Scientific Support Plan for a Sustainable Development Policy
(SPSD II)

Part 1:
Sustainable production and consumption patterns

Summary

Specifying household profiles for more efficient energy demand-side management

CP 50

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1. Introduction. Reducing household energy demand: Is this a mobilising goal?

The aim of this study is to determine Belgian households' capacity to reduce their home energy use. This goal comes under the obligations derived from the Kyoto Protocol, since about 80% of the potential for global warming comes from the combustion of fossil fuels (via $C0_2$ emissions). Still, the importance of the Kyoto Protocol lies in its binding nature and consequently the mobilisation of means and people that should follow. Are Belgium's households ready to participate in this effort? What are their current attitudes and practices? Are they capable of changing their behaviour? What about the other players on the market, especially architects, general building contractors, and heating specialists? Are they equipped to meet a possible demand for energy-saving solutions? These are the key questions that the study answers.

Belgium has one of the highest per capita total energy consumption rates in Europe. Moreover, it seems that energy consumption for heating is also relatively high compared with the figures in neighbouring countries. The heating of buildings (including the tertiary sector) was the leading source of greenhouse gas (GHG) emissions in Belgium in 2003 (21.8%) and was up 14.3% over the 1990 baseline. Moreover, this was the second largest rise in GHG emissions, after transport. Households are thus an important target for measures aimed at controlling energy demand.

To put their policy instruments into effect, the public authorities often rely implicitly on a relatively simple and seemingly obvious approach, *i.e.*, each individual can control her/his own behaviour, but it is up to industry to put more efficient products on the market. This dominant approach is effectively anchored in the microeconomic theory that describes the formation of consumers' preferences on the basis of a fiction, that of an individual acting rationally in a perfect market in order to maximise her/his satisfaction or personal use. This economic approach comes up against many problems when it is confronted with real consumer practices. To understand the dynamics of consumption, one must not only allow for market flaws and barriers, but also depart from the economic model in order to grasp (1) the gaps between consumers' statements and behaviours, (2) energy-consuming practices and the uses of energy-consuming objects, and (3) the diversity and multifaceted nature of consumption profiles.

2. Research hypothesis

In a previous study of sustainable consumption (CP17) we showed that the adoption of environmentally friendly behaviours resulted from complex dynamics that varied with the individual, consumption sector, and circumstances. We found that very few people made choices predicated on protecting the environment. In the best cases, our respondents included environmental protection-related criteria in their choices to select one of the various options that met their priority motivations. The rationality of consumers' choices must always be *situated*, that is, placed in the context of the constraints that limit their theoretical possibilities of action. Seen from this angle, information does not appear to be sufficient in itself. Such instruments are effective only if they back up other initiatives, such as financial incentives and regulations.

We wanted to see if these results could be transposed to the area of household energy consumption and to develop a methodology in order to understand current practices in Belgium. Our aim was to document the dynamics of the Belgian population's attitudes and behaviours in the area of household energy use, to understand the rationales that underlie energy-saving actions, and to evaluate the degree of sensitivity to various existing instruments used to achieve energy savings. The central idea of the study was to segment the population along the lines of sensitivity to the country's various policy instruments. Can one distinguish between social groups on the basis of energy consumption practices? How

and by whom is energy-saving information taken up? What are the decisive factors for saving energy in the various social groups? Who has changed their heating installations or home's insulation, and for what reasons? Who uses the subsidies that are offered?

At the beginning of the study we hypothesised that the way in which people live in their dwellings can be an adequate angle of analysis. Indeed, living habits can be connected to differentiated energy use practices and to the ways in which energy-saving arguments and incentives are received prior to all study. We thus drew up a typology of six profiles (see §5 below) on this basis. However, we could not confirm this interesting result because it became apparent that the dynamics of household energy use differed with the various sectors (heating, electricity, and hot water) and sub-sectors (the various services provided by electricity) of energy consumption. Consequently, energy savings must be tackled differently according to the sector and cannot simply be linked up to the way a household lives in its home.

3. The determinants of household energy consumption

As the subject of our study was home energy consumption of Belgian households (consequently excluding transport), the basic unit of study was the household in its accommodation. We thus considered all of the variables likely to influence a household's energy consumption in Belgium. Our theoretical model takes up all of the relations that appear to be the most decisive for residential energy consumption. In the middle we have the household and its dwelling seen from the energy standpoint, that is, everything that constitutes the *setting* (heating system, building's shell, and electrical appliances) on the one hand and everything that creates *mood* or *atmosphere* (energy consumption uses and behaviours, ways of living in the different rooms, and ties and relationships among the members of the household) on the other hand.

The relations that a household can have with these elements of setting and atmosphere are what we call *action variables*, because they are what determine the household's energy consumption directly and can be mobilised at the outset to reduce its energy consumption. In contrast, we call the relations that influence energy consumption indirectly *situation variables*. These variables are socio-demographic characteristics, attitudes and cognitive resources, the characteristics of the dwelling and appliances, the supply of products that can change the residential setting, and the energy supply. In our model, these factors are represented as external constraints or even the situation's *givens*. However, it is clear that these variables can change: changes in the characteristics of the accommodation and its appliances, changes in representations of comfort, even changes in ownership. Policy instruments have a special place in our model, given the analysis of them that we want to conduct. These instruments do not act directly upon the households' characteristics and behaviours, but rather on certain attitudes and representations, as well as on market opportunities. We shall explain briefly the various situation variables, that is to say, what must be taken into account to understand how and why households use energy.

Socio-demographic characteristics

Income gives access to investments in both energy use and savings. The household's composition says something about the types of relation that are possible inside the household. Instruction flags the degree of competence for understanding aspects of energy use. The occupation refers to a set of cultural resources but above all to an income. Instruction and occupation thus definitely have ties with access to information. The status of property owner or tenant obviously is decisive for understanding behaviour (making or not making investments). Changes in the family's composition (separations, remarriage, etc.) also influence energy consumption. The mean number of persons in a household has been falling steadily since the second half of the 20th century. This is important if we bear in mind that a one-person household consumes some 20% more energy per person than a two-person household. The other socio-demographic variables indicate the social ties (include

gender) of the members of the household, connections with generations and history, and connections to change and transformations.

Attitudes and representations

Consumer goods must be analysed from various standpoints, to wit, functionality (*e.g.*, services provided and routines) and symbols (*e.g.*, the owner's place in society and aesthetics). Attitudes can be general (concern for the environment or the future) or specific (towards specific energy-consuming activities). Representations can concern social standards (comfort, identifying with others), behaviour (perceived effectiveness of an action), or the way to assess a decision (cost/benefit analysis).

Characteristics of the dwelling and its amenities

From the energy use standpoint, a dwelling is characterised by its shell (volume, surface area, and insulation) and amenities (furnace, type of fuel, and electrical appliances).

Belgium's housing stock is old and not or little insulated. This means that households are confronted with sizable technical insulation problems that require major investments. Compared with the other countries of the European Union that have comparable climates, Belgium still has some progress to make in insulating housing, especially when it comes to roofing and flooring. So, according to Eurostat data, only 14% of the country's housing had floor insulation and 43% insulated roofs. Moreover, these figures reflect the number of dwellings with insulation, not those with sufficient levels of insulation. In addition, the SENSIVV study (CSTC, 1999) of 200 dwellings suggests that about 90% of new buildings do not meet the country's insulation standards, even though these standards are below other countries' and fall short of the economic optimum.

Market opportunities

Market opportunities include the availability of various technologies, their absolute and relative cost, the accessibility of information, and the availability of credit. We should point out that the price of heating oil (the reference energy source for Belgian families) in Belgium is among the lowest in Europe. The taxes that are applied to energy (mainly VAT) do not heighten the visibility of fossil fuels' environmental impacts. Absolute consumption of heating oil does not seem to vary significantly with household income. In contrast, we see a slight rise in gas consumption with rising income and a very clear correlation when it comes to electricity. Nevertheless, when we look at these expenditures' shares in the households' overall budgets, we see that even electricity occupies a smaller share of the budget of higher-income households.

Policy instruments

Policy instruments are traditionally broken down into four categories, *i.e.*, economic, regulatory, sociocultural, and physical (including regional planning & development). In view of our approach, we considered two categories, to wit: (1) instruments that are aimed at changing the household's immediate environment: subsidies, standards, labels, and seals of approval; and 2) instruments that are aimed at changing attitudes and representations to engender new behaviours and practices.

We identified more than forty measures that the public authorities in Belgium have taken or plan to take to encourage more rational use of energy by households. While this inventory is not exhaustive, it does give an overview of the types of measure preferred by the various levels of government. In Belgium, players acting on different levels of jurisdiction have developed a host of instruments to control energy consumption. These instruments have been compared with those used in other countries, from which it appears that Belgium seems to have developed a balanced range of diversified instruments.

Our analysis shows that the public that these instruments target is primarily the "public at large", especially in the case of vast information campaigns, followed by owners ready to

invest in energy-efficient appliances and structures. There are few "supporting" measures. Instead, emphasis is put on the households' "spontaneity" and the existence of strong motivations to save energy. A policy to control energy consumption must thus manage to allow for both low-income households, which have proportionately higher energy budgets and limited investment capacity, and high-income households, which spend relatively little on energy compared with their overall budgets but have high investment capacity.

4. Methodology: the steps in the investigation

To circumscribe the possibilities that households have to control their energy consumption, we decided to analyse their attitudes, representations, behaviours, and practices linked to energy in general and energy savings in particular. We thus made use of various methods belonging to diverse disciplines, shuttling to and fro between the qualitative approaches and quantitative questionnaire. The various steps of our investigation are described below.

Focus groups

To start off, we organised focus groups, the idea being that such discussion groups make it possible to reveal the contrasts between peoples' attitudes and to determine various profiles present in the population. Focus groups are a way to express a maximum number of different ways of thinking. Through the use of associations of ideas, spontaneous observations, concept comparison, and materials to garner reactions and comments, the focus group allows broad exploration of the participants' perceptions of the subject being studied. The aim of a focus group is not to achieve consensus on each idea or proposal but, on the contrary, to let its members talk freely about their diverse opinions and how they are reflected in their daily lives.

So, we organised four focus groups of eight people each in Brussels in December 2004 and January 2005. Each group, whose members ranged in age from 25 to 60, was given a specific subject, as follows:

- Group 1: Problems of heating and investment in heating and/or insulation.
- Group 2: Behaviour taken to save energy in the home and potential for adopting rational use of energy (RUE) behaviours.
- Group 3: Motivations of the consumers who have adopted rational use of energy (RUE) behaviours.
- Group 4: Problems of heating and investment in heating and/or insulation. The members of this group were all owners of at least one dwelling unit that they rented to a tenant ("landlords group").

In-depth *in situ* interviews

We visited seven households in February and March 2005 to ask them about their perceptions and practices regarding energy consumption. The advantage of going to their homes was to be able to understand how they consumed energy in addition to simply collecting information about their general and specific attitudes about their accommodation and energy. Consequently, after completing a semi-directed interview we walked through the dwelling with the respondent or respondents and ran through a list of energy-saving practices as we did so.

The quantitative survey

Following the first two steps, we developed some hypotheses in order to draft the quantitative survey questionnaire. This survey was conducted by phone interviews of 1,000 people 18 years old and up who lived in Belgium and selected from the telephone books. The survey was conducted in the Summer of 2005. The sample was taken randomly and

stratified and then corrected for location, gender, and social group. The results underwent appropriate statistical treatment (χ^2, margin of error). The maximum total margin of error for the sample was 3.1%.

Each datum was analysed by location (province), linguistic characteristics, gender, age class, household size and composition, type of accommodation (CIM), dwelling size (number of rooms that could be lived in), dwelling age, occupancy status (owner or tenant), whether the dwelling had been built by the occupants, social group (lower, middle, upper), status with regard to purchasing (main person in charge of purchasing or not), type of education (scientific or not), temperature in the living room in winter, and declared amounts of the electricity and heating bills.

We also developed a typology based on Diday's dynamic clustering method and segmentation according to Belson's index. We analysed the entire corpus and did transverse analyses by occupancy status, social group, region, and age group.

In-depth interviews

Following this survey, we conducted a series of in-depth individual interviews to be able to interpret some of the quantitative survey's results.

Interviews of intermediaries

Households are not alone when it comes to consuming energy. They must deal with architects and builders when they build or renovate a home, heating specialists when they install a new furnace, salespeople when they want to buy electrical appliances, and so on. We thus interviewed twenty-one professionals or "intermediaries" from various fields in October and November 2005 with the following two objectives:

- to collect quickly, through a series of interviews, information about the practices of and specific pressures on the various professions that intervene in some way in controlling household energy consumption; and
- to spark proposals to enhance the households' abilities to control their energy consumption. The most interesting proposals were then discussed at a round-table in December 2005.

5. A few results of the household survey

The final report contains a large number of findings that came out of the survey, especially from its quantitative part. Here we shall merely touch upon some of the general findings of the survey and skip, for example, the analyses that reveal the contrasts between different categories of social groups.

General findings

The public at large continues to have problems grasping energy as a physical parameter. Energy gets visibility only through its various uses, as heating, lighting, the functioning of household appliances, and so on.

Very often, our respondents were unable to say how much energy they used, be it overall or by type of source (gas, heating oil, electricity, etc.), or even by type of use (heating, lighting, etc.). They were not able to give even a rough estimate of how much they used, whether in cubic metres or kilowatt-hours. Most of our respondents were no more able to give us estimates of their monthly or annual home energy use costs.

Generally speaking, the population is not guided by ONE single energy use rationale or ONE single energy-saving rationale. Their rationales tend to depend rather on the sector of household activity, *i.e.*, lighting, heating, cooking, washing clothes, etc. People make choices and adopt certain behaviours in each of these sectors in line with a set of criteria and

constraints in which saving energy or money is often a less important factor than other personal criteria.

Attitudes and behaviours

The focus groups enabled us to discern six separate household profiles according to how they conceived of their dwellings, which in turn was linked to their perceptions of energy, interest in specific policy instruments, and importance attached to energy saving and the use of lighting. We labelled the six profiles as follows: management, conviviality, nest, demonstration, accessory, and transit. Each individual can be composed of several profiles, but one of the profiles often dominates.

Our segmentation analysis established that socio-demographic criteria were more powerful explanatory factors of thrifty behaviours than attitudinal factors. The latter helped explain thrifty and wasteful behaviours, but in a complementary way. "Positive" attitudes (towards the environment or the impact of one's activities) were not indicators of taking action, but more positive attitudes were observed in those who did follow up word with deed. Negative attitudes (towards expensive energy, technological progress, difficulty of controlling one's energy consumption) did not seem to influence behaviour one way or the other. Those who took action attached more meaning to achieving savings than the others.

However, saving money is not a dominant motivation, either. For example, the energy savings that are achieved by an investment are not considered financial savings, but slow returns on the investment.

Our respondents' motivations to adapt energy-saving behaviours were varied. They varied with the individual, but also with the sector of consumption and/or type of behaviour for the same individual. So, we saw different reasoning at work when it came to investments and daily practices. People tended to think that savings were more the results of investments than of daily behaviour. Those who invested thought that they had done what was necessary to save energy and made little effort to adopt more energy-saving behaviours.

The qualitative approach underlined the influence of education on these types of behaviour. Changes in behaviour regarding energy use also occurred following breaks in routines or moments of sudden realisation, such as the worsening of one's financial situation after losing one's job.

Heating

In our sample, most of the dwellings (83%) had central heating fuelled by natural gas (57%) or heating oil (40%). Electricity was used very little as the main source of heat. Some people were likewise unable to specify the main features of their central heating system (type of energy source, type of furnace, etc.).

The majority of the respondents who had made investments were owner-occupants. These investments depended as a rule on the level of well-being to which these people aspired, but above all to the state of the dwelling (accommodation to renovate, new construction, etc.). Currently, the subsidies on offer do not play an entrainment role. Very few applications for these premiums are submitted when investments are made. This is because either they are not known or people do not know where to apply for them.

Many respondents said that they were willing to avoid energy consumption that they deemed useless or superfluous (willing to lower the temperature at night, when they are not home, etc.). In contrast, it appears much more difficult to get them to adopt new behaviours that influence their comfort or change they habits. Moreover, just one member of a household cannot regulate energy consumption due to heating on her/his own; a family consensus is required for this. The indoor temperature was found to be a source of disagreement in half of the households that we interviewed. Such conflicts were generally settled by setting the temperature in line with the needs of the person most sensitive to the cold.

The most frequently expressed motivation for undertaking energy consumption-related work was greater comfort. Measures aimed at improving infrastructure (*e.g.*, heating and insulation) so as to keep the home just as warm while consuming less energy would be better received than awareness-raising campaigns encouraging people to lower the temperature by lowering the thermostat, for example.

Electricity

Belgian households' electricity consumption is up. This is explained notably by the increase in the number of appliances that households own and the rise in their frequency of utilisation. Some appliances (refrigerators, TV sets, washing machines, and microwave ovens) were present in the majority of the households that we interviewed. Others (freezers, computers, electric cookers, clothes dryers, dish washers, and a series of small appliances) were present in a smaller number of households. As a rule, the households had at most one appliance of each type. The exceptions were television sets and computers, for the households that had one of these appliances usually had more than one.

However, we see no single, homogeneous electricity consumption pattern, nor do we see a consistent electricity saving pattern. Electricity consumption can be understood only by examining it in relation to the various sectors of activity (lighting, cooking, cleaning, recreation, etc.). This is borne out inside a household (for example, care will be taken to switch off appliances on standby, but rooms will be lit by powerful halogen bulbs) and in a given sector in different households (for example, when it comes to lighting, most of the respondents stated that they switched off lights when no one was in a room and considered this a way to avoid wasting energy, but many respondents said that they used lighting to "create an atmosphere", that is to say, to create an impression of animation, life, space, warmth, intimacy, or cosiness.

Unlike savings in heating, which require a consensus, a single person can, by her/himself, dictate when lights are to be switched off or limit the use of lighting in the family, for the consequences are not as vital as with heating. When it comes to electrical appliances, very few respondents felt it was possible to buy and use only the appliances that they might truly need. Similarly, very few respondents entertained the idea of using their appliances differently. However, many respondents felt it would be easier to buy more energy-efficient appliances.

Policies and measures

Some hobbles on investment showed up clearly. They were the occupancy status, envisioned length of occupancy, overestimation of the state of the dwelling's insulation, source of advice (heating specialist for the heating, no one for insulation), procedures to get information, ignorance of subsidies and rebates, and non-utilisation of subsidies.

The measures that the households stated as being the strongest incentives varied with the group, but there was general agreement on what would prompt people to pay more attention to their energy consumption, namely, more regulation, better visualisation of energy consumption and its environmental impacts, high energy prices, and personalised advice.

6. Survey of the intermediaries

To complete our investigation, we met with various people deemed to be prime observers or practitioners in areas that concern residential energy consumption, *i.e.*, architecture, heating, building, government administration, instructors, energy advisers, and so on. The information that we gleaned from their answers is summarised below.

Most of the intermediaries whom we interviewed gave the poor insulation of existing housing as the reason for the relatively high energy consumption of housing in Belgium. When it comes to new housing, their opinions were more divided: some of them thought that they continued to be poorly insulated, whereas other thought that things were improving.

However, they all agreed that the problem was one of enforcing current standards. What is more, building professionals came across as lacking qualifications. The intermediaries were generally in favour of supporting measures such as the Walloon Region's "construire avec l'énergie" (building with energy) plan.

The intermediaries who had not thought about the general problem of household energy (over)consumption suggested organising vast information campaigns (television commercials, etc.) as their first reflex. However, those who had studied the matter observed that mass media information campaigns were fairly ineffectual because they were fleeting.

Subsidies were often perceived to be good tools for communication but of rather limited effectiveness when it came to influencing energy consumption. The current system of subsidies was also criticised for being rather dispersed (hence the considerable amount of time needed to gather all the subsidies together) and unstable (changing each year, in line with the availability of budgetary resources).

The interviews of certain professionals amongst the intermediaries confirmed their importance in residential energy consumption and the practices (whether good or often bad) that they perpetuate. The upshot was the continued weight of tradition in the building and heating trades and the need for household energy advisors – a role that has yet to be filled. The 'wait-and-see' attitude seems to remain widespread.

7. Conclusions and recommendations for an energy culture

We can conclude that Belgium does not have an energy management culture today. We saw this in the qualitative and quantitative surveys of households. We ascertained this as well in the responses of the professionals who are involved in one way or the other in residential energy consumption. Finally, we confirmed this during the round-table that was held to discuss these issues.

From the households' viewpoint, energy is distributed in a series of actions, the purpose of which is not to consume energy but to provide a set of services. This set of services is disparate and as a rule is not perceived to belong to the energy category (unless people are questioned on this point). Some households have got into the habit (through education in particular) of paying attention to certain uses, but energy-consuming practices continue to come in for varying degrees of thought. Of course, the households know in general that energy has a cost and its consumption poses environmental problems, but energy is an abstract notion, for it is not easily associated with the myriad of actions that lead to energy consumption.

The various trades that are involved in housing construction and living conditions (architects, general contractors, heating specialists, and so on), for their part, are not very sensitive to the issue of energy efficiency today. In addition, certain ways of doing things that have been "learnt on the job" seem to influence the situation in Belgium heavily.

With a view to drawing up recommendations, we can ask the following question: Is talking in terms of energy relevant to affect these practices, or should we respect the fragmentation of these practices? We believe that both must be done, but in the right order, starting with the practices. The first step could be that of support policies, of policies that adapt to the myriad of cases that concern households and building professionals alike.

Our survey findings show that people are very interested in free audits. They would in a way like it if someone came to their homes and explained what energy consumption was and how they could reduce it. As each household and each house is a special case, it seems normal to request individualised assistance. If audits are to be followed by effects, they must nevertheless be accompanied (by financial support or by close, regular contacts). Moreover, the private individual who wants to do work in her/his home is currently completely at sea: It is very difficult to find reliable information (for households and professionals alike), and

professional support for each of the stages in the process, from design (new construction or renovation) to inspection, is lacking. There is call for a new profession to develop, that of an energy advisor, especially within the framework of the European Directive on the energy performance of buildings (Directive 2002/91/EC).

Policy measures must be better focused. Today, financial incentives are too limited to have a true entrainment effect. Soft (*i.e.*, low interest) bank loans for renovations to improve a building's energy performance could be one avenue, but we must not forget the cases in which this measure does not work, *i.e.*, tenants and poor homeowners. Reaching landlords in this connection is particularly difficult, because they generally do not pay their tenants' utility bills. However, it could be done by linking the energy performance of buildings (EPB) and property taxes, which would make it possible to reach all owners and give more weight to EPB. Subsidised or council housing also needs special attention.

In a second step, once a person has done something to save energy, it is possible to use these changes to turn energy into an important issue and thus give meaning to the Kyoto Protocol, for example. The two steps are linked not chronologically, but logically, that is, one must be as close to people's daily practices as possible (*e.g.*, audits), to then be able to show them the connections between their actions and the environment. One cannot take as a starting point the essential issues that are raised by the consumption of non-renewable energy sources without first organising a general policy of aid and support that takes account of the many different practices that occur in the field, on pain of making people feel guilty (and thus rendering them powerless).

The climate plans of Belgium's three federal regions count in part on households to meet Belgium's Kyoto objectives, but the political will to say this clearly to the households and above all to give them the means to achieve these objectives is clearly lacking. Of all the measures that we studied, regulations were found to have the greatest potential. Our respondents said that they were most sensitive to regulations. As a rule, we found that people were in favour of political intervention if it was fair, that is, if it applied to everyone.

Belgium is currently at a strategic turning point when it comes to controlling its energy demand. The European Directive on the energy performance of buildings will force it to correct some of its failings in this area. Such an improvement appears to be very necessary, for with its high living standards and old housing inventory, compounded by a rather long heating season, Belgium looks to be a prime target for Europe's crackdown on wasting energy. The traditions that govern the various building trades have helped trigger an awareness that now seems proven but still lags behind that of some of our neighbours.

However, to grasp this opportunity, the public authorities must take strong measures that, most importantly, are consistent with each other. The new regulations will have to be accompanied by supporting measures if they are to be taken up by housing professionals. Information will also be necessary to publicise the existence of the instruments that are available to enable households to get a better grip on their energy consumption. Finally, it is important to find ways to make electricity (and energy in general) more visible and, to achieve this, to develop a cluster of expertise in energy consulting.