DESIGNING TAILORED INTERVENTIONS.
A pragmatic segmentation approach to change energy behaviour in residential buildings

A. Sohre[1]*, I. Schubert[1], J. DeGroot[2], V. Kämpfen[1] and P. Burger[1]

1: Sustainability Research Group
Department of Social Sciences
University of Basel
Petersgraben 52, CH- Basel 4051
e-mail: annika.sohre@unibas.ch, web: https://nachhaltigkeit.philhist.unibas.ch/de/home/

2: Faculty of Economics and Business
School or Faculty
University of Groningen
Nettelbosje 2, NL- 9747 AE Groningen
e-mail: j.i.m.de.groot@rug.nl, web: https://www.rug.nl/staff/departments/11669

1. Introduction

In contrast to significant political goals to reduce individual energy consumption the overall household energy consumption has shown stagnation or, at best, a marginal reduction (Statista, 2017). Thus, the efficacy of current instrument designs to reduce energy consumption need to be reviewed and improved.

There is growing consensus that, with regards to interventions, one size does not fit all when addressing household ECB (Klöckner, 2015; He et al., 2010). We can identify at least five rationales for tailoring interventions rather than applying one fits all approaches: (1) *People are heterogeneous*, i.e. there is no "average" consumer. Instead, interventions should be directed and tailored to different consumer (or social) segments. (2) People show *different types of energy-related behaviours*. Therefore, behaviour change needs to be triggered in accordance with the diversity of existing behaviours. (3) People *respond differently to behavioural factors,* i.e. sets of norms, a diversity of values, attitudes and socio-economic factors related to various contexts and circumstances (e.g. different places, accommodations, financial situations as well as knowledge and access to technology, etc). Assuming that

(combinations of) these factors are trigger points to change individual behaviours, it is reasonable to assume that they can be stimulated through tailored interventions. (4) People *do not change their behaviour continuously/linearly*, but behavioural change can be divided into different, no necessarily consecutive phases. Therefore, phase-based interventions have a bigger effect on behavioural change than temporally cross-cutting ones. (5) Finally, people *respond differently to different types and combinations of interventions,* e.g. rational information, price-based instruments or normative appeals. In addition, single interventions are less effective than consistent policy mixes.

Without claiming tailored interventions are the key for a pathway with substantial decreasing energy consumption, we nevertheless identify tailoring interventions as an important element towards this change. The aim of this paper is to develop an approach to systematically set up tailored intervention strategies. We thereby want to answer the following research question: How can different types and packages of instruments be tailored to different groups of people, different types of ECB, different trigger points and different behavioural phases?

To answer these questions, we develop a framework including the above-named features of tailored interventions in a recommendation engine, designed in the Horizon 2020 Project UtilitEE (https://www.utilitee.eu/). We, therefore, not only contribute to the scientific debate on tailoring interventions to change ECB but also address different governance actors, foremost utilities, to set up pragmatic intervention strategies.

2. State of the Art and Methodology

A small but rapidly growing body of literature in ECB (e.g., Klöckner, 2015; Poortinga & Darnton, 2016; Sütterlin et al., 2011) has taken up the task of identifying consumer segments and types of behaviours that are responsive to specific tailored instruments. Mostly, this is investigated in terms of personalized feedback instruments (e.g. Abrahamse et al., 2007; Coleman et al., 2013). Others investigate how instruments can be tailored to different behavioural phases or trigger points (e.g. Bamberg, 2013). However, there is little evidence on how to tailor different designs/mixes of instruments to different societal groups, with varying types of behaviour, trigger points and behavioural phases in real-world contexts.

To this end we conducted a systematic literature review on (designs of) tailored interventions to change ECB. Based on this, we used the method of argumentative reasoning to develop our framework, that builds on two precedent frameworks, Burger et al. (2015) and Bornemann et al. (2018). The two frameworks are further spelled out and adapted according to the real-world contexts of residential and commercial buildings and according business models of utilities in five European countries. This leads to our pragmatic framework and a recommendation engine of tailored ECB interventions.

3. Results and Findings

Important elements of our framework are:

(1) Tailoring to different consumer segments. For group-specificity, we integrate a segmentation approach along the core values (egoistic, hedonistic, altruistic, biospheric), finally distilled into three groups "self-focused", "environmentally concerned" and "socially concerned".

(2) Tailoring to types of behaviours. To be type-specific, our framework refers to energy services and focusses mainly on habitual behaviours in the fields of electricity and heating as main consumption domains.

(3) Tailoring to different trigger points. We integrate different trigger points or factors (multi-factorial), to be influenced by the interventions or ICT tool applied by utilities or other governance actors. These are for example knowledge, values or social norms etc.

(4) Tailoring to behavioural phases and dynamics. Interventions are tailored to three phases of behavioural change (unfreeze, change and refreeze habits), allowing for a dynamic approach to influencing ECB.

(5) Tailoring different types and combinations of instruments. Interventions are tailored different groups of people (recommendations and feedback), types of behaviours and trigger points (recommendations, information, feedback and nudging). It thus combines different tailored interventions in a dynamic approach.

The framework is currently being tested with a recommendation engine. In order to implement the behavioural change framework in real world settings, we spelled out the different elements in the recommendation engine that were then implemented by utilities through a configuration of technical appliances.

4. Discussions and Conclusions

The framework was successfully translated into a tailored recommendation engine to change ECB. Most importantly, the scientific claim of not following a one-size-fits-all approach and tailoring interventions has been translated into a design that is applicable in real-world settings. It tailors different types (and packages) of interventions, by differentiating consumer groups, types of behaviours, trigger points and behavioural phases. Specifically, recommendation are specified for three consumer groups that are identified by a segmentation questionnaire. Preliminary results show that engaging people via the different interventions already decreases energy consumption.

References

[1] Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2007). The effect of tailored information, goal setting, and tailored feedback on household energy use, energy-

related behaviors, and behavioral antecedents. *Journal of environmental psychology*, 27(4), 265-276.

[2] Bamberg, S. (2013). Changing environmentally harmful behaviors: A stage model of self-regulated behavioral change. *Journal of Environmental Psychology*, 34, 151-159.

[3] Bornemann, B., Sohre, A., Burger, P. (2018). Future governance of individual energy consumption behavior change—A framework for reflexive designs. *Energy Research & Social Science*, 35, 140-151.

[4] Burger, P., Bezençon, V., Bornemann, B., Brosch, T., Carabias-Hütter, V., Farsi, M., Hille, S., Moser, C., Ramseier, C., Samuel, R., Sander, D., Schmidt, S., Sohre, A., Volland, B. (2015). Advances in understanding energy consumption behavior and the governance of its change–outline of an integrated framework. *Frontiers in Energy Research*, 3, 29.

[5] Coleman, M. J., Irvine, K. N., Lemon, M., & Shao, L. (2013). Promoting behaviour change through personalized energy feedback in offices. *Building Research & Information*, 41(6), 637-651.

[6] He, H. A., Greenberg, S., Huang, E. M. (2010). One size does not fit all: applying the transtheoretical model to energy feedback technology design. *Proceedings of the SIGCHI conference on human factors in computing systems*, 927-936. ACM.

[7] Klöckner, C.A. (2015). Target Group Segmentation — Why Knowing Your Audience Is Important, in: *The Psychology of Pro-Environmental Communication - Beyond Standard Information Strategies*. Palgrave Macmillan UK: 146–160.

[8] Poortinga, W., Darnton, A. (2016). Segmenting for sustainability: The development of a sustainability segmentation model from a Welsh sample. *Journal of Environmental Psychology*, 45, 221-232.

[9] Statista (2017). Energieverbrauch privater Haushalte, retrieved 19.03.2018 from: https://www.umweltbundesamt.de/daten/private-haushalte-konsum/wohnen/energieverbrauch-privater-haushalte.

[10] Sütterlin, B., Brunner, T. A., Siegrist, M. (2011). Who puts the most energy into energy conservation? A segmentation of energy consumers based on energy-related behavioral characteristics. *Energy Policy*, 39(12), 8137-8152.