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# Fostering Climate-friendly Behaviors – Designing Effective Interventions

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## ***Foreword***

In the 1980's Israel issued a huge environmental campaign, which discouraged the picking of wild flowers. In the 1980's, environmental awareness was hardly developed in Israel and picking wild flowers in an unsustainable way (that is, with the root) was a big problem. Since in this arid land wild flowers only grow for several weeks, this phenomenon threatened to wipe out flowers from the natural scenery. Fortunately, the campaign was a huge success, not-picking wild flowers became the social norm, and the wonderful scenery of an arid land turning colorful during the spring was preserved for future generations.

This story tells an important lesson. It can be highly beneficial to educate the public to behave in a more sustainable way and means to do so have been successfully applied in the past. This story was also one of the inspirations for writing a paper about fostering sustainable behavior in one of the most urgent environmental issues at the moment – climate change. The inspiration for this topic also came from authors who dealt with fostering 'positive' behaviors in other domains, such as health, wealth and quality of life (Green & Kreuter, 1999; Thaler & Sunstein, 2008). The shared vision in these approaches is that we have a better chance of tackling our current (environmental) problems if we engage the public in taking an active part in the solution.

This research is an independent research, which was conducted for the partial fulfillment of a master degree in Environment and Resource Management, at the Vrije Universiteit of Amsterdam. The research was conducted as part of an internship in the Institute for Environmental Studies (Instituut voor Milieuvraagstukken, IVM), under the supervision of Prof. Frank Biermann and Drs. Annick de Witt.

An important partner in the research was Dimitrina Chakinska, a fellow master student at the Communication Science department at the Vrije Universiteit of Amsterdam, who also served as student-assistance at the Center for Advanced Media Research Amsterdam (CAMERA). This partnership was important due to the multi-disciplinary skills required for such research. Hence, Dimitrina's background in communication and psychology contributed significantly to the research. This partnership was further supported by Dimitrina's supervisor, Dr. Jolanda Velduis, who is an expert in health communication.

## Table of contents

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Chapter 1 – Introduction and Rationale .....	4
Chapter 2 – Methodology.....	8
Chapter 3 - Conceptual framework.....	11
Chapter 3 – Analysis of the case studies .....	23
1. Energy Advice Project Rotterdam.....	23
Results.....	23
Analysis of the results.....	28
2. The Climate Street Festival.....	33
Results.....	33
Analysis of the results.....	44
Conclusions.....	49
Bibliography .....	54
Annexes .....	58
Annex 1 – List of interviews.....	58
Annex 2 – Energy Advice Project Rotterdam: Specifications of the tools and the advice given in the house audit.....	59
Annex 3 – Climate Street Festival: List of collective actions and earned points .....	60

## Chapter 1 – Introduction and Rationale

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*Policy has certain goals, that's the hoop. Certain people and firms have to jump through the hoop. You can achieve this with laws and regulations, that is one way, that is the whip. You can hold a carrot in front of them, that is a subsidy, or a charge if necessary. Or you can say: well, decent people would jump through that hoop.*

*Pieter Winsemius*

### - *A new generation of environmental problems*

Climate change and many other contemporary environmental problems introduce a new generation of environmental problems, in at least two ways: First, sources of pollution are large in numbers, small in scale and much more diffused than they used to be; and second, there is a multi-dimensional distance between the source of the problem and its impacts (Rejeski & Salzman, 2002). In the 70s and 80s industrialized countries have focused mainly on environmental problems resulting from local, large-scale and evident sources of pollution, such as air and water pollution from the industrial sector (often termed “smokestacks”). However, as many developed nations have shifted from an industrial-oriented to a service-oriented economy, sources of pollution have shifted accordingly. First, the share of the service sector as a source of pollution has increased significantly. Second, this shift has led to economic growth, which increased private consumption, thus raising the share of households as direct and indirect sources of pollution (Rejeski & Salzman, 2002).

In 2005, the residential sector within the EU accounted for 26.6% of final energy consumption. Since energy production is the main source of greenhouse gas (GHG) emissions (80% within the EU) and since energy consumption in the residential sector has steadily increased, reducing emissions in the residential sector is crucial for achieving EU's emission reduction targets. The residential sector in the EU is also one of the sectors with the largest potentials for energy efficiency, especially with regard to reducing heating and cooling demand (European Environment Agency, 2008, p. 67)

Furthermore, the contribution of households' consumption to CO<sub>2</sub> emissions goes far beyond direct energy consumption. Indirect energy consumption, i.e. the consumption of energy used for the production of different commodities (food, appliances, cloth, etc.), contributes even more significantly to the increase in CO<sub>2</sub> emissions. For example, in 1990 54% of household's energy consumption in the Netherlands was indirect, and by 2030 this is expected to increase to 70% (Vringer, 2005).<sup>1</sup> This is explained by the coupling of economic

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<sup>1</sup> A study from 11 EU countries showed similar results, with indirect energy consumption accounting for 36%-63% of total energy requirements (51% on average) (Reinders, Vringer, & Blok, 2003).

growth with the growth in private consumption, which far outweighs energy efficiency improvements, thus leading to a net increase in CO<sub>2</sub> emissions from households (Ibid).

The distinction between direct and indirect sources of pollution is associated with the second feature of the new generation of environmental problems, the multi-dimensional distance between the source of the problem and its impacts. Climate change stands out as an excellent example. Not only is there a temporal and spatial distance between emitting CO<sub>2</sub> and realizing the impacts of climate change, there is often also a complex and indirect link between an activity and the pollution it causes. This creates a greater challenge for policymakers in designing effective climate policies, both in terms of identifying the polluting activities and in terms of acquiring legitimacy for controlling activities which will *indirectly* cause environmental damage *somewhere* and *sometime* 'far away'.

- *New problems demand new solutions*

Environmental policies were initially designed to deal with the traditional set of problems, thus they often involved command-and-control or economic instruments that could be negotiated with and enforced on a small number of large entities (Dietz & Stern, 2002). Climate policies in the EU have often followed a similar path, which led to relatively progressive policies with respect to the 'big emitters', such as the establishment of the EU Emission Trading System (Oberthur & Kelly, 2008). Reaching the large number of 'small emitters', such as households, is still a great challenge for climate policymakers. This is often due to the fact that the traditional set of environmental policy instruments, which impose external controls on behavior or provide economic incentives, are in themselves insufficient for influencing households' direct and indirect energy consumption (Dietz & Stern, 2002; McKenzie-Mohr & Smith, 1999).

Regulation, to begin with, is only efficient to the extent that people are willing to comply with the regulation, or else monitoring and enforcing compliance becomes very costly. Regulation can also discourage internal motivation for change, which is often seen as a crucial factor in influencing people's intimate habits and routines (Lindén, Carlsson-Kanyama, & Eriksson, 2006). Market-based instruments, on the other hand, are designed according to the 'rational-economic' model of behavior, which claims that individuals need only to be informed of the financial advantages of a given behavior and they will change their behavior accordingly. Mohr (1994) claims that past attempts to promote energy conservation in the residential sector in the US have had limited success precisely because they were based on this 'rational-economic' model, which overlooks the "rich mixture of cultural practices, social interactions, and human feelings that influence the behavior of individuals" (McKenzie-Mohr, 1994, p. 226).

Furthermore, different evaluations of residential energy use show a high variance in residential energy use across different households with identical physical features. Some studies have shown that energy use in households can vary by a factor of two, despite the fact they use identical appliances and equipment (Lindén et al., 2006). Furthermore, a study conducted by the US Department of Energy (DOE) on changes in household-level energy use in the United States during 1979-1987, suggested that behavioral factors were the main attributes to efficiency gains during that period. Behavioral factors accounted for about 4.1 quads in annual savings, compared to only 1.2 quads which were attributed to infrastructural improvements (building-shell retrofits and improved new-house efficiencies) (Lutzenhiser, 1993). These studies suggest that social and behavioral factors are significant determinants of energy saving, and that they need to be addressed through multi-faceted intervention strategies (Stern, 2002).

The need to address environment-related behavioral change in a more comprehensive way, led to a search for 'new tools' in environmental policymaking, such as communication instruments and public education programs (Dietz & Stern, 2002). They distinguish themselves from other policy instruments, in the sense that they attempt to foster behavior on a voluntary basis, without imposing any explicit sanctions on those who do not change their behavior and without providing financial rewards for those who do. Instead, they try to influence other personal and social attributes of environmental behaviors, such as lack of knowledge on the personal and societal benefits of changing behavior, misguided attitudes towards the desired behavior or normative perceptions of how 'others' are behaving (Stern, 2002).

Moreover, communication instruments and public education programs have several co-benefits, which make them particularly attractive to policy makers. To begin with, influencing peoples' knowledge, attitudes or even values associated with a certain behavior can increase citizens' involvement in and sense of responsibility towards the policy issue at hand (Green & Kreuter, 1999). This has the potential to shift some of the burden from the government to civil society, which coincides with the decreasing ability of governments to regulate polluting activities of individuals discussed earlier. It can also assist in creating political support for policy change (Ibid). This is especially important with regard to promoting climate policies, such as spreading land-based wind parks or introducing a carbon tax.

#### ***- No silver bullet***

It is important to note that the search for 'new tools' did not come to substitute the 'old tools', but rather to supplement them. "Communicative and diffusion instruments... can influence some aspects of the target individuals and their immediate social contexts, but they can not make inconvenient behaviors convenient, make expensive behaviors inexpensive, or

remove institutional or legal barriers to behavioral change” (Stern, 2002, p. 202). In fact, many documented failures of public environmental information programs is attributed to the fact that these programs did not address significant non-informational barriers to behavioral change, such as infrastructural, financial or institutional barriers (Ibid).

These observations highlight once again the need to design multi-faceted interventions and to shift the discussion away from finding the right instrument (*the silver bullet*), to designing the right framework for putting a variety of instruments together in order to achieve the designated policy, that is to foster behavioral change. This approach also has origins in the domain of public health, where there is extensive experience in designing interventions for fostering populations' behavior (e.g. improve family planning or reduce smoking rates) (Maibach, Roser-Renouf, & Leiserowitz, 2008). Similarly, public health analysts could not find one intervention method that had superiority over others across different populations. Instead, they found that interventions are successful because of the "planning that went into the strategic selection of methods that matched the learning and behavioral needs of the patients" (Green & Kreuter, 1999, p. 7). This approach can also guide researchers and practitioners in the search for effective intervention methods for fostering climate-friendly behaviors.

Thus, the *aim* of this dissertation is to contribute to climate policies aiming at fostering climate-friendly behaviors of households, by offering a model for evaluating and enhancing the effectiveness of climate behavioral change interventions. This model could be further developed in the future in order to help practitioners in designing and implementing climate behavioral change interventions.

The outline of this dissertation is as follows: the second chapter will give an overview of the methodology. The third chapter is the conceptual framework, which presents a model for evaluating climate behavioral change interventions and the theoretical base behind it. The third and fourth chapters analyze two interventions which are evaluated according to the model. The fifth chapter presents relevant conclusions with regard to enhancing effectiveness of interventions and with regard to the strength of the model as an evaluative tool.

**The question that this research will deal with is how can behavioral-change interventions be effectively used to foster climate-friendly behaviors of households?** In order to answer this question, a model will be developed for evaluating existing climate behavioral change interventions, in order to improve our understanding of what determines (and how to enhance) their effectiveness. This model builds on the PRECEDE-PROCEED model, which was initially designed for evaluating public health interventions. It is further modified in this dissertation into a 'Model for Evaluating Climate Behavioral-change Interventions' (MECBI) to match the unique characteristics of climate-related behaviors, in the context of advancing climate policies in the household sector.

Thus, the main hypothesis made in this dissertation is that interventions which aim at fostering climate-friendly behaviors of households are more effective if they adhere to the MECBI model. This hypothesis will be further developed in the conceptual framework and broken down into specific planning, implementation and evaluation phases, against which interventions will be evaluated. The objective of this analysis is to arrive at a better understanding of what determines and how to enhance the effectiveness of climate behavioral change interventions.

The hypothesis above is made upon the assumption that the MECBI is an adequate model for evaluating climate behavioral change interventions. This assumption is partially based on a previous modification of PRECEDE-PROCEED for evaluating *energy* behavioral change programs which was conducted in a large meta-analysis called the BEHAVE project.<sup>2</sup> Yet, it is important to reflect back on this assumption throughout the research and a summary of these reflections will be presented in the conclusions.

#### - ***Research Methods***

In order to explore the hypothesis above, several case studies were identified, out of which two were selected for the evaluation. The first case study is Energy Advice Project Rotterdam and it entailed house audits in low income households in Rotterdam. In these audits households received an energy advice and an energy box with standard tools for saving energy. The second case study is the Climate Street Festival, which is part of the Dutch Climate Campaign (called HIER). The project entailed a competition between streets in the Netherlands on becoming climate-friendly and it focused on utilizing community-based social networks.

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<sup>2</sup> BEHAVE is a comprehensive study issued by Intelligent Energy – Europe (IEE) which has evaluated 40 energy behavioral change programs in eleven European countries (Oy, 2007).

These case studies were selected upon several criteria: First, in order to match the context of this dissertation, they had to be interventions which aim at fostering climate-friendly behaviors of households, in the context of a well-defined *climate policy*. Second, these case studies had to obtain sufficient information on the planning, implementation and evaluation of the intervention. This was important, since no outcome or impact evaluation on the effectiveness of the interventions was included in the research (due to the large amount of time and resources which are needed to conduct such evaluations). Third and last, the preference was to find interventions which applied different strategies and used different methods for fostering climate-friendly behaviors. This was in order to provide a broader perspective on how to enhance effectiveness.

The evaluation of the case studies was qualitative in essence, and it was done according to three sources of information: a) first source evaluation of the *process* of the intervention, through interviews at the policy level and at the operational level, and through a study of the intervention's documentation (a detailed list of interviews is brought in annex 1);<sup>3</sup> b) second source evaluation of the *impact and/or outcome* of the intervention, according to previous evaluation studies that has been conducted; c) documented evaluations of other similar interventions which could provide a point of reference.

It is important to mention several limitations with regard to the applied method. First, as mentioned earlier, no evaluation of the impact or outcome of the case studies was conducted in the research, thus it was solely dependant on what has been done beforehand. Second, climate policies are in their infancy (most of the climate offices approached had only been operating for two-three years), especially with regard to the household sector. Thus, most of the evaluated programs were either still operating or have only just been completed. This meant that evaluative data on effectiveness was rather scarce.

Two other methodological challenges are worth mentioning. First, analyzing these types of interventions demands multidisciplinary knowledge, including knowledge from environmental sciences, public policy, social and behavioral sciences and communication science (Abrahamse, 2007; Green & Kreuter, 1999). This was dealt with through collaboration with a fellow student from communication science with a background in psychology. This collaboration also contributed to the second challenge, which is lack of adequate command over the local language (Dutch).

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<sup>3</sup> Operational refers to the organization or company which carried out the intervention.

- *Definition of key terms*

The term 'intervention' was adopted from the literature on public policies for fostering behavioral change, and has its origins in the public health literature (Green & Kreuter, 1999, p. 32). A parallel term is behavioral change programs (Oy, 2007), which was modified here into behavioral change interventions.

Climate-friendly behaviors are defined here as reducing direct and indirect energy consumption, which are equally significant in household's contribution to emitting greenhouse gases (Vringer, 2005). This term was taken from practitioners' definition (Klimaatbureau, 2009), since no adequate term in the literature was found. A related term often mentioned is climate-related behaviors (Maibach et al., 2008), but it does not specify if the behavior is positive or negative for mitigating climate change.

The definition of climate behaviors is crucial since it differentiates this dissertation from a large array of research which was conducted on energy behavioral change programs and has focused solely on direct energy consumption.

## Chapter 3 - Conceptual framework

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*The history of public health interventions could be written as the successive redefinition of the unacceptable*

*Sir Godfrey Vickers*

The following conceptual framework aims at providing a model for evaluating climate behavioral change interventions, in order to improve our understanding of what determines and how to enhance their effectiveness. The model builds upon the PRECEDE-PROCEED model, which was designed for planning, implementing and evaluating interventions for fostering health-related behaviors. It has been widely used for more than three decades and it is considered a theoretically robust model (with a record of over 750 published applications) (Green & Kreuter, 1999, p. 36).<sup>4</sup> This model was further modified for evaluating energy behavioral change programs in the BEHAVE project, a comprehensive study issued by Intelligent Energy – Europe (IEE) which has evaluated 40 energy behavioral change programs in eleven European countries (Oy, 2007, p. 21).

The Moto of the model is that intervention planning should start at the end, with the social and environmental outcomes of the designated policy, and trace back its different attributes in order to design an adequate intervention. It further offers a systematic tool for assessing the different factors which influence people’s behavior, in order to examine which intervention methods should be applied. This approach was developed because it was observed that practitioners often take a quick glance at the problem at hand and immediately begin to design and implement the intervention, based mostly on common practice and their prior experience. Thus, the model offers a method for integrating theoretical understanding of behavioral change into practice (Green & Kreuter, 1999, p. 37).

The PRECEDE-PROCEED model has been modified into a ‘Model for Evaluating Climate Behavioral-Change Interventions’ (MECBI), in conjunction with the some of the modifications done in the BEHAVE project. Similar to the original model, MECBI consists of a *planning section* (which corresponds to the PRECEDE part) and an *operative section* (which corresponds to the PROCEED part). The planning section consists of four phases:

- 1) Contextual analysis: According to a context analysis, the targets of the intervention are defined, in line with broader policy goal.

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<sup>4</sup> This model was chosen through a consultation with Dr. Velduis from the Communication Science department at the VU University, who specialize in public health communication.

- 2) Behavioral assessment: Identifying the relevant changes in behavior for meeting the targets of the intervention and ranking them according to changeability and impact.
- 3) Assessing the determinants: The corresponding determinants influencing the behavior of the target group are analyzed. These are categorized into predisposing, enabling and reinforcing factors and ranked according to their significance.
- 4) Intervention design: Choosing methods and strategies to influence the significant determinants. These are chosen according to the administrative and organizational capabilities and resources for implementing the intervention.

The operative section of the model includes three phases: 5) implementation and monitoring; 6) process evaluation; 7) impact and outcome evaluation.

The MECBI model is presented in figure 1. The upper section of the diagram shows the planning phases and the bottom section of the diagram shows the operative phases. The middle section represents the desired sequence of the intervention. The seven phases mentioned above will now be elaborated. The relevant literature on fostering climate-friendly behaviors will also be integrated into the analysis.

#### *Where to put the emphasis?*

Before turning to the description of the model, it is important to mention where to focus the attention in the description and in the use of the MECBI. Green and Kreuter (1999) emphasize that as you go back to the initial planning phases, the significance of the decisions which the planner makes increases, since these decisions are most influential in setting the intervention in the 'right direction' (Green & Kreuter, 1999, p. 40). In line with this observation, it can be hypothesized that adherence to the planning phases of the MECBI model will be most significant in determining the effectiveness of the intervention. This will serve as a sub-hypothesis in this dissertation.

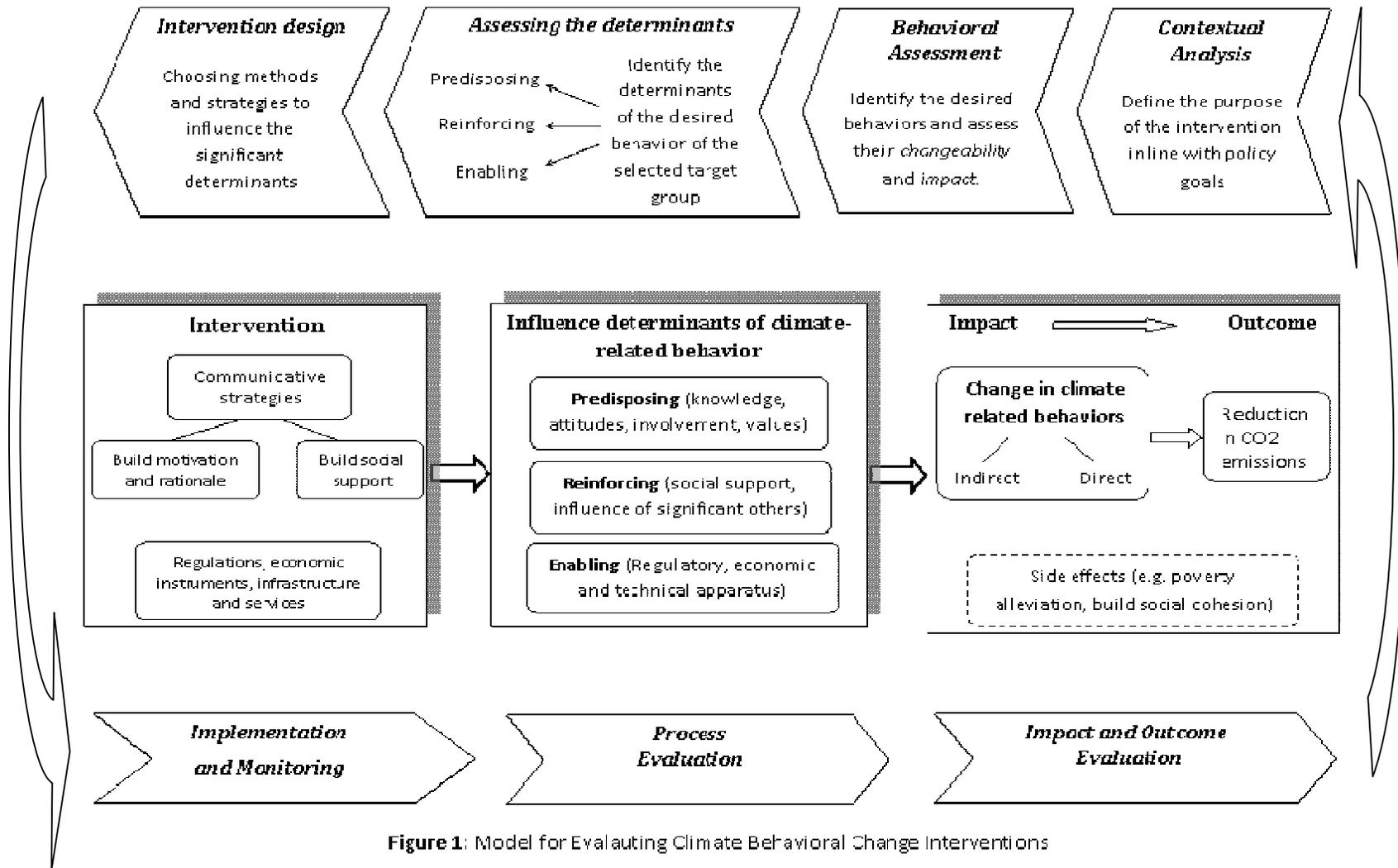


Figure 1: Model for Evaluating Climate Behavioral Change Interventions



## **Phase 1 – Contextual analysis**

Every behavioral change intervention is designed within a certain context, which is affected by social, political and institutional circumstances in which the intervention is being designed and implemented. Context analysis begins with the policy goals which the intervention wishes to advance. With regard to climate policies, interventions can relate to CO2 emission reduction targets, but they can relate to broader policy goals, such as increasing public support for climate policies, increasing the market for ‘green’ products, etc.

Furthermore, context analysis takes into account the possibilities and constraints which will affect the intervention, such regulatory framework, market structures, level of awareness towards the problem, willingness to change behavior, timing (occurrence of external events), etc. (Oy, 2007).

This phase ends with defining the aim of the intervention in line with policy goal, taking into account the possibilities and constraints mentioned earlier. The aim of an intervention usually refers to a *desired activity* (e.g. reducing CO2 emissions) by a certain *target group*. Defining the target group can be done through a market-segmentation, in which the population is segmented according to the relevant parameters (e.g. level of awareness towards the problem at hand, socio-demographic characteristics), depending on the aim of the intervention (Ibid).

## **Phase 2 – Behavioral Assessment**

This phase seeks to identify behavioral changes which can best achieve the targets of the intervention. These behaviors need to perform well on two criteria: impact and changeability (Green & Kreuter, 1999, p. 40).

*Measuring Impact* – In climate behavioral change interventions impact can be defined as direct and indirect energy consumption. Direct energy consumption is the energy an individual or a household consumes to perform an activity, such as heating, using an electric appliance or driving a car. Indirect energy consumption refers to the consumption of energy used for the production of different commodities, such as food, cloth, appliances, etc. Figure 2 provides an example of energy requirements of different activities, relating to both direct and indirect energy consumption.

However, these activities need to be further translated into *behavioral changes* and their impact in terms of energy consumption. Behavioral changes are usually divided into habitual (or curtailment) behaviors and investment (or efficiency) behaviors. The first category are behavioral changes which are associated with changing everyday habits and routines, such as switching off lights, turning down the heating in unused rooms, avoiding car use or energy-intensive food products, etc. Typically, indirect energy consumption belongs to this category. The second category are behavioral changes which are associated with a single

investment, such as insulating ones house, buying an energy efficient car or appliance, etc. Typically, behavioral changes in this category have a larger impact on energy consumption (Abrahamse, 2007, p. 12).

	<b>Energy requirement</b>		<b>Energy intensity</b>
	<b>(GJ)</b>	<b>(% of total)</b>	<b>(MJ/Dfl)</b>
Total	240	100	6.3
Indirect energy requirement	130	54	3.5
Food	41	17	5.6
Household effects	19	8	5.5
House	9	4	1.4
Clothing and footwear	8	3	2.7
Hygiene	5	2	4.1
Medical care	12	5	3.4
Education	5	2	4.2
Recreation	19	8	3.7
Communication	1	1	1.7
Transport	9	4	3.6
Direct energy requirement	110	46	45.0
Petrol	22	9	22.4
Heating	60	25	57.8
Electricity	28	12	46.5

Figure 2: Total energy requirement of an average Dutch household in 1990, per main category and the total, direct and indirect energy consumption (Vringer 2005).

*Measuring Changeability* - Changeability is more difficult to measure, since it is more context dependant and it has to encompass the different determinants of behavioral change. Thus, changeability is often derived from common practice in other interventions or by using basic rules of thumb, such as the degree to which a behavior is rooted in cultural patterns and lifestyles (Green & Kreuter, 1999, p. 136).

However, several relevant indicators of changeability of climate-friendly behaviors can be identified. One indicator is the monetary costs of a given behavior. Table 1 provides an example of four different measures for reducing direct energy consumption in households, categorized according to their impact and (monetary) changeability.<sup>5</sup> Assuming monetary costs is the relevant indicator for the target group, according to table 1 interventions can more easily promote energy-efficient lighting (or advanced heating systems), will have a more difficult time promoting retrofitting of houses and should not focus on energy efficient appliances.

	<i>High impact (t CO2 eq.)</i>	<i>Low impact (t CO2 eq.)</i>
<i>Changeable (low euro/tCO2 eq.)</i>	Retrofit houses: (highly) insulated windows	Energy-efficient lighting
<i>Less changeable (high euro/tCO2 eq.)</i>	Advanced heating systems: heat pumps	Energy efficient washing machines, clothe dryers, dishwashers

Table 1: Mapping behaviors according to their impact and changeability

<sup>5</sup> Note that data is relevant for the whole household sector in EU15 (Joosen & Blok, 2001, p. iii).

Another indicator of changeability is willingness to change behavior, which can be assessed through constructed surveys or interviews with the target group.<sup>6</sup> Changeability is also related to opportunities for changing behavior, which are determined by whether the target group is an owner or a tenant, by levels of income, and other structural and socio-economic factors. Hence, measuring changeability often demands a rather thorough study of the target group.

### **Phase 3 – Assessing the Determinants**

The second phase consists of identifying the determinants of the desired behavior. These are divided into three categories: predisposing, reinforcing and enabling factors. Predisposing factors are antecedents to behavior which provide the rationale or motivation for behavior (such as knowledge, attitudes, values, involvement, self-efficacy). Reinforcing factors are factors following a behavior that provide continuing reward or incentive for the persistence or repetition of the behavior (such as social support, peer influence and influence of significant others). Enabling factors are antecedents to behavior that allow motivation to be realized, such as characteristics of the environment that facilitate action and any skill or resource required to attain specific behaviors (Green & Kreuter, 1999, p. 41; Oy, 2007, p. 41).

The purpose of the following section is to map the determinants of climate behaviors as they are identified in the literature. Some of this literature is based on efforts to ‘educate’ households to reduce their energy consumption following the Oil Crisis in the 70s. Additionally, literature on fostering other types of sustainable behaviors of households, such as reducing solid waste and increasing recycling, will also contribute to the discussion.

#### **- *Predisposing determinants of climate-related behaviors***

Based on the literature mentioned above, five cross-cutting predisposing determinants of climate-related behaviors are identified: *knowledge, attitudes, involvement, self-efficacy and values.*

*Knowledge* is often mentioned as a determinant of several pro-environmental behaviors. Put simply, people need to be aware of a problem and what they can do about it, in order to change their behavior. Knowledge can be defined in at least two ways: *procedural knowledge*, which refers to the how to change behavior (e.g. what kind of measures to take in order to save energy); and *impact knowledge*, which refers to the impact of your changing your behavior (e.g. combating climate change). The majority of informational programs have focused on increasing these two types of knowledge (Schultz, 2002). Yet, although knowledge has been found to be a barrier to behavioral change, a large portion of studies

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<sup>6</sup> For more details on these methods see Green and Kreuter (1999).

show that merely increasing knowledge does not lead to behavioral change (Lindén et al., 2006; Lutzenhiser, 1993; McKenzie-Mohr & Smith, 1999; Schultz, 2002; Stern, 2002).

The second important attribute of behavioral change, which often complements changes in knowledge, is *attitudes* towards the desired behavior. According to the innovation-diffusion model, the adoption of new behaviors by a given population follows more or less a typical pattern over time, in which knowledge accumulates (relatively fast), followed by a gradual change in attitudes and even a more gradual change in behavior (Valente & Schuster, 2002). Attitudes serve different functions that make them important attributes of behavior, such as a value-expressive function, “which occurs when holding a particular attitude permits us to convey an important message to others”; or a utilitarian function, “where the adoption of certain attitudes helps people gain awards and avoid punishments” (Ibid, p. 113). Research in other fields also confirms that pro-environmental attitudes are strong predictors of environmental behavior (Lutzenhiser, 1993; Valente & Schuster, 2002; Verplanken, 2002), and that strengthening pro-environmental attitudes can serve to reinforce different environmental behaviors down the path (Jan Verbeek, 2002).

A third predisposing determinant, which can also be instrumental in changing attitudes, is *involvement*. The problem with many environmental problems is that people do not perceive them as touching them personally, i.e. they do not feel involved. One way by which involvement can be increased is by relating environmental problems to personal issues such as work, health and family. This is called increasing outcome involvement. In general, the more involved people are, the more likely they will hold positive and strong (long-lasting) attitudes towards environmental behaviors (Verplanken, 2002). Furthermore, low involvement can also lead to negative attitudes. Bronner and Reuling (2002) evaluated an environmental campaign in the Netherlands conducted in the 90s, titled: ‘a better environment starts with oneself’. In the evaluation they segmented the population into experts, moderates and ignorants. They concluded that the campaign had a positive effect on experts, no effect on moderates and a contra-effect on ignorant (making them feel more powerless, experience more anxiety, anger and sadness, and hold others more responsible). The fact that the campaign did not pay attention to these differences in knowledge and involvement increased the involvement gap within its target population (Bronner & Reuling, 2002).

The observations of Bronner and Reuling converge with other observations, in which people with low involvement often avoid environmental behaviors due to a perceived *lack of self-efficacy*. Hence, it is believed that empowering people and providing them with information on what they can personally do, is instrumental in changing their involvement in and attitudes toward environmental behaviors (Harland & Staats, 2002; Raaij, 2002).

Another way to influence people's attitudes and their level of involvement, is addressing their core values. When an individual perceives a certain behavior as having

impacts on what she values as important, it influences another type of involvement termed value-involvement (for example, associating climate-related behaviors with human rights of vulnerable populations). When people have a high value-involvement they will change their behavior even when the personal costs outweigh the benefits (Verplanken, 2002). Indeed, *value orientation* has often been seen as an important predictor of environmental behaviors. Eimers and Pieters (2002) conducted a research on the value-orientation of the Dutch society, in which they arrived at four different segments which could be distinguished according to their core values. These segments also differed significantly with respect to their environmental-related knowledge, attitudes and behaviors (Eimers & Pieters, 2002).

- ***Reinforcing determinants***

Reinforcing factors are factors following a behavior that provide continuing reward or incentive for the persistence or repetition of behavior. One reinforcing determinant of pro-environmental behaviors is *social norms*. Schultz (2002), who examined different attributes of behavioral change with regard to household recycling, found that *social norms* are a significant predictor of behavioral change. Social norms are influenced by beliefs of what others *are* doing (descriptive norms) or about what others *ought* to do (injunctive norms) (Schultz, 2002). Schultz (2002) found that contrary to increasing knowledge, which did not result in behavioral change, influencing people's beliefs about how others are behaving did have an impact on household recycling rates.

Another related reinforcing determinant is 'social support'. Staats et al. (2004) evaluated a team-approach for improving environmental behaviors of households, called Eco-Team Program. This program included the provision of information, feedback and social support for behavioral change. Staats et al. (2004) concluded that social support (or social influence) was a significant determinant of behavioral change, regardless of changes in other predisposing determinants (such as habits) (Staats, Harland, & Wilke, 2004). Similar research has also pointed out that the greatest prospect for fostering sustainable behavior is when behavior is more visible to others (Lindén et al., 2006), and that behavior is more likely to change when it is reinforced by significant others (Lutzenhiser, 1993; Verhue & J. Verbeek, 2002).

- ***Enabling Factors***

Enabling factors can be described as the institutional, technological and economical context in which behavior takes place. They are instrumental in setting the opportunities and constraints for climate-related behaviors. Institutional barriers, such as principal-agent problems, are often seen as crucial factors that prevent efficiency investments in households

from being realized (de T'Serclaes & Jollands, 2007).<sup>7</sup> The availability of technology is another important factor in encouraging the adoption of certain measures, such as energy-efficient appliances or purchase of solar-boilers. Financial costs and rewards also play an important role in facilitating the adoption of new behaviors, such as reducing the high initial investment costs which often deter households from adopting efficiency behaviors (e.g. windows insulation) (G. Termeer, personal communication, May 26, 2010). Others enabling factors include laws and regulations (e.g. energy labels on households) and convenience determinants (e.g. availability of information on energy saving measures) (Stern, 2002).

- ***Ranking the most significant determinants***

The literature review above can help to map the relevant determinants, but their significance will change across different populations and in different contexts. Thus, a field study is required in order to assess the most significant determinants of climate behavioral change in the selected target group. This type of ranking guides the planner in designing the intervention in the next phase (Green & Kreuter, 1999, p. 178).

**Phase 4 – Intervention design**

The third phase aims at choosing methods and strategies to influence the significant determinants. It begins with assessing administrative and organizational capabilities and resources for implementing the intervention, which determine its limitations. Some of these limitations can be overcome through cooperative arrangements with other agencies at the local, provincial or national level (Green & Kreuter, 1999, p. 42). This is especially important with respect to addressing enabling factors, which often demands that structural measures at the national level are taken (e.g. providing subsidies, enhancing public services, etc.).

Numerous intervention methods and strategies can be applied to tackle the determinants of climate behaviors, and describing all of them is beyond the scope of this dissertation. The following section will only present several examples of intervention methods which are considered common practice in environmental behavioral change programs.

The first example is house audits by energy advisors who provide households with information on different options for energy savings, which is tailored to the specific situation of the household. The method builds upon the notion that providing personal and tailored information is an effective way of influencing several predisposing factors of behavioral change, such as knowledge and self-efficacy (Abrahamse, 2007, p. 119). However, it should

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<sup>7</sup> Typical principal-agent problems occur when two parties in a contract have different goals and different levels of information, such as landlords (interested in reducing investment costs) and tenants (interested in reducing utility costs) (de T'Serclaes & Jollands, 2007).

be noted that the effectiveness of such programs in changing behavior varies significantly, and it is usually depended on their combination with other intervention methods (Ibid, 33).

The second example is providing feedback on energy consumption. One of the main knowledge deficits with regard to energy consumption is often related to the fact that energy is *invisible*, hence people are not aware of how much energy they are actually consuming. Hence, it is perceived that providing people with frequent feedback on their energy consumption can lead to energy savings (Foxall, 2002; Lindén et al., 2006; Lutzenhiser, 1993). Yet, McCalley and Midden (2002) show that in order for this feedback to be truly effective, it has to be short-term (more often than once a week), and it also has to be attached to a goal-setting process. This entails that households set a goal for achieving a level of energy conservation and make a commitment to achieve that goal. Experience shows that interventions which included daily feedback, combined with goal-setting, have resulted in a reduction of 10-20% in energy consumption (McCalley & Midden, 2002).

The third example is the social network approach, which emphasizes the reinforcing factors as key determinants of behavioral change. This approach utilizes social ties within a community, in order to disseminate information and create social influence for behavioral change. It is essentially a bottom-up approach in which the community is involved in designing and implementing the intervention, through the engagement of local community centers or by recruiting local volunteers which serve as 'change agents' in the community. The underlying assumptions behind this approach, is that communication is most effective when knowledge is tailored to a specific target group, transferred from a (local) trustworthy source, by informal and personal means of communication (Weenig, 2002). Another common method which builds on this approach is the recruitment of block leaders, which are volunteers who work to facilitate and promote certain environmental behaviors within their neighborhood (block). This method was proven effective in several programs which aimed at increasing recycling rates in neighborhoods (Schultz, 2002; Staats et al., 2004).

Studies on the effectiveness of these methods show a high variance across different interventions (Abrahamse, 2007; Maibach et al., 2008; McCalley & Midden, 2002). This coincides with similar observations from public health interventions, where analysts could not find a single method which had superiority over others across different populations. It seems that it is rather the strategic combination of different methods together, in line with the analysis conducted in the previous planning phases, which determines the effectiveness of interventions (Green & Kreuter, 1999).

#### **Phases 4-6 – The operative phases**

The operative phases consist of three phases: implementation and monitoring, process evaluation and impact and outcome evaluation. These phases will not be described in detail, since little or no adjustment is needed when applying these phases in climate behavioral change interventions. However, general principles will be now discussed.

*Implementation and monitoring* – In this phase the program is followed according to plan but proper adjustment should also be made according to changes which within the process. In general, successful implementation depends on the cooperative arrangements between all partners and activities, the means by which core partners are motivated to participate and the degree by which the target group is motivated to participate (e.g. through rewards). In addition, ensuring that that program operators acquire proper skills is another important component in a successful implementation (Oy, 2007, p. 53). Monitoring is also an essential step in the intervention and it serves two main purposes: first providing feedback for the operator of the intervention (or controlling the intervention); second, providing data for the evaluation (Ibid, 55).

*Process Evaluation* – is a “systematic assessment of the program for the purpose of improving its design, its delivery and the usefulness of the quality of services delivered to the consumer” (Ibid, 60). In sum, this means evaluating all of the planning and implementation phases of the intervention. This can provide explanations with regard to why the intervention was more or less effective. Changes in the determinants of predisposing, reinforcing and enabling factors can provide good indicators for the process evaluation (Green & Kreuter, 1999, p. 226).

*Impact and Outcome evaluations* – Impact corresponds to changes in behavior due to the intervention, while outcome evaluation corresponds to changes in the environment which result in those behavioral changes. Although evaluation is the last phase of the intervention, it should be incorporated in the intervention from the beginning in the definition of the targets and objectives, which are then translated into the standards by which the intervention is monitored and evaluated (Ibid, 42).

Beside the value of measuring the effectiveness of the intervention, the evaluative phases serve as important inputs in future applications of the intervention. This is represented in figure 1, as the arrow which connects the evaluative phases to the planning phases at the beginning of the intervention cycle.

## Chapter 3 – Analysis of the case studies

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The following chapter will include an analysis of the case studies, starting with the Energy Advice Project Rotterdam and ending with the Climate Street Festival. Each case study will be divided into two sections - results and analysis. The first section is a descriptive presentation of the case study according to the phases of the MECBI. The second section assesses how the intervention performed in each one of the phases and what can explain the level of performance.

### 1. Energy Advice Project Rotterdam

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#### Results

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##### **Phase 1 - Contextual analysis**

The municipality of Rotterdam has developed its own climate policy, which consists two main objectives: First a 50% reduction of CO2 emissions by 2025 compared to 1990 levels, and second, to make the city 100% climate proof by 2025. These ambitious objectives have been set forward by the Rotterdam Climate Initiative (RCI), which was established in May 2007 as part of the C40 - Large Cities Climate Leadership Group (formerly known as the Clinton Climate Initiative).<sup>8</sup> The RCI coordinates and facilitates climate-related policies within the metropolitan, together with different parties (Rotterdam Climate Initiative, 2009).

Rotterdam climate mitigation policy is mainly concentrated towards the industrial sector, which accounts for 85% of Rotterdam's CO2 emissions. However, Rotterdam also has a mitigation policy for the household sector, with a target of achieving a 50% reduction in CO2 emissions from all homes and buildings by 2025. In addition, the RCI initiated a project called 'Energizing City', which is focused primarily at involving citizens and carrying out 'publicity campaigns to persuade citizens to adopt new ways of responding to the climate change issue' (Ibid). An interview with the project leader at RCI, revealed that RCI's approach towards changing (climate-related) behavior is focused on connecting climate-related behaviors with other issues, such as helping poor households save money through energy savings or improving health problems by changing mobility habits.

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<sup>8</sup> The C40 was formed in 2006 to strengthen the role cities can take in tackling climate change, by supporting the development of efficient policies and by forming alliances which will "accelerate the uptake of climate-friendly technology and influence the market place" (C-40 website: <http://www.c40cities.org/about/>).

The rationale behind this approach is twofold. First, the idea is that dictating a climate-related lifestyle will not work, but people can be motivated to change climate behaviors where they see personal benefits from it (M. van Dongen and P. Verschoor, personal communication, April 28, 2010). Second, since RCI has to work with a limited budget it has to find cost-effective methods to pursue its policy. One way to do so is to match climate policies with policies of other departments, such as the Social Affairs and Employment department in Rotterdam (SoZaWe). Rotterdam is the city with one of the largest poverty problems in the Netherlands, with over 60,000 low-income households - one fifth of Rotterdams' households! Since poverty receives quite a lot of attention (and resources) in the Municipality, the RCI initiated a joint project with SoZeWe and the DCMR (Environmental Protection Agency for the Rijnmond district). The project was titled 'Energy Advice Project Rotterdam' (Ibid).

Targets of the intervention: Energy Advice Project Rotterdam has two main sets of targets: an environmental target (reducing CO2 emissions) and a set of social targets (poverty reduction and employment). These targets are in line with the two main policy goals mentioned earlier: halving Rotterdam's CO2 emissions by 2025 and addressing the poverty problem. The justification for matching these targets has intensified due to the increase in energy prices over last decade.

The intervention targets 22,500 low income households, which are 34% of the target group (64,000 households).<sup>9</sup> Building on past interventions, it was estimated that each household could save, on average, about 200KWh/year of electricity and about 110m<sup>3</sup> of gas annually, which is equivalent to 325 kg of CO2. This amounts to a potential saving of 7,312,500 kg of CO2 per year (van de Meer, 2008). In financial terms this can save each household, on average 104€/year.<sup>10</sup> In addition, at least 90 job-seekers will be recruited as energy-advisors over the course of 3 years (30-40 per year) (Stichting Collusie, 2010)(Stichting Collusie, 2010). Additional benefits (side effects) that the intervention aims at is increasing quality of life (e.g. through reduction of indoor pollution), as well as higher integration of the target group in society.

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<sup>9</sup> Low income household are households with an income of 100-120% of the social minima or households which receive Work and Social Assistance due to inadequate financial resources to meet their essential living costs (van de Meer, 2008). In 2009, social minima was between 1,500€ and 1,968€ gross per month (depend on family status).

<sup>10</sup> Tariffs are updated for 2009 and were retrieved from the EU energy portal <http://www.energy.eu/>.

## **Phase 2 – Behavioral assessment**

The behavioral changes chosen for the intervention are habitual energy-related behaviors (e.g. closing curtains at night, defrosting refrigerator) and small-scale investment behaviors (e.g. putting radiator foil or wind strips) (van de Meer, 2008). Behaviors were also chosen if, in addition to energy savings, they had potential health benefits (e.g. ventilation).

Behaviors had to correspond to two sets of impact: environmental impact, which refers to reducing CO<sub>2</sub> emissions; and socio-economic impacts, which refers to improving quality of life and saving money on energy bills. Changeability is mentioned only implicitly, in terms of the personal benefits for the households. Hence, the higher the personal benefits, the more changeable the behavior is (H. Brugman, personal communication, May 19th, 2010). In addition to these two factors, it can be assumed that behaviors were also chosen according to the subsidizing costs.

## **Phase 3 – Identifying the determinants**

- 1) Predisposing: *Knowledge* and *attitudes* were considered significant determinants. Knowledge refers to the personal benefits from energy savings, namely reducing energy bills and indoor pollution (e.g. through ventilation) (H. Brugman, personal communication, May 19, 2010). Attitudes is referred to twice: First, creating a ‘positive feeling towards saving energy’ was mentioned as important for achieving behavioral change and for enhancing the quality of the energy advice (Ibid). Second, creating positive attitudes towards the intervention was also mentioned. The appearance of a stranger on the doorstep, which is affiliated with the government, could generate a negative response. Partially, this has to do with the alienation of the target group from society and mistrust in the government (Ibid).
- 2) Reinforcing: Social support is mentioned as an important determinant. The policy plan identifies the importance of utilizing social networks in order to increase awareness and create positive attitudes towards the intervention. This is especially important with regard to the potential negative attitudes mentioned above (van de Meer, 2008).
- 3) Enabling: Financial incentives and accessibility are mentioned. Financial incentives play an important role in the intervention, especially due to the socio-economic characteristics of the target group. For example, it is perceived that the energy box is crucial for making the intervention successful. In addition, facilitating access to the intervention is also highly important, especially with regard to overcoming the language barrier. Illiteracy (particularly Dutch illiteracy) is a big problem in the target group, which makes it harder to reach the target group and provide it with information on energy savings (H. Brugman,

personal communication, May 19, 2010; L. van der Meer, personal communication May 6, 2010).<sup>11</sup>

### **Phase 3 – Designing the intervention**

The core instrument of the intervention is the house audit, which included personal and tailored advice on energy savings and an energy box with basic tools for saving energy (see annex 2 for a detailed list of the tools and the advice). However, households had to apply for the house audit, and therefore local communicative instruments and social networks were used for enhancing the response rate. These instruments will now be described in detail.

**House audit:** Certain elements were included to match the house audit to the determinants of the target group. First, the house audit appeals to the potential of saving money. Thus, all products and services are completely subsidized. The household could also apply for a free ‘job service’ for installing the measures provided in the box.

Second, house audits were conducted by jobs-seekers from low-income households in Rotterdam, who were trained as energy advisors.<sup>12</sup> The rationale was that these advisors are closer to the target group and would know better how to approach and appeal to it. The operator has also chosen relatively old-aged job-seeker, due to their perceived credibility. Furthermore, the advisors are given a relatively long timeframe for each audit (one hour for the advice and one hour to write a report), in order to gain a sufficient understanding of each household and tailor an adequate advice. They also used this opportunity to acquire into social problems which need to be reported to the department of social affairs (SoZaWe) (H. Brugman, personal communication, May 19, 2010; L. van der Meer, personal communication May 6, 2010).

**Communication and social networks:** Communication is an essential part of the plan, since the response rate of households determines the rate of success. The procedure is as follows: letters are sent to households (which are elected from the mailing list of SoZaWe), in which a free energy advice is offered to the household. The household can sign up for the advice through a free phone number or through a free mail post. In addition, different communication tools are used in order to encourage households to participate, such as local newspapers, local websites, flyers and publicity events in central meeting points (e.g. markets) (Stichting Collusie, 2010).

Another mean to enhance participation in the project was to approach social networks, i.e. local organizations which have strong ties in the neighborhood (e.g. community centers, neighborhood associations, churches and mosques).

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<sup>11</sup> According to Dutch social policies, these public interventions have to be conducted in Dutch (Ibid).

<sup>12</sup> The training is part of a one-year program which aims at getting unemployed people back into the job market (H. Brugman, personal communication, May 19, 2010).

#### **Phase 4: Implementation and monitoring**

A pilot was conducted between September and May 2010, which targeted three districts with 18,710 households, out of which 4,679 (25%) responded to the letter and 3,503 received an energy advice. 1,606 households signed up for energy monitoring. Most of the households were approached by a letter but some have also received information through the communication scheme described above. In one district, where the response rate was particularly low (14%), a poll was conducted to inquire the reasons for the low-response rate, followed by sending a second letter and handing out flyers through local organizations (in this district the project is still ongoing). In addition, 32 jobseekers have been successfully recruited for the energy advisor training (Stichting Collusie, 2010).

The main gap between the plan and the implementation of the pilot project is the fact that social networks were only marginally approached, without realizing their full potential (Van de Meer, 2010). The reasons for this implementation gap were a lack of strong social cohesion in the target group (fragmented into small immigrant groups) and lack of sufficient resources (H. Brugman, personal communication, May 19, 2010).

Monitoring – Monitoring is conducted in three ways:

- 1) Information on the implementation process: The number of households which receive an advice and an energy box are registered in the Bureau of Energy Service. After six month, the bureau conducts a follow up call for one out six participating households.
- 2) Quality of advice: A phone-based survey is conducted with one out of 10 participating households right after the intervention, which are used as inputs for the training of the energy advisors.
- 3) Changes in energy consumption: Permission is asked from households to obtain information on their energy meters, which are monitored over the course of 3 years.

#### **Phase 5: Process Evaluation**

An evaluation of the pilot project has been conducted by the operating organization. The study revealed that the response rate in the pilot project has been relatively low (25%), compare to the target (34%). The phone survey revealed that a large portion of the respondents did not reply to the letter since they could not read it (Stichting Collusie, 2010). Several activities were recommended in order to improve the rate of response:

- 1) Improve the engagement of social networks. This includes creating public events for enhancing publicity, approaching local community centers which can help to disseminate information, use local media channels more intensively (Ibid).
- 2) Acquire permission to conduct phone calls to households.

3) Send 2<sup>nd</sup> notifications and conduct polls where response rate is particularly low.

In addition, recommendations for improving the advice were mentioned, since some of the products did not match the needs of the households (e.g. lamps did not fit). It was also recommended to extend the contract of outstanding advisors and to enhance the prospect of integrating them in the energy job market (Ibid).

The study also evaluated the quality of advice, according to the phone-based survey. The survey was conducted with 300 households and each household was asked 8 questions on the quality of the advice. Out of 2,426 answers, almost 1,700 are positive, 500 were neutral and 200 were negative.

### Phase 6: Impact and Outcome Evaluation

The pilot project reached 4,679 households which are 25% of the households in the three targeted districts. The pilot project is estimated to produce annual monetary savings of about 132€ and a reduction of 937 kg of CO2 emissions perhousehold, which amounts to 2.8 tons of CO2 emissions for the 3,003 households which participated so far (13% of the final target). The calculated annual savings for the participating households are shown in table 2.

	Electricity (KWh)	Gas (m <sup>3</sup> )	Water (m <sup>3</sup> )	Auto Gasoline (liters)	Savings (€)	CO2 (kg)
Per Household	279,10	73,20	6,23	11,20	131,92	937
Total	838.134,41	219.817,17	18.697,08	33.629,45	396.157,79	2.813.811

Table 2: Estimated annual savings per household and for the total 3,003 participating households.<sup>13</sup> These estimations were conducted by an external agency (Stichting Collusie, 2010).

In order to validate these estimations, the households were asked to sign up for monitoring their energy meter over the course of three years. However, the results of these readings were not available at the time of this research.

### Analysis of the results

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The analysis below will evaluate the performance of the intervention in each phase of the MECBI. The evaluation will be conducted according to the conceptual framework, the evaluation studies mentioned above and with reference to other evaluation studies of similar interventions.

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<sup>13</sup> 500 households are not included in the calculations since they are in a district where the project is ongoing.

### 1) *Contextual analysis*

The targets of the intervention are well in line with the contextual analysis, hence they corresponded both to Rotterdam's climate policy and to its poverty reduction policy. Matching social goals to the environmental goals was essential for deriving the resources for this intervention. However, it is important to question the relative contribution of this project to Rotterdam's climate policy in the household sector. Although low income households make up over 20% of Rotterdam's households, low income households have on average a lower CO<sub>2</sub> requirement, compared to middle and high income households. Studies suggest that there is a strong correlation between CO<sub>2</sub> emissions and expenditures per household (Wier, Lenzen, Munksgaard, & Smed, 2001). Hence, the combination of policy goals also demanded that some trade-off is made, which will also be apparent in the next phases of the intervention.

One notable strength of the intervention is that it set clear targets, hence it was very much goal-oriented. This had positive implications for the rest of the intervention, such as the emphasis on accurate monitoring (based on readings of energy meters over the course of three years) which will provide an accurate outcome evaluation at the end of the intervention.

### 2) *Behavioral Assessment*

Choice of behaviors will be evaluated according to the evaluation of their impact and changeability. With regard to impact, the choice of behaviors is consistent with the targets since it incorporates a combination of environmental and social benefits. However, this also demands that some trade-off is made, which is apparent in the choice of climate behaviors. Climate behaviors were defined in a rather narrow way, taking into account only direct energy consumption. This creates a problem with regard to the potential *rebound effect*, in which households use the money they saved on energy for increasing their private consumption. In some cases, this can cause a net increase in CO<sub>2</sub> emissions (van den Bergh, 2009).

One possible solution for this trade-off would be to include climate-friendly behaviors which have other, non-monetary personal benefits. One example is reducing meat consumption, which has several environmental and health benefits and contributes significantly to reducing CO<sub>2</sub> emissions (Aiking, de Boer, & Vereijken, 2006; Fiala, 2008). Indeed, it was given as an advice in other similar interventions which also targeted low-income households, such as the Eco-Team project (see box 1).

With regard to changeability, no data was available prior to the intervention on the changeability of desired behaviors in the specific target group. One possible point of reference

is a citizen panel which was conducted in Rotterdam in October 2009 (at the start of the intervention). It reveals that most of the behaviors addressed in the intervention were identified as ‘sensible measures’ for reducing energy consumption. For example, out of 163 respondents, 131-135 stated they were willing to adopt different habitual energy-saving measures (e.g. use energy efficient light-bulbs or turn down the heating) (Productiegroep Klimaat, 2009). To the extent that this study is representative for the target group, it confirms a high changeability of the chosen behaviors.<sup>14</sup>

### 3) *Assessing the determinants*

All three sets of the determinants are identified in the planning phases. However, it seems that they were based primarily on prior experience in other interventions rather than on prior research of the target group. One point of reference is the citizen panel mentioned earlier, but it should be used with great caution because it is unclear to what extent it represents the target group.<sup>16</sup> The panel revealed the following findings about citizens in Rotterdam: a) they have a high level of awareness on the climate change problem, but lack knowledge about what they personally can contribute to the solution; b) they have a high level of self-efficacy (e.g. 78% perceive that they themselves can do something about climate change); c) they hold positive attitudes towards climate-friendly behaviors (Productiegroep Klimaat, 2009). These results are in line with one part of the diagnosis of the determinants, regarding lack of knowledge on climate-friendly behaviors.

More research is needed in order to thoroughly evaluate the assessment of the other determinants. It should be noted, that although all three set of determinants were identified in the planning phases, they were not given even weight in the intervention design and in the implementation. This will be reflected in the analysis below.

### 4) *Intervention design and implementation*<sup>15</sup>

Although all three sets of determinants were identified, they were not evenly representative in the design and implementation of the intervention. Overall, it can be assessed that the intervention performed high on addressing the predisposing factors, medium in addressing the enabling factors and low in addressing reinforcing factors.

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<sup>14</sup> Although no data is available regarding how representative the study is, it is representative of the population of Rotterdam of which 20% belong to the target group. Moreover, one third of the interviews were conducted in a low-income neighborhood in Rotterdam (Ibid).

<sup>15</sup> These phases were integrated into one analysis, since no significant discrepancies were found between them. Where discrepancies exist they will be mentioned in the text.

The strength of the intervention was in addressing the predisposing determinants by providing personal, tailored information, which is known to be an effective way of influencing predisposing determinants of behavioral change (see chapter 3). Especially, an emphasis was given on creating positive attitudes, which was incorporated in the advice ('they should feel something in reducing energy') and in the training process of the advisors ('advisors need to like their job and be proud of it') (H. Brugman, personal communication, May 19, 2010). This was also reflected in the long amount of time which was given for each audit (2 hours), compared to other similar projects where the advice lasted for only 15 minutes (E. Boukris, personal communication, May 20, 2010).

The financial element was also well addressed, as the intervention was completely subsidized, demanded zero costs for the households and offered concrete measures for saving money of 132€ per year (on average), which is considered substantial for a low-income household (H. Brugman, personal communication, May 19, 2010; L. van der Meer, personal communication May 6, 2010). However, the intervention did not address accessibility barriers sufficiently, such as language. Indeed, in a poll conducted where response rate was particularly low (14%), about 50% of the participants indicated that they could not read the letter. Lack of accessibility is also confirmed in the overall low response rate (25%).

The main weakness of the intervention, reflected both in the interviews and in the low response rate, is the lack of utilization of social networks. The social network approach was emphasized as an important component in the design of the intervention, but was only partially incorporated in the implementation of the pilot project (L. van der Meer, personal communication May 6, 2010; Stichting Collusie, 2010). This was due to financial constraints and lack of social cohesion in the target group, which made it more difficult to identify and approach the relevant social networks (H. Brugman, personal communication, May 19, 2010). Improving the engagement of social networks was one of the key recommendations in the evaluation study, which could help overcome the accessibility problems mentioned earlier and enhance the overall effectiveness of the intervention.

**Box1: Eco-Teams**

It is interesting to mention here other interventions in the Netherlands (and in Rotterdam) which approached the same target group primarily through social networks, rather than on a personal level. One example is the Eco-Team project which was conducted in the North District of Rotterdam, in which groups of women were informed on how to take different measures which benefit both the environment and their quality of life. These meetings were conducted over a period of six weeks, and took place in the natural surrounding of the women and in their mother tongue. One of the main reasons these interventions are known to have substantial and durable effects is that they create social support for behavioral change (Staats et al. 2004).

### 5) *Monitoring and Evaluations*

It was mentioned in the beginning of the analysis that the intervention is goal-oriented and this is reflected in an accurate monitoring, which is rather unique for these types of interventions (Oy, 2007; Stichting Collusie, 2010).

The evaluation studies are rather preliminary, due to the fact they only evaluate the pilot phase of the intervention. Yet, some conclusions can be made regarding the assessment of the of the outcome for the pilot project, by comparing it to other similar interventions which were conducted in the Netherlands. One example is the TELI subsidy scheme, which included 27 similar projects which were conducted over the course of 3 years (2002-2005), targeting a total of 65,000 households. The evaluation of TELI concluded with a lower estimate of energy savings and carbon emissions per household compare to the pilot project in Rotterdam. In the TELI project, households saved on average 200 KWh of electricity and 110 m<sup>3</sup> of gas, which were equivalent to 325 kg of CO<sub>2</sub> emissions (Uitzinger & Derijcke, 2007). The pilot project estimated that an average household would save 279 KWh of electricity, 73 m<sup>3</sup> of gas and 11.20 liters of benzene, which are equivalent to 937 kg of CO<sub>2</sub> (Stichting Collusie, 2010). Although higher than the TELI figures, the estimated results of the pilot project do match other similar interventions which are considered successful, such as a project conducted in Leeuwarden which included goal setting of 10% energy reduction (through a bet with the mayor). In this project an average household reduced 280 KWh of electricity and 136 m<sup>3</sup> of gas, which amount to 401 kg of CO<sub>2</sub> (Uitdenbogerd & Uitzinger, 2010). Both the pilot project and the project in Leeuwarden correspond to about 10-11% in energy saving, per household. Thus, the outcome estimation can be considered an upper end of a realistic estimation, under a best-case scenario. Whether this will be realized, however, remains to be seen.

	Electricity		Gas		CO <sub>2</sub> emissions (Kg)
	KWh	%	(m <sup>3</sup> )	%	
Pilot project Rotterdam	279	10.3	73	11.8	937 <sup>16</sup>
TELI	200		110		325
Leeuwarden	280	10.5	136	10.8	401

Table 3: Comparing the estimated outcomes of the pilot Energy Advice Project Rotterdam with other similar interventions in the Netherlands.

<sup>16</sup> This figures includes annual savings of 11.20 liters of auto benzene (Stichting Collusie, 2010).

## 2. The Climate Street Festival

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### Results

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#### **Phase 1 - Contextual analysis**

The HIER Climate Campaign was launched in the Netherlands in 2006, as a joint initiative of 40 NGOs which were involved in different climate-change related activities. The purpose of HIER (Dutch for 'Here') was to coordinate those different activities under one voice, focusing on making climate change a problem of 'Here and Now'. The first program of the HIER campaign (2006-2007) was funded by the National Postcode Lottery and included different awareness-raising activities (through media, publicity events), branding of the HIER logo and a school campaign with a famous Dutch rapper (Ali B) called 'Switch Now' (G. Termeer, personal communication, May 26, 2010).

In the second program of the campaign (2008-2009) it was decided that the coordination between the different NGOs will be improved through the creation of different clusters, in which NGOs working on the same theme could cooperate with one another.<sup>17</sup> Thus, four climate change clusters were created, around four different themes: humanitarian issues and development, forests and nature conservation, a political campaign and energy-saving at home. The latter cluster aimed at promoting energy-saving in the Netherlands and it included the klimaatstraatfeest (Dutch for Climate Street Festival), a competition between streets in the Netherlands on the adoption of a climate-friendly lifestyle (Klimaatbureau, 2009).

Most of the funds for the Klimaatstraatfeest (KSF) were given by public organizations, most notably the Ministry of Housing, Spatial Planning and the Environment (VROM) (G. Termeer, personal communication, May 26, 2010). There are several reasons for VROM's decision to support the KSF. To begin with, VROM is committed to advance the Dutch Climate Policy goals, including a 30% reduction in greenhouse gas emissions by 2020 (relative to 1990 levels), increasing energy efficiency by 2% annually, and increasing the share of renewable energies to 20%. With regard to the built environment, the Netherlands aims at achieving a reduction of 6-11 M/tCO<sub>2</sub> (23-42%) from the built sector by 2020, which corresponds to a 50% reduction of energy consumption at homes (Ministry of Housing, Spatial Planning and the Environment (VROM), 2007).

However, one of the main challenges the ministry is facing with regard to the household sector is how to reduce GHG emissions from private homes, which account for almost 60% of the dwellings in the Netherlands. A variety of different instruments have been

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<sup>17</sup> In the second program 30 NGOs participated in the campaign (Ibid).

put to address this sector, such as subsidies for energy-efficient investments (e.g. insulation), the labeling scheme for households and mass-media campaigns. However, there is much doubt in the ministry regarding the ability of these instruments to provide the necessary change. Regulations were also considered, but the current political and social conditions do not allow their realization. Hence, the ministry's decision to support the KSF was part of its exploration for innovative methods for advancing its climate policy in the household sector (F. Ekerschot, personal communication, June 21, 2010).

### Targets of the interventions

The goal of the campaign was to reach 70% of the Dutch population in order to promote the adoption of a climate-friendly lifestyle. The *target group* of the campaign was the common Dutch person: "In this campaign we tried to reach normal people in the normal street, who are willing to do the good thing, as long as it is made clear what the good thing is to make it easy" (G. Termeer, personal communication, May 26, 2010). This was done based on former research which revealed that in 2008 nearly three quarters of the Dutch population have not adopted 'basic' climate-friendly behaviors, such as switching to an energy-efficient light-bulbs. The term 'reach' has a dual meaning which is used interchangeably in the campaign: raising awareness and changing behavior (Ibid).

The campaign also set more concrete objectives, in order to meet these goals. In the second KSF, those objectives included:

- 1) The participation of 5,000 streets.
- 2) One million people will be motivated to take the first steps towards a climate-friendly lifestyle.
- 3) 100 municipalities will play an active part in the campaign and 40 municipalities will be actively involved in promoting citizen participation.
- 4) 200 resident groups will make concrete civil society initiatives, such as Energy Teams, joint purchase and membership in windmill corporations.
- 5) The KSF will make a tangible contribution to More-with-Less foundation in its ambition to reduce energy consumption in existing buildings.
- 6) The campaign promotes the need for cooperation on energy between the municipalities, the construction sector, housing associations, private owners and residents.
- 7) 5 streets will be from 'empowered' neighborhoods.<sup>18</sup>

In addition, the campaign recognized several side benefits, such as citizen support for ambitious climate policies, increasing the market for climate-friendly products and services,

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<sup>18</sup> 'Empowered' neighborhoods (in Dutch: *prachtwijken*) is a list of 40 neighborhoods which suffer from economic, social and physical problems and demand special support from the government.

creating more accessible solutions to energy efficiency, improving cooperation between citizens and public authorities and making energy efficiency the norm in society.

## **Phase 2 – Behavioral Assessment**

In the behavioral assessment, two differentiations were made: one was based on the and the other was based on the mode.

The first differentiation (impact) was between behaviors which directly lead to energy savings and behaviors which have a recruitment effect. The first type refers to a broad set of climate-related behaviors, including both direct and indirect energy-use. The impact of these behaviors was weighed against their contribution to reducing GHG emissions. The second type refers to the impact the behavior has on the recruitment of other participants, the engagement of public authorities and general publicity (i.e. raising awareness).

Both of these impacts were taken into account, albeit the first type of behaviors was ranked higher in the competition. This was reflected in the scoring system: the largest amount of points was given to large-scale investment measures taken by the whole street (e.g. solar boilers, insulation) and the smallest amount of points was given to one-time actions (e.g. climate-neutral dinners). In between were recruitment activities which were also differentiated according to their impact – large scale (e.g. setting up an Energy Team) or small-scale (e.g. publicity in a local newspaper).

The second differentiation was between collective measures and individual measures. Collective measures are measures that the participant could take together with its neighbors. This set of measures was more emphasized in the campaign and the reward for these measures (number of points) was bigger relative to the individual measures. These measures included seven categories (see annex 3 for the full list of actions):

- I. Awareness actions (e.g. information meetings or setting up Energy Teams).
- II. ‘Green activities’ (e.g. planting trees)
- III. Electricity (e.g. all the participants in the street decide to wash at 30 degrees, switch to energy-efficient light-bulbs, make a membership in a windmill corporation).
- IV. Nutrition (e.g. one day a week without meat)
- V. Gas (e.g. Joint purchase of insulation, solar boilers or radiator foils)
- VI. Publicity (e.g. in newspapers or on television)
- VII. Transport (e.g. carpooling, car-free day).

Individual measures were measures that each household could take individually and they were divided into six categories: electricity, heating, laundry, green energy, transport and vacation (see table 6 at the end of this sub-chapter). This could refer to the situation of the

household at the start of the campaign (e.g. how many efficient light bulbs are installed) or to measures that the household has taken during the campaign.

The assessment of changeability was not straightforward, but it can refer to the second differentiation. Collective behaviors were emphasized over individual behaviors because it was perceived that these measures will appeal more to the target group and will also create a higher commitment to take the measures. In addition, it can be assumed that a low changeability was assessed for large-scale investment behaviors, since it was possible to earn points for declaring that you will take action before the action was actually made.

### **Phase 3 – Assessing the determinants**

**1) Predisposing factors:** Several predisposing factors are mentioned including: involvement, attitudes, self efficacy and knowledge.

First, level of involvement in environmental issues was seen as an important feature of the target group: “its was not about the original backbone of environmental organizations, a certain group in the Netherlands that always go and sign the petitions and goes to demonstrations...it is about the normal people in the normal street” (G. Termeer, personal communication, May 26, 2010). Consequently, one of the key features of the campaign, which was strongly emphasized in the campaign, was creating positive attitudes towards a climate-friendly lifestyle. The aim of the campaign was to portray climate-friendly behaviors as ‘fun, entertaining, cosy, easy and even financially attractive’. Moreover, the campaign emphasized the importance strengthening people’s perceived self-efficacy, hence giving them a feeling that they can personally contribute to the solution, rather than providing them with knowledge about the problem. Thus, knowledge regarding Climate Change (the problem and its consequences) was not assessed as an important determinant for changing behavior (Ibid; Klimaatbureau, 2009).

**2) Reinforcing factors:** Reinforcing factors and the social aspect were at the heart of the campaign: “most citizens in the Netherlands know that Climate Change is a problem and that it is related to their energy use, but as a consumer they want a bigger TV and a bigger car, and as long as their social environment is not telling them to change their behavior, nothing will change...”, and “the idea (of the campaign) is that saving energy and climate-friendly behavior is the normal social thing to do” (G. Termeer, personal communication, May 26, 2010). Lessons from previous interventions, such as recycling or anti-smoking campaigns, were incorporated in this approach (Ibid).

**3) Enabling factors:** Enabling factors were also recognized as important determinants of behavioral change. Instruments corresponding to them were defined as the backbone of

the campaign which facilitates the adoption of energy saving measures. Specifically, making energy-saving financially attractive and convenient were seemed important. Convenience corresponded to the availability of information, products and services for achieving energy-saving measures. It also corresponded to the accessibility of the participation in the campaign (Klimaatbureau, 2009).

### **Phase 3 – Intervention design**

The campaign was divided into two conceptual sections: the front side and the back side. These are communicative concepts, in which the front side creates a stimuli for behavioral change (through a variety of communication methods) and the back side enables that stimuli to be realized (by providing an adequate infrastructure).

#### *The front-side of the campaign*

The front side of the campaign targeted mainly the predisposing and reinforcing factors of climate-friendly behaviors. Regarding these factors, the campaign recognized three levels of reasoned behavior which need to be addressed: 1) ‘I can contribute in making the right moral choice’; 2) ‘I behave socially’; 3) ‘I am smart, I pay less’ (Klimaatbureau, 2009). Thus, three intervention methods were designed to simultaneously address these ‘personal incentives’ for behavioral change:

- 1) **The mass media campaign** aimed at increasing awareness towards the activities which a citizen can take for adopting a climate-friendly lifestyle and to create positive attitudes towards it. This was done by referring to activities which others have taken, referring to climate-friendly products and through the use of role models. It was emphasized that the moral aspect will be mentioned only implicitly: ‘The target group will not be influenced by messages emphasizing the urgency of the CO<sub>2</sub> problem, the melting Arctic or endangered polar bears. This audience likes fun, entertainment and accessibility to the Climate problem and the solution’ (Ibid).

One of the important features of the campaign was the use of a famous Dutch weatherman (Piet Paulusma), due to his popularity in the target group (it was assessed that over a million people watch his show on TV) and his credibility regarding climate-related issues. This TV show was also a platform for presenting successful streets which took ambitious climate-friendly measures (Ibid).

- 2) **Partnerships with businesses** were instrumental in marketing climate-friendly products and services and in involving the private sector in the campaign. The idea was that businesses could use the HIER logo on their products, providing that these products were ‘climate-friendly’. One of the most successful examples was the branding of Ariel

washing powder (by Procter and Gamble), which allowed people to wash all their clothes at 30 degrees (instead of at higher temperatures). This was accompanied by a successful advertising campaign and Ariel sales in the Netherlands went up from 20% to 50%! Similar product-based cooperation's with other companies were carried out throughout the campaign (G. Termeer, personal communication, May 26, 2010).

- 3) **KSF (climate street party)** was the core of the intervention which was focused on fostering behavioral change. Building on the block leader approach, each street had a formal recruiter which tried to get other people in the street to participate and take action. The intervention was designed as a competition between streets, in which 500 winning streets could win a street party (including a party package and 25€ vouchers for each participant) and the street which wins the biggest amount of points received a 'super street party' (with a live performance). In addition, personal prizes were given for the three best recruiters. As mentioned earlier, the scoring system rewarded both recruitment activities and energy-saving actions. The scoring system also differentiated between actions that you take individually and actions that you take together with your neighbors, with an emphasis on the latter. This represented the main approach of the campaign - that people are more likely to change their behavior if their social environment is telling them to do so. It encouraged the creation of forums in which informal and personal communication could take place, in the context of energy-saving (Ibid).<sup>19</sup>

One of the more common forums was the Energy Café. In these Energy Cafés people sat together with their neighbors in a familiar and comfortable setting (usually at someone's home or a nearby café) and a consultant was invited to advise them on energy savings. The consultant would provide tailored practical information on how to take energy-saving measures and would round up with an agreement form in which households could opt for their actual implementation. Both the tailored information and the social atmosphere were important components of the energy cafes and of similar other activities which were promoted in the campaign (van den Bosch, 2010).

**The website** – The website was defined as the engine of the campaign, the central point of communication.<sup>20</sup> The website is where people could sign their street or view the status of their streets in the competition. The homepage of the website consisted of map of all of the participating streets in the Netherlands, with information on how other streets are performing in the competition. This created a virtual connection between the household, the street and the other participating streets throughout the Netherlands. In this way, people can also be inspired by actions others are taking to move towards a climate-friendly lifestyle. Furthermore, the website provided information about energy saving

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<sup>19</sup> Some of the information was taken from the KSF website: [www.klimaatstraatfeest.nl](http://www.klimaatstraatfeest.nl)

<sup>20</sup> [www.klimaatstraatfeest.nl](http://www.klimaatstraatfeest.nl)

measures with links to other centers of information, which belong to the back-side of the campaign (see details below) (Klimaatbureau, 2009).

#### *The back-side of the campaign*

The back side of the campaign targeted mainly the enabling factors of climate-friendly behaviors. It included partnerships with numerous parties, which provided information, products and services for different energy saving measures. Providing a thorough overview of these activities is beyond the scope of this analysis, however several important partnerships should be mentioned:

1. Milieucentraal (Environmental center) – a national information center on environmental issues with a helpdesk where people can ask questions about energy-saving measures.<sup>21</sup>
2. Meer-Met-Minder (More with Less) – a governmental foundation for supporting and promoting energy efficiency in the built environment. Meer-Met-Minder provides information about energy saving at home, a comprehensive review of subsidies and ‘green loans’, as well as links to suppliers of products and services related to energy conservation which meet high quality standards (Klimaatbureau, 2009).<sup>22</sup>
3. Tenant association provided tenants with advice and practical assistance on energy savings, as well as on negotiating with their landlords or housing association.
4. Companies which offer subsequent supply of products and services.
5. Provincial Environmental Federation played an important role in supporting the KSF, with the aim of assisting participants in the implementation of small and large-scale energy saving measures (C. van Slagmaat, personal communication, June 16, 2010).
6. Municipalities played an important role in KSF and it was observed that in active municipalities the participation rate was higher than the average (Klimaatbureau 2009). Municipalities were actively engaged in communicating the campaign and in facilitating the implementation of certain actions. The involvement of the municipalities further deepened in KSF#2, where 50 municipalities could join the competition (thus rewarding all their streets with 2,000 points). The municipalities also used the KSF events as an opportunity to communicate their climate policies to their citizens (Ibid).

#### **Phase 4: Implementation and Monitoring**

The first program was conducted in the winter of 2008-2009 and included 3,282 participating street from 771 different locations throughout the NL. These accounted for 5,709 activities of joint neighborhood actions. The first program was considered a great success due

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<sup>21</sup> For more information see Milieucentraal website: <http://www.milieucentraal.nl/>

<sup>22</sup> For more information see Meer Met Minder website: <http://www.meermetminder.nl/home/>

to the high participation rate, which lead to a growing interest in the KSF by different public and private parties. Municipalities saw the KSF as a good venue to communicate their climate policies and linking them to local initiatives and different public foundations (such as More-with-Less) saw the great potential KSF had for increasing their utility (C. van Slagmaat, personal communication, June 16, 2010; Klimaatbureau, 2009).

Thus, the second program was launched in the winter (November-May) of 2009-2010 with a greater support from the ‘back-side’ of the campaign. The second KSF included 5,507 participating streets, from over 1,000 locations throughout the Netherlands. In addition, 49 municipalities who joined the competition received the ‘Golden Star’ for actively engaging their citizens in the campaign and carrying out energy saving measures in the participating streets (e.g. LED street lighting) (G. Termeer, personal communication, May 26, 2010). The results of the two campaigns are summarized in the table below:

	Streets	Locations	Golden Star Municipalities <sup>23</sup>	Actions
KSF 1	3,282	771		5,709
KSF 2	5,507	>1,000	49	NA

Table 4: Summary of the participating streets, locations, Golden Star municipalities and actions taken for KSF 1 and KSF 2.

*Monitoring* was conducted on the process and on the impact of the campaign. Monitoring the process included monitoring the amount of participating households, streets, municipalities, provinces, etc. The database included postcodes of each participating street, which was instrumental in monitoring whether the target group has been influenced by the campaign (see evaluation below). Monitoring the impact of the campaign included monitoring individual actions and collective actions, which was used in the scoring system in order to set the results of the competition. Monitoring did not include changes in energy consumption.

#### **Phase 4: Process Evaluation**

Two evaluation studies were conducted by an independent research organization: a general assessment of the KSF participants and an in depth analysis of one targeted segments.

The first study examined what are the socio-demographic characteristics of the KSF participants, in order to assess to what extent the KSF reached its target audience. The study did a preliminary segmentation of the Dutch population, according to a behavioral model and research on environmental perceptions in the Dutch population. This segmentation arrived at five segments in the Dutch population, which were presented across 2 axes: Ego-oriented vs. Group-oriented and introvert vs. extravert (see figure 3). These segments and their

<sup>23</sup> Only existed in KSF 2

environmental attitudes are: 1) Lime Group (38%): ‘Living, Doing’ - especially interested in what they themselves can do; 2) Orange Group (10%): ‘It can be better’ - Would like to see more activities and inspiration from the side of the government; 3) Green Group (15%): ‘Mistrustful’ – Little interest in environmental issues); 4) Aqua (12%): ‘Seriously engaged’ – Are well aware but want to know more; 5) Purple (25%): ‘Not active’ – Would like to be obliged into taking environmental actions (Wolters, 2010).<sup>24</sup>

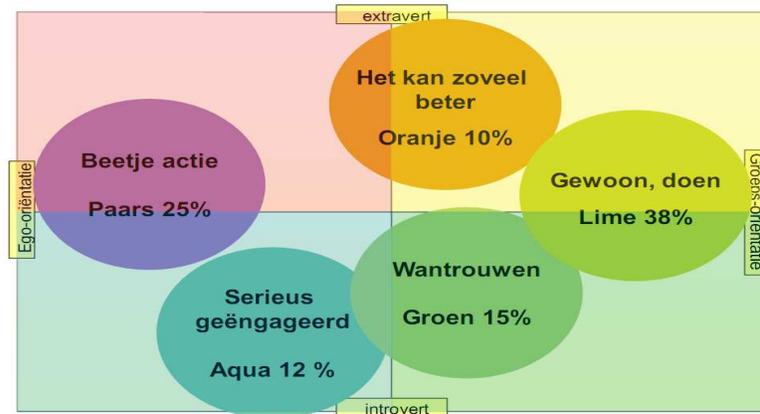


Figure 3 – Segmentation of the Dutch population (Wolters, 2010)

The hypothesis of the campaign designers was that the Lime Group would be the main group targeted in the campaign, since they are willing to change behavior (if they can learn how to do it easily). It was also assessed that the social aspect of the campaign would be especially appealing to them, as they more socially-oriented - ‘they are interested in other people and find friendships with other people important to them’ (Ibid).

Although the study reveals several characteristics of the participants, it is especially worth mentioning the results with regard to the 5 segments. Each of these segments was compared to KSF participants, according to three categories: average KSF participant, participants with 1 household and participants with 2 or more households. A fourth category was included to compare the results to the average Dutch (Ibid). Table 5 shows the portion of each segment in each of the 4 categories.

	Average KSF	1 Household	>=2 Households	Average Dutch
Lime	38.1%	39.1%	32.9%	37.4%
Green	13.1%	13.5%	11.1%	14.3%
Purple	27.5%	26.4%	33.2%	26.6%
Orange	8.7%	8.7%	9%	8.3%
Aqua	12.5%	12.3%	13.8%	13.3%

Table 5: Representation of the five segments in KSF participants, compared to the Dutch population (Wolters, 2010).

<sup>24</sup> Percentages are of the general Dutch population. Titles are roughly translated from Dutch and small misalignments from the source may exist. The information was taken from a documented presentation given to HIER on the results of the study.

Table 5 shows that the average KSF participant more or less represents the Dutch population. However, when examining streets with 2 or more participating households (which can be titled successful streets) significant differences appear. Particularly, the *Lime group* is under represented and the *Purple group* is over represented. The high rate of participation in the *Purple group* was explained by the fact they are highly educated, they have good organizational skills and they are highly motivated in a competitive setting (they were focused on winning) (Ibid). However, a question remains regarding the reasons for the (relatively) low success rate of the *Lime Group*, the main target group of the campaign.

In order to answer this question, a second qualitative evaluation study was conducted, with a focus group representing Lime participants. The study revealed that the Lime group is not homogenous and it is comprised of ‘*initiating*’ and ‘*following*’ types of people. While the campaign was very appealing to the *initiators* it was less appealing to the *followers*, because of the strong emphasis on actions which you take together with your neighbors. The *followers* are more interested in what they can individually, before they start acting in a group setting.

The study also revealed several other conclusions regarding the strengths and weaknesses of the campaign. In general the campaign appealed to the Lime Group because of the *cost-element* (saving money), because it offered them the means of delivering a *personal contribution* for the environment, because a *reward* was given in accordance to their efforts and (partially) because of the social element. The main barriers to participation are the communication to the followers mentioned earlier, and the complexity of the website which was not user-friendly enough (Smart Agent, 2010).

### **Phase 5: Impact and outcome evaluations**

Collective measures were monitored, but only in a qualitative way which made it very difficult to aggregate them. Thus, they could not be presented in this dissertation.<sup>25</sup> However, individual measures were monitored in quantitative way and they are presented below (see Table 6). Assuming that most households reported their individual measures, table 6 could provide a good representation of the impact of the campaign in terms of energy-savings.<sup>26</sup> However, this impact evaluation has several important drawbacks. First, the monitoring system gave no point of reference. For example, a household could report in the campaign that it had a refrigerator with energy label A+ or A++, but we can not know what type of refrigerator the household had beforehand. Moreover, there is not way of knowing when the household purchased the refrigerator, thus it is impossible to attribute these measures to the campaign. Thus, deriving an accurate outcome evaluation from these results was not possible.

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<sup>25</sup> For example, for KSF 1 this included a list of 8,398 verbal descriptions of measures.

<sup>26</sup> Households could report their individual actions even if they were also counted as collective actions.

What table 6 does show is the remarkable increase in impact from KSF 1 to KSF 2, which on average is a 33% increase in the amount of reported individual measures.

Type of measure taken by the participants	KSF 1	KSF 2	% Change
<b>Electronics</b>			
Number of LEDs and energy saving lightbulbs in the house	21524	26866	24,82
Refrigerator with energy label A + or A ++	2008	2709	34,91
Washing machine with energy label A	2045	2803	37,07
No dishwasher or a dishwasher with energy label A	1940	2447	26,13
<b>Vacation</b>			
Vacation this year held at home	1539	2241	45,61
Have not flown this year	1865	2574	38,02
This year I flew, but climate-neutral	210	249	18,57
Decided not to fly in 2009	1742	2290	31,46
<b>Washing</b>			
I wash at 30 degrees	2445	3100	26,79
Use a clothesline	2492	3235	29,82
Have a dryer with energy label A +	1071	1645	53,59
Have a water saving showerhead	2073	2855	37,72
<b>Heating</b>			
Heating no higher than 20 degrees	2514	3249	29,24
I do not use heating in unused rooms	2755	3520	27,77
I find out what is the energy consumption of my house	746	1059	41,96
I made the energy-label of my home 'greener'	515	708	37,48
<b>Transport</b>			
I have discarded my car (or never had)	649	808	24,50
I decided to take the car for short journeys	1763	2260	28,19
I chose an A-label car	300	514	71,33
I chose the New Rider test	1456	1984	36,26
I have a green car insurance	226	380	68,14
<b>Green Energy</b>			
I opted for green power	1815	2245	23,69
I opted for green gas	916	1308	42,79
I have a solar or heat pump water heater	365	381	4,38
I have a solar panel on my roof	384	385	0,26
<b>Number of participants who reported the measures</b>	3422	4273	24,87
<b>Total number of participants in the campaign</b>	9188	12532	36,40

Tabel 6: Results of individual actions taken in KSF1 and in KSF 2 and percentage of change (from KSF1 to KSF2). At the bottom: number of participants who reported individual actions and total amount of participants. Results were obtained from Klimaatbureau, HIER campaign, July, 2010.

## Analysis of the results

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The analysis below will evaluate the performance of the intervention in each phase of the MECBI. The evaluation will be conducted according to the conceptual framework; the evaluation studies on the KSF participants; the results of the participation rate and the impact of the intervention; and with reference to other evaluation studies of similar interventions.

### 1) *Contextual analysis*

The KSF was born, designed and managed by the energy-saving cluster of the HIER campaign, which coordinates a group of private non-governmental organizations. However, it was supported and financed mainly by public money, most notably the Ministry of Housing, Spatial Planning and the Environment (VROM). Although both parties had a shared target, that is to reduce CO<sub>2</sub> emissions from Dutch households, they had different perceptions of how that target should be achieved. This can be described as the difference between impact-orientation and outcome-orientation.

Typically, HIER was more impact oriented, thus it focused on reaching a large audience: its target group was 70% of the Dutch population and its operative objective was to reach one million people in the Netherlands. Rather than focusing on certain behaviors, HIER's goal was 'to promote the adoption of a climate-friendly *lifestyle*', which addresses a much more comprehensive array of climate-related behaviors. However, the outcome of these lifestyle changes was never defined. The intervention aimed at making a '*tangible contribution* to energy saving in existing buildings', but it did not mention what that contribution will be.

VROM, on the other hand, is a public agency which is committed to public policy goals. These goals are typically outcome-oriented, such as the reduction of 50% CO<sub>2</sub> emissions from Dutch homes. Thus, there was a clear inconsistency between the targets of the intervention and the policy goals it was meant to address. This inconsistency was not resolved, and KSF remained an impact-oriented intervention. This can explain why the intervention had a high participation rate with thousands of reported actions, but these could not be translated into an accurate and measurable outcome.

### 2) *Behavioral Assessment*

The HIER campaign was not the first to use the term *lifestyle*. Interestingly, health promotion also experienced a similar shift from changing behaviors to changing lifestyles. The reason for this shift was the acknowledgement that behaviors are not isolated actions, but they are embedded "in cultural heritage, social relationships, geographic and socio-economic

circumstances and personality” (Green & Kreuter, 1999, p. 17). This broad interpretation of behavioral change is reflected in the behavioral assessment. The campaign promotes a broad array of climate-related behaviors, including direct energy consumption, indirect energy consumption (e.g. holidays or meat consumption), but also awareness raising activities and social events related to climate-change (the recruitment measures). In addition, collective measures are strongly promoted in the campaign, in order to create the ‘social atmosphere’ for behavioral change (G. Termeer, personal communication, May 26, 2010). This broad interpretation of climate-related behaviors corresponds to the definition of influencing lifestyles, which is the target of the campaign.

With regard to the impact-outcome trade-off mentioned earlier, it should be mentioned that the advantage of some of these behavioral changes (such as reducing flight-holidays), is that they go beyond the national commitments of reducing direct CO<sub>2</sub> emissions and they incorporate some of the global consequences of climate-related behaviors.

### *3) Assessing the determinants*

The campaign identified a broad range of determinants which correspond to all three categories, including predisposing factors (knowledge, attitudes, self-efficacy), enabling (convenience, financial incentives) and a special focus on short term and long term reinforcing factors (social support and social norms, respectively). It also differentiates between more significant determinants (such as positive attitudes towards climate change) and less significant determinants (such as knowledge on the consequences of climate change). Similar to the first case study, it seems that these determinants were identified based primarily on prior experience, rather than on research of the target group. Fortunately, two evaluation studies were conducted by an external organization, which allows us to evaluate the assessment of the determinants. Indeed, this evaluation indicated some unexpected results regarding the significant determinants of behavioral change for the target group.

The first study showed an underrepresentation of a segment which is more group-oriented (called the Lime segment in the evaluation) and an over representation of a segment which is more ego-oriented group (Purple segment in the analysis). The high participation of the latter was attributed to the fact people in this segment are highly motivated in a competitive setting. Thus, it can be assumed that the reward and the incentive to win the competition were more influential in determining the final results, compared to the social incentive to act together with your neighbors and receive social support for your actions. However, this is based on findings from a statistical analysis and further research on the target group is needed in order to validate this assumption.

The second study provides more concrete insights into the reasons for participation, albeit only with one segment of participants (the Lime segment), which account for 38.1% of the total participants.<sup>27</sup> This evaluation revealed four main significant determinants in the success of the campaign: the cost element, the ability to make a personal contribution, the reward element and the social aspect. The cost element corresponds to a financial incentive (enabling factors), but also to predisposing factors, such as attitudes towards energy saving and a feeling of self-gratification (I am smart, I pay less). This is also true for the reward element. The personal contribution corresponds mainly to a perceived self efficacy (predisposing factor). The social aspect was at the heart of the campaign, and corresponds to reinforcing factors. Indeed, the moral aspect which has to do with combating Climate Change was not mentioned. These findings are generally consistent with the initial assessment of the determinants.

However, there was one main inconsistency, which coincides with the findings of the first evaluation study and that is the role of reinforcing determinants. Although for some of the participants the social aspect was an incentive to participate, it created a barrier to participate for others. This was due to the fact the segment group is not homogenous, and it consists of *'followers'* which found it hard to respond to the social "demands" of the campaign. Thus, the results of the first and second evaluation raise important questions regarding the large emphasis which the campaign put on the reinforcing determinants. Although these factors were important in creating a support for behavioral change, it is doubtful whether they were the primary drivers behind the decision to take ambitious energy saving measures.

#### *4) Intervention design and Implementation*

The KSF demonstrates the importance of combining different policy instruments in order to maximize the impact of an intervention. This is well reflected in the coordination between what is defined the 'front side of the campaign' and the 'back side of the campaign'. The front side of the campaign aims to stimulate behavioral change through a variety of communicative instruments and the back side of the campaign aims to enable that stimulation to be realized, through financial instruments and by providing the needed infrastructure and services. Important features in the intervention design will now be discussed in detail.

The front side of the campaign was designed according to a clear strategy, that is to brand climate-friendly lifestyle as 'enjoyable and easy to attain', as 'social' and as 'financially attractive'. Because the campaign targets people with low involvement in environmental issues, it uses a peripheral route, rather than a central route, to influence its target audience. This coincides with the theoretical argument that people with low involvement will not be

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<sup>27</sup> It is also worth mentioning that the study was rather limited in scope, as it was conducted with 6-8 participants which participated in a two-hour focus group session.

influenced by strong and persuasive arguments about the problem, but rather through ‘peripheral cues’, such as the use of messages that elicit positive emotions or via a repetitive stimuli (Bronner & Reuling, 2002; Verplanken, 2002). A variety of these cues are present in the HIER campaign, such as the use of the ‘festival’ to stimulate positive associations and the multiple use of communication channels to convey the message over and over again.

Another familiar peripheral cue which was used in the campaign is the use of experts and role models to convey information. The use of role models have been proven to be an effective mean for promoting positive attitudes towards environmental behaviors, as long as the role model is perceived as credible (with regard to the issue at stake), is associated with the subject and has (some) similarity to the targeted audience (Verhue & J. Verbeek, 2002). These components seem to be well incorporated in the HIER campaign, such as in the use of the Dutch Weatherman.

At the heart of the front side of the campaign is the KSF. The KSF is unique in it that it targets primarily the social aspect of behavioral change, hence creating social support for (immediate) behavioral change and embedding (long term) social norms. This strategy is consistent with a large range of studies which indicate that addressing social support and social norms can greatly enhance the impact of intervention, if not a vital condition for their success (McKenzie-Mohr & Smith, 1999; Schultz, 2002; Staats et al., 2004; Valente & Schuster, 2002). This is especially important with regard to the social dilemma which features environmental behaviors.<sup>28</sup> KSF directly addresses this social dilemma, at different levels. It does so by creating the neighborhood support for behavioral change. It also does so through the website, which is a virtual connection between the household, the street and the rest of Netherlands. This creates an important reinforcing effect from society to the participant which helps to overcome the social dilemma.

In addition to increasing social support for behavioral change, social networks are also used to diffuse information, albeit in an informal and personal way (Weenig, 2002). Similarly, KSF promoted the creation of forums (e.g. Energy cafes, energy teams), in which people received tailored and personal advice on how to save energy in a familiar settings. These forums were instrumental in addressing all three sets of significant determinants – they provide tailored knowledge, they influence attitudes (e.g. by choosing a familiar settings), they create social support (social setting) and they facilitate the further implementation of the measures (through the energy advisor).

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<sup>28</sup> The core of the social dilemma with respect to the environment is that one the one hand, people feel that they should and want to do more but that they can actually can do little. At the same time, they feel that other actors in society, can do much more but want to do relatively little. This creates a perceived ‘motivation surplus’ of one owns household and an ‘ability surplus’ of others (Raaij, 2002).

One drawback of the intervention design, which was mentioned in the evaluation study, was the design of the website. Some of the participants found the website a barrier for participation, due to its complexity or overload of information. This highlights the importance of enhancing accessibility to participating in the intervention, especially if it relies on impersonal means of communication.

#### 5) *Monitoring and Evaluations*

One finding that was consistent across the different sources of information is that the KSF did a remarkably good job at reaching its target audience. Both the designers of the campaign and its supporters at the government were overwhelmed by the high participation rate in the KSF (F. Ekerschot, personal communication, June 21, 2010; G. Termeer, personal communication, May 26, 2010; Klimaatbureau, 2009). In KSF 2, nearly 10,000 people and more than 5,500 streets participated in the campaign, from over 1,000 different locations throughout the Netherlands (Klimaatbureau, 2009; G. Termeer, personal communication, May 26, 2010).

However, it is hard to draw conclusions regarding the actual impact of the campaign, due to the problems in the monitoring system. First, no reference point is given regarding the state of the households prior to the campaign, thus it is impossible to measure the *changes* in behavior. Second, no time reference is given regarding when the measures were taken, thus one can not attribute the reported measures the campaign (and even if a time was specified, additional research would be needed to prove attribution). The monitoring of collective measures could help overcome these problems, because they are only reported during the campaign, but they were registered in a qualitative way which makes it very difficult to aggregate them. Naturally, the problems in the monitoring system do not allow us to arrive at an outcome evaluation.

These shortcomings are strongly related to the overall orientation of the intervention and the definition of targets mentioned earlier. It can not be said that the intervention failed to meet its targets, because it never intended going beyond a *tangible contribution* to energy savings. However, if the intervention truly aspires to serve broader policy goals, it would need to significantly enhance its monitoring system.

## Conclusions

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The aim of this dissertation is to contribute to climate policies aiming at fostering climate-friendly behaviors of households, by offering a model for evaluating and enhancing the effectiveness of climate behavioral change interventions. The following chapter will present the conclusions in light of this aim, in two separate sections. The first section will deal with answering the research question and testing the hypothesis. The second section will reflect on the main assumption of this dissertation, that is that the MECBI is an adequate model for evaluating climate behavioral change interventions.

- *How can climate behavioral change interventions be effectively used?*

The question that this research dealt with is how can behavioral-change interventions be effectively used to foster climate-friendly behaviors of households? The main hypothesis made in this dissertation was that interventions which aim at fostering climate-friendly behaviors of households are more effective if they adhere to the MECBI. It was further hypothesized that the adherence to its planning phases would have the most significant influence on effectiveness. This hypothesis was tested in two case studies: Energy Advice Project Rotterdam (EAPR) and the Climate Street Festival (KSF).

Before turning to answer the research question it is important to conclude what we know about the effectiveness of these interventions. With regard to the first case study (EAPR), a preliminary assessment shows a low participation rate but a relatively high (estimated) outcome per household, which matches the upper average of these types of interventions. The second case study (KSF) shows a remarkably high participation rate, but no data is available on the outcome in terms of energy savings. The assumption made in this dissertation is that there is a certain trade-off between aiming at a broad impact (in terms of the participation rate and number of actions taken), as oppose to aiming at an accurate and measurable outcome. Thus, determining effectiveness highly depends on how the planner and the policymaker define the aim of the intervention.

This leads us to the first phase in exploring the hypothesis, with regard to the contextual analysis and setting the targets. The conclusions regarding this phase can be divided into internal and external consistency. Internal consistency is the degree to which the targets of the intervention are in line with the policy goals they were meant to address. Here clear differences between the interventions were observed. Whereas in EPAR clear targets were set in line with policy goals, in the KSF there was clear inconsistency between the targets (focused on broad impact) and the policy goals (focused on measurable outcome).

Consistency with policy goals is important for enhancing effectiveness because it determines the durability of support for the intervention, and increasing durability is an important component in enhancing effectiveness (Staats et al., 2004).

External consistency, on the other hand, is the degree to which the policy goals of the intervention are in line with the overall contextual analysis. Also here, significant differences were observed, albeit in the opposite direction. Whereas the KSF targets a broad target group (70% of the Dutch population), where there is the largest potential for reducing CO<sub>2</sub> emissions, EAPR targets low income households, which contribute least to CO<sub>2</sub> emissions compared to middle-high income households (Wier et al., 2001). Hence, whereas EAPR performed higher than KSF in terms of internal consistency, the opposite can be said for external consistency. It is interesting to link these different performances to the different definitions of effectiveness mentioned earlier. It can be assumed that there is a link between internal consistency and an outcome oriented intervention, and between external consistency and a broad-impact oriented intervention. However, this assumption clearly demands further research.

The second planning phase, behavioral assessment, also revealed significant differences in performance. Whereas EAPR targeted only behaviors which lead to direct energy consumption, the KSF promoted the adoption of a wide range of climate-related behaviors, which correspond to direct and indirect energy consumption, awareness raising activities and climate social events. Moreover, the KSF put behavioral change into the broader context of lifestyle change. This is especially important with regard to the potential rebound effect that can occur when only direct energy savings are addressed (van den Bergh, 2009). Thus, the degree to which interventions incorporated the wide range of climate-related behaviors (and lifestyles) had a significant influence on their potential outcome.

Moreover, this difference in performance can also be related to the broad-impact vs. measurable-outcome trade-off mentioned earlier. Behaviors which are associated with indirect energy consumption, or other broader lifestyle changes (e.g. increased interest in environmental issue), are much harder to measure and attribute to a single intervention. Nevertheless, these lifestyle changes can lead to a broader and more durable set of behavioral changes. A similar rationale gave rise to the lifestyle approach in public health promotion (Green & Kreuter, 1999). Yet, although measuring intangible behavioral changes is complex, it should not be discarded as insignificant and exploring ways to do so is an important task for intervention designers.

With regard to the third planning phase, assessing the determinants, an important distinction needs to be made between assessing the determinants and successfully incorporating this assessment into the design and implementation. Both interventions performed high on identifying all three set of determinants (predisposing, reinforcing and

enabling factors). However, only one intervention (KSF) incorporated the assessment of all three determinants in the intervention design and implementation.

Specifically, both interventions performed quite well in addressing the predisposing factors, but only one intervention (KSF) sufficiently addressed social support and accessibility to the intervention (reinforcing and enabling factors, respectively). The assumption made in this dissertation, is that this had an impact on the participation rate of both interventions, which was high when these factors were addressed (KSF) and low where they were not (EAPR). In addition, these results are consistent other studies that emphasize the role of social support in enhancing the effectiveness of environmental behavioral change programs (McKenzie-Mohr & Smith, 1999; Schultz, 2002; Staats et al., 2004; Valente & Schuster, 2002). It can be partially attributed to the importance of tackling the social dilemma which features environmental behaviors (Raaij, 2002).

Yet, it is also important to note that an evaluation study in one intervention (KSF) found significant variance with regard to the determinants of behavioral change. Hence, different people respond to different appeals (even in the same segment), and interventions should be able to identify the different segments in their target group and address them accordingly. This observation confirms similar findings in the literature (Eimers & Pieters, 2002; Oy, 2007). This conclusion also highlights the importance of conducting a preliminary research on the target group, which was the exception rather than the rule in the selected case studies.

Finally, in evaluating the fourth and last planning phase (intervention design), both intervention methods employed methods and strategies which are considered effective intervention methods in the literature. To begin with, both interventions applied methods for providing personal and tailored information, such as the house audits in EAPR and the energy cafes in KSF. This mode of communication is known to be effective in influencing determinants of behavior (Lindén et al., 2006; Weenig, 2002), especially with regard to knowledge and self-efficacy (predisposing factors) (Abrahamse, 2007, p. 119).

Second, both interventions identified the importance of employing social networks, albeit only one intervention fully applied this method in practice (KSF).<sup>29</sup> The social network approach has been proven to be an effective intervention method, to the extent that the social network is small, homogenous and cohesive (Valente & Schuster, 2002; Weenig, 2002). Indeed, lack of social cohesion was a barrier for the realization of this method in the EAPR intervention. Thus, there seems to be lack of knowledge regarding the application of this method in 'difficult social settings' (e.g. immigrant neighborhoods in big metropolitans).

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<sup>29</sup> The KSF also incorporated the use of 'block-leaders', which has been successfully applied in other environmental behavioral change interventions (Schultz, 2002; Staats et al., 2004).

Lastly, both interventions identified the need to create financial incentives and to enhance the accessibility to the participation in the intervention. However, while the former was successfully implemented, both interventions had problems with the implementation of the latter. This seems to be an important component of an intervention which does not always receive sufficient attention.

Overall, it can be concluded that the adherence to the MECBI model, particularly with regard to its planning phases, can significantly influence the inputs which go into the intervention design and implementation, thus determining their effectiveness. Particularly, these relate to: internal and external consistency in the contextual analysis; a broad assessment of climate-related behaviors; identifying all three set of determinants and incorporating them in the intervention design; and applying commonly used intervention methods which have previous records of success.

- *The MECBI – an adequate evaluative tool?*

The main assumption made in this dissertation is that the MECBI model is an adequate model for evaluating climate behavioral change interventions. This section will reflect on the different potential and pitfalls of using the MECBI as an evaluative tool for this purpose. Beforehand, it should be reminded that MECBI is a modification of the PRECEDE-PROCEED model, and as such, it should be examined and used in line with the guidelines of its ancestor. Different modifications were made in this dissertation, in order to match the PRECEDE-PROCEED to climate-related interventions and according to personal judgments of the author. Clearly more research is needed in order to arrive at any conclusions regarding the validity of the MECBI model as an evaluative tool.

Yet, several insights can be drawn from this preliminary experience. First, the contextual analysis needs to be further developed in order to match it to the context of climate policies. This research identified internal and external consistencies as guiding principles, but more research is need in order to identify concrete factors which should be used to evaluate performance in this phase. One point of reference can be the list of factors mentioned in the BEHAVE report (Oy, 2007, p. 29), although this consists of a long descriptive list which needs to be modified into a more systematic evaluation tool.

Second, the categorization into predisposing, reinforcing and enabling factors seems problematic, since it implies a relationship between personal-predisposing factors and between social-reinforcing factors. However, there are also social-predisposing factors (e.g. social norms) and personal-reinforcing factors (e.g. personal feedback) (Abrahamse, 2007; Oy, 2007). The categorization into personal and social factors, on the other hand, does help to match intervention methods to the determinants, such as providing information and prompts

to influence personal determinants and providing social support to influence social determinants. Thus, it seems more useful than the predisposing-reinforcing categorization. Yet, more research into this field is needed in order to refine this planning phase.

Third, the issue of changeability is insufficiently addressed in the model, especially with respect to measuring changeability of behavior. Different methods have been offered for measuring health-behavior changeability (Green & Kreuter, 1999, p. 137), but these need to be further modified in order to match the characteristics of climate behaviors (e.g. the monetary aspect). In addition, changeability is highly related to the assessment of the determinants, thus the model needs to incorporate an input from the assessment of the determinants (phase 3) back to the behavioral assessment (phase 2).

Overall, the Moto of the model (beginning at the end) and the division into the different phases seems highly instrumental in applying it as an evaluative tool.

To conclude, it is important to mention two future paths of development for enhancing the MECBI and for improving our understanding of how to foster climate-friendly behaviors. First, similar to the path which the PRECEDE-PROCEED has taken, the MECBI should be tested as a model for designing and implementing interventions, which will further contribute to its development. Second, the MECBI can be developed for evaluating behavioral change interventions in other environmental domains, such as waste recycling and water consumption. Since environmental behaviors are strongly interlinked with one another (Staats et al., 2004), it makes much sense to develop a model for designing, implementing and evaluating *environmental* behavioral change interventions down the path. This will enrich our understanding of how to foster an array of environment-friendly behaviors, in order to arrive at a more sustainable society in the future.

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## Annexes

### Annex 1 – List of interviews

#### Energy Advice Project Rotterdam

	Name of Interviewee	Interviewee position	Date and Time	Place
1	Monique Van Dongen	Communication Manager, Rotterdam Climate Initiative	April 28 <sup>th</sup> , 2010 10:00-11:00	Rotterdam Climate Initiative offices, Rotterdam, The Netherlands
	Peter Verschoor	Project Manager 'Energizing Cities'		
2	Loentine Meer van Der	Policy Advisor, DCMR (Environmental Protection Agency for the Rijmond district)	May 6 <sup>th</sup> , 2010 15:30-17:00	DCMR offices, Rotterdam, The Netherlands
3	Hans Brugman	Director, Stichting Collusie	May 19 <sup>th</sup> , 2010 10:00-11:30	Stichting Collusie, Amsterdam, The Netherlands
4	Elise Boukris	Environmental policy advisor for Amsterdam Noord	May 20 <sup>th</sup> , 2010 9:00-10:00	Municipality offices, Amsterdam Noord, The Netherlands

#### Climate Street Festival (KSF)

	Name of Interviewee	Interviewee position	Date and Time	Place
1	Gijs Termeer	Policy advisor on Climate and Development; HIER campaign	May 26 <sup>th</sup> , 2010 10:00-12:00	Climate Bureau/ HIER campaign, Utrecht, The Netherlands
2	Charlotte van Slagmaat	Advisor on local and regional climate initiatives, Ministry of Housing, Spatial Planning and the Environment (VROM)	June 16 <sup>th</sup> , 14:00-15:00	Ministry of Housing, Spatial Planning and the Environment (VROM), The Hague, The Netherlands
3	Frans van Ekerschot	Coordinator of Climate and Energy Saving Policy for Housing	June 21 <sup>st</sup> , 2010 15:00-16:30	Ministry of Housing, Spatial Planning and the Environment (VROM), The Hague, The Netherlands

## Annex 2 – Energy Advice Project Rotterdam: Specifications of the tools and the advice given in the house audit

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### 1. Tools given in the house audit:<sup>30</sup>

- a. Radiator Foil
- b. Energy saving Showerhead
- c. Sill strips
- d. Wind strips
- e. Letterbox brush

### 2. Advice given in the house audits and (maximum) projected savings per advice:<sup>31</sup>

<p><b>GAS</b></p> <p><u>Spatial heating</u> (450 m3)</p> <ul style="list-style-type: none"> <li>• Vent rooms daily while heating is turned off</li> <li>• Close curtains at night</li> <li>• Turn off heating an hour before going to sleep</li> <li>• Put the heating one degree lower</li> <li>• Dress warm</li> <li>• Turn off heating in spaces that are not used</li> <li>• Pilot flame off when away for a longer time</li> </ul> <p><u>Warm water</u> (50 m3)</p> <ul style="list-style-type: none"> <li>• Shorten duration of showers</li> <li>• Take a shower instead of a bath</li> <li>• Rinse with cold water before doing the dishes</li> <li>• Do the dishes in a tile with water, not under a running tap</li> </ul> <p><u>Cooking</u> (40 m3)</p> <ul style="list-style-type: none"> <li>• Put a lit on the pan</li> <li>• Choose the smallest suitable pan</li> <li>• Make sure the flame stays under the pan</li> <li>• Choose a pressure cooker if time of preparation is long</li> <li>• Cook in as little water as possible</li> </ul>	<p><b>ELECTRICITY</b></p> <p><u>Heating</u> (25 kWh)</p> <ul style="list-style-type: none"> <li>• Don't use extra electrical heating</li> </ul> <p><u>Lighting</u> (150 kWh)</p> <ul style="list-style-type: none"> <li>• Turn lights off in non-used spaces</li> </ul> <p><u>Refrigerator and freezer</u> (100 kWh)</p> <ul style="list-style-type: none"> <li>• Don't put the fridge/freezer in a warm spot (in the sun)</li> <li>• Defrost the freezer regularly</li> <li>• Clean the grid at the back yearly</li> <li>• Defrost things from the freezer in the fridge</li> <li>• Don't put warm dishes in the fridge</li> <li>• Don't leave the door of fridge/freezer open longer than necessary</li> <li>• Turn fridge off during holidays</li> </ul> <p><u>Washing/drying</u> (400 kWh)</p> <ul style="list-style-type: none"> <li>• Do the laundry at 40 degrees</li> <li>• Only do laundry when you have a full machine</li> <li>• Don't use a dryer</li> </ul> <p><u>Cooking</u> (30 kWh)</p> <ul style="list-style-type: none"> <li>• Put a lit on the pan</li> <li>• Choose the smallest suitable pan</li> <li>• Choose a pressure cooker if time of preparation is long</li> <li>• Cook in as little water as possible</li> <li>• Make sure the hot plate is smaller than the pan</li> </ul>
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<sup>30</sup> These tools were used for the pilot phase of the project. This toolkit will be expanded in the next phases (Stichting Collusie, 2010).

<sup>31</sup> This is a documented advice which was given to households in TELI project and it serves as guidelines for the Energy Advice Project Rotterdam. It assumed that in an average audit half of these energy tips are given (Uitzinger & Derijcke, 2007).

**1. Awareness raising actions**

- \* Appoint car puller (500)
- \* Build Climate Street Team (1000)
- \* Organizing neighborhood meetings (750)
- \* Organize Energy-day for children (750)
- \* Organize lecture (750)
- \* Organize Movie Evening (1000)
- \* Organize Information Day (1000)
- \* Create your own newsletter (1000)
- \* Take part in a local debate (1000)
- \* Submit request for insulation from the housing corporation (2000)
- \* City participating in Climate Street Festival (2500)
- \* Create an Energy Team (3000)
- \* Organize an Energy Barrel (1000)
- \* Joint Purchase of Energy Meters (1000)
- \* Participate in warm sweater day (1000)
- \* Organize Energy Cafe (1500)

**2. ‘Green’ actions**

- \* Joint tree planting in the National Tree-planting day (500)
- \* Engaging in an activity of Natuurmonumenten (Dutch organization which holds nature conservation projects which also contribute to combating climate change) (500)
- \* Jointly opt for green gas (3000)
- \* Joint support a compensation (carbon offset) project (4000)

**3. Electricity**

- \* Place standby killers in all participating households (3000)
- \* Replace all lamps with energy savings light bulbs or LED light bulbs (5000)
- \* Joint motion sensor outdoor lighting (3000)
- \* Organize defrosting your freezer-relay (750)
- \* All participants purchase Green Electricity (2000)
- \* Make an application for placing solar panels (200)
- \* Place Solar panels (1000)
- \* Joint membership in a wind energy association (3000)

- \* Establish a new wind energy association (10000)
- \* Make an application for Energy efficient street lighting (3000)
- \* Joint drying on a line instead of using a dryer (750)
- \* Jointly purchase LED Christmas lights (750)
- \* Washing laundry together with your neighbors (300)
- \* Jointly decide to wash at 30 degrees (1000)

#### **4. Nutrition**

- \* Organize a Climate-conscious dinner (500)
- \* Jointly decide one day a week not to eat meat (1000)

#### **5. Gas**

- \* Visit of the Energy Bus of the tenant housing association (1500)
- \* Customized advice for all of the street participants (1500)
- \* Make a joint infrared scan (2000)
- \* Jointly place radiator foils (500)
- \* Jointly place an shower timer (hourglass) (100)
- \* Jointly install water-saving showerhead (300)
- \* Joint sealing cracks in windows and doors (500)
- \* Joint put pipe insulation (200)
- \* Joint put letterbox brushes (100)
- \* Request for joint purchase of roof insulation (2000)
- \* Joint purchase of roof insulation (1000)
- \* Request for joint purchase of double glazing (2000)
- \* Joint purchase of double-glazing (1000)
- \* Request for joint purchase of efficient boilers (2000)
- \* Joint purchase of efficient boilers (1000)
- \* Request for joint purchase of wall insulation (2000)
- \* Joint purchase of wall insulation (1000)
- \* Request for joint purchase of floor insulation (2000)
- \* Joint purchase of floor insulation (1000)
- \* Request for joint purchase of solar water boilers (2000)
- \* Joint purchase of solar water boilers (1000)

## **6. Publicity**

- \* In the newspaper or magazine (1000)
- \* On television (1500)
- \* On Piet Paulusma's show (2000)
- \* Organize a resident committee meeting on Climate-Street Festival (1500)

## **7. Transport**

- \* Do the New-Rider test (750)
- \* Jointly inflate the tires (1500)
- \* Inform all the dwellings in your street on New Brand tires (500)
- \* Organize Car Free Day (2000)
- \* Subscribe your car for car-sharing (2000)
- \* Participate in Deelauto (3,000)
- \* Purchase a tricycle (1000)
- \* Carpooling (1000)