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Interventions to change energy- relevant behaviour

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1 Background

Energy is consumed by people rather than by buildings. However, most of the strategies to achieve energy efficiency in buildings are related to technical mitigation measures, while the behaviour aspect is often neglected. But, in the end it is the actions of the users that will create the impact. So, if we want to achieve the ambitious goals on a Low Carbon society set by the EU, both structural and soft approaches are to be considered in a complementary way. When it comes to getting people to change their energy-relevant behaviour, the question arises as to the use of suitable interventions.

There are different types of interventions to increase energy efficiency and hence lower carbon emissions. Some of these intervention strategies are currently implemented and tested within the interdisciplinary project “THE4BEES” (Transnational Holistic Ecosystem 4 Better Energy Efficiency through Social Innovation) funded by the EU Alpine Space Programme. The intervention measures are aimed at diverse building types and user groups: schools, office buildings, social housing and alpine huts. In this project, IREES takes over the social science part by providing information regarding (a) awareness raising with respect to energy efficiency in buildings and (b) the development of ICT tools to reduce energy consumption based on a participative approach¹. Knowledge about psychological principles concerning behavioural change is an important factor in order to foster a common understanding of relevant technical terms within the interdisciplinary and transdisciplinary project team.

In this working paper the shared basics concerning the complex topic of intervention strategies are summarized (for an extended version see the forthcoming report “Knowledge Base on Efficient Behaviours”, Chassein et al.[2018]).

2 What is an intervention?

Interventions or stimuli “shape the individual’s action possibilities or have an influence on the effects of any actions performed” (Flury-Keubler and Gutscher 2001: 113). Interventions can be categorized as

- 1) direct (real-time or nearly real-time) versus indirect (delayed) feedback (Darby 2006) or
- 2) opt-in (deciding to take part in a programme, e. g. online) versus opt-out (not actively decide to take part, e.g. monthly reports of energy consumption sent to customers from the energy supplier), e. g. by feedback programs (Carroll et al. 2009).

In regards to energy consumption, one has to bear in mind that it is not just “one behaviour” that has to be changed. Instead it concerns a set of different behaviours in different contexts that are influenced by seasonal conditions, as for example in winter more light is needed than in summer (Karlin et al. 2015).

¹ for more information see <http://www.irees.de/irees-en/inhalte/projekte/laufend/sowi/The4Bees.php> and <http://www.alpine-space.eu/projects/thefourbees/en/home>

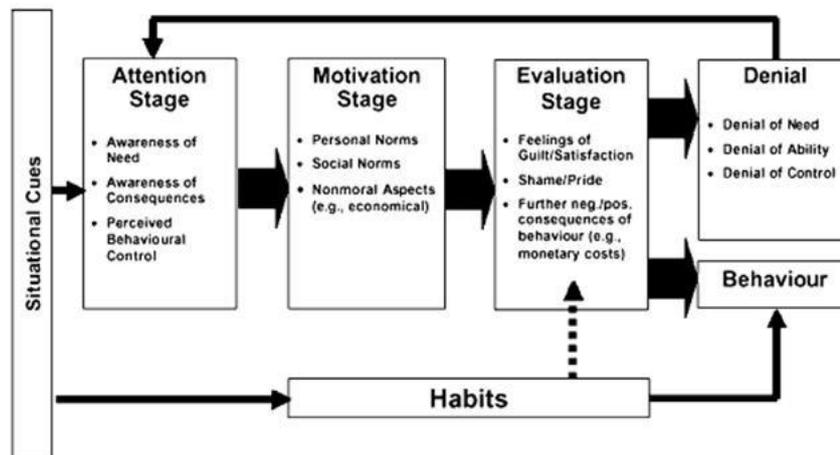
2.1 Psychological background and principles

People are mostly dominated by non-environmental motives in their everyday life (e.g. buying food, travelling, working, spending free time in a pleasant way), but their behaviour has got an impact on the environment.

An important goal of interventions is therefore to motivate them to “incorporate pro-environmental motives into their personal set of everyday motives” (Flury-Keubler and Gutscher 2001: 114). However, “human needs or goals cannot be influenced at will” (Flury-Keubler and Gutscher 2001: 111). High-level goals - such as eating, drinking, and surviving - are determined predominantly by universal biological necessities. Lower level goals such as to eat at a specific restaurant or to regulate the room temperature in a certain range are triggered more individually and can therefore be influenced all the more by others (ibid). Especially in contexts with highly repeated activities of daily life, persons develop stable patterns of behaviour; therefore, habits play an important role in interventions. Activities of day-to-day life are often linked to the use of supply systems (e.g. heating) or technical appliances (e.g. washing machines, coffee machines, television, computer, printers), which facilitate the organisation and routines of activities. Thus, these supply systems and devices define to a certain extent the maintenance and change of daily habits (Birzle-Harder et al. 2013). Therefore, they are of relevance in interventions.

Regarding environmental-related behaviour, the comprehensive modified norm activation model (Klöckner and Matthies 2004) was developed to explain the role of norms as well as the role of habits with respect to behaviour. A *situational cue* (e.g. feeling cold in the office at 20°C) is the starting point in this model. In the *attention stage* - reacting to the *situational cue* – one pays attention to the situation and becomes aware of possible reactions and their impacts. Awareness of behavioural consequences (increased energy consumption by turning on the heat) or perceived behavioural control (knowing alternative possible behaviours) follows as a next step in the model. Regarding the *motivation* to a certain behaviour, the activation of social norms (values or standards within a community, e.g. ‘We have to protect the environment’), personal norms (e.g. being an environment-friendly person as a consequence of the internalization of the social norm), as well as non-moral aspects (e.g. saving money by reducing the energy consumption) are relevant. Often *habits* or perceived behavioural costs (e.g. time, physical or psychic effort of initiating, maintaining and changing a certain behaviour) lead people not to behave pursuant to their (actually environmentally friendly) personal norms. This might have the consequences to not behave in an energy-efficient way. In the *evaluation stage*, not behaving in an energy efficient way might evoke feelings of guilt or shame. **Not** to behave in accordance with one’s personal norms or to discover that one’s personal norms are not in compliance with energy-efficient behaviour may lead to defence mechanisms: e.g. the *denial* of need for a change in behaviour (e.g. „The energy consumption is not so high when I turn on the heat.“), responsibility (e.g. „It’s up to the industry to do fundamental changes in energy saving.“), redefinition of a situation (e.g. „I need warm temperatures in the office to achieve good performance.“) or perceived control (e.g. „The devices in my office for indoor climate are not reliable/ intelligibly.“).

The model is applicable to identify constraints and possible risks of implementing intervention measures. Having the different stages and the role of habits in mind, approaches can be planned in a more concrete and step-by-step procedure.



Modified norm activation model (Klößner and Matthies 2004)

2.2 Intervention strategies

A first approach for a strategy to motivate somebody to change his or her behaviour is to give him or her

- *background information* in order to raise awareness (e.g. reasons why a change of behaviour might be meaningful),
- *information about possible actions* (hints and tips) or
- *feedback information* about energy consumption and related parameters (Kastner and Matthies 2014).

In research and literature, a deficit of knowledge about energy efficient and pro-environmental behaviour can be found in most cases (Karlin et al. 2015; Selvfors 2014). Various examples of concrete information based intervention programmes can also be found in the project list linked to THE4BEES (Roser et al. 2016). Information may be helpful in every step of the modified norm activation model. However, mere information strategies or additional knowledge about environmental issues does not necessarily lead to environmental friendly behaviour - the so called knowledge-action gap (Zainudin et al. 2017). There are other factors like habits/routines, norms or perceived control of behaviour that influence behavioural change as addressed in the *Modified norm activation model* (see above). This is why information should be combined with other intervention strategies (Abrahamse et al. 2007).

Another approach is to 'build bridges', which means that the environment is transformed in order to make a specific behaviour more suitable to achieve a certain goal, or offering the possibility to make new experiences. In contrast, interventions that make a certain behaviour less suitable for achieving goals are 'barrier building' interventions. As we know that peoples' tendency is to make good experiences and to

avoid unpleasant ones, barrier building interventions might lead to negative feelings and to bad evaluations of a behaviour and therefore might lead to ineffective or even negative consequences of the intervention.

Behaviour can also be changed by requesting people to behave in a certain way. However, it also has to be pointed out that without motivation to conserve energy (see modified norm activation model), providing information about how to do it and how well one performs is useless.

In order to be successful, requesting actions should be based on a polite, motivating or casual style instead of combining it with the threat of punishment. Flury-Keubler and Gutscher (2001) differentiate between action appeals with and without arguments. They point out: "Action appeals without arguments are only effective if they can activate a motive that the addressee already has." (p. 120). When arguments are given with a certain appeal, new information such as scientific findings regarding energy consumption or air pollution are supposed to result in the agreement of the addressee and might consequently lead to behavioural change.

Participation processes in terms of involving the target group of a specific intervention, are appropriate to foster positive effects (Kastner and Matthies 2014): Within the implementation process of an intervention in organizations, a wide integration of staff members is to be aimed at as far as possible.

Research also strongly recommends to use **a mix of several intervention types** in order to overcome barriers of changing behaviour and to repeat interventions several times in order to achieve long-term impact (Maréchal and Holzemer 2015). Especially the combination of energy usage **feedback with advice** on how to adjust routines over a minimum period of three months is necessary for the persistence of savings (Carroll et al. 2009; Darby 2006). In contrast, programmes which include **reward incentives** in order to achieve energy savings (extrinsic motivation) lead to short-term behavioural changes that revert as soon as the reward is taken away (Carroll et al. 2009: 35). Another way to combine measures is to integrate environmental interventions into interventions regarding other topics such as integrating information about energy saving in flyers for migrants, for example. When energy consumption is the issue, it could also be linked to information on energy production at local level.

The use of **media**, e.g. photography, music or video can be used to present specific parts of the environment to target individuals of an intervention in order to trigger emotions. Especially **gamification** approaches and **storytelling** can benefit from supportive images or sounds. **Apps**, as situational cues in the field of energy consumption, fulfil different functions. They are appropriate to raise awareness and to initialise a change of behaviour, e.g. by visualisation or giving information about the behaviour of others (role model). Additional functions, such as a weather forecasts, could also make informative ICT tools more attractive (The S3C Consortium 2012-2016).

Even successful interventions tend to show a decrease of its effects over time. Thus, interventions and campaigns should be repeated in order to *stabilise the desired effects*.

2.3 How information should be implemented in intervention strategies

As an example for an often applied approach, a short overview of recommendations is given regarding the provision of information in interventions. According to research (Abrahamse et al. 2007; D'Oca et al. 2014; Karlin et al. 2015; Kastner and Matthies 2014; Klöckner and Matthies 2004; Maréchal and Holzemer 2015; Mourik et al. 2015; Nies et al. 2015) it has to be considered that:

- Present information as tailor-made, accordingly designed, personally, easily understandable, lively and colourful as possible according to the habit strength, knowledge background, intention and environmental constraints of the target group.
- The intervention should be linked to daily life and adapt information to the reference frame of the target group. For example, feedback effects differ between target groups.
- Information should be linked to the addressed behaviour: e.g. prompts at the switch instead of elaborated manuals.
- The impact of current behaviour needs to be explained and the advantage of behavioural change has to be visible and plausible (e.g. depict the water consumption of a five minute shower compared to a ten minute shower).
- Possible actions should be directly realisable with moderate effort (e.g. switch off the light when leaving the room).
- Face-to-face information is more effective than (impersonal) flyers and posters. However, less people can be reached by face-to-face propaganda. A combination of both types of information might be meaningful (e.g. in schools, energy saving topics should be discussed during lessons and supported by posters; in social housing, on-site visits in the flats can be supported by flyers).
- Do not provide too much information on different appliances. Otherwise, this might lead to an overload and drop-outs.

3 Research design and measurement of interventions

Assessing the effect of interventions aimed at energy related behaviour change is a difficult topic. There are many influencing factors on energy consumption so that it is difficult to find out if the triggered change in behaviour of one single person may or may not have led to observed kWh changes. In most cases, a change of behaviour is measured indirectly (through outputs as energy savings) or by subjectively reported behaviour through interviews or questionnaires (Mourik et al. 2015). Especially long-term effects of behaviour change are hardly measured (Gulbinas et al. 2014: 1077). However, missing reliable information about the impact of energy consumption does not necessarily determine the (in)effectiveness of interventions. Regarding the measurement of interventions, a pre-post-design would be desirable, but is often not possible because of the lack of control groups, the lack of sufficient resources or lack of options for pre-test measures (Abrahamse 2016).

4 Conclusion

The human factor in energy consumption is of high relevance. This becomes clear when behaviour is considered. Very often it is neglected when buildings or technologies are planned and designed.

When it comes to behavioural change, it is helpful to understand the underlying processes. To provide a good basis for successful implementation, the selection and combination of suitable approaches for the respective target group requires careful preparation. Because of the impact of habits in everyday actions, the way to an effective energy usage often is a long-term challenge. The various approaches mentioned above may intervene in this behaviour.

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