No need to save – tailoring energy advice services to medium- and high-income households in an urban environment

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Abstract

Consumption by private households in various areas of demand – housing, mobility, nutrition, services and products – contributes to around 10 % of total emissions in Germany. Of this, higher-income households are responsible for a disproportionate share. At the same time, many households often lack the knowledge, time, or motivation to deal with their own energy-relevant and climate-impacting behaviours. In this context, energy advice services play an important role for raising awareness, activating consumers and imparting knowledge about available options for action. However, conventional energy advice services are mostly limited to the topics of building and appliance energy efficiency – especially for middle- and high-income households – without considering private consumption behaviour and the related social practices as a whole. In practice, there has been little differentiation to date in addressing target groups in a way that takes into account different lifestyles and realities and the underlying values and motivations in a pluralistic society. The present paper presents a methodological approach to develop targeted energy advice approaches in urban environments that are oriented towards the motivations of different types of households with medium and high incomes. It proposes a three-step approach consisting of 1) a microdata-based population analysis to identify and categorize target subgroups, 2) an inventory of existing advice offers with regard to their coverage and approach and 3) a gap analysis based on the results of the preceding steps. Applied to a large city in Germany, the analysis finds that gaps are rarely found with regard to communicated facts but rather the way in which information is conveyed. Accordingly, recommendations relate to more effectively use windows of opportunity and framing of measures to match target group motivations.

Introduction

The transition towards a more sustainable future requires both structural reform of the systems governing our social and economic existence as well as changing behavioural (consumption) patterns. These elements of change are closely interconnected with political and economic framework conditions, which on the one hand are being influenced by changing lifestyles and norms and on the other hand enable (or prevent) more sustainable lifestyles. A concept commonly used to capture the sustainability of individual lifestyles is the carbon footprint (Wiedmann 2008), which measures all direct and indirect emissions accounted to households as a result of their consumption of goods and services. Income has been found to be one of the most important factors determining the carbon footprint of Western households, with footprints generally increasing with increasing incomes (Wier et al. 2001; Dey et al. 2003; Weber and Matthews 2008; Kerkhof et al. 2009; Baiocchi et al. 2010; Buchs and Schnepf 2013; Chitnis et al. 2014; Ivanova et al. 2017). A recent study investigating the distribution of emissions cuts in the EU since 1990 by income level found per capita emissions of German high- and middle-income households exceeding the necessary levels to stay below 1.5 °C by a factor of around 15 and 5 respectively (Oxfam/SEI 2020). While having the financial means to opt for more climate friendly goods and services, households with higher disposable income consume

more and often lack financial pressure as incentive to learn about and pursue more (cost)efficient or sufficient consumption practices. As a consequence, other factors determining the acquisition and practical implementation of knowledge on climate friendly behaviour, such as individual lifestyles and corresponding norms and values (White et al. 2019), gain importance for the design of effective policy responses. A common means to support households with information on possible options for action is the provision of energy advice. Respective offers however tend to focus on technical and behavioural energy efficiency actions while neglecting sufficiency potentials. Furthermore, while the content of a consultancy taking place may to some extent be adapted to individual circumstances, usually (too) little emphasis is placed on designing the content and communication strategy to better match the preferences of specific target groups. Attempts to better align energy efficiency programmes with heterogenous consumer preferences have been made by means of data driven consumer segmentation analyses (Pedersen 2008; Frankel et al. 2013; Ellermann et al. 2020).

The present paper outlines an approach to improve the design of energy advice offers in an urban environment to more effectively reach out to and activate medium- and high-income households in different action fields. To this end, an analysis of household data from a large German city is performed to identify and categorize different target groups according to their lifestyles and corresponding preferences to guide the further analysis. Based on a comparison with the results of an inventory of existing offers and complemented with expert interviews, the study identifies gaps in the current energy advice landscape and derives recommendations for its further development to better harness climate protection potentials of these income groups.

The paper first describes the methodological approach of the study and the data used and/or collected within each step. Subsequently, the results of the different analytical steps and the derived recommendations are presented. The next section discusses the findings and recommendations of the study with regard to their policy implications and highlights limitations of the study design. Lastly, the paper provides conclusions and recommendations for similar research in the future.

Methodology and data base

The development of target group specific advice approaches was implemented within three analytical steps: a target group analysis, an inventory of the energy advice landscape and a gap analysis. In the following sections, the proceeding of each analytical step and their interaction towards the study aim are described in detail.

TARGET GROUP ANALYSIS

In a first step, a hierarchical cluster analysis of household data was conducted to identify different social groups among medium and high-income households and thus define the target groups towards which measures were to be tailored. The analysis was performed using micro data from the national Survey of Household Income and Consumption (EVS). The survey is implemented every five years and collects statistical information on the provision of consumer durables, the income, asset and debt situation, and the consumption expenditure of private households[1]. First, the data set was reduced to those households with equivalised incomes of more than €1,500 per month (representing the threshold value of the first quartile) leaving a total of 1,029 households (out of 1,590) as a database for the cluster analysis. In a second step, the cluster analysis was implemented using socioeconomic variables (age, net income, household size, professional education, living space, social situation) as well as household equipment and expenditures (car, bicycle, television, DVD player, PC, game console, cell phone, refrigerator, freezer, dishwasher, microwave oven, electricity expenditures). The variables used for clustering were selected to enable a subsequent assignment of the household types determined from the EVS to seven different social milieus identified by Ahlert et al. (2015) (cf. Table 1). To this end, average values of these variables within the clusters were compared to the corresponding values of the different milieu groups.

Table 1. Social milieus as identified by Ahlert et al. (2015).

M1 = “Modern Mainstreamers”
M2 = “Young”
M3 = “Established”
M4 = “Large families in rural areas”
M5 = “Disadvantaged”
M6 = “Elitists”
M7 = “Performers”

Since not all of the characteristics included in the cluster analysis were discrete variables and thus average values of the respective clusters could not be defined for all variables in this study, the assignment was based on qualitative as well as quantitative criteria. A quantitative assignment was made for household furnishings, living space, income, and energy expenditures. In each case, the mean value was determined for the entire sample and then the percentage deviation from this mean value for each cluster. The same procedure was followed for the social milieus, which were originally defined in a similar way (i.e., through a cluster analysis of national EVS data, taking into account socioeconomic variables, household equipment and consumption category specific expenditures and subsequent matching on respective mean values with a sample study defining social milieus. For a detailed description see Ahlert et al. 2015). Finally, clusters that showed a similar percentage deviation from the mean as a corresponding social milieu were assigned to it. In addition, variables that did not allow quantitative assignment, such as vocational training or social status, were assigned qualitatively. This cluster assignment made it possible to attribute further sociocultural characteristics to the clusters that were not surveyed in the EVS.

To further derive specific motivations for climate friendly behaviour, participation opportunities for energy advice, and barriers of the target groups, additionally results from pertinent empirical studies were included in the analysis. The

1. It should be noted that the EVS is not a representative sample of the respective city population. Accordingly, the target group analysis does not provide reliable information on the frequency shares of the identified household types. It was not possible to conduct an own sample survey within the scope of the study. Nevertheless, the data allow an assessment of recommendations for exemplary milieus.

considered literature comprised an environmental awareness study conducted in Germany in 2018 (Rubik et al. 2018) and an evaluation of empirical studies on environmentally related consumption and lifestyle research conducted by Schipperges et al. (2018). By integrating results from these three studies, as well as information on the household expenditures and equipment with consumer goods of the clusters, it was possible to characterise whether potentials for energy advice services exist for the examined action fields mobility, housing, nutrition, and products and services. For example, a pronounced mobility behaviour due to high individual mobility at work and increased private long-distance travel was considered an indication of high (energy/emission) savings potential in this field. For the action field mobility, the equipment with cars and bicycles as well as the mobility expenditures were taken into account. In addition, data from the aforementioned studies on travel behaviour, private and professional mobility, and attitudes toward private motorized transport and public transport were included. For the housing action field, the analysis included household furnishings, household expenditures, and housing repair expenditures, as well as data from the three studies regarding housing furnishings.

In addition, it was determined for each social milieu whether addressing them via information and communication media (ICT), such as apps, could be promising. For this purpose, the equipment with ICT (e.g., cell phones and laptops) as well as communication expenditures and data from Ahlert et al. (2015) and Rubik et al. (2018) were analysed, whereby high equipment rates and communication expenditures were considered to indicate an affinity for technology. The basic attitude of the target groups toward environmental and climate protection measures was also derived from the environmental awareness study (Rubik et al. 2018).

To facilitate the subsequent analytical steps and to present the results of the target group analysis in a tangible and concise manner, profiles of representative personas were developed to provide an overview of 1) socio-economic characteristics, 2) distinct lifestyle features, 3) motivations towards climate friendly behaviour, 4) participation opportunities in the different action fields and 5) suitable addresses and barriers for energy advice of the different household types.

INVENTORY OF THE ENERGY ADVICE LANDSCAPE

In parallel to the target group analysis, an inventory of the energy advice offers available for private households in the examined urban area was conducted. The aim was to quantitatively and qualitatively record the current status quo and to categorise them based on a range of differentiating characteristics. Energy advice offers were broadly defined as all passive and active, digital and analogue information services that aim to reduce the energy demand and/or emissions of households. The analysis was carried out in three steps.

In the **first step**, possible measures through which households can reduce their climate impact were identified for the action fields housing (subdivided into energy demand for appliances, heating/hot water/ventilation/cooling, and lighting), mobility, nutrition, and products and services as potential advisory contents. The measures were differentiated according to whether they are aimed at increasing efficiency, sufficiency or consistency, and whether this requires investment or a change in behaviour.

In a **second step**, web-based literature and source analysis (via search engines, databases, and app stores) were used to identify offerings aimed at providing advice on the contents identified in the first step. Both local and supra-regional/national offers were taken into account. Different advice offers of a provider with different foci were counted as independent offers. Subsequently, their characteristics were structured in tabular form with the help of a preliminary analysis grid. The following differentiating features and possible characteristics were used for the structuring:

- **Provider:** Public, non-profit or private sector provider
- **Content:** e.g., behaviour or technology-related (investment); electricity and/or heat; efficiency, sufficiency or consistency; housing or also other action fields
- **Form of dissemination:** digital (website or app), stationary or on site
- **Target groups:** Owners, landlords, tenants or consumers in general.
- **Addressed motivations:** e.g., costs, environment, comfort, innovativeness, comparison with others
- **Coverage (spatial and numerical):** nationwide, urban area, district level; number of people advised (if available)
- **Costs:** free of charge, fee-based (with/without eligibility)
- **Effort for those seeking advice:** low, medium, high

In the **third step**, based on the findings, the analysis grid was refined with regard to the characteristics of individual features or the addition of further features, and a final categorisation was made. The results of the target group analysis were also taken into account here, as household (type) characteristics were used to compare the identified advice needs, motivations and action fields.

In addition, as a complement to the target group analysis, the inventory identified barriers that prevent the target groups from making greater use of the advisory services or impair the effectiveness of the advisory services in terms of the subsequent implementation of recommended measures/behaviours.

GAP ANALYSIS

A two-stage approach was chosen to identify gaps in the current advice landscape as well as potential for further development across target groups and for specific target groups. Figure 1 provides an overview of the process design.

First, a comparison was made between the corresponding findings of the target group analysis and the inventory to determine the extent to which the target groups and their potential action fields and needs are covered by the current offering. An overview of different measures as possible advisory content and the persona profiles – developed as representative of the target group analysis – served as the basis for this. Specifically, the types of measures and their implementation requirements and implications were compared with the target groups' motivations and behavioural/expenditure profiles to qualitatively assess their theoretical open-mindedness to the respective measures. This comparison was carried out on three levels:

- *Does a type of measure correspond to the motives of the target group(s)?* For example, target groups that are opposed to restricting their (consumption) behaviour and do not see themselves as responsible for climate protection were also attributed a low degree of openness to sufficiency approaches or behavioural adjustments in general. Also (spending) behaviour and average equipment rates of households were taken into account when assessing the relevance of various advisory services for specific target groups.
- *Is there an appropriate advisory / information service aimed at inducing the implementation of the measures?* Yes/No
- *Does the form of dissemination of these offers correspond to the needs of the target group?* The study looked at the extent to which the form of dissemination (digital, stationary, telephonic or outreach) and the incentives communicated in the description or advertising of the offer/the advised measures correspond to the needs and motivations of the target groups. In particular, the ICT equipment, innovation orientation and technology affinity of the households served as orientation for the qualitative assessment.

This comparison was then used to initially identify potential for expansion in terms of formats, content, approach and accompanying measures. In addition, further questions for the expert interviews were derived on the basis of the results and potential interview partners were identified.

In a **second step**, expert interviews were conducted with current providers of energy advice services and topic-specific experts to expand the knowledge base regarding advice gaps and barriers of the target groups as well as to gather further impulses for the development of new approaches or the further differentiation of existing approaches. Furthermore, ideas developed by the project team were mirrored with the interviewees to check their relevance and practicability. The interviews also served as an "extended inventory" by examining the extent to which identified gaps in advisory services or own ideas for further development were already covered by services outside of traditional energy advice. This was intended to avoid redundancies in further development and to identify possible synergies, e.g., by networking different services or actors. Six interviews were conducted and recorded via video conference. The documented results of the interviews, together with the upstream analyses (i.e., target group analysis, inventory and gap analysis), formed the basis for the development of recommendations for the further development of the energy advice service and, where necessary, sensible accompanying measures.

The following section presents the results of the analysis structured along the lines of the different analytical steps.

Results

TARGET GROUP ANALYSIS

The EVS based cluster analysis resulted in an optimal cluster solution of 4 types with varying cluster sizes: Cluster 1 (C1) with n = 400 households, C2 with n = 211, C3 with n = 275 and C4 with n = 120. Clusters 1 and 3 were characterized by a similar level of furnishings, living space and electricity expenditures and the qualitative assignment of the characteristics also revealed an assignment to the social milieu M1 for both clusters. Therefore, both clusters were assigned to the "Modern Mainstreamers" milieu and the clusters were aggregated to one cluster in the further course of the analysis. Cluster 2, with a share of 20.6 %, clearly corresponded to the "Established" milieu in terms of quantitative characteristics. The qualitative classifica-

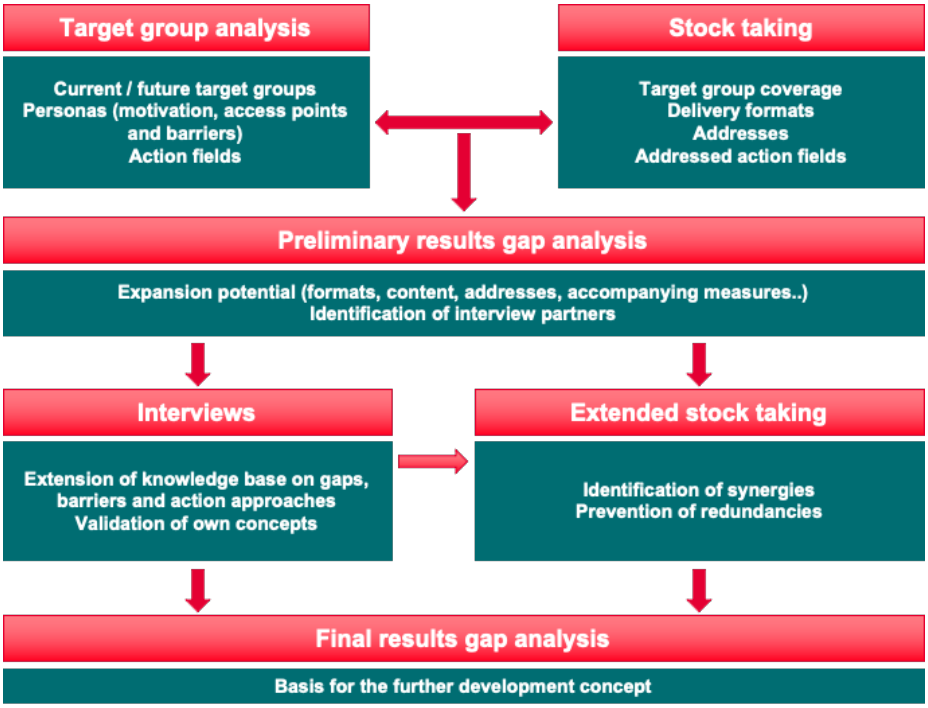

Figure 1. Proceeding of gap analysis.

Table 2. Characteristics overview of the aggregated clusters (based on EVS data).

	Cluster		
	Modern mainstreamers	**Established**	**Upscale**
Share in the EVS sample	65.8 %	20.6 %	13.6 %
Household characteristics			
Number of persons in household	1.51	1.73	3.34
Children living in the household	0.06	0.01	1.56
Living space	72 m²	94 m²	101 m²
Share of HH with space sufficiency potential	75 %	87 %	9 %
Net household income	€2,753	€4,635	€4,621
Ownership rate	18 %	50 %	36 %
Characteristics of main income earner			
Age	57	56	44
Share of pensioners	41 %	37 %	2 %
Equipment			
ICT (% of Ø)	85 %	104 %	124 %
Total equipment (% of Ø)	79 %	104 %	137 %
Expenditure (as a percentage of income)			
Rent	17 %	8 %	12 %
Food	10 %	7 %	10 %
Mobility	10 %	15 %	10 %
Leisure and culture	12 %	8 %	12 %

tion also provided sufficient grounds for the assignment with a match in two out of four cases. In the quantitative assignment, cluster 4 showed a similarly high degree of agreement with the social reference milieus "Elitists" (M6 – 19 %) and "Performers (M7 – 23 %). Since all four qualitative characteristics matched with regard to M7, but only two matched with regard to M6, the cluster was eventually assigned to M7. In order to illustrate the similarities between the two social milieus in terms of the upscale social and economic situation of their members, cluster 4 will be referred to as "Upscale" in the following. Table 2[2] provides an overview of selected descriptive statistics depicting relevant characteristics of the different clusters/target groups.

In the next step, further characteristics such as environmental awareness, as well as attitudes regarding mobility, agriculture, consumption, etc. were attributed to the three target groups using insights from Rubik et al. (2018) and Schipperges et al. (2018). For the "Upscale" cluster, an inference to the social milieus classified in the environmental awareness study and those in Schipperges et al. (2018) was not clear, as the subdivision here was in part more small-scale. According to the socioeconomic variables, two milieus came into question that differed significantly in their environmental awareness. Therefore, in this case the cluster was subdivided with regard to environmental awareness. One target group reflects a rather passive environmental awareness, the other a sustainability-oriented environmental awareness.

The integrated data, consisting of the clusters determined by the EVS analysis as well as the characteristics attributed to the social milieus, were summarized through the creation of profiles of fictitious characters. These so-called personas enable the most relevant characteristics and attitudes of the respective target group to be represented and were used for the following comparison with the inventory. Short summaries of them are presented in the following.

Persona characteristics

Modern Mainstreamers

'Modern Mainstreamers' as rather conservative and community-oriented middle-class households tend to evaluate measures against a possible comfort reduction or gain and the (assumed or perceived) cost-benefit ratio. This leads to the assumption of a fundamentally sceptical attitude with regard to high-investment measures such as energetic renovation or car purchase. These households assess behavioural measures in terms of their comfort effect, so that changing routines is opposed by a corresponding reservation. However, their community-orientation can support the use of sharing offers, again as long as they are not perceived as reducing comfort. The expenditure profile of the households points to a theoretical saving potential in the action fields housing and nutrition.

Established

'Established' households are characterized by high standard of living, innovativeness and affinity for technology. At the same time, they refuse restrictions on their own (consumer) behaviour. Accordingly, technology-focused measures might be most suitable for this target group, motivated by possible gains of status or prestige and the confirmation of the self-image as innovative pioneers. According to their expenditure profile, high theoretical savings potentials lie in the action fields housing and mobility. However, in light of their high equipment rate and consideration of energy efficiency as status symbol, specific measures may already have been exhausted to the greatest possible extent.

2. Share of HH with space sufficiency potential: This potential was defined in reference to commonly applied adequacy thresholds derived from German social legislation (§ 10, WoFG). Accordingly, for a single person a floor area of 45 m² is considered adequate and an additional 15 m² per additional household member. In this study, a downsizing potential was defined if a household is living in a dwelling where the floor area exceeds these household size dependent thresholds.

Upscale (environmentally passive)
The environmentally passive 'upscale' type is characterised by a similar motive profile as the established households. These households are defined as status oriented with a desire of being innovative or pioneers. Compared to the "Established", they have an even stronger negative attitude towards personal restrictions and less interest in energy-related topics. Efficiency-enhancing investments might have a high theoretical potential, which however is possibly also limited by measures already taken.

Upscale (environmentally oriented)
The environmentally oriented 'upscale' households are the group that already implemented many ecological practices and widely purchases green electricity. They are open to social innovations such as sharing approaches, e.g., for the use of technical devices or sufficiency concepts, e.g., regional holidays to reduce air travel.

INVENTORY

The inventory revealed a diverse picture of the energy advice landscape. A large part (31) of the 56 identified information and/or advice offers referred to the action field housing and the energy consumption arising in this field, followed by mobility (9), products & services (8) and nutrition (5). In addition, three offers were identified with cross-sectoral content.

Regarding the **providers**, most of the information and advice services were offered by non-profit organizations (23) or by these in cooperation with the public sector (2). A total of 18 offers were identified by public institutions, two of which are implemented by private-sector partner organizations. Finally, a total of 10 offers were identified by private-sector actors.

With regard to the **content** of the advisory services, a broad range of topics was identified in the housing field, ranging from various energy consumption audits and guides for energy-saving behaviour in the household (efficient cooking, washing, ventilation, heating, etc.) to advice on appliance replacement and technical building measures (insulation, heating replacement, renewable energies) and information on funding opportunities. The identified offers in the field of mobility include information on climate-friendly travel, car-free everyday mobility (in general and especially for families), multimodality (including car sharing) and electro mobility (cost calculator, charging infrastructure and market offer). In the field of nutrition, the offers provide information on ways to reduce food waste (e.g., through correct storage, needs-oriented shopping and food sharing) as well as waste avoidance when shopping. Finally, in the products and services fields, information was provided on climate-friendly financial investments, energy-saving use of digital services (e.g., streaming), and resource conservation through sharing, repairing, or exchanging products.

With regard to the **form of dissemination**, digital offers (41) such as information websites, online tools (e.g., CO_2 calculator), online events (seminars, workshops), apps or online articles or brochures dominated. In addition, 10 stationary as well as 5 on-site advice services were identified. In some cases (3), the stationary offer is supplemented by a telephone advice offer. On the spot advice is offered exclusively in the housing field. Likewise, stationary advice services were largely located in this field (7), with a few exceptions in the fields of nutrition (1) and products and services (2).

In line with the structure of the service providers and the dominance of digital services, almost all information and services (53) were offered free of charge, but also tend to be less in-depth and less tailored to individual needs/circumstances. Some of the free advisory services were also flanked by bonus offers from the provider for the implementation of the measures advised.

With regard to the **motivations addressed**, environmental or climate protection is the most frequently communicated incentive for using advisory services or implementing the measures advised. In 43 of the offers examined, this was cited as a reason. The second most common incentive (32) to motivate households was the prospect of cost savings. Furthermore, increases in comfort (12), innovativeness (9), positive health effects (8) and increases in public welfare (3) were associated with the implementation of the advised measures.

GAP ANALYSIS

Following the procedure described above, first target groups were assigned suitable advisory content with view to the characteristics outlined in the persona profiles. Using this reduced set of measures, a comparison was made with the advice landscape, in how far corresponding offers existed. In consideration of political priorities and the field specific emission saving potentials of households, the focus of the analysis was narrowed to the action fields housing and mobility. The comparison showed that the majority of the suitable advice content was already covered by existing offers. However, to become effective in terms of promoting climate friendly (investment) behaviour, households need to be motivated to make use of available offers in the first place. Accordingly, a conclusion was that a further development should focus on the question of target group specific communication of advisory content and overcoming barriers to implementation.

Table 3 provides an overview of the measures and approaches that have been identified as suitable for further development in the two action fields housing and mobility. The brackets indicate where in principle a measure would be suitable for the target group but it is unclear whether a majority of households have already implemented it or have general reservations with regard to costs, comfort restrictions or digital applications.

Interview results

The expert interviews provided further insights to action field specific barriers for both the use of existing and potential new offers as well as the subsequent implementation of advised measures. In addition, interviewees pointed out gaps in the current advice landscape and suggested possible innovative solutions to improve outreach and effectiveness of advice offers. The following paragraphs present interview results by action field with regard to selected topics and present general recommendations with regard to the design of advice offers.

Housing
Advice on optimizing the living space of older households, also with regard to accessibility, was confirmed as a relevant topic. According to a provider of such services, these were frequently requested by single women (approximately 80 %) and to a less-

Table 3. Overview of suitable advisory content/measures per action field and target group.

Action field	Advisory content/measures	Target group			
		M	E	U1	U2
Housing	Energy renovation	(X)	(X)	(X)	X
	Living for the elderly (Housing remodelling; apartment swaps)	X	X		
	Saving energy in everyday life (behaviour)	X			
	Use of ICT/energy-saving apps	(X)	X		X
	Appliance replacement	X		X	
	Renewables (PV, heating) + storage		X	X	X
	Smart-Energy-applications		X	X	X
Mobility	Economical driving behaviour	X			
	Use of ICT/mobility apps	X	X	X	X
	P2P sharing in the neighbourhood (legal questions of shared vehicle use)	X			X
	Regional vacation; sustainable travel/tourism	X			X
	Sustainable family mobility				X
	Switch to e-mobility		X	X	X
	Modal shift		(X)	(X)	X

Note: M = Modern Mainstreamers; E = Established; U1 = Upscale (environmentally passive); U2 = Upscale (environmentally oriented).

er extent by couples and single men. The motive is often self-determined living in old age with social connection (society, security, support). Financial problems, on the other hand, were said to be rarely a reason for seeking advice.

With regard to the reduction of living space through apartment swaps, the emotional bond and apartment and living environment was named as a central barrier. Furthermore, older households were said to shy away from the effort involved. On a structural level, barriers with regard to finding open spaces for the development of community housing projects and their financing due to increased land and construction prices were pointed out.

While there are advisory services for barrier-free and/or communal living in old age, these are not linked to energy issues or aimed at exploiting space-saving potential (e.g., by swapping or converting apartments for communal use). In addition, there are neither financial nor practical support offers for the implementation of the latter. Accordingly, a novel advice offer should both aim to integrate information and implementation support and better link individual needs with climate protection targets.

Mobility

In the mobility field, the purchase of electric vehicles (including pedelecs), traffic safety as well as climate-friendly travel were named as topics on which information was often requested. In the field of leisure mobility, e.g., with regard to air travel, the interviewees identified a strong defensive reflex against external influence. In addition, as in everyday mobility, routines and habits act as a strong barrier for change. For example, the large car is seen as a requirement for a comfortable (family) vacation or to ensure the safety of children. In the professional context on the other hand, the target groups have little influence on the design of mobility, e.g., for business trips.

Generally, the advice contents should be tailored against the background of the individual physical, family, professional situation as well as the infrastructural circumstances. With regard to the current advice landscape, a lack of such permanent target group specific offers was pointed out. Also, the potential of digital advice formats has not yet been sufficiently tapped.

Elements of effective advice

Generally, guidance should be understood and communicated as part of an overarching political vision or strategy. A customised advice should be linked to specific conditions, such as existing infrastructure, economic incentives and regulation.

To facilitate the access for the target group, the offer should have a low threshold to minimise the effort to find the right service. Local services bureaus, visiting or video advice and the linkage with other topics of real-life situations can help.

In personal sessions – whether in a local facility, on site or at public events – the trustworthiness and credibility of the advisors play an important role. In addition to thematic knowledge, authenticity is important: the advisor should be convinced of what he or she is offering, and ideally have experience of it him- or herself. A person from one's own peer group, i.e., people from the same social groups, usually supports confidence.

In addition, the advertising of advice services as well as the advice measures themselves should correspond to the motivations of the target groups next to rational motives, decisions to accept an offer are also made on an emotional level (Liebel 2011). For example, the promotion of an electric vehicle can work better on the basis of aspects such as acceleration or prestige than (solely) through a contribution to climate protection. Also, being financially solvent, the target group is not in need for saving costs but partly interested in the visibility of their investments. Others are reluctant against a decrease of comfort but interested in its increase. In this regard, the motivation for energetic measures in buildings can be a higher indoor comfort in winter or hot summer times rather than saving energy costs.

Last but not least, the right time can be decisive to not only conduct a consultation but also take it up and implement the advised measures. These so-called 'windows of opportunity' can be biographical turning points, e.g., the founding of a family or child birth, a relocation, a new job, children moving out or retirement. Turning points are often accompanied by changes in routines, such as:

- New routes to work or in a new neighbourhood can lead to changed mobility behaviour.

- The purchase of a property and moving are occasions for conversion and modernisation measures.
- Starting or growing a family changes the need for mobility, as does the entry of children into day care, kindergarten or school.
- Retirement may result in more time capacities and changed daily routines, which are associated with more or less environmentally and climate-relevant activities and decisions.

These kinds of disruption of daily life can motivate changes in routines. Regular advice services normally do not know about these changes in rather private areas. Thus, to address the target groups in specific situations or at the right times it might make sense to cooperate with other institutions or multipliers. Some examples will be described in the following.

Recommendations

Eventually, the recommendations comprised 15 measures for an extended energy advice programme tailored for the four identified target groups of medium and high income: seven in the field of housing, five in the field of mobility and one targeting both fields (cf. Table 4). The recommendations referred to the further development of existing measures in terms of more strategically using windows of opportunity and/or target group specific framing (#1, #6, #7, #8, #11, #12, #13, #14), the development of novel services (#2, #3, #5, #9, #10) or the use of intrinsic motivations (#4, #15).

To elaborate a bit further on the proposed measures within the restricted length of the paper the following examples shall explain in more detail the tailoring of the recommendations addressing the four target groups specifically.

Housing for elderly: Adjustment of living space

What used to be family-friendly living can become a burden after the children moved out and with reduced physical ability of increasing age. Elderly households in (too) large flats and houses report they could imagine downsizing but often do not find the right alternative. The target groups considered here live in relatively large dwellings, and some of the children have already moved out or will be moving out in a few years. Thus, they may be interested in adjusting their housing conditions in case that upkeep becomes a burden or the dwelling is not barrier-free.

Roughly spoken, three kinds of housing adaptation can be distinguished: Moving, subletting and conversion. A major obstacle to moving is that re-renting or buying a new home can easily be just as or even more expensive than the former larger flat. Furthermore, emotional bonds with the neighbourhood may represent an additional strong barrier to move. In case of renting, the option of a flat exchange, as it is already practised in some cities, can be supported. To address both the financial and emotional obstacles for a more sufficiency-oriented distribution of living space, advice and implementation support offers thus need to be accompanied by intelligent urban planning in combination with conducive regulatory frameworks and financial incentives for owners and tenants.

Community housing projects (e.g., shared flats for the elderly, multigenerational living) can offer adapted forms of housing. Overall, there appears to be an increasing interest in new housing concepts apart from one's own household. Information could also be passed on in a targeted manner via energy advice. These kinds of projects might be interesting for the environmentally oriented 'upscale' households.

Especially for the target groups of the 'established' and environmentally oriented 'upscale' households it might be interesting to move into a serviced apartment. These apartments still offer the privacy of a separate household but also provide help and care, which can be booked as needed. Even if the flats tend to be smaller than the current flats, they represent an increase in comfort due to the additional services.

For those who do not want to move, energy advice can also raise awareness of possible adaptation measures through targeted conversion. These can be, for example, the separation of individual rooms or the division of an apartment or house into two apartments. Depending on the layout of the flat, it may also be possible to sublet individual rooms, areas or granny flats without construction. Subletting might be an interesting option for the group of the 'Modern Mainstreamers'.

In all the target groups elderly women are particularly represented. For them, projects such as "Wohnen für Hilfe" (Living for help) might be interesting: students live in subletting in the households of older people and compensate for the relatively low rent by helping out in the household.

The windows of opportunity for these options are children moving out, retirement, or during other kinds of consultations such as energy advice, advice and planning services by archi-

Table 4. Overview of recommended measures by action field.

Housing	Mobility	General
1. Energy advice during the purchase of a property	8. Economical driving behaviour	15. Energy saving competition
2. Energetic retrofit guidance	9. Smart advice: Mobility app	
3. Housing for elderly: adjustment of living space	10. P2P sharing in the neighbourhood (legal questions of shared vehicle use)	
4. Energy saving in everyday life	11. Regional vacation; sustainable travel/tourism	
5. Smart Energy applications/Energy saving apps	12. Sustainable family mobility	
6. Replacement of inefficient appliances	13. Switch to e-mobility	
7. Renewable energies + storage	14. Modal shift	

tectural bureaus in the case of modernisation, conversion, or extension, consultations on the subject of "living in old age" and accessibility or consultations on the subject of security and burglary protection.

These options might be part of online advice offers to address those who seek information on the internet, which can be assumed for the target groups of the 'Established' and the 'Upscale' in general. In case of a personal consultation the advice from a person of their own peer group can be particularly useful as "housing" is a private and sensitive topic.

The topic 'adjustment of housing size' has been little publicised so far, but is increasingly attracting attention, especially in strained housing markets. Advice should therefore take place as widely as possible in order to raise awareness of the topic among the target groups: online, in stationary advice facilities on the above-mentioned topics, and during on-site advice with other housing and building related topics. The offer can be supported by innovative campaigns such as the possibility of "test living" in a housing project or a serviced apartment.

Family mobility

Families have special mobility needs, from transporting prams and other paraphernalia for toddlers, to getting to kindergarten, school, or to the children's leisure activities. When starting a family, mobility patterns change. Even ecologically oriented households often see the need to buy a (larger) car to meet their mobility needs without stress. When children go to kindergarten or start school, their mobility needs change again. Dropping them off "briefly" on the way to work is a practical solution for many families. Alternatives to this can be cargo bicycles, possibly with electric pedal assistance, "walking buses" in the sense of organised groups that walk to school together with several children, and other non-motorised variants. To counter comfort as a strong driver of individual (motorised) transport, positive effects on children safety in the drop off areas may serve as a powerful narrative to promote alternative solutions.

In younger generations, car ownership has declined in recent years (Nobis & Kuhnimhof 2018). With a corresponding expansion of infrastructure and organisational offers for collective transport for children, the switch to the car can be avoided, especially for young families. In cooperation with kindergartens, schools, family facilities and organisations such as the Verkehrsclub Germany e.V. (VCD), appropriate information can be brought to the target groups.

This measure is mainly interesting for the group of environmentally oriented upscale persons in the starting or growing a family phase, with children starting kindergarten or school. The motivation for the parents can be seen thematically with references to health, social and safety-related advantages of car-free mobility, as well as their children's independence.

The topic of sustainable family mobility can be addressed by multipliers, e.g., antenatal classes. The organisation of "walking buses" can be developed in cooperation with schools and kindergartens and might be most successful in a neighbourhood-specific approach in rather homogeneous districts (e.g., neighbourhoods with many families). Campaigns and advice activities in the vicinity of kindergartens and schools, as well as in cooperation with sports clubs or other providers of leisure activities for children can also be successful.

Discussion

The described approach in this paper provides public decision makers with a means to develop differentiated strategies to reach and activate specific target groups for more climate friendly lifestyles. The analysis has shown that while there is an abundance of offers that cover information on most imaginable measures, few are targeted at specific groups in terms of communication and the linking of topics that are of interest to them. Accordingly, there is a current gap in the energy landscape of the examined city, which can be filled using the developed recommendations. At the same time, particularly the results of the expert interviews underlined the importance of embedding advice programmes into an overarching policy package, which additionally provides for an economic and regulatory environment that promotes the alteration of behaviour and investment routines.

Despite its merits in terms of providing policy makers with a better decision basis for the design of targeted energy advice programmes, the approach has several limitations. These relate to the data basis, the connection of household composition, equipment and expenditure data with social milieu characteristics, the implicit assumption of homogeneous preferences within milieus and the low specification of details within the recommendations.

First, as pointed out, the survey data used for the target group analysis in the target city is not from a representative sample, which restricts policy makers' ability to prioritize among the different target groups with regard to their share in the population. In other contexts though, in which representative data is available, a more precise analysis of household cluster characteristics is possible further increasing its value as a decision basis.

Second, the attribution of consumption related preferences to the different household clusters based on quantitative and qualitative matching of their characteristics with the results of previous studies may not sufficiently consider other relevant predictors/influencing factors such as values learned during upbringing. Accordingly, the derived persona profiles used for determining suitable advice content/communication forms can only provide a rough orientation regarding the target groups' open-mindedness towards specific measures. An alternative but also more time and resource intensive approach would be the design and implementation of an own (representative) survey comprising all household characteristics including lifestyle related information. However, this approach may not fit the restrictions of strained municipal budgets.

A third limitation is more general in nature but may in effect favour a preference rather than milieu-oriented design of energy advice programmes. While contradicting the chosen approach in this study, one of the interviewed experts pointed out that there is increasing evidence of non-stable consumption preferences across action fields within milieus. In combination with the other insights on effective advice, further spatial differentiation of advice offered in line with local demographics, infrastructure and civic society structures may be sensible.

Lastly, the modular nature of recommended measures reflects both the requirement of flexibility to choose on side of the client but also a lacking depth of the analysis with regard to specific on-site circumstances. While providing a rich toolbox to choose from, the adaption to the respective environment still

lays with the local authorities. Furthermore, a field test to examine the suitability of the outlined options to reach and activate medium and higher income households within the defined action fields is still pending.

Conclusions

The present study outlined a mixed methods approach to provide policy makers with an analytical basis to decide on the further development of energy advice services in an urban environment. A modified and extended energy advice can directly address the specific needs of each target group by analysing the target groups and their realities. The concept for the (modular) further development of the examined city's energy advice landscape was developed with regard to the identified advice gaps and comprises target group specific approaches that are tailored to the respective lifestyles and value systems.

The analysis indicates that in many instances it is not the lack of information opportunities that prevents climate friendly investment/behaviour but rather a lack of tailored offers matching the preferences and circumstances of specific target groups. Thus, the study concludes that rethinking energy advice with regard to how (motivation), when (window of opportunity) and where (situations and multipliers) to address which target group can be a promising approach. However, it would be interesting to know in more detail if the targets groups are aware of the already existing offers, if they are interested in or conducted consultations already and if the advice matches their expectations and needs. Based on this, it could be concluded if the existing options fit for the target groups but lack communication and advertisement or if the design and/or content of the advice needs to be adapted. Accordingly, the next step now would be to implement, test and evaluate these kinds of approaches.

Furthermore, advice services may only be effective to induce behavioural change if they are flanked by other political measures changing the economic and structural framework conditions, which shape daily consumption decision making. Accordingly, thinking about motivating specific groups within society to alter their living patterns needs to start from an analysis of structural enabling and preventing factors.

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