in all three of the environmental variables that formed the study – purchasing decisions, habits and recycling. Energy saving and waste management were the most popular activities and many in this cluster asserted that they always or usually undertook a range of these activities. The tendency to compost waste in this group was seen as being particularly significant;
- Mainstream environmentalists: this group engaged in a smaller range of environmental activities than the above group. For instance, this group were less likely to compost (60% said that they never composted kitchen or garden waste). This group therefore held a more ambivalent environmental position than the committed environmentalists;
- Occasional environmentalists: this group were less likely than the above lifestyle groups to engage in a range of environmental behaviours, particularly green conservation and certain water conservation practices. Some of interviewees professed to be 'occasional environmentalists';
- Non-environmentalists: the research found that 'far fewer than 50% took part in each of the research variables with most being under 20%' (p. 913).

Barr and Gilg suggest this last group were particularly illustrative of the fact that environmental practices are not always consciously motivated behaviours. They pointed out for instance that in Devon recycling is highly structured and likely to inform a common sense practice whereby recycling boxes and wheeled bins collected by the roadside mean that householders must sort out their waste whether they hold environmental views or not. [Barr, Gilg, 2006/RESOLVE-01]

A way to link daily behaviours and environmental concerns is to find a "device" allowing to visualise one's consumption in terms of environmental impacts. Some experiences are developed to attribute to each gesture and to each bought product a quantity of CO₂ emissions (carbon emissions):

It is also suggested that working in the language of carbon emissions rather than energy efficiency may have more resonance with people's latent fears concerning climate change. It is argued that this could stimulate greater change from the demand end of the market and to utilize consumer pressure for the transitions which are necessary to drive change from producers. The research concludes that it is up to the policy-makers to identify the gaps in this 'virtuous circle' and, in particular, to offset 'the negative effects of our profligate tendencies' (p. 1932). [Boardman, 2004/RESOLVE-10]

Finally it is noticeable that the people interviewed on the responsibilities of different public and private

actors often lay the responsibility on the State, on the industrialists, etc. This is interpreted as a way to remove one's responsibility, but we can add that this also corresponds to a perception concerning the intermediary actors and stakeholders who play a strong part in the determination of the behaviours.

2.2.5. The social-cultural context: comfort dominates energy savings

There is a strong link in the social representations between comfort and energy consumption. For people, energy has to be abundant and continuous to allow an action freedom and a material comfort within the household [Zelem, 2005/EDF-09]. Thus, very strong standards are implemented around daily practices requiring energy consumption. "Comfort, cleanliness and convenience", the three domains analysed by Shove (2003), are now "classical" examples to understand how social practices lie within technologies leading to a certain consumption level. And how this leads to "socio-technical regimes" that may be difficult to evolve in a "less intensive resource" direction.

Moreover, the number of equipments at home remains a material and symbolic sign of the social ease. Globally, the consumption of goods, of services and of energy is a symbol of the social identity [Jackson, 2005]. The resulting comfort and energy consumption thus refer to very "positive" social representations (modernity, social ease, generosity, etc.), whereas the energy savings are synonymous of comfort loss, of backward-looking practices, of stinginess, of material and social poverty, etc. [Zelem, 2005/EDF-09]

However, some renovations allowing a better insulation of buildings are also carried out to increase comfort. "Comfort" may thus be a barrier to explain energy savings as well as a driver:

Comfort can trigger energy-saving actions, especially in the area of insulation, or the demand of comfort may justify high indoor temperature. [Bartiaux et al., 2006/EDF-15]

We have to notice that new definitions of "comfort" seem to appear, in particular a more immaterial comfort, with "post-material" values referring for example to the comfort to put in coherence one's practices and one's values, or one's practices and one's constraints [Moussaoui, 2007/EDF-12].

Edwin Zaccarì (2007) formulates "a short list of contradictions", concerning sustainable consumption. Some of them are very relevant for the "energy savings" and "energy efficiency" subject:

- Economic growth constitutes a basic foundation of economies, which thwarts limits to consumption;
- Growth in consumption is still identified with a model of well-being;
- There is an accelerated adoption of high consumption standards in rapidly industrializing countries;
- Consumers take advantage of high levels of competition to put downward pressure on prices, which discourages more costly – and sustainable – production standards (both social and ecological);
- Discriminating between products, to identify those that meet sustainable consumption requirements, demands means of analysis lacking to consumers;
- From the standpoint of enterprises, the green profile of products is not a first order positioning factor, while at social level voluntary commitments reflect limited changes;
- Information instruments are preferred tools for change even though their impact is weak.

Zaccarì concludes that "the question of sustainable consumption stands at an essentially contradictory stage". We can take up this conclusion, concerning the energy consumption on a macro level.

It thus seems a paradoxical injunction (a double bind) in the current energy consumption which is hold at the same time at the political level (valorisation of the energy growth and of the sustainable development), at the social/cultural level (the energy consumption is essential for comfort, but the environmental concerns increase), at the technical level (energy distribution and production infrastructures on the abundance model and on the energy supply safety model, but also alternative technological developments - renewable energies and energy efficiency), at the level of the market of mass products (purchasing power or environmental quality of products), at the social-cultural level (consumer society and sustainable consumption) and at the level of the energy market (necessity to

develop markets in a stage of liberalisation, accompaniment to minimise the increasing price of energies and to increase “green” offers).

☞ These assumptions of the new definitions of comfort should be tested in the survey/study to understand the cultural differences of comfort notion, its link with the energy consumptions, and possibly an evolution towards a disconnection between these two words.

☞ The energy savings concealed in the actions having other objectives should be detected in the surveys. (So we have to highlight energy savings as a “means” and as an “end”)

2.3. The social level: socio-demographics differences, constraints and agency

This level is that of the sociological and anthropological analyses of household energy behaviours, It includes first of all the quantitative analysis, showing the main socio-demographic variables explaining energy behaviours, and then also the qualitative analysis, showing the main factors restraining or facilitating the energy-saving behaviours.

2.3.1. The main socio-demographics variables of energy-related and energy-saving behaviour differences

First of all we have noticed that it is important to take into consideration the household material environment variables related to their incomes or to other socio-demographic variables:

- size and characteristics of the accommodation
- (often related to the latter) number of appliances present in the accommodation
- "dwelling, tenure, household composition and rural and urban location" [Jackson, 2008/RESOLVE-03]

These "material environment" factors may take a great part in energy consumptions:

The purpose of this study was to examine energy-conserving practices and consumption from 1987 to 1997 using a human ecosystem framework. Research on energy consumption and practices at the household level has been minimal in recent years. Factors that influence household energy consumption were examined, including climate, demographic characteristics of the households, housing characteristics including weatherization features and appliances, and occupant behaviours. This study was a secondary analysis of data compiled by the Energy Information Administration from the 1987, 1990, 1993, and 1997 Residential Energy Consumption Surveys and included only owner-occupied, single-family detached residences. Based on multiple regression analyses, more than 30% of the household energy consumption was accounted for by the variables representing the environments of the human ecosystem. [Yust, Guerin, Coopet, 2002/RUG-11]

The environmental factors refer also to social factors, in particular to family size and to family composition [Bartiaux et al., 2006/EDF-15] that are linked to the accommodation size.

Moreover, occupation status (owning/renting a dwelling) is important to understand the investments made or not made in the building:

Some persons do not have the possibility to make changes because of their renter status. [Bartiaux et al., 2006/EDF-15]

Income or, more globally, "social ease": the higher the income, the higher the energy consumptions:

This process of investigation illustrates that emission levels in household energy use are often correlated, although not exclusively, to levels of income. The research also shows that energy consumption patterns are linked to other variables such as 'dwelling, tenure, household composition and rural and urban location' (p. 12). The research also shows that it is low income households who are often discriminated against in regard to present pricing structures and price fluctuations where they often pay more per unit of energy than higher income households. [Jackson, 2008/RESOLVE-03]

The people with a high income invest in and buy equipment rather than doing gestures for saving energy:

- Socio-economic factors (household incomes): direct and indirect energy uses rise with income per capita in the household and, on the other hand, a higher household-income predicts the least environmental concern. Families having higher income have more energy-consuming practices in order to save time and maintain their usual comfort level. Despite the fact that these high-income families use more energy, they have in proportion lower energy expenses than low-income households. To consume less energy, they can afford to invest in more appliances and technical solutions because they prefer to purchase energy efficient appliances for their house rather than to change their everyday habits. [Bartiaux et al., 2006/EDF-15]

The question of vulnerable populations (low income, “fuel poor” people³) is asked in terms of social justice, but also in terms of focalisation of some public policies on themselves whereas they have limited agency responses and are those that can less accede to comfort:

"The households have well internalised the validity of the debates on the water saving but [...] apart from an eco-acting minority or apart from some fractions with limited incomes, they go on privileging the increase of their comfort and do not impose to restrict themselves in this field" [Dujin, Poquet, Maresca, 2007/EDF-08]

The cultural variable: according to different societies and to different cultures, some behaviours are more “energyvorous” than others. We have to also mention that a same global consumption level may in fact mean very different things and refer to very diverse practices:

The study find significant differences in end use patterns for space heating, lighting and hot water use. The authors discuss how these patterns are related to cultural and economic factors. The data show that while energy intensive space heating and lighting habits have become an integral part in the presentation of the Norwegian home, the Japanese habits on these fields are more disciplined, and less culturally significant. While in Japan, the bathing routine is extremely important to the Japanese lifestyle and at the same time very energy intensive. Other energy intensive patterns are identified which apparently do not have the same cultural significance, such as lax temperature reduction at night and for unused rooms in Norway, and dishwashing practices in Japan. Policy implications are discussed. The results shed light on the role of culture in the formation of energy use habits and purchase patterns in the home. It can help in sorting out which patterns that are deeply culturally rooted, and as such may be more resistant to rapid changes, and which that may be more susceptible to change. [Wilhite et al., 1996/SIFO-01]

Education level also explains environmental awareness. But income and education are correlated. We thus find a financially well-off group with a high education level which consume a lot of energy despite a high environmental awareness:

Level of education: the higher education, the higher awareness of environmental issues. But they are less engaged with energy saving behaviour. Educated people rather believe in economic growth. [Bartiaux et al., 2006/EDF-15]

This result corresponds to the Zaccà’s analysis in terms of contradictions concerning the sustainable consumption (see 2.2.5.).

We can synthesise these data distinguishing three groups in terms of incomes in relation with different energy behaviours:

- the more vulnerable people manage energy and have some deprivation practices
- an important middle class searches for comfort, but without excess (the moderation), using important quantities of energy, but thinking of not wasting and paying a financial attention to its invoices.
- A well-off class is aware of the environment but consumes a lot.

Age explains energy behaviours as well, but it depends on the type of energy behaviour, how age contributes to this explanation. Moreover, we wonder whether “age” refers to a generation effect or to an age effect.

Analysis of the carbon footprint generated by many of the lifestyles enjoyed by the over-50s in the research illustrates that they often have higher than average CO₂ levels per capita per annum in comparison to other age groups. The research found that the 50-54 age group

³ Is considered as “fuel poor” a household who needs to spend more than 10% of its income on total fuel use.

currently have the highest carbon footprint of the over-50s age group (13.52 tonnes per annum), followed by the 65-74 year age group who hold a per capita status of 12.2 millions tonnes a year (ONS, 2005). [Haq, Minx, Whitelegg, Owen, 2007/RESOLVE-07]

Age: direct residential energy use rises with age while indirect energy consumption linked to transport and usage of car peaks at the age of 50-55 years and after suddenly drops. [Bartiaux et al., 2006/EDF-15]

The correlation between age and "social ease" is to take into consideration as well. For example, the 50-54 years old age bracket in England seem responsible for important CO2 emissions but also ready to improve the energy efficiency and the energy sources of their accommodations:

The survey and focus group analysis of attitudes amongst the over 50s shows that there is a general concern about the urgency of climate change as an issue. There was also a positive response and a general willingness expressed amongst those in the focus groups and in the more general survey to taking action. The researchers suggest that one area for further exploration is where the gap between present levels of consumption and attitudes can be narrowed and emissions reduced amongst this group. From the interview data therefore, the researchers identified four areas to be of potential consideration by policy makers looking to facilitate behaviour change in this demographic group: *Household energy issues*: it was felt by many interviewees that more fiscal incentives to improve the energy efficiency of housing stock would better enable those who wished – but felt financially restricted – to invest in things such as insulation, double glazing and micro-renewables. [Haq, Minx, Whitelegg, Owen, 2007/RESOLVE-07]

The gender variable seems to be less analysed in terms of energy conservation practices. This can be understood when the survey/study unit is in most cases the household. However, we find a relationship between gender on issues related to environmental concern:

- gender: female consumers express more concern for maintenance of environmental quality by giving money to organisations and acting in a pro-environmental manner and they are more strongly engaged in energy saving practices. [Bartiaux et al., 2006/EDF-15]

We have to notice that a same variable may be correlated to energy consumptions and to energy savings practices:

New, expensive and detached homes were likely to have more energy saving appliances but also more appliances per se than older, less expensive homes. (...) The researchers argue therefore that this research is useful in identifying often conflicting trends between energy efficiency measures and rises in household energy consumption – the so-called rebound effect. [O'Docherty, Lyons, 2008/RESOLVE-13]

The "social segmentation" notion is evoked a lot in the conclusions of the analysed documents. But most of time, policies do not give any answer to specific problems of different segments of the population, and thus suffer from this gap:

In summary, the paper underlines the significance of a real understanding of the benefits of energy-efficient technologies as a precondition for their market success, and emphasises that simple awareness raising campaigns may not be sufficient to convey the benefits to all market segments. Thus, the authors draw the attention of programme designers to the importance of segmented marketing for delivering more complex messages related to these benefits. The authors also suggest that the level of education maybe a crucial segregating factor for differentiating the effective message related to the economic gains of energy-efficient technologies. [Ürge-Vorsatz, Hauff, 2001/CEU-07]

Thus, there are "important" variables that enable an initial explanation level of energy behaviours (in particular the consumption level) and environmental awareness exist. They are "determinants" because they highly structure such behaviours:

The energy use in the residential sector is an important area for campaigns to conserve energy. In the first section of this article, a model is proposed that relates personal, environmental (e.g. home) and behavioural factors to energy use. This model is instrumental in relating variables that determine energy use in the home. These determinants of household energy use (i.e., socio demographics, family life-style, energy prices, energy-related behaviour. cost-benefit trade offs, effectiveness and responsibility. feedback. information. home characteristics) are discussed. Several options for energy-saving campaigns are discussed. [Van Raaij, Verhallen, 1983/RUG-03]

This paper sheds light on different behavioural contexts:

This paper develops an empirical model to investigate the main determinants of household energy conservation patterns in Greece employing cross-section data. In the empirical analysis, household energy-conserving choices models are employed, using a discrete and a latent trait variable respectively as a dependent variable. The results show that socio-economic variables such as consumers' income and family size are suitable to explain differences towards energy conservation preferences. In addition, the results suggest that electricity expenditures and age of the respondent are negatively associated with the number of energy-conserving actions that a consumer is willing to adopt. Finally, other variables such as environmental information feedback and consciousness of energy problems are characteristics of the energy-saver consumer. By evaluating consumer's decision-making process with regards to energy conservation measures, we are able to formulate and propose an effective energy conservation framework for Greece. An energy policy framework is among the main prerequisites not only to achieve sustainable development but also to maintain consumers' quality of life. [Sardianou, 2007RUG-09]

However, the crossing of the variables and other factors complicate the energy relation and the relation to the households' environment.

2.3.2. The micro-social practices: how energy behaviours are embedded in everyday life

An analysis of the actual consumption practices gives a complementary view, showing how socio-demographic variables cross each other in the daily life and how they integrate themselves to other problems.

Thus, environmental values are not always in the centre of family priorities. Families with children give priority to comfort and to the education of their children, which may be in contradiction to "energy savings". Moreover, energy attention gestures are not always done in the name of the environment:

Basic energy saving gestures are present in households and are based on four principles: financial principle; anti-waste principle; environmental principle; a principle which criticises excessive consumption. [Moussaoui, 2007/EDF-12]

Energy consumption patterns often refer to social functions that are priority in daily life:

Energy has social functions which are hardly compatible with restrictions in consumption:

- The notion of comfort restricts energy saving practices: a comfortable environment at home, the making of a 'home'.
- time saving
- building of a family and harmonious relationships between its members

"There is a strong link between the level of energy consumption and access to these social functions. There are therefore large social barriers to energy saving as moderation means breaking this link (retaining the same social functions while improving energy efficiency) and either means modifying these social functions in favour of other values (taking one's time, developing less of a materialistic level of comfort, separating family relationships from the home). [Moussaoui, 2007/EDF-12]

The gestures and the purchases of energy equipment are very "routinised". Moreover, energy equipments refer to services, to social activities and are means rather than aims. Within this framework, a change in practice means a change in the social meaning and continuous changes in the family activities:

Daily routines: changing energy-consuming practices into energy-saving behaviour is a very slow process because these practices are inserted in everyday routines. But habits can be modified if other motivations are strong enough to the actor's eyes. Many interviewees have expressed that they keep their habits because of a lack of other possibilities that are not seen as easy to adopt and as comfortable as the previous ones. [Bartiaux et al., 2006/EDF-15]

According to the social groups and the life experiences, as well as according to the level of the households' obligations, the "agency feeling" can thus be more or less strong:

Agency feeling: Environmental problems can generate either an agency feeling or its contrary helplessness sense. The agency feeling is related to the social position obtained by the families and it strongly influences the openness to environmental information. [Bartiaux et al.,

2006/EDF-15]

A micro-social analysis of what people say also separates environmental values according to their incorporation level in the daily life ("ready-made" discourse against adapted discourse):

Environmental values: Biel (2004) makes a difference between environmental values that are sufficiently interiorised to make the actors more likely to act in a pro-environmental manner and more peripheral values, which are more neutral and do not constitute a lever to adopt pro-environmental behaviours. [Bartiaux et al., 2006/EDF-15]

The visible social identity question is also important in relation to energy behaviours. We saw a relationship between a high consumption level and social abundance and comfort. However, the excess notion may be negative in terms of social consideration [Moussaoui, 2007/EDF-12], either in terms of luxury and comfort or as in terms of "ecological" excess.

Identity factors: Conspicuous consumption, or in showing his/her environmental concern. The interviews show a rather wide concern to present oneself as a moderate person without "exaggerated" practices due to ecological values and without "excessive" concern for the environment. [Bartiaux et al., 2006/EDF-15]

However several studies show that the environmental-friendly or "green" goods and services can also contribute to an "ostentatious sobriety". Solar panels, labels mentioning a green energy supplier, visible goods become "trendy" [Moussaoui, 2007/EDF-12].

Within this framework, the households' networks play an important role in the definition of the social identity and of the more or less energyvorous contents it requires.

Social influence: Friends, colleagues, neighbours, family members, children, the media watched, read or listened are elements of the social support. People are expecting support for their action from the persons or the networks they value the most. [Bartiaux et al., 2006/EDF-15]

The arguments provided in favour of the energy savings are of four main orders [Moussaoui, 2007/EDF-12]:

- economic and financial argument
- environmental argument
- anti-waste argument
- argument of the overconsumption's critic

The motivations to make energy savings: The answers can vary according to the fields of energy consumption concerned. The most frequent answer is the ecological motivation (28.8% of the respondents). The second one is "to avoid wasting" (25%), the third one is "by sense of collective responsibility" (17.3%), the fourth one is "for economic reasons". The motivations are statistically related to the age. The oldest people mention firstly "to avoid wasting" (29.2%). The less-than-30-year-old group mention firstly "the interest for new technologies" (13%).

The interviews show other mechanisms: habits, and to change habits takes time; education, that can be an unconscious imitation or a deliberate choice; aesthetics and fashion, for lighting, radiators or heating systems (example: wood stove).

Wasting: What is considered as a waste for one is not automatically a waste for someone else. But all decry it. And all interviewees dislike wasting.

Economy-ecology: the energy consumption practices are often motivated by economical and ecological criteria. Those two motivations are dependent. The ecological motivation is not sufficient. Often it appears as a complement of other choice criteria. [Moreau, Wibrin, 2005/EDF-15]

We will come back for a longer time to this observation scale in the D15 deliverable concerning the gestures and purchases of equipment at home.

2.4. The individual level: cognition, attitudes and motivations

The psychological and cognitive factors are also important to take into consideration alongside structural processes in order to understand the variety of energy behaviours and the motivations underlying them.

2.4.1. Rationality versus the rationalities

First, researchers in the field of social sciences generally agree on the limits of an analysis in terms of “rational agent”, in the micro-economic sense of the word.

The theme in this article is the role of individual consumer in energy policy. It is theoretical and political discussion of the main stream economic models for consumer behaviour. The point of departure is the idea that: ‘Consumers are rational in their energy behaviour; Their motives are non-conflicting; They are acting as a fully independent agent. Wilhite’s contribution to this discussion is that economic theory has to be replaced by a more robust theory of consumption, one which incorporates social relations and cultural contexts, as well as perspectives on individual agency and social change. The paper draws attention to a marginalised theme, that comfort and other energy services are socially constructed. It argues for a replacement of the individual rationality with a perspective which account for how individuals create meaningful lives within a matrix of social relations which both enable and constrains behaviour. [Wilhite, 2001/SIFO-13]

The findings of the research suggest that as environmental practices become more routinely embedded in everyday life, policies to target behaviour change must become more accustomed to lifestyles and behavioural settings rather than simply thinking of individuals as always acting as rational agents. The authors suggest that the role of geography as well as advances in social psychology and quantitative sociology may be crucial to this process. [Barr, Gilg, 2006/RESOLVE-01]

The rationality question is indeed important to take into consideration, to understand the plurality of actors’ rationalities:

The change in behaviours is not necessarily based on the only maximisation of the individual interest and has to be understood in respect to other dynamics, in particular the moral requirements of the individuals. [Dujin, Poquet, Maresca, 2007/EDF-08, referring to Amartya Sen].

A virtuous consumption behaviour can thus not express the carrying out of the preferences in the sense of a maximisation of the usefulness and however not be irrational. (Dujin, Poquet, Maresca, 2007/EDF-08)

2.4.2. An efficient but not sufficient price signal

However, the question of the willingness to pay for energy efficient equipment and the question of the investment cost of the "big" equipment or of the home energy efficiency renovations for instance, are also a very important consideration. Surveys show that the households see a paradox in paying for an expensive price for equipment dedicated to save energy.

The economic calculation is present, but it is one mechanism among others. Moreover, other calculation types which may be more "symbolic" also appear. In particular, the balance of comfort against the energy savings is often taken up in favour of comfort (see also § 2.2.5.):


When it is asked if they did the uttermost to make energy savings in their household, 19.6% of the respondents answered “completely”. Among the others, the reason for not doing the uttermost is generally that the respondents do not want to lose any comfort. It also seems that a quarter of the people have the impression that their efforts would not have an impact and answer that it would be a drop in the ocean. On another side, a quarter of the respondents estimate that they do not have enough financial means.

“We can retain that the economic reasons play a significant role but not a fundamental one for the majority of people. A large part of the respondents, even if they think that energy savings are useful, do not want to change their way of life and/or their action appears insignificant to them.” (Moreau, Wibrin, 2005/EDF-15)

For instance, a French research [Zelem, 2005/EDF-09] thus showed that energy savings correspond to concrete/visible costs versus intangible profits.

The lack of information, the low priority, the important costs and the lack of simple alternatives to implement are barriers to behavioural change:

It is commonly assumed that behaviour changes of households are needed to reduce the problems caused by increasing levels of fossil energy use. Strategies for behaviour change will be more effective if they target important antecedents of the relevant behaviour. Therefore, this paper first discusses factors influencing household energy use. Three barriers for fossil energy conservation are discussed: insufficient knowledge of effective ways to reduce household energy use, low priority and high costs of energy savings, and lack of feasible alternatives. [Steg, 2008/RUG-04]

 In the survey/study, take into account the total social costs, rather than only the financial costs.

2.4.3. From attitudes to behaviours: a weak link?

A lot of psychological research on (reducing) energy behaviours show a weak relationship between attitudes and behaviour. Attitudes seem to contribute to intentional measures, but less to actual behavioural measures:

Although the various (indirect and direct) measures of pro-environmental intent were significantly related to the value dimensions and especially to environmental concern, these variables could only explain a very small amount of the variance in home and transport energy use. This is in line with the findings of a recent Dutch study (Gatersleben et al., 2002). In this study, it was found that whereas environmental behaviours defined from an intent-oriented perspective are related to attitudinal variables, such as environmental awareness, environmental behaviours defined from an impact-oriented perspective were not. (Poortinga, Steg, & Vlek, 2004).

Scholars indicate various reasons for this weak link. As mentioned before, socio-demographics, such as income or household characteristics, contribute sometimes more strongly to the explanation of energy behaviours:

Energy use was more strongly related to household size and household income. It appeared that general environmental attitudes are especially relevant when behaviours do not cost too much effort or only minor changes in comfort. In other cases, such as energy use, it appeared that as soon as people have the financial ability to perform the behaviour, they are tempted to do so (...). It seems important to expand the study of antecedents of environmentally significant behaviour to non-motivational variables such as behavioural opportunities and abilities. (Gatersleben, Steg & Vlek, 2002).

Household energy use appeared to be especially related to socio-demographic variables, which influence individual abilities to perform specific behaviours, such as household size and income. Likewise, the present study showed that home and transport energy use were more strongly related to socio-demographic variables. (Poortinga, Steg, & Vlek, 2004)

Other reasons for weak relationships between attitudes and energy behaviours may be found in variables such as knowledge, awareness and low-priority:

People may not always be aware of the environmental impacts of behaviours related to energy use and the environmental benefits of changes in these behaviours. This is supported by the low and moderate correlations that were found between respondents' actual and perceived (compared to others) environmental impact for several consumption categories. The development of information and education programmes on the environmental impact of (high-impact) household consumer behaviours seems worthwhile. Indeed, studies have shown that information and education about energy-saving options can result in reductions in energy use of households. In order to develop effective educational programmes more research into the antecedents of environmentally significant consumer behaviour is needed (Gatersleben, Steg & Vlek, 2002).

Yet people often do not act in line with their concerns, and total household energy use is still rising. As well as lacking knowledge of the energy use related to various behaviours, many people attach only a low priority to saving energy. Energy use is not only driven by concerns about environmental and energy problems. Many other factors play a role, such as status, comfort and effort [Stern, 2000/RUG-07].

The weak relationship between attitudes and energy behaviours does not suggest that it is not important to study these relationships. However, we should examine under which circumstances attitudes do contribute to explain energy behaviours in order to promote reducing household energy use:

This does not imply that attitudes, such as environmental and normative concerns, do not affect high-cost behaviour. Some people do reduce their energy use even at the cost of personal disadvantage. Normative and environmental concerns are important in promoting energy conservation, because they provide the most solid basis for it. If people only conserve energy for hedonic or cost reasons, they will stop doing so as soon as the behaviour is no longer attractive or cost-effective. When energy conservation results from normative concerns, it is more robust against such changes. (Lindenberg and Steg, 2007)

When attitudes are measured on an aggregated level, they hardly explain energy use. However, when attitudes are measured more specifically, they do explain energy behaviours significantly. Specifically, general attitudes, such as values and environmental concerns, contribute strongly to the explanation of for example, low-costs behaviours, acceptability and specific beliefs:

People are less likely to reduce their energy use when saving energy involves high behavioural costs in terms of money, effort or convenience. People are far more likely to carry out pro-environment activities such as recycling, which has a low cost in money and effort, than others such as reducing car use which have higher financial and lifestyle costs (Lindenberg and Steg, 2007).

Normative and environmental concerns (i.e., general attitudes) also play an important role in the acceptability of energy saving policies. Energy policies are more acceptable when individuals value the environment, are aware of the problems resulting from energy use and feel responsible for it, and when they feel morally obliged to do their bit to help reduce these problems (De Groot and Steg, 2007; Steg et al., 2005).

- 📁 Attitudes hardly explain high-cost energy behaviours when measured on an aggregated manner. Therefore, we should focus on a specific level in our study.
- 📁 General attitudes such as normative and environmental concerns are important determinants of intentions, acceptability (of energy policies), low-cost energy behaviours and specific beliefs. In the survey/study, focus on those behaviours that can be explained by attitudes.

2.5. Conclusions

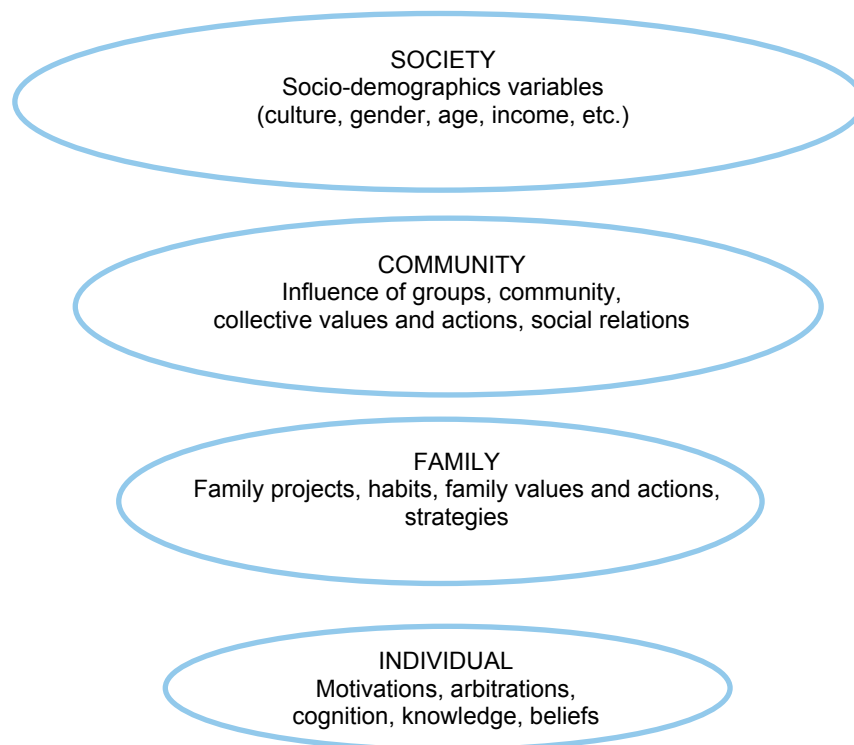
In conclusion, the analysis in terms of barriers and of drivers that would only focus on individuals and households would be incomplete. We have shown that political, technical and infrastructure factors highly structure energy consumptions. Households cannot be the unique targets and the only units in charge of energy usage:

A collection of studies conducted in different countries show that attitudes to ecological problems vary in terms of problems and products, social categories, but also concrete local situations. Aside from these technical obstacles which should be considered in the design of efficient policies and actions, there exists a fundamental criticism of the idea of placing the burden of responsibility for these choices on individuals, introducing at the very least the importance of consumer group dynamics, or other collective social drivers. (Zaccaï, 2007)

Nevertheless, we have identified social and psychological mechanisms having relationships to the energy behaviours in increasing or decreasing energy consumption.

Moreover, through the analyses at different observation scales, we can better understand what forms the individuals' behaviours that are integrated to concrete groups or influenced by variables.

Figure 1: How individual's behaviours are integrated to concrete groups



To understand the mechanisms encouraging consumption or those encouraging the energy attention, we have to analyse more in-depth the equipment's uses and the energy management services.

3. The initiatives of energy-related behavioural change: which drivers for which barriers?

Behavioural change initiatives may be divided into four categories (Linden et al., 2005):

- Information (long time effects)
- Economic measures (have to be repeated)
- Administrative measures (immediate effects, but a "passive" way)
- Technology (but a need of technological culture)

All these measures share a top-down perspective and are intended to motivate an actor to change routines or behaviour by external means (Linden et al., 2005).

The specifications of Linden et al. are: improve knowledge / simplify practice / make the new behaviour visible.

Each initiative induces efficient behaviours and inefficient behaviours (e.g., rebound effect, other reasons more important than energy efficiency).

The recent initiatives are rather centred on the voluntary behavioural change, with technical or incentive tools, but little with constraining tools or change in the context structures:

Interestingly, most studies focus on voluntary behaviour change, by changing individual knowledge and/or perceptions rather than changing contextual factors (i.e. pay-off structure) which may determine households' behavioural decisions. Interventions have been employed with varying degrees of success. [Abrahamse, Steg, Vlek, Rothengatter, 2005/RUG-01]

Resuming the categorisation of the tools of public policy by Bemelmans-Videc, Rist and Vedung (1998), a survey (Dujin, Poquet, Maresca, 2007/EDF-08) also notices a very important development in

the policies of the European Union of the tools of "carrots" or of "sermons" types rather than tools of "sticks" type:

the approach developed by the European Union leads to a certain conception of the energy control, in particular the development of market tools highly conditioning today the national policies. [...] The public action in terms of EC presupposes precautions, indeed a certain economic rationality from the different users concerned" [Dujin, Poquet, Maresca, 2007/EDF-08]

3.1. Information: how to go from the knowledge to action?

Information delivered to consumers increases their awareness and their knowledge of the issues and of "virtuous" behaviours. But the impact on the behaviours depends on the type of information delivered. As a matter of fact, information can be divided into two sub-categories:

- The feedback information (see below, § 3.4.);
- General awareness which has a long-term effect, but which seems to be not enough to induce a behavioural change of households:

Information tends to result in higher knowledge levels, but not necessarily in behavioural changes or energy savings. [Abrahamse, Steg, Vlek, Rothengatter, 2005/RUG-01]

Lots of researches show the same result. For example, in the ToolSust project, we can read: "Information is a necessary, but not sufficient, precondition for action" (Vittersø, 2003, pp. 98-99).

The information has thus to be more personalised, more targeted, and has to correspond more to the life constraints of the households to be effective:

Most psychological studies on energy use have focused on the effectiveness of informational strategies (see Abrahamse et al., 2005, for a review). Generally, information campaigns result in only modest behavioural changes. But there are some informational strategies that appear to be successful in promoting household energy conservation. They include prompts; individualised social marketing approaches in which information is tailored to the needs, wants and perceived barriers of individual segments of consumers, commitment strategies, eliciting implementation intentions in which people indicate how they plan to reduce their energy use, and modelling and providing information about the behaviour of others. Informational strategies are especially effective when pro-environmental behaviour is relatively convenient and not very costly in terms of money, time, efforts or social disapproval, and when individuals do not face severe constraints on behaviour. Besides, informational strategies may be an important element in the implementation of structural strategies intended to force individuals to change their behaviour. [Steg, 2008/RUG-04]

Information is thus a useful tool for public policy in regard to energy savings, but the personalisation and the taking into consideration of the actors and of their life constraints would favour a better appropriation. Moreover, the information often focuses on "sermons" or guilt, and does not always increase the action capacities of the households.

Thus, some initiatives assert that information can not remain at the global and national level only, but has to be transferred to the local level:

The Green Living Initiative proposes that a more joined up approach is needed if government aims to promote more systematic energy, water and waste practices are to be realized. The researchers argue that current energy efficiency initiatives must be more deeply grounded within aims to reduce initial demand and to more directly address 'locked in' consumer behavioural patterns (p. 1). Environment Direct, New Home Information packs and the Code for Sustainable Homes were all launched under the UK Government's Sustainable Development Strategy as the first steps in providing a more integrative approach to household behaviour change. The integrative approach seeks to combine different levels – national policy initiatives to be translated into local action – of policy initiatives through which to address the complexities of behaviour change in the three areas of energy use:

National level branding and information. This would include the Green Living Initiative brand through which to raise awareness, and to integrate information provision; the dissemination of advice and information through Energy Efficiency Advice Centres and Environment Direct;

National level action on products and new homes. This would include national level initiatives on products such as energy and water inefficiency charges for instance and concessions for homes

which meet with agreed standards set by the Code for Sustainable Homes;

Local level action on energy, water and waste. This would include: reductions on council tax for insulation measures; water metering and tariffs which could be linked to council tax bands; waste charging for unsorted waste. [Dresner, Ekins, Willis, 2006/RESOLVE-05]

📁 The public policies seem to elect informational interventions, whereas there is a weak link with behavioural change. Ask questions to the stakeholders on this issue.

📁 Ask questions to households on their knowledge as regards the awareness campaigns in their country, and if this changed something in their practices.

3.2. Economic measures

Economic measures can be efficient, but they do not have a long-term effect on energy behaviours. For instance:

Rewards have effectively encouraged energy conservation, but with rather short-lived effects. [Abrahamse, Steg, Vlek, Rothengatter, 2005/RUG-01]

The governmental incentives, making use of "subsidies" may have a real effect on the market of energy efficient appliances:

Governmental subsidies for all three technologies (heat exchangers, pellets ovens and automatic heat control) have been granted in all countries, with some regional variations between them. Households are generally satisfied with the new technologies and their effect on heat comfort and in house climate. Some practical problems are reported, mainly for heat exchangers (ice on outer wall parts, filter problems, adjustments) and pellets ovens (pellets feeding, pellets quality). Nevertheless, most households were satisfied with the investment. For households where the investment mainly replaced heating with electricity, the mean annual saving amounted to 5 770 kWh; approximately 33 % of electricity used for heating. The saving effect is largest for heat exchangers and smallest for automatic control. Households' economic profitability was largest for automatic control systems and heat exchangers. With the government subsidy, these investments were profitable in 75 and 73 % of the purchases. Only 20 % of the investments in pellets ovens were profitable, due to a too small price difference between pellets and electricity. Around 21 000 households might have invested in one of these technologies as a direct effect of the government subsidy. [Bjørnstad, Grande, Sand, Wendelborg, 2005/SIFO-06]

Intermediary actors position themselves on this issue, assuming the financial risk instead of the households, proposing low rate credits for important investments (renovation, change of energy source, etc.) [refer to deliverable D15, for further information].

📁 Ask if the households already benefited from such measures and which importance it had in their choices.

3.3. Constraining measures

We have little documentations referring to these measures, undoubtedly partly because they are not popular and do not allow to policy makers to directly assess the behavioural change. However, they change the context effects mentioned at the beginning of the document:

Politicians are often reluctant to implement stringent policies, because they believe that these policies can threaten individual quality of life. Though policies such as substantial price increases for energy may reduce individual quality of life in some respects (e.g. freedom, money), they may also increase individual quality of life in other respects (e.g. improved environmental quality and health), and overall quality of life may not be harmed much (De Groot and Steg, 2007; see Steg and Gifford, 2005, for a review). [Steg, 2008/RUG-04]

📁 Ask questions to the stakeholders on the contradiction between social desire of the politicians and the efficiency of the measures?

3.4. Feedback: make consumption visible

According to the researchers having carried out experiments, feedback provides interesting results:

Feedback has also proven its merits, in particular when given frequently. [Abrahamse, Steg,

Vlek,Rothengatter, 2005/RUG-01]

The conclusions concerning feedback (bills, displays, etc.) show shared “positive” evaluation results:

- Efficient to decrease consumption (Darby, 2000); usual savings are between 5 and 12% (Fischer, 2007)
- Detailed information on its own consumption is the first step to “think about” it (but it is not enough to act): Make the consumption visible => habits broken up and more consciousness
- “The more targeted the information is, the more efficient it appears to be” (Linden et al, 2005)

The assessments propose some recommendations to make the feedback useful:

- Information has to be presented in a clear and appealing way (Fischer, 2007)
- Historic or normative comparisons: compare with... neighbours? national average consumption? same lifestyle households? (cultural question)
- Frequent and over a long time information (Fischer, 2007)
- Appliance-specific breakdown (Fischer, 2007)
- Computerized and interactive tools (Fischer, 2007)
- What works best? User's choice, interactive element, more often than monthly, detailed breakdown, comparisons with previous period (Fischer, 2007)
- But there is probably not “the” perfect feedback for everybody.

Feedbacks can take various forms, from the energy bill to complex technical devices, which are either “displays” added to the energy system of the dwelling, or “smart meters” replacing the usual meters.

The interest mentioned for these displays is the visibility of the immediate energy consumption (contrary to the bills that come afterwards) and the possibility to be aware of the consumption of some activities, some appliances during the real time of their use. However there are some limitations to the experiments and to the behavioural change (novelty effect, Hawthorne effect, technology too difficult to understand, question of durability, etc.) [Kidd, Williams, 2008/RESOLVE-04].

For a detailed analysis of the different displays providing feedback, refer to [Darby, 2006/Darby, 2006/RESOLVE-18] resuming the literature review concerning this subject.

📁 The question of the energy invisibility is important: understand how people make their consumption visible. What perceptions do they have of what consumes a lot or a little?

3.5. The energy audits

The energy audits are an example of personalised advice. In England, the “Green Doctor Project” for instance is addressed to “lower income households” in order to remedy the increase in energy prices, to increase energy efficiency, and to address environmental issues:

Green Doctor visits are free, alongside any measures that are installed. The service is partly funded by utility companies and supported by a range of public and private sector bodies. The Green Doctor audits household energy use, insulation measures and the level of awareness in the household regarding issues which need to be addressed. In addition to information and advice offered, some of the technical measures addressed may include the installation of: energy saving light bulbs; draught excluders and radiator panels. Conservation and waste reduction measures are also addressed through the provision of compost boxes and water savers. Results from the three year duration of the Green Doctor project included:

- It was estimated that the Green Doctor Project saved 0.68 tonnes of carbon per annum for each household during its three year lifespan – a figure equating to a total of 408.92 tonnes;
- 6884 energy saving measures were installed;
- 265 visits per year, working out at a consequent energy saving of £59,826 for beneficiaries over the three years of the project;
- Using these figures within a wider context, it has been estimated that if the measures addressed under the Green Doctor Project were implemented to residential households on a national level, savings nationally could amount to as much as 2 billion pound and carbon savings could total 16 milli- Follow up interviews with beneficiaries found that Green Doctor

visits were often instrumental in raising awareness of environment and energy practices. Some argued that it was the personal contact that helped to foster 'trust' in the expertise offered. [Devine-Wright, Devine-Wright, 2006/RESOLVE-06]

However, one of the questions is the generalisation of this type of initiative, as it is a very personalised service and is initiated at a local rather than a national level:

The short life-span and limited geographical location of this project means that it is difficult to tell whether it would work on a more widespread scale. [Devine-Wright, Devine-Wright, 2006/RESOLVE-06]

3.6. Initiative assessment difficulties

The assessment of the different initiatives is complex, because the change criteria are complex to define and to measure and quantify:

Some important issues cloud these conclusions, such as methodological problems. Also, little attention is given to actual environmental impact of energy savings. Often, an intervention's effectiveness is studied without examining underlying psychological determinants of energy use and energy savings. Also, it is not always clear whether effects were maintained over a longer period of time. Recommendations are given to further improve intervention planning and to enhance the effectiveness of interventions. [Abrahamse, Steg, Vlek, Rothengatter, 2005/RUG-01]

3.7. Initiatives at the towns and communities level: networks and the varied logics of actors

Several studies show a link between the individual and the collective in the sense of a community of interests embedding individual behaviours:

The research paper begins with the observation that both the major policy statements produced in 2006 – the UK Climate Change Programme and the Energy Review – emphasised the part that must be played by individuals in tackling climate change. In order to facilitate this process, both documents stressed that it was the development of 'grassroots' projects which were likely to be the most effective in fostering long-term changes at both community and individual level. Some of the findings from this research included:

- Evidence that community level projects can be important in raising consciousness at a 'grassroots' level of awareness. One of the stakeholder workshops pointed out, for instance, that climate change is unlikely to emerge of its own accord as communities, and the individuals who reside within them, often have what they consider to be more pressing issues;
- Local level initiatives need further resources through which to evaluate change and impacts although it was stressed that direct behaviour change is often difficult to measure;
- An essential component of success in developing local level responses to climate change is establishing 'trust', particularly between communities and institutions. This is a long-term process but is important in building social networks and social cohesion;
- Linking behaviour change in communities to existing initiatives, activities and needs – for instance educational schemes – is often an effective way to develop more sustainable strategies at the local level;
- A cohesive and responsive *national policy context* is important in encouraging and stimulating community and local level initiatives. The research pointed out that in two of the schemes that were explored, there was a direct connection made with national policy considerations;
- From the range of interviews conducted for the research, six factors were identified as being critical for the success of local level projects: (1) a sense of ownership and responsibility; (2) relevance to local needs; (3) the ability to achieve small successes; (4) a sense of satisfaction and shared well-being; (5) the knowledge that those in authority have heard and responded to a need; (6) a trusted resource space, including professional support, funding, and physical space;
- The issue of climate change poses specific challenges for community-based initiatives since it shares few of the characteristics of typical issues for such initiatives (local and immediate, known beneficiaries and clear sense of agency and potential for feedback). This challenge applies similarly for initiatives aimed directly at individuals;
- Projects such as the Community Action for Energy programme, initiated by the Energy Savings Trust, have illustrated future scope for engaging communities with sustainable energy and local level responses to climate change [DEFRA, 2007/RESOLVE-14]

But local public policies also have to face the barriers of the needs of intermediary actors and stakeholders:

Today, the energy issues are in the centre of the sustainable development problems. But mobilise the local elected representatives on these issues does not seem to be obvious. The movement remains relatively minority, as reserved to the big communities or to towns managed by highly involved mayors respect to environmental issues.

A survey next to mayors of small towns show political, cognitive and pragmatic constraints which clash with the public action in the energy field.

- The environment is not priority and seems abstract.
- The community management is in fact centred on usual problems and the management of the emergencies dictates the classification into a hierarchy of the priorities.
- The management of the energy is a purpose not a lot tackled in the town councils of the small town councils. It is associated to heating, sometimes to the public lighting, but practically never to the behaviour of the buildings.
- The energy budget is very often lived like a fate. Most often, the maintenance obligations (technical failure) or safety issues (obsolescence) leading to reflect on the existing systems and on the works to undertake are also lived like a fate.
- Moreover we find a certain number of blocking factors in the implementation of projects related to energy: recurrent deficit in terms of technical information and in terms of understanding of the stakes in terms of energy saving. The energy issue requires competences the elected representatives do not have ; negative prejudices on the technologies or the devices recommended to favour the energy savings ; a mistrust respect to the renewable energies are "renowned constraining, rustic, complex and requiring a specific maintenance relying on a particular training. They are allocated risks in terms of regularity and we often think that the after-sales service will be weak", backward-looking picture, of come-back + controversies on wind energy projects make the elected representatives overcautious. [Zelem, 2007/EDF-14]

The financial issue is also important for the local elected representatives, because the investment time often does not correspond to the political tenures time:

The devices supposed to favour the energy savings are renowned more expensive than the usual technologies or than the conventional materials. If there is a profitability, it can only be on the long-term; but it is not compatible with an electoral tenure, and thus not politically profitable. [Zelem, 2007/EDF-14]

Moreover, the elected representatives are preoccupied by vote-catching and social network logics:

Partner routines: it is for example difficult to change energy distributor and change contract linking the town to the usual subcontractor. The mayors search for local social peace. [Zelem, 2007/EDF-14]

The "calculation" between social and financial costs on the one hand and electoral and social profits on the other hand urge the mayors of the small towns to slow down the energy management projects:

The efforts to produce in terms of change are considered as too important (adoption of innovating technologies, supposed more expensive, change of partners, political risk-taking, cultural conversion, fear to be politically compared to the ecologist movement famous in the left...), badly compensated by the profits to draw from the involvement in a more thrifty (real energy savings but postponed, come-back to late investment, impacts on the imperceptible environment and finally little electoral gain). [Zelem, 2007/EDF-14]

However, the big European towns implemented cooperation and initiative networks against the climate change:

Those European cities which have taken the initiative to limit greenhouse gases have mainly explored three pathways: reduce CO2 emissions at home, in urban planning, in experimental pilot operations and then standardise this in new builds and renovation work, develop renewable energies, and go after a 'sustainable' form of mobility which is impossible to find. There is a willingness of UN representatives to associate cities with international efforts. An association of local authorities is created in 1990 with the support of the UNEP: ICLEI, based on pilot cities. Two programmes: local agenda 21 programmes and urban CO2 reduction plan programmes. Relayed by two (international) municipal associations in 1990 in the wake of the GIEC report: Energie-Cités (Besançon, France) which focuses its attention on energy saving and the development of renewable energies; Alliance climat (Frankfurt, Germany): fight against climate change on the basis of north-south equality. [Emelianoff, 2007/EDF-44]

📁 Stakeholders' ideas to meet: cities' networks

3.8. The rebound effect as a limit on change

The rebound effect is a “must” social mechanism that can not be avoided but needs to be managed:

- “The substantial improvements in energy efficiency have been absorbed into more and larger products.” (Boardman, 2004)
- Households prefer maximising opportunity rather than minimising cost
- The level of rebound effect varies with the technology concerned and the groups concerned (generally less than 50%, although nearly 100% for “fuel poor” people). (Herring, Roy, 2007)⁴

We will come back below, but we have to notice in particular the rebound effect issue between the eco-efficient appliances and the way to use them:

This article contributes to the theoretical and empirical discussions on how it could be possible to transform technical eco-efficiency into reduced environmental impact of consumption. The rebound effect is an important concept in this context. The relevance of consumer behaviour is addressed within three important sectors for the Zero Emissions Techniques and Systems: shopping of paper products, energy use in household and waste management. It is not only important how much the consumers buy, but also what kinds of products they buy and how they use and dispose of them. However, the responsibility for a sustainable development should not entirely be put on the shoulders of the individual consumer. [Throne-Holst, Stø, Strandbakken, 2007/SIFO-12]

3.9. The necessity of combining several approaches in a “tool mix”

Each initiative provides results and often leads to rebound effects. Therefore, social sciences researchers often agree that it is necessary to combine several tools.

For example, feedback is even more useful when it is accompanied by clearly identified objectives for households:

Various moderators of the relationship of goal setting and feedback are explored in four examples of applied empirical research. A selection of theoretical frameworks adapted from varied disciplines guided the studies and are discussed in terms of their value to the particular questions investigated. The experiments all entailed the use of product-integrated energy feedback and illustrate a progressive understanding of how goals, feedback and other information provided to the user can generate or support better energy conservation. Experiment 1 exemplifies the successful use of combining goal setting and feedback, and provides a basic understanding of the interaction from the perspectives of goal setting theory and feedback intervention theory (FIT). Experiment 2 compares FIT to another, fundamentally different, cognitive framework, and the minimal justification principle. The study gives insight into how goals and feedback work through attention focus and the goal hierarchy to guide behaviour, the role of attitude in this process, and offers evidence that FIT better accounts for task specific conservation behaviour. Experiment 3 addresses the role of goals and information in strategy planning through the perspective of goal setting theory. Results of this study suggest the need for more development of the basic theory and illustrate the strong motivational properties of having a goal. Experiment 4 investigates a more fundamental process, anchoring bias, taken from decision theory and the theory of rational choice. This experiment was based again on FIT and provided further evidence of behavioural control through the focus of attention at a particular level of the goal hierarchy. Findings are discussed in terms of potential energy savings and policy development impact. [McCalley, 2006/RUG-08]

Experiments combining several intervention types show encouraging results:

In this multidisciplinary study, an Internet-based tool was used to encourage households (N = 189) to reduce their direct (gas, electricity and fuel) and indirect energy use (embedded in the

⁴ « The rebound effect is the extent of the energy saving produced by an efficiency investment that is taken back by consumers in the form of higher consumption.” (Herring, Roy, 2007).

production, transportation and disposal of consumer goods). A combination of tailored information, goal setting (5%), and tailored feedback was used. The purpose of this study was to examine whether this combination of interventions would result in (i) changes in direct and indirect energy use, (ii) changes in energy-related behaviours, and (iii) changes in behavioural antecedents (i.e. knowledge). After 5 months, households exposed to the combination of interventions saved 5.1%, while households in the control group used 0.7% more energy. Households exposed to the interventions saved significantly more direct energy than households in the control group did. No difference in indirect energy savings emerged. Households exposed to the interventions adopted a number of energy-saving behaviours during the course of the study, whereas households in the control group did so to a lesser extent. Households exposed to the interventions had significantly higher knowledge levels of energy conservation than the control group had. It is argued that if the aim is to effectively encourage household energy conservation, it is necessary to examine changes in energy use, energy-related behaviours and behavioural antecedents. [Abrahamse, Steg, Vlek, Rothengatter, 2007/RUG-02]

Moreover, the "tool mix" has to take into consideration not only the diversity of households but all the action systems of the stakeholders and of the intermediary actors in order to better take into consideration the constraints and the action levers of different actors:

"The result of the analysis of the evolution of the different packages of measures is that the public policies are today based on the individual consumption behaviours of the economic actors as a main spring of the management of the energy demand. The aim is thus to try to change them combining an incentive approach (using the financial tools or, more and more, the market tools) with information and awareness actions" [Dujin, Poquet, Maresca, 2007/EDF-08]

The main conclusion is that consumers have an important part to play in zero-emission strategies, but the responsibility cannot be put on the individual consumers alone. Based upon the ToolSust project the article focuses on six possible environmental investments in five European cities: Fredrikstad, Groningen, Guildford, Padova and Södermalm in Stockholm. [Throne-Holst, Stø, Strandbakken, 2007/SIFO-12]

4. Conclusion

Within the framework of this project, our multi-disciplinary approach allows an analysis of energy behaviours from different points of view, showing some action points and constraints on individuals. The comparison approach allows a closer analysis of the complexity of energy behaviours and of the multitude of barriers that characterise different levels. It also enables consideration of potential drivers, when the latter are thought like overcoming a part of the barriers and not trying to "solve" a global problem defined outside households. These results lead to consider the energy behaviours not globally as a coherent and homogeneous whole, but lead to disaggregate the notion of "energy behaviours" into categories allowing to better understand the specific barriers and drivers [cf. Deliverable D15].

5. Specifications

5.1. General specifications

- ✓ Energy behaviours entail a complex system, which includes many actors and behavioural determinants. To be an innovator in the questionnaire and in the interview guides, not to be satisfied to ask only questions concerning uses and opinions on their behaviours to the consumers and to ask questions concerning only institutional themes to the stakeholders.
 - ⇒ Try to cross the discourses of each other (consumers/stakeholders), to include/understand the cross representations
- ✓ The barriers towards the behavioural changes are not located only in consumers, so we have to include different actors and not only consumers:
 - ⇒ Try to highlight the barriers, constraints, representations, world visions of the stakeholders too.
- ✓ Include various levels of comprehension of the behaviours in the studies/surveys (i.e., context, social, individual).
- ✓ Correctly separate the types of energy sources in the interviews and in the studies/survey

5.2. Specification for the Work Package 4 – Interviews with stakeholders

5.2.1. Examples of stakeholders to meet

- ✓ Market: manufacturers, distribution network, maintenance: Warning, the “channel” of each technology is different
- ✓ Policy: “makers” and “disseminators” (education system, associations, energy audit companies, NGOs, etc.)
- ✓ Civil society: individual “opinion leaders”, Internet forums, non-structured groups, initiatives at the workplace/office play a role in the dissemination of energy awareness + City networks
- ✓ The actors concretely in relation with the “consumers”/the households: the “contractors” for refurbishment, the local association, the shops, the garage mechanic, the community, etc.
- ✓ The energy suppliers: energy-saving / green energy advices and devices, renewable energy labels, etc.

5.2.2. Examples of questions/themes

- ✓ How do the stakeholders manage the contradiction between the discourse concerning economic growth and recommendations to decrease the energy consumption?
- ✓ From their perspectives, what are the easiest and what are the most difficult behavioural barriers to overcome?
- ✓ What do they think citizens/consumers can accept? What is negotiable? Non negotiable?
- ✓ What do they personally judge acceptable? Unacceptable?
- ✓ Do they think a fast change is possible? In which conditions?
- ✓ Representations of the “energy consumer” and of the “good” level of action
- ✓ What are the constraints, the agency, the strategies, the interests, the values of each stakeholder? (Barriers are also in the side of stakeholders)
- ✓ Evaluation of the policies by different stakeholders

- ✓ From their perspectives, what are the efficient policies/"devices" for a reduction of energy consumption?
- ✓ Public policies seem to elect the interventions based on sensitization information , whereas the results in terms of behavioural change seem to be questioned. Ask questions to the stakeholders on this issue.
- ✓ Hierarchical structure of the policies in each country (energy savings/energy efficiency, which energies, combination of tools or one tool especially, etc.)
- ✓ From their perspectives, what are the efficient arguments to sensitize households to energy efficiency and energy savings?
- ✓ How to overcome the initiatives who are addressed to "pioneers"/environmentally conscious people towards a "general public" policy?
- ✓ What are the (three) main problems they have [to implement a policy/a service/ a commercial proposition]?
- ✓ Do the stakeholders blame other stakeholders for their actions/ non-actions?
- ✓ Who are their partners, co-operation network? With whom do they communicate?

5.3. Specifications for the WP5 et WP6 – Consumers focus groups and quantitative survey

5.3.1. Examples of variables to take into account / social groups

- ✓ Tenants/owners
- ✓ Low income, middle class, high income: an indicator for the "social ease"? For the social precariousness?
- ✓ Education level
- ✓ Household composition
- ✓ Material environment: number of appliances, size of the dwelling
- ✓ "Technology sensitive" people
- ✓ Gender: important, not many results, but question of the survey's unit (household or individuals)
- ✓ Generations/ages: specific uses and representations of energy: try to disaggregate the variable of age into generation (living some historical experiences at a specific age?) or life cycle (the stages between young/adult/pensioner, for instance) explanations.

5.3.2. Examples of questions/themes

- ✓ How to evaluate the acceptability and the support to different measures? (Incentives and constraints)
- ✓ The assumptions of new definitions of comfort should be tested in the studies/survey to understand the cultural differences of the comfort notion, its link with the energy consumptions, and possibly an evolution towards a disconnection between these two words.
- ✓ The energy savings concealed in the actions having other objectives should be detected in the surveys.
- ✓ Rebound effect: see the consequences of the behaviours
- ✓ The "agency feeling": what are the people's room for manoeuvre, in their opinion? In their behaviours?
- ✓ What is negative in terms of social identity nowadays in each country (concerning energy behaviours)?
- ✓ What are the main rationalities of people for energy use? In the survey/Study, take into account

the total social costs, rather than only the financial ones.

- ✓ Ask questions to the households on their knowledge as regards the awareness campaigns in their country, and if this changed something in their practices.
- ✓ The question of the energy invisibility is important: understand how the people make visible their consumption? What perceptions do they have of what consumes a lot or a little?

6. “One-page” documents

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